



Health & Safety

Hazardous Substances Policy

(Safe Purchase, Storage, Transportation and Disposal of Hazardous Substances)

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<i>Authorised signature</i>	David Conner, Health & Safety, School of Applied Sciences

¹ or earlier if change in legislation or on risk assessment

Amendment Control

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1.0	Nov 2021	
2.0	Jun 2023	Addition of S15 Transportation of Hazardous Substances

Health & Safety
Finance & Operations

health&safetyoffice@napier.ac.uk

Policy Summary

The University has a responsibility to comply with The Control of Substances Hazardous to Health Regulations (COSHH) in regard to the purchase, storage and disposal of hazardous substances.

These regulations are to ensure both the health and safety of staff, students and other individuals who may be affected by hazardous substances within the University and to ensure the university is complying with local rules and current regulatory requirements.

This policy is appropriate for all individuals who may handle or are responsible for the purchase, storage, or disposal of hazardous substances.

The policy covers:

- Purchase and delivery of hazardous substances
- The Hazardous Substances Database
- Safe storage of hazardous substances
- Safe disposal of hazardous substances
- Safe transportation of hazardous substances

From initial purchase through delivery, storage, use and finally disposal it is essential that Schools/Services prevent or reduce the exposure from hazardous substances to workers by:

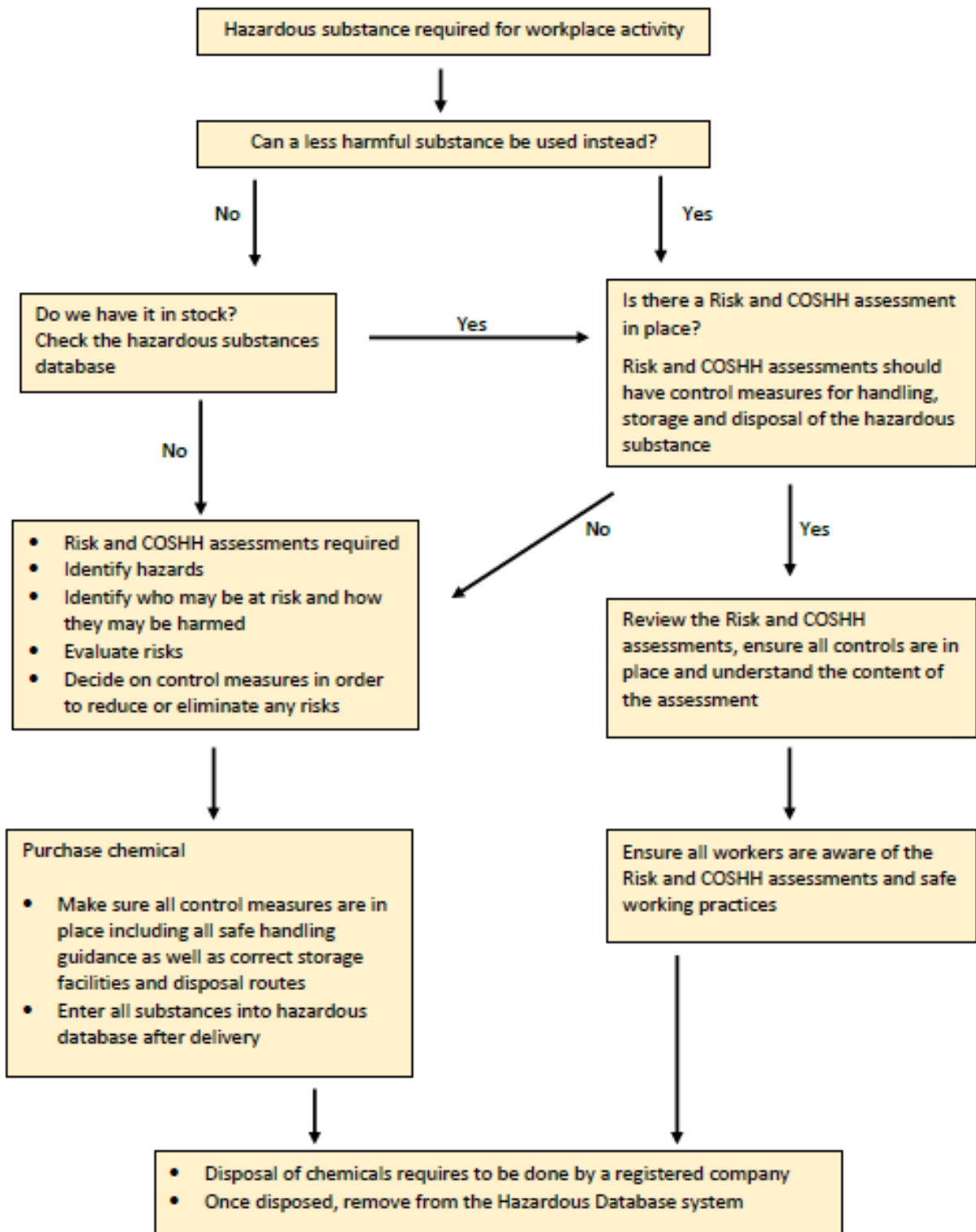
- Identifying any hazards
- Identifying who may be at risk and how they may be harmed
- Evaluating risks
- Deciding on control measures in order to reduce or eliminate any risks

Risk and COSHH assessments will be required for any work involving hazardous substances.

Staff, students and other individuals should be given appropriate training or instruction prior to working with hazardous substances and should be made aware of any control measures in place.

This policy will provide guidance but is by no means exhaustive and in all cases the material safety data sheets (MSDS) **must** be referred to in order to determine safe storage and disposal procedures of any hazardous substances.

Safe Purchase, Storage and Disposal of Hazardous Substances - Flowchart



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1. Introduction

The University has a responsibility to comply with The Control of Substances Hazardous to Health Regulations (COSHH) in regard to the purchase, storage and disposal of hazardous substances.

The COSHH regulations are in place to protect staff, students and other individuals who may be affected by the hazards of the University's work involving substances hazardous to health. The regulations apply to all substances hazardous to health, not just to pure laboratory chemicals. Substances such as cleaning materials, construction materials, etc. are covered by the regulations.

These regulations apply to all Schools/Services across the University who purchase hazardous substances and includes guidance on all storage areas such as laboratories, workshops, internal storerooms and external storage units.

Each School/Service (or nominated personnel) is responsible for ensuring that:

- any purchase of a hazardous substance is required and that no alternatives can be used
- Risk and COSHH assessments are in place for the purchase, storage and disposal of any hazardous substances
- storage containers/cupboards/units used for storing hazardous substances are suitable and appropriate for the type of storage required.

Once purchased it is the responsibility of the School/Service area to ensure hazardous substances are recorded on the University's Hazardous Substances Database. It is also the School/Service area's responsibility to make sure substances are stored safely and securely until required for use and that disposal guidelines are properly followed and that substances are disposed of safely.

2. COSHH and DSEAR

2.1. COSHH

COSHH stands for the Control of Substances Hazardous to Health. COSHH is a set of regulations put in place to protect workers from ill health when working with specific substances and materials.

Hazardous substances covered by COSHH include liquids, solids, fumes, dusts, vapours, fibres, mists and gases as well as biological agents such as bacteria and viruses. The harm or ill health part includes damage to lungs, skin, nose, mouth, genes, internal organs, eyes or central nervous system. Hazardous substances can harm people through:

- Contact with the skin (touch or spillage)
- Inhalation (breathing in vapours, mists, gases or fine dusts)
- Ingestion (through eating or swallowing)
- Injection (through a puncture in the skin or a cut)

Hazardous substances can also cause harm due to combustion or explosion.

Schools/Services are required to prevent or reduce the exposure from hazardous substances to workers (staff, students and other individuals) by:

- identifying any hazards
- identifying who is at risk and how they may be harmed
- evaluating the risks
- deciding on control measures



2.2. DSEAR

Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) are regulations aimed to protect employees from hazardous substances that may harm them through fire and explosion.

Dangerous substances that could, if not properly controlled, cause harm to people as a result of a fire or explosion can be found in nearly all workplaces and can include things such as:

- Solvents
- Paints
- Varnishes
- Flammable gases
- Dusts (from machining and sanding operations)
- Dusts (from foodstuffs)

DSEAR requires the University to carry out risk assessments in order to identify hazardous substances that could have a fire or explosion risk and to put in control measures to either remove the risks or by reducing them.

Nominated, trained individuals are required to:

- Carry out suitable and sufficient assessments.
- Ensure that the necessary controls are implemented and used.
- Disseminate the relevant information to staff and students in this area.
- Review the assessment at regular intervals or if there have been any material changes e.g. new chemicals, processes, equipment and/or locations.

- Input all chemicals into the University Hazardous Substances Database and update as required.

For COSHH and DSEAR Regulations Schools/Services also have a duty to:

- Ensure any control measures are being used and are working properly.
- Provide information, instruction and training for any staff, student or other individuals working with hazardous substances.
- Provide monitoring and health surveillance in appropriate cases.
- Plan for emergencies such as accidental leaks or spillages.

3. Guidance for purchasing hazardous substances

Each School/Service will need to consider how hazardous substances are delivered into the University and from there transported to the appropriate work area, e.g. laboratory, workshop or other storage facility. The likelihood is that the person raising the order will not be the end user of the substance and will not want the hazardous chemical delivered to their office. A delivery location, either to a reception/iPoint or to another delivery/receiving area must be in place prior to any purchase being made. This delivery point can be discussed/arranged through Property and Facilities and the stores personnel.

Each School/Service must ensure:

- That all relevant Risk, COSHH (Control of Substances Hazardous to Health) and DSEAR (Dangerous Substances and Explosive Atmosphere Regulations) assessments are carried out as required.
- That a register of staff exposed to hazardous substances is established and ensure, where required, staff receive the relevant Health Surveillance.

3.1. Pre-purchase

In order to process the safe purchase of a hazardous substance it is essential that all checks and control measures listed below are in place prior to placing any order. These are:

- That checks are made to ensure that stocks of the hazardous substance are not already on site and that excessive quantities are not purchased.
- That the purchase of the hazardous substance is required and that there are no safer alternatives available.
- That a safe delivery destination is established on campus and hazardous substances are not going to be delivered to offices/left on desks etc.
- That stores/delivery personnel are aware of the location of a delivery point and are able to deliver hazardous substances safely and securely.

- That suitable storage is in place before any purchases are made. Checks may be required to ensure your school/service area has appropriate safety cabinets or storage areas, with appropriate signage were required (see section on [Safe Storage of Hazardous Substances](#)).
- That a nominated person is able to move delivered substances from the delivery point to an appropriate storage container/area (see section on [Safe Storage of Hazardous Substances](#)).
- Suitable disposal routes must be considered prior to purchase and use (see section on [Safe Disposal of Hazardous Substances](#)).
- Disposal methods must be in place not just for the pure chemical that has been purchased but also for any products or by-products that may be generated through the working process.
- Thought should also be given for any excess substance left over following any workplace activity plus the potential of any accidental spillage.

3.2. Post-purchase

- Any substances purchased should be logged onto the University's Hazardous Substances Database on receipt (see section on [Hazardous Substances Database](#)).
- Substances should be stored in appropriate containers (see section on [Safe Storage of Hazardous Substances](#)) until required for use.

4. Training

Training should be provided for any personnel (staff, students and other individuals) who may come into contact with hazardous substances.

Training can be in the form of:

- Formal classroom based/online training courses
- On the job training/instruction

5. Information

Suitable and sufficient information should be passed on to any member of staff, student or other individual working with hazardous substances.

This information can be:

- MSDS (Material Safety Data Sheets) – see section on [Chemical Hazard Information](#)
- Risk assessments
- COSHH assessments
- DSEAR assessments
- Any other relevant information regarding the hazardous substances being used

6. Hazardous substances database

Maintaining an inventory of chemicals stored at Edinburgh Napier University (either in laboratories, workshops, store cupboards or in outside storage units) is required.

Edinburgh Napier University has an electronic inventory management system (Hazardous Substances Database) in place. Nominated users can access the site and input in new chemicals on arrival, adjust any amounts of substances that have been used and remove any substance that is no longer onsite.

- It is essential that should the substance be moved to another storage area within the University, that this information be updated on the database.
- Any change in the amounts being stored, either through usage or through more of the substance being purchased, must also be updated in the database.
- The database should also be updated when a substance is no longer being stored within the University either from being used completely or disposed of. In these cases the substance(s) should be removed/deleted completely from the database.

Note: To become an authorised system user, you must contact the [Health and Safety Team](#).

Emergency Services: should the emergency services require access, in the event of say a fire to a laboratory or workshop, they may be reluctant to enter the area because of doubt over what chemicals are present and how safely they are being stored. This can mean that valuable time is lost and a situation that would have been easy to deal with leads to major loss. The database can be accessed remotely and so the emergency services are able to ascertain which substances are in which location before they enter the premises.

With this in mind it is essential the database be kept up to date.

7. Chemical hazard information

Chemical hazard information about the hazards posed by chemical materials is available from a number of sources including:

Material Safety Data Sheets (MSDS)










- Suppliers are required by law to provide up to date hazard information for their products which have been classified as hazardous to supply.
- Safety data sheets must include information about the properties of a substance, the hazards posed, handling, storage, disposal and transportation instructions including exposure measures.
- A paper copy of the MSDS will be supplied with any new hazardous substance purchased.
- Should this be misplaced, or lost, electronic copies of the data sheets can be found on the supplier's websites.

Note: the safety data sheets will only have information on the substance you have purchased. Any products/by-products created through laboratory work/experiments will have different properties to the original substance and possibly different hazards.

Container Labels

- Suppliers must label a substance according to Classification, Labelling and Packaging Regulations EC 1272/2008.
- Container labels should contain the supplier contact information, the approved or trade name of the substance, the nominal quantity supplied and all relevant hazard statements, pictograms, signal words and precautionary statements.

Hazard Pictograms

								
Health Hazard	Toxic	Corrosive	Harmful/Irritant	Flammable	Oxidising	Explosive	Compressed Gas	Harmful for the Environment

8. Safe storage of harmful substances

It is essential that all hazardous substances are stored correctly and there are a range of storage facilities suitable for storing these substances in laboratories and workshops. Some of these storage units are designed specifically for different types of hazardous substances. It is important to know which storage units can be used for which type of substance.

8.1. Safe storage

a) Labelling

All containers should be labelled clearly with the following information:

- Name of substance
- Hazard category (flammable, corrosive, oxidising, toxic etc.)

b) Compatibility

Incompatible substances must be stored separately. Poor or incorrect chemical storage practices can lead to inadvertent reactions between incompatible materials with the potential to cause harm, fire or even explosions. All chemicals should be stored in such a manner as to prevent incompatible materials from being accidentally mixed together in the event of the breakage of one or more containers in the storage area, or to prevent the formation and build-up of reactive vapours.

The correct storage of chemicals within storage areas/stock rooms, workshops and laboratories is an on-going problem which can sometimes be complex and potentially confusing. The overall purpose of correct storage is to maintain control over the chemicals so that they can be both stored and retrieved safely.

c) Quantities

It is important to keep stock levels of hazardous substances to a minimum level that is reasonable for the level of usage in the laboratories/workshops. Larger amounts, especially flammable liquids, should be kept in external storage units and only brought into the main campus building in smaller, more manageable volumes. Chemicals stored at the bench or other work areas should be those that are used frequently and quantities should be limited to the minimum that is convenient.

d) Good housekeeping

This is essential in all laboratory/workshop areas but also very important in storage rooms/cupboards/shelving units. These should be kept clear and tidy and not be cluttered. Breakages and spillages are far more likely if storage arrangements are cramped, overcrowded or there is limited visibility.

e) Stock control

Regular reviews of what substances are being stored should be carried out and older, out-of-date and unwanted chemicals should be disposed of. Attention should be paid to expiry dates and the date a bottle was first opened. Some materials will deteriorate or decompose on extended storage.

8.2. Storage facilities

Storage facilities need to serve several functions:

- Strong enough to carry the weight of the stored material.
- Must be compatible with the materials stored.
- Must be easily cleanable.
- For flammable liquids/solvents, the storage facilities must have suitable resistance to flame and heat and not distort or melt for a sufficient period of time.
- For storage of corrosives (acids and bases), the material must be compatible with, and resistant to, the corrosive nature of the stored material.

a) Shelving

- Shelves should not be too high. Workers should not be accessing shelves via lab stools or by climbing on benches.
- Shelves should not be overloaded.
- Liquids should be stored on shelves at a safe, appropriate height i.e. not too high.
- If new shelves are required to be fitted this should be requested through Property and Facilities.

b) Flammable solvent cabinets

Flammable liquids should be stored in clearly labelled, flammable-liquid cabinets (flame-resistant metal cabinets) which are at least:

- Of 30 minutes fire resisting construction.
- Robust enough to withstand foreseeable accidental damage.

- Able to retain spillage equivalent to 110% of the contents of the largest container.
- Appropriately labelled to indicate contents and signed to indicate the nature of the hazard.
- Sited so as to ensure adequate separation of incompatibles, and away from sources of heat or ignition, as necessary, and away from hazardous areas and emergency escape routes.

The maximum volume of flammable liquid that should be stored in such a flame-resistant cabinet(s) in a laboratory or workshop is 50 litres, regardless of the capacity of the storage cabinet(s).

c) Acid cabinets

Wooden cabinets provide excellent strength for storing corrosives. Their laminate finish offers a high level of chemical durability. In some laboratories/workshops older metal cabinets have been used for storing acids and over time these will start to show signs of corrosion. Wooden cabinets should not be used to store oxidising acids such as Nitric or Perchloric. These should be stored in ventilated cabinets (see below).

d) Ventilated cabinets

These are cabinets which are fitted with forced ventilation. They may be sited under a fume cupboard and attached to its ducting system or they may be free standing. These cabinets are designed to store chemicals that give off noxious fumes and smells.

e) Fridge and freezers

Domestic fridges and freezers can be used to store certain hazardous substances.

- Flammable substances must **not** be stored in domestic fridges.
- Laboratory fridges that do not have an internal light source or thermostat must be used.
- Laboratory fridges (or Spark proof fridges) that do not have an internal light source or thermostat can be purchased from various laboratory equipment suppliers.

Flammable liquids must not be stored in cold rooms that do not have explosion-proof wiring and fixtures. Such storage facilities pose explosion hazards because the various control switches and defroster heaters can spark and ignite flammable vapours.

f) Fume cupboards

The storage of hazardous substances within fume cupboards is strongly discouraged, unless it is for the reaction at hand, as materials stored in the fume cupboard can adversely affect the containment provided and increase the risk of accidental spillage and/or contact with incompatible substances. Materials stored in fume cupboards may disrupt the airflow making the fume cupboard less efficient and compromising the safety of the user.

g) Spill trays

Certain storage cupboards will have lipped trays or banded shelves. These are in place to reduce the spread of materials from spillage or leakage beyond the confines of the cupboard.

The same principle can also be applied to rooms where the floor is banded and the threshold of the door is raised to contain and prevent the spread of any spilt material.

Some flammable solvent cabinets will have lipped shelves with holes in the bottom that allow spilt material to flow through and collect in a sealed sump at the base of the cabinet.

h) Safepaks

Safepaks are plastic secondary, over-packing containers which can help contain toxic or volatile chemicals. They come in various sizes and fit over the chemical bottle/jar. Some of the sizes (100ml to

1L) are clear plastic which allows the label, condition and contents of the inner container to be checked before opening. They also allow the safe transfer of hazardous or malodorous materials from the storage location to a contained area such as a fume cupboard before opening.

9. Storage of different materials

It is essential that chemicals that are incompatible with each other are stored separately. Incompatible chemicals stored together could react and the generation of energy may be extremely violent resulting in explosions, fire or the release of toxic vapours.

The most common chemical storage practice is that of simply storing chemicals in alphabetical order on shelves. This often results in incompatible chemicals being stored together. Chemicals should not be stored alphabetically unless they have first been separated into their hazard classes.

There are no absolute rules on how many classes of chemicals should be segregated. The degree of segregation will depend upon the risk. However, isolation of chemicals into the basic hazard classes will eliminate most accidental adverse reactions that may occur due to breakages or leakages in storage areas.

The aims should be:

- To segregate incompatible chemicals from each other.
- To separate hazardous chemicals from unsuitable conditions for reasons of their toxicity, flammability or reactivity e.g. preventing exposure to unsuitable temperature, air, moisture, sources of ignition, sunlight etc.
- To provide ventilation which will remove dilute malodorous, noxious, toxic or flammable vapours.

9.1. Segregation

Some key incompatible chemicals that must be segregated from each other are:

- Strong acids from strong bases (alkalis)
- Strong oxidisers from organic or flammable materials

If mixing of these incompatible materials occurs due to spillage, breakage or leakage the danger is one of reactions which may generate heat, toxic vapours, fire and even explosion. [Appendix 1](#) gives a non-exhaustive list of incompatibilities of common laboratory chemicals.

Typical classes requiring segregated storage in a laboratory/workshop are:

- Acids
- Bases
- Highly flammable liquids (those with a flashpoint of 32°C or lower)
- Chlorinated solvents
- Malodorous or noxious chemicals
- Toxic chemicals or poisons

- Oxidising reagents
- Highly reactive compounds
- Controlled drugs
- Regulated chemicals e.g. subject to chemical or biological weapons legislation
- Temperature sensitive compounds

It is not always essential to segregate these materials but it is important the segregation in the following paragraphs occurs.

Strong mineral acids (sulphuric, nitric, hydrochloric) must be kept apart from strong bases. Even storage in the same cupboard on different shelves should be avoided. For example Hydrochloric acid in the same enclosure as ammonia solution will cause a white deposit of Ammonium chloride to form over everything.

Highly flammable liquids should be kept away from other materials. Chlorinated solvents, although they are generally non-flammable, should not be stored together with highly flammable liquids as toxic vapours such as phosgene could be generated should a fire occur.

Volatile and malodorous materials such as mercaptans should be stored in a ventilated enclosure such as a cupboard beneath a fume cupboard with forced ventilation. Such ventilated cupboards can be used for storing volatile chlorinated solvents. Certain other materials such as diethylamine are organic bases, flammable and possess an unpleasant odour and should be stored in a secondary container in a ventilated cupboard.

9.2. Separation

The easiest way to achieve separation of harmful substances is by means of storage cupboards. Storage cupboards/cabinets will physically divide incompatible substances. These cupboards may need specific properties or provide separation by means of distance (see section above on [Storage Facilities](#)). They may also require secondary containment (spill trays or bunded shelves) and security (locks/bolted to wall etc.).

In some laboratories/workshops separation could be achieved by distance alone. Separation by distance is more common in outside storage buildings e.g. dedicated flammable stores or gas cylinder compounds. It can also be applied to chemicals in laboratories as a means of keeping incompatibles a safe distance apart or reducing risk from more than one flammable cupboard becoming involved in a fire. However, the limited size of many laboratories/workshops may preclude this.

Separation will be needed for certain classes of chemicals which require control of access. These include:

- Extremely toxic
- Poisons
- Controlled drugs
- Regulated chemicals (certain chemical weapon precursors, biological toxins and explosives)
- Certain high-risk other materials depending on local procedures e.g. carcinogens, teratogens, mutagens etc.

- Radioactive substances (reference must be made to your local rules/procedures and Radiation Protection Supervisor (RPS))

Extremely toxic materials and poisons should be stored in a locked secure cupboard. Controlled drugs will also require to be stored in a locked secure cupboard but must be stored separately to poisons and the cupboard should not be labelled as containing controlled drugs. They are subject to strict controls and will require a licence, annual returns and restrictions on quantities held. Regulated chemicals (chemical weapon precursors and certain biological toxins) must also be stored in a locked cupboard but could be stored with the poisons. They are also subject to strict controls that may require a licence, annual returns and restrictions on quantities held. Fridges used to hold these materials would need to be lockable.

It is recommended that a separate record (as well as the hazardous substances database) is kept on chemicals that require secure storage. This record, either in a book or an electronic record, should include:

- The amount of the substance being stored
- The name of anyone using the chemical
- The date the chemical was being used
- The amount used
- A countersignature by an authorising person

9.3. Ventilation

Ventilation is often an essential requirement for safe storage of hazardous chemicals. Its main function is to allow extraction of vapours or gases that may escape out from containers during storage. This can mean that they no longer present a risk from the viewpoint of noxious smell, hazardous exposure or creation of an explosive atmosphere. In laboratory areas the most common storage of this kind is ventilated cupboards under fume cupboards.

Materials that should be stored in a ventilated cupboard include:

- Malodorous or noxious substances such as mercaptans and mercaptoethanol (which should also be stored in sealed secondary containers and only opened in the fume cupboard)
- Volatile non-highly flammable substances such as chlorinated solvents
- Formaldehyde
- Volatile, malodorous amines (in secondary containers)

Ventilated cupboards should not be used for storing highly flammable liquids unless the cupboards also meet the requirements for highly flammable liquids and have dampers fitted to the extract that will shut off the ventilation in the event of a fire.

10. Chemical Incompatibility Matrix

In general chemicals should only be stored with compatible substances according to the following categories (note: always consult the MSDS – Material Safety Data Sheets)

	Organic Solvents	Acids Inorganic	Acids Organic	Acids Oxidising	Alkalis (bases)	Oxidisers	Toxics Inorganic	Toxics Organic	Water reactives
Organic Solvents	✓	X	✓	X	X	X	X	✓	X
Acids Inorganic	X	✓	X	✓	X	✓	X	X	X
Acids Organic	✓	X	✓	X	X	X	X	X	X
Acids Oxidising	X	✓	X	✓	X	✓	X	X	X
Alkalis (bases)	X	X	X	X	✓	✓	✓	X	X
Oxidisers	X	✓	X	✓	✓	✓	✓	X	X
Toxics Inorganic	X	X	X	X	✓	✓	✓	X	X
Toxics Organic	✓	X	X	X	X	X	X	✓	✓
Water reactives	X	X	X	X	X	X	X	✓	✓

Key: X = NOT compatible – do NOT store together

✓ = may be compatible – consult SDS

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11. Workshops

Workshops, unlike most laboratories, are not designed for storing large quantities of hazardous substances. In most workshops segregation of hazardous substances will be enough to maintain safe storage. Separation will be required where larger volumes are stored or if any of the following substances are present:

- Highly flammable liquids
- Toxic chemicals
- Malodorous or noxious chemicals
- Controlled drugs or regulated chemicals (weapon precursors, toxins etc.)
- Poisons

In these cases appropriate storage cupboards would be required.

In most workshops following the guidance below would be sufficient to reduce any risk to a manageable level:

- a) Good working practice is essential. Follow any guidance laid out in the MSDS and COSHH assessment.
- b) Good housekeeping is important – any hazardous substances not in use should be stored away safely.
- c) Minimise the amount of chemicals stored in the workshop.
- d) Any toxic substances should be kept in cupboards and secured where appropriate.
- e) Ensure any flammable liquids used in the workshop is kept to a minimum.
- f) Any larger volumes of flammable liquids should be stored in a metal solvent cabinet.
- g) Do not store any flammable solvents in close proximity to any source of ignition including:
 - Open (naked) flames such as burners, heaters, glass blowing / cutting / welding torches or forge benches
 - Grinding wheels - hand held or fixed
 - Electric heaters or heat guns
 - Electric arc welders
 - Electrical tools and equipment
 - Sources of static electricity.

12. Internal storage rooms

Indoor storage rooms are very useful and can help avoid over storing in laboratories/workshops. The following guidelines should be in place regarding the safe use of internal storage rooms.

- a) Good housekeeping is essential in all storerooms.
- b) Shelving units should be kept tidy and clear where possible.
- c) Segregation is essential in storerooms - incompatible substances should not be stored together.

- d) Separation can be achieved through the use of appropriate safety cabinets.
- e) Storerooms should be adequately ventilated to disperse vapour from any leakage or spillage.
- f) Means of containing spillage should be provided:
 - Lipped trays can be used on shelves to contain any small spills.
 - Spillage absorbent granules should be stored close by and used to mop up any small spills.
 - Drip trays and bunded units can be used on floors for larger containers.
 - Absorbent pads and spill socks can be used to contain any larger spill.
- g) Any heating and lighting provided in the store must not be able to act as a source of ignition. There should be no possibility of flammable vapour being ignited by hot surfaces and adequate ventilation of the store must be maintained.
- h) All stores should be operated so that the risk of spillage is minimised.
- i) They should not normally be used for dispensing operations – substances should be transported to laboratory/workshop areas and dispensed there.
- j) Other materials must not be stored in these rooms.

13. Outside storage areas

Outside storage units are ideal for storing larger quantities of hazardous substances especially flammable liquids/solvents in drums. It is important to ensure the guidance on chemical incompatibility storage ([Segregation](#), [Separation](#) and [Ventilation](#)) referred to above is also adhered to for the use of external storage units.

The following guidelines on external storage units are essential:

- a) Storage units should be a clear distance away from the main campus building.
- b) The unit should comply with all COSHH and DSEAR Regulations.
- c) Good housekeeping should always be present in storage areas.
- d) Incompatible substances should be kept apart.
- e) Appropriate chemical cabinets can be used to ensure incompatible chemicals are separated.
- f) The storage units should be well ventilated.
- g) Have firefighting (fire extinguishers) equipment installed.
- h) Have bunding units/drip trays to contain any spillage.
- i) Shelving units should not be overloaded and should not be too high.
- j) The units should be secure with only authorised personnel able to gain access.
- k) Dispensing of chemicals should be avoided in the unit and substances should be transported into laboratories/workshops and dispensed there*

**The exception to this rule is with larger volumes of flammable liquids/solvents i.e. 25 litre drums. Smaller, more manageable volumes of solvents can be dispensed from drums into appropriate containers (2.5 litre Winchester bottles, Lab chemical bottles etc.). This operation can take place in the*

external storage area if there is enough ventilation. If ventilation is not sufficient then the operation can be done outside but only if it is safe to do so and if spillage containment measures are in place i.e., bunded units, absorbent pads and spill socks. PPE would be required to be worn and Risk and COSHH assessments in place.

14. Compressed gas

- a) When not in use or empty compressed gas cylinders should be stored in an external storage unit away from the main campus building.
- b) Only the smallest size cylinders should be purchased based on frequency of use and volume used.
- c) The unit should be well-ventilated, weatherproof and be separate from any external units storing hazardous substances or waste chemicals.
- d) Compressed gas cylinders should be stored separately from combustible materials, ignition sources or intense heat.
- e) Cylinders must be secured in a vertical position to prevent them falling over. Chains are recommended, in storage units, over clamp plus strap assemblies due to the fact that straps can melt or burn in a fire.
- f) Incompatible compressed gases should not be stored together – flammable gases (Hydrogen, Acetylene) should be stored separately from oxidising gases (Oxygen).

15. Transportation of Hazardous Substances

Transporting substances such as chemical or gas cylinders can be hazardous. Whether the items are being transported across campus buildings, e.g. from storage areas to laboratories or being moved from one campus to another, it is essential that all safety guidelines are being followed and the correct control measures are in place.

15.1. Transporting hazardous substances across campus buildings

Chemicals

When hazardous substances are being transported across a campus building, either from one laboratory to another or from a storage area to a laboratory or workshop, it is essential that the following guidelines are followed:

- Vessel should be closed. Caps and lids should be on securely.
- No opened topped beakers, flasks or containers.
- Container should be carried securely and not held by the cap or lid.
- Trolleys, carry boxes or Winchester (bottle) carriers should be used when carrying more than one bottle or container.

- When using a trolley or carry box you must ensure all containers and bottles are packed securely to avoid any movement or glass bottles bumping/clinking together and potentially breaking.
- Any spillages must be cleaned up immediately.
- PPE such as a laboratory coat or protective apron must be worn, and suitable protective gloves, safety glasses/goggles and appropriate footwear used where required.
- Only the minimum amount of chemicals required to be used should be transported into a building and stock kept inside should be as low as possible.

Where possible do not transport hazardous substances through campus social areas. If alternative routes are not available then this activity must be done at quieter times of the day i.e. first thing in the morning or late in the afternoon/early evening. Lifts can be used for the transportation of most hazardous substances* but every effort should be made to avoid using lifts during busy periods on campus.

*See note below regarding the transportation of dry ice and liquid nitrogen

Anybody undertaking the transportation of hazardous substances across the campus must have an understanding of the potential hazards involved and procedure in place should there be:

- A spillage
- An incident or accident
- An emergency evacuation of the building during the transportation but unrelated to the activity

Nobody should be carrying or lifting any goods that are classified as heavy and especially not if they are hazardous substances. Trolleys or other lifting devices should be used for larger, heavier volumes.

Manual handling training for staff is available to ensure lifting techniques and carrying are safe.

*Certain hazardous substances such as **dry ice or liquid nitrogen** should only be transported across campus using extreme care and following all health and safety guidance.

- Dry ice should be transported in a polystyrene container with a tight-fitting lid.
- Liquid nitrogen must be transported in a proper Dewar style flask with a closed lid.
- PPE such as a laboratory coat, protective gloves, eye protection and appropriate footwear must be worn.
- **Do not use lifts when transporting dry ice or liquid nitrogen.**
- If you are transporting dry ice or liquid nitrogen to a work area on another floor then you must use the stairs.

If unsure about the procedure please contact the health and safety team.

Gas Cylinders

Standard size gas cylinders weigh about 16Kg when empty and around 20Kg when filled (depending on the gas or gas mixture), and larger cylinders can be nearly 5 times heavier. Perhaps even more importantly, they are filled with gas held at high pressure and, if a cylinder discharges or ruptures, there are likely to be serious consequences.

Gas cylinders must be handled and moved carefully in accordance with the manual handling regulations and other health and safety guidelines:

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- Gas cylinders can be manhandled on their own for very short distances.
- Moving them across campus or from one laboratory to another requires a cylinder trolley.
- Cylinders being transported using a trolley must be secured correctly so they do not tip, fall, or roll.
- Wear suitable safety shoes and other PPE, as identified by risk assessment, when handling gas cylinders.
- Once in the laboratory/workshop gas cylinders should then be fixed to a bench using a clamp.
- Trolleys should only be used for the transport of cylinders. Gas cylinders should not be used when sitting on a trolley and they should not be stored on a trolley for long periods.
- Only the minimum amount of gas cylinders required to be used should be transported into a building and stock kept inside should be as low as possible.

Manual handling training for staff is available. Gas cylinder safety awareness training should be carried out for any new staff members or anybody unfamiliar with handling and moving gas cylinders. This can be done as on the job training.

Please contact the Health and Safety team if training is required.

15.2. Transportation of Hazardous Substances by Road

Transporting hazardous substances by road can involve the risk of spillage, fire, explosion, chemical burns or environmental damage, and can endanger the people handling and transporting them as well as other road users. In order to comply the university must follow strict guidelines for transportation. The Carriage of Dangerous Goods Regulations (CDG) places a statutory requirement on all employers to protect everyone who is either directly involved with, or who may become involved with (e.g. members of the public) the carriage of dangerous goods by road. Dangerous goods may be pure chemicals, mixtures of substances, or manufactured products which can pose a risk to people, animals or the environment if not properly packaged and secured when in transit.

You cannot transport hazardous substances by carrying them on public transport, by taxi, or by train. Transporting hazardous substances in your personal vehicle should only be considered if there are no other options available and if all safety considerations have been put in place. Contact the Health and Safety Office if you are unsure.

Classification, Packaging, Labelling and Provision of Information

The Carriage of Dangerous Goods by Road Regulations classifies hazardous substances as follows:

1. Explosive
 - 2.1. Flammable gas
 - 2.2. Non-flammable gas
 - 2.3. Toxic gas
3. Flammable liquid
 - 4.1. Flammable solid
 - 4.2. Solid liable to spontaneously combust
 - 4.3. Solid which will react with water to produce a flammable gas
- 5.1. Oxidising substance
- 5.2. Organic peroxide
- 6.1. Toxic substance

- 6.2. Infectious substance
7. Radioactive material
8. Corrosive substance
9. Miscellaneous dangerous goods

The numbers above refer to the UN number of chemical identification (the International System for Identifying Hazardous Substances) and classify the chemical according to its hazard. Flammable and toxic gases are also defined by the Carriage of Dangerous Goods (CDG) as well as the Use of Transportable Pressure Equipment Regulations.

Chemicals

Private vehicles should not normally be used to transport hazardous substances. Any person intending to transport hazardous substances by private vehicle should seek advice from the Health and Safety team. All packaging should be secure and ensure that the hazardous substance cannot escape, leak, or cause any other type of risk to health and safety when exposed to normal stresses and strains of transport. The type of packaging will depend on the container the substance is in, e.g. plastic container or glass bottle, and the hazard of the substance. To comply with the Hazard Information and Packaging for Supply Regulations the container for the hazardous substance should be appropriately labelled.

Gas Cylinders

Ensuring that you transport gas cylinders in a safe and responsible manner is essential to the safety and welfare of your employees and the general public. Any drivers must receive adequate and appropriate training and instruction. For vehicles with a maximum permitted weight of 3.5 tonnes or below, this training must cover:

- The potential hazards and dangers relating to the goods carried
- Safe handling of gas cylinders
- The action to be taken in an emergency
- Emergency procedures and the use of firefighting appliances

It is recommended that any organisation transporting dangerous goods follows the basic legal safety regulations within CDG, which include:

- Driver training
- Vehicle ventilation
- Safety equipment
- Basic safety training

Drivers must adhere to the following safety rules:

- Wear safety footwear, gloves and eye protection when handling cylinders.
- Do not remove/deface cylinder labels provided by gas supplier.
- Do not drop/throw cylinders when loading/unloading vehicle.
- Secure cylinders properly on vehicle.
- Ensure cylinder valves are closed before and after transportation.
- Do not smoke or expose cylinders to sources of ignition when carrying flammable gas, e.g. LPG, Hydrogen, Acetylene, etc. or Oxygen.
- Protect carbon dioxide cylinders from direct sunlight and all cylinders from heat.
- Carry LPG and acetylene cylinders in a vertical position, valve uppermost.

- Gas cylinders should not remain on the vehicle longer than is required to make the journey and if the vehicle is parked, it must be parked in a safe place or supervised by the driver or other competent person.
- If at any point you smell gas whilst transporting gas cylinders immediately pull over in a safe space, stop the engine and do not move the vehicle until the source of the leak has been found and the vehicle has been declared safe by a competent person (this may be the supplier of the gas cylinder).
- If you are unable to find the source of the leak, call a competent person immediately, maximise ventilation by fully opening all doors, windows, and vents where possible and be sure not to turn on any electrical equipment.
- If involved in a road accident, advise emergency services what cylinders are being carried, how many and show them details of gases carried.

Any vehicle that is used for the transportation of gas cylinders should be open, and if this cannot be achieved, then the vehicle must be well-ventilated. Any cylinders carried on the vehicle must have a label that is produced in accordance with current legislation attached to it. If the label is removed or defaced you should not load the cylinder onto your vehicle. Each cylinder must be closed during transit, and any equipment that is connected to them must be unattached. Furthermore, all gas cylinders must be secured properly and should not project beyond the sides or ends of the vehicle.

16. Safe disposal of hazardous substances

Hazardous waste, including chemical waste is subject to environmental regulations concerning disposal. **The Hazardous Waste Regulations** is an environmental legislation relating to the segregation, classification and consignment of hazardous waste which includes chemical waste. Hazardous waste must be disposed of appropriately and therefore each School/Service area must consider the types of waste being produced and investigate the appropriate, safe routes of disposal.

Any hazardous substances which cannot be disposed of safely, and in an environmentally compliant manner, must be disposed of through a recognised licenced contractor. MSDS (Material Safety Data Sheets) will have information on safe disposal routes for hazardous substances. But it is important to remember that the information on the MSDS is for the pure chemical/substance purchased.

Any changes/modifications to the substance through the chemical process/laboratory work may render the waste product having different properties to the original substance and this needs to be taken into consideration. Any Risk or COSHH assessment relating to the lab activity and the chemical process for the hazardous substance should include disposal guidelines for waste substances produced and any by-products created.

Hazardous waste substances, which require disposal via a licenced contractor, can be stored on site whilst waiting to be uplifted.

The same guidelines in place for the safe storage of hazardous substances (see section on [Storage of Hazardous Substances](#)) must be in place when considering the storage of waste chemicals.

These are as follows:

- Segregation – segregate incompatible waste chemicals from each other.

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- Separation – separate hazardous waste chemicals from unsuitable conditions.
- Ventilation – to provide ventilation to remove malodorous, noxious, toxic or flammable vapours of waste hazardous substances.

Waste containers should be labelled clearly with the description of the waste product and any hazard associated with that substance and stored securely. It is common practice for empty chemical bottles/drums to be used for storing waste chemicals. This is permissible but the empty container should be clean and dry before being used for storing waste.

Any previous labels should be covered over and the name of the waste product written clearly. Any old hazard labels, if not appropriate to the waste now being stored, should be covered over and new hazardous label stickers placed over the top (hazard label stickers can be purchased from most chemical supply companies).

If the laboratory/workshop is storing waste substances in a specialised cupboard/cabinet this should be clearly labelled.

Note - incompatible hazardous waste substances cannot be stored together in the same cabinet/cupboard. Certain noxious waste chemicals may require secondary storage i.e. [Safepak](#) (see section on storage of hazardous substances).

Schools/Service areas which produce large volumes of hazardous waste substances may have an external storage unit specifically used for storing waste chemicals. Rules must also be in place in these units to ensure incompatible waste substances are kept segregated, separated and ventilation is in place to avoid any accidental mixing and potentially dangerous occurrences such as fires or explosions.

Waste substances should not be stored indefinitely and regular checks and audits of waste storage areas should be carried out. For Schools/Service areas producing large volumes of waste hazardous substances regular waste uplifts by licenced waste contractors should be done.

On completion of disposal or use, the university hazardous database must be updated.

Appendix 1 - Common laboratory chemical incompatibilities







Note: this list is not exhaustive and merely indicates some frequently encountered examples

Chemical	Incompatible with
Acetic acid	Chromic acid, Nitric acid, Hydroxyl compounds, Ethylene glycol, Perchloric acid, Peroxides, Permanganates
Acetylene	Chlorine, Bromine, Copper, Fluorine, Silver, Mercury
Acetone	Nitric acid (conc), Sulphuric acid
Alkali and alkaline earth metals	Water, Carbon tetrachloride and other chlorinated hydrocarbons, Carbon dioxide, Halogens
Aluminium	When finely divided with Iron oxide or other metallic oxides
Ammonia	Mercury, Chlorine, Calcium hypochlorite, Iodine, Bromine, Hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, Chlorates, Nitrites, Sulphur
Aniline	Nitric acid, Hydrogen peroxide
Azides	Acids, heavy metals such as Silver, Gold, Lead, Copper
Bromine	See Chlorine
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite. All oxidizing agents
Chlorates	Ammonium salts, Acids, powdered metals, Sulphur
Chromic acid	Acetic acid, Naphthalene, Camphor, Glycerol, Alcohol, and flammable liquids in general
Chlorine	Ammonia, Acetylene, butadiene, Butane, Methane, Propane (or other petroleum gases), Hydrogen, Sodium carbide, Benzene, Turpentine
Chlorine dioxide	Ammonia, Methane, Phosphine, Hydrogen sulphide
Copper	Acetylene, Azides, Hydrogen peroxide
Cumene hydroperoxide	Acids (organic and inorganic)
Cyanides	Acids
Flammable liquids	Ammonium nitrate, Chromic acid, Hydrogen peroxide, Nitric acid, Sodium peroxide, Halogens
Fluorine	All other chemicals
Hydrocarbons	Fluorine, Chlorine, Bromine, Chromic acid, Sodium peroxide
Hydrocyanic acid	Nitric acid, Alkalis
Hydrofluoric acid (anhydrous)	Ammonia
Hydrogen sulphide	Fuming Nitric acid, Oxidising gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, Ammonia, Hydrogen
Mercury	Acetylene, Fulminic acid, Ammonia
Nitric acid (conc)	Acetic acid, Aniline, Chromic acid, Hydrocyanic acid, Hydrogen sulphide, Flammable liquids and gases, Copper, Brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, Amines
Oxalic acid	Silver, Mercury
Oxygen	Oils, Grease, Hydrogen, Flammable liquids/solids/gases

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Chemical	Incompatible with
Perchloric acid	Alcohols, Acetic acids, Acetic anhydride, Bismuth and its alloys, Organic materials, paper, wood, grease, oils
Peroxides, organic	Acids (mineral or organic),
Phosphorous (white)	Air, Oxygen, Alkalis, Reducing agents
Picric acid	Strong oxidising agents, Bases, most common metals, Ammonia, strong reducing agents
Potassium chlorate and perchlorate	Sulphuric and other acids
Potassium permanganate	Glycerol, Ethylene glycol, Benzaldehyde, Sulphuric acid
Selenides	Reducing agents
Silver	Acetylene, Oxalic acid, Tartaric acid, Ammonium compounds, Fulminic acid
Sodium	Carbon tetrachloride, Carbon dioxide, Water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethanol, Methanol, glacial Acetic acid, Acetic anhydride, Benzaldehyde, Carbon disulphide, Glycerin, Ethylene glycol, Ethyl acetate, Methyl acetate, Furfural
Sulphides	Acids
Tellurides	Reducing agents

Appendix 2 – Suggested best practice storage scheme for some chemicals

	<p>Flammable liquids:</p> <p>H224, 225, 226</p>	<p>Do not store anything else in the cupboard except substances that are non-hazardous AND have been packaged in non-combustible containers, e.g. glass.</p>
	<p>Combustible solids:</p> <p>H250, 260, 261</p>	<p>Keep segregated from everything else – INCLUDING flammable liquids.</p>
	<p>Toxic substances:</p> <p>H300, 301, 310, 311, 331, 340, 341, 350, 351, 360, 361, 370, 371, 372, 373</p>	<p>Do not routinely store anything alongside these except non-hazardous substances.</p>
	<p>Corrosive substances:</p> <p>H314, 318 and EUH071</p>	<p>Avoid keeping incompatible substances such as acids and alkalis together.</p>
	<p>Oxidizing substances:</p> <p>H270, 271, 272</p>	<p>Keep entirely segregated from all other classes.</p>
	<p>Organic peroxides:</p> <p>H240, 241, 242</p> <p>(May also have other warning symbols)</p>	<p>Keep segregated from everything else.</p>

