CODE OF PRACTICE:	**CODE OF PRACTICE (COP) FOR MANAGEMENT OF HAZARDOUS CHEMICAL SUBSTANCES**
Q-PULSE NUMBER:	RISK-COP-7 **REVISION** 3
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1. INTRODUCTION AND SCOPE

This code of practice (COP) is based on the controls laid out in the site Chemical Management Operational Risk Assessment (OpRA) (RA000756) and outlines the general steps that should be taken in order to prevent or control exposure to hazardous chemical substances and comply with duties under the Control of Substances Hazardous to Health Regulations 2002 (COSHH).

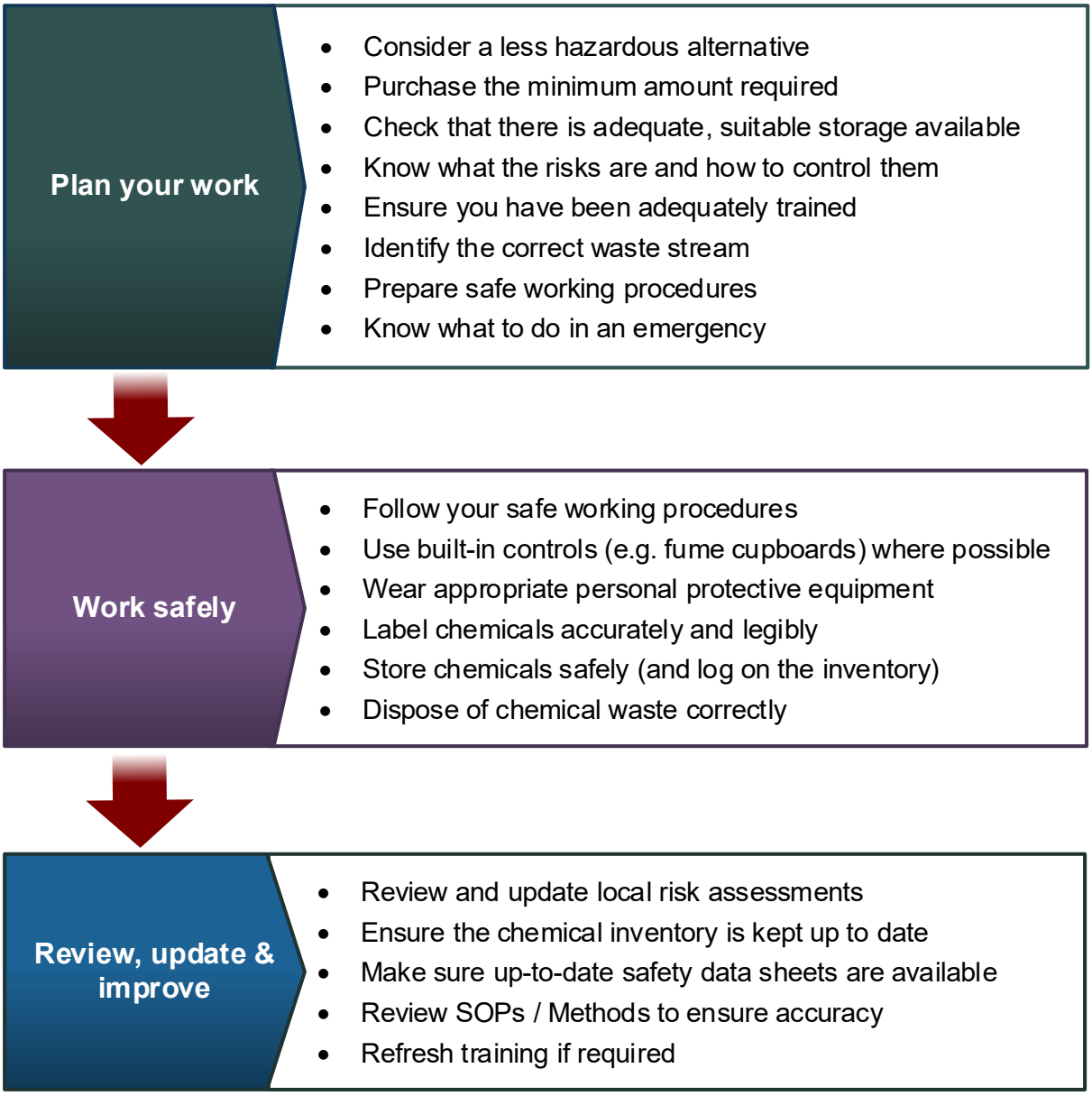
This COP is intended to assist users to recognise the hazards and assess the risks associated with the use of chemicals, and to handle chemicals safely from acquisition to disposal. It is not exhaustive; for substance-specific guidance, reference must be made to safety data sheets and, where in place, specific

activity and/or chemical risk assessments. Guidance documents are also available for certain chemicals, including cyanides and phenolic substances. Specialist advice can be sought from HSBS.

This COP does not cover radioactive materials, asbestos, or explosive substances. Such materials and substances are subject to specific regulations.

1.1. Safe Working with Chemicals – an Overview

The diagram below summarises the contents of this COP by setting out the minimum actions to take before starting work with chemicals.



1.2. Definitions

1.2.1. Hazardous Chemical Substance

A hazardous chemical substance (hereinafter referred to as a 'chemical') is primarily defined as something that has the potential to cause harm to human health. It may also have the potential to affect workers' safety, or cause harm to the environment.

1.2.2. Harm to Health, Safety and the Environment

Chemicals may:

- Cause health effects, for example be a respiratory sensitiser or skin irritant.
- Act as fuel for a fire or explosion.
- Adversely affect the environment if they are used, stored, or disposed of incorrectly.

Exposure to chemicals may have immediate consequences (e.g. corrosive or toxic materials) or long-term risks (e.g. carcinogens, mutagens, reproductive toxins (teratogens) and sensitisers).

1.3. Routes of Exposure

For a chemical to affect human health, it must enter the body. There are four main routes of exposure and understanding these in the context of chemical use will enable effective control.

The main routes of exposure are:

- Inhalation of airborne vapours, fume, particulates, fibres, mists, dusts, and aerosols.
- Absorption via skin or eye contact, e.g. by splashing, direct contact with the substance or contact with contaminated items. Substances may affect the skin or eyes, or be absorbed through the skin or eyes and affect internal organs.
- Ingestion, e.g. via splashes to the mouth or from contaminated hands or items.
- Injection, e.g. via a sharps injury or open wound.

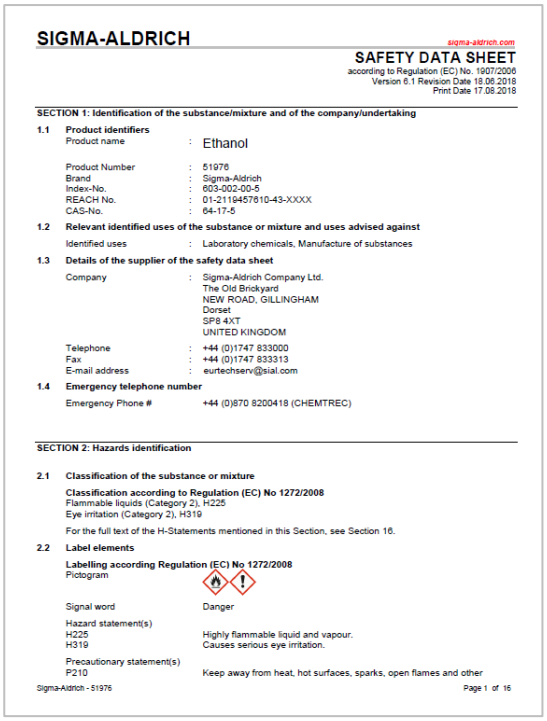
Certain activities (e.g. spraying, decanting, cutting) can increase the risk of exposure and must be considered during the risk assessment process.

2. IDENTIFICATION OF CHEMICAL HAZARDS

2.1. Safety Data Sheets

By law, chemicals must be supplied with a safety data sheet (SDS). This document is made up of 16 sections; these sections contain the following information, which is important for carrying out a chemical risk assessment:

1. The name of the substance and supplier details
2. The hazards of the substance (hazard statements)
3. Information on the ingredients of the substance
4. First aid measures
5. Fire-fighting measures
6. How to manage leaks or spills
7. How to safely handle and store the substance
8. Exposure controls and personal protection
9. Physical and chemical properties
10. Stability and reactivity, including incompatibilities



SIGMA-ALDRICH

sigma-aldrich.com

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006
Version 6.1 Revision Date 18.06.2018
Print Date 17.08.2018

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Ethanol

Product Number : 51976
Brand : Sigma-Aldrich
Index-No. : 603-002-00-5
REACH No. : 01-2119457610-43-XXXX
CAS-No. : 64-17-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Company Ltd.
The Old Brickyard
NEW ROAD, GILLINGHAM
Dorset
SP8 4XT
UNITED KINGDOM

Telephone : +44 (0)1747 833000
Fax : +44 (0)1747 833313
E-mail address : eurtechserv@sial.com

1.4 Emergency telephone number

Emergency Phone # +44 (0)870 8200418 (CHEMTREC)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 2), H225
Eye irritation (Category 2), H319

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 Label elements

Labelling according Regulation (EC) No 1272/2008
Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H319 Causes serious eye irritation.

Precautionary statement(s)
P210 Keep away from heat, hot surfaces, sparks, open flames and other

Sigma-Aldrich - 51976 Page 1 of 16

Figure 1: Example safety data sheet (front page)

11. Toxicological information
12. Ecological information
13. How to safely dispose of the substance
14. Transport information
15. Regulatory information
16. Other information

The SDS will also include the most recent revision date.

If a hard copy SDS is not supplied with the substance, it can be obtained by contacting the supplier, or an electronic copy can be downloaded from the supplier website. SDSs are updated as new data on a substance becomes available.

SDSs for all chemicals in use must be stored in a location that can be easily accessed by all relevant personnel. It is recommended that the public folder N:>HSBS>Public>1. Chemical Inventories is used.

NOTE: Where the task itself generates substances hazardous to health, an SDS may not be available. Industry guidance and advice from HSBS should be sought as to how to carry out assessments in this case. Examples include mixing chemicals to form a new compound, or welding and woodworking activities that generate fume or dust.

2.2. Hazard Warning Pictograms

Table 1 shows the pictograms and their definitions, together with indicative hazard statements.

Pictogram	Definition	Pictogram	Definition
	**Toxic** *Hazard statements: H300-H313, H330-H333, H370-H373*		**Flammable** *Hazard statements: H220 – H228, H241-H242, H250-H252, H260-H261*
	**Oxidising** *Hazard statements: H270-H272*		**Corrosive** *Hazard statements: H314, H318*
	**Explosive** *Hazard statements: H240, H241*		**Harmful to the Environment** *Hazard statements: H400-H413*
	**Materials with moderate risks in relation to:** Toxicity; skin and eye irritation; skin sensitisation; target organ toxicity and environmental impact. *Hazard statements: H302, H312, H315, H317, H319, H332, H335, H336*		**Health Hazard:** Sensitiser, mutagen, carcinogen, teratogen, target organ toxicity, toxic by inhalation *Hazard statements: H340, H341, H350, H351, H360, H361, H362*

Table 1: Hazard warning pictograms

2.3. Labelling

Chemicals purchased from a supplier must be packaged in a suitable container and be labelled with the following (see Figure 2):

- The chemical name
- The name and contact details of the supplier
- The hazard warning pictogram(s)
- The quantity of the substance
- Other information as applicable, e.g. signal words such as ‘danger’, precautionary statements such as ‘wear protective gloves’

Where chemicals are stored in their original containers, it is preferable that the original label is kept in place. Any label must be legible at all times. Additional information may be added, e.g. the owner’s name and date of receipt, provided that it does not obscure other important information.

Where a chemical is to be decanted for storage or use or mixed with other substances to make a working stock solution, the container must be clearly labelled with the substance name, the hazard, the preparation date and (if appropriate) the owner (see example in Figure 3). The same applies for chemical waste; a template label that can be used is linked in Appendix 15.11. In the event of an emergency, such as a spillage, the responder must be able to identify any hazard associated with such preparations.

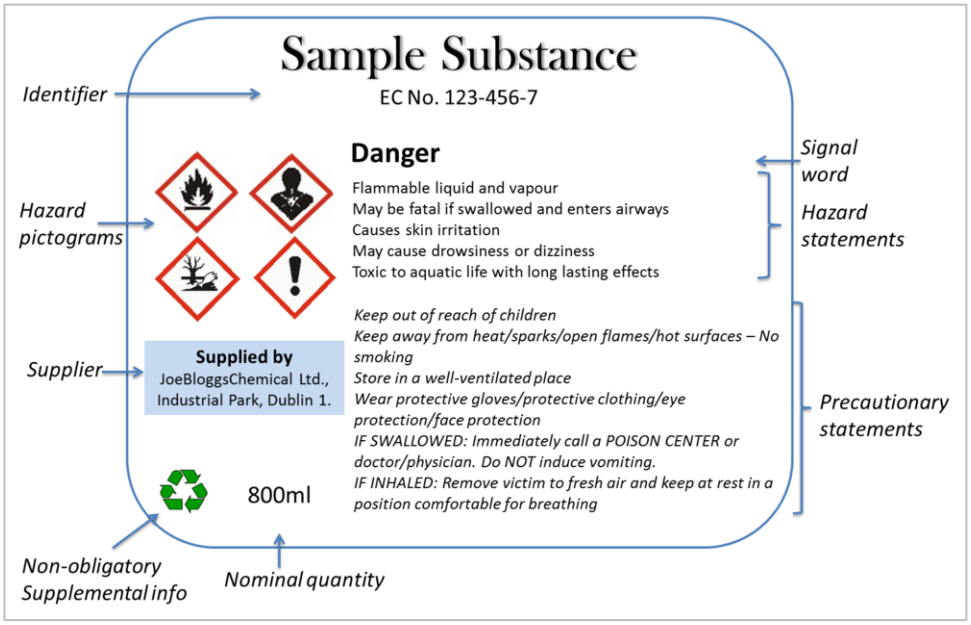


Figure 2: Example chemical label

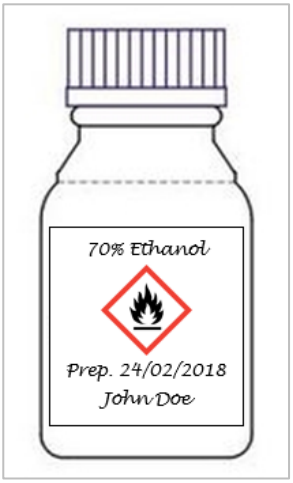


Figure 3: Example of correct labelling of a working stock chemical

2.4. CAS Number

Chemicals frequently have alternative names (synonyms). These may include trade names, trivial (non-standard) or historical nomenclature. Each chemical does, however, have a unique identification number: the Chemical Abstract Service (CAS) number is unique to each chemical and is recognised internationally. If you have to reference a particular chemical that has known synonyms, using the CAS number removes ambiguity, e.g. caustic soda and sodium hydroxide both share the CAS number 1310-73-2. This can be found on the SDS and is frequently printed on the packaging.

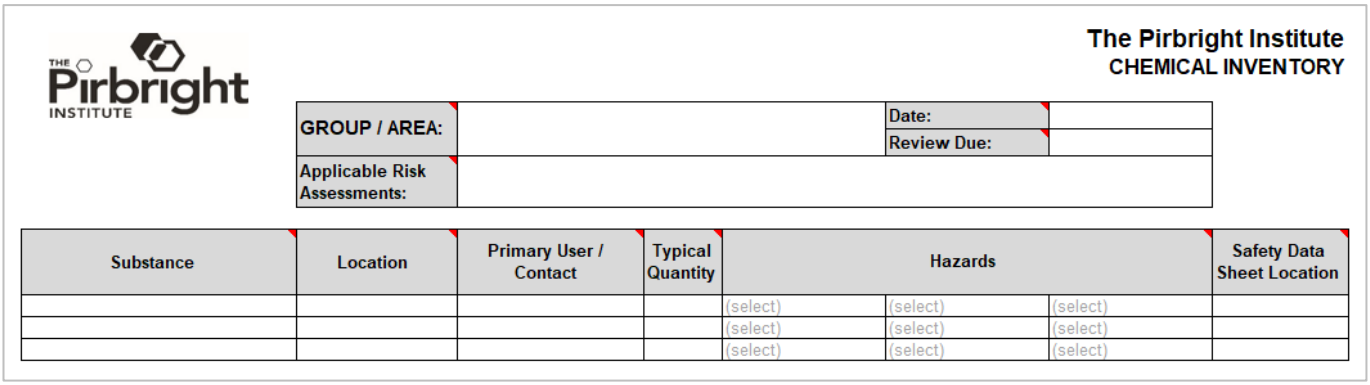
2.5. Hazard and Precautionary Statements

Information regarding the potential hazards and handling advice can be found on the SDS. Within this information there are hazard (H) statements and precautionary (P) statements (for a full list refer to the GHS document). H-Statements provide information about the nature and degree of the hazard whereas P-Statements describe recommended measures to minimise or prevent adverse effects resulting from

exposure. The hazard and precautionary statements replace all risk (R) and safety (S) phrases which will no longer be used but may still be found on older chemicals and SDSs.

3. CHEMICAL INVENTORY

All groups and departments are responsible for maintaining a local chemical inventory using either RISK-FORM-29 (Figure 4) or their own template, so long as it captures the same information. The chemical inventory records the nature, quantity, and location of chemicals. This information is critical in providing the baseline knowledge for identifying and understanding the risks posed by the chemicals in use, and for informing the Chemical Management OpRA (see Section 4.1).



The Pirbright Institute
CHEMICAL INVENTORY

GROUP / AREA:		Date:	
		Review Due:	
Applicable Risk Assessments:			

Substance	Location	Primary User / Contact	Typical Quantity	Hazards			Safety Data Sheet Location
				(select)	(select)	(select)	
				(select)	(select)	(select)	
				(select)	(select)	(select)	

Figure 4: RISK-FORM-29 – Chemical Inventory Template

Groups are encouraged to save their inventories in N:>HSBS>Public>1. Chemical Inventories. This allows access by HSBS for oversight and audit purposes. If the inventory is held elsewhere, a shortcut to it should be included in the folder above. The folder also contains a list of frequently asked questions relating to chemical inventories.

Inventories must be updated when new chemicals are procured, or when chemicals are disposed of and not replaced. A routine review must be carried out on an annual basis to ensure accuracy.

NOTE: Electronic safety data sheets can also be stored in the folder above and reviewed at the same time as the inventory to ensure that the most up-to-date version is available. It is also permissible to include a link to an online safety data sheet in the inventory so long as it is kept up to date.

4. RISK ASSESSMENT

All hazardous tasks within the Institute must be covered by a suitable and sufficient risk assessment. Where the task involves the use or generation of substances hazardous to health, the risk assessment must address the requirements of the COSHH Regulations.

The aim of any chemical risk assessment is to safeguard human health, safety and the environment by ensuring that there are controls in place to reduce the likelihood of exposure to a hazardous substance, and procedures in place to mitigate the consequences should exposure occur.

4.1. Chemical Management Operational Risk Assessment (OpRA) RA000756

RA000756 on OSHENS has been informed by chemical inventories maintained by individual groups and departments, and in turn informs this Code of Practice. It complements the Facility OpRAs and is intended to cover the majority of activities that involve hazardous chemicals on site.

NOTE: It is not anticipated that there will be many ‘outliers’ (activities involving chemicals that are not fully covered by RA000756), but such activities would be subject to a separate risk assessment in order

to identify the specific hazards and risks, and the measures to control these. This allows users to concentrate on assessing and controlling the risks associated with the most dangerous chemicals and processes, while continuing to apply standard controls to manage the more routine substances and activities.

Where users determine that RA000756 and this COP fully cover the chemicals used in an activity, they should be referenced in the activity risk assessment (where in place) and any associated SOPs or Methods.

4.1.1. Determining Whether a Separate Risk Assessment is Required

Appendix 1 contains guidance for users to determine whether a separate risk assessment is required for any chemicals that they are using or propose to use.

Where release of and/or exposure to a chemical could lead to serious harm (acute or chronic) or death, or where required by law, a separate risk assessment will be required to ensure the risks are fully considered and robustly controlled. The following list provides an indication of the types of substances that will or are likely to require a separate risk assessment:

- **Schedule 1 poisons** (Appendix 2). A separate risk assessment will always be required for these and is subject to approval by Risk & Assurance.
- **Schedule 5 toxins** (Appendix 3). A separate risk assessment will always be required for these, and their use must be approved by Risk & Assurance. There are requirements for purchasing these substances as described in Section 5.
- **Toxic** chemicals, due to the severity of potential health effects. These are substances with hazard statements such as *H300: Fatal if swallowed, H310: Fatal in contact with skin, H331: Toxic if inhaled*, etc. Examples that may be found on site include sodium azide, osmium tetroxide and pilocarpine hydrochloride.
- **Carcinogens** (particularly Category 1 carcinogens), including cytotoxic and cytostatic drugs. These are substances with the hazard statements *H350: May cause cancer* and *H351: Suspected of causing cancer*. COSHH places particular legal duties on the employer to control exposure to these substances. An indicative list of cytotoxic and cytostatic medicines can be found in Appendix 4.
- **Mutagens and reproductive toxins** (teratogens). These are substances with the hazard statements *H340: May cause genetic defects, H341: Suspected of causing genetic defects,* and *H360: May damage fertility or the unborn child.* These substances are not subject to the same specific legislative requirements as carcinogens, however following the same controls will usually be sufficient to manage the risks.
- **Sensitisers** (skin and respiratory), where user assessment finds the general controls set out in this COP to be inadequate to control exposure.
- Hazardous substances stored in **large amounts**, e.g. sodium hydroxide or acetic acid in intermediate bulk containers (IBCs), or fuel stored in bowsers.

4.2. Completing a Chemical Risk Assessment

Where a separate risk assessment is required the chemical risk assessment form on OSHENS must be used, which is structured to meet the requirements for a COSHH risk assessment.

The risk assessment process involves identifying the hazards associated with the chemical, evaluating the risk, and deciding on control measures. As with all risk assessments, a COSHH risk assessment must be kept under regular review to capture any changes to the activity, the level of risk, the controls, etc.

- The **hazard** presented by a chemical is its **potential** to cause harm (to human health, safety and/or the environment).
- The **risk** from a chemical is the **likelihood** that it will cause harm in the actual circumstances of use combined with the potential **consequence** of the harm.

4.2.1. Risk Evaluation

The risk depends on a number of factors that the risk assessment process considers:

- The physical, environmental and health hazards associated with the chemical (from the SDS).
- The possible route(s) of exposure.
- The nature or form of the chemical, e.g. solid, powder, liquid.
- How the chemical will be used, including the frequency and duration of the activity.
- The quantity that will be used.
- Where the chemical will be used (e.g. in an open laboratory or workshop).
- Workers at additional risk, such as new or expectant mothers (e.g. from work with mutagens or teratogens).

4.2.2. Control Measures

If the level of risk with existing controls is intolerable (refer to RISK-POL-4 Risk Policy for tolerability limits), then additional controls will need to be put in place. When selecting controls, consider the hierarchy of control (Figure 5); the top level controls will provide more effective control of the risk than those lower down.

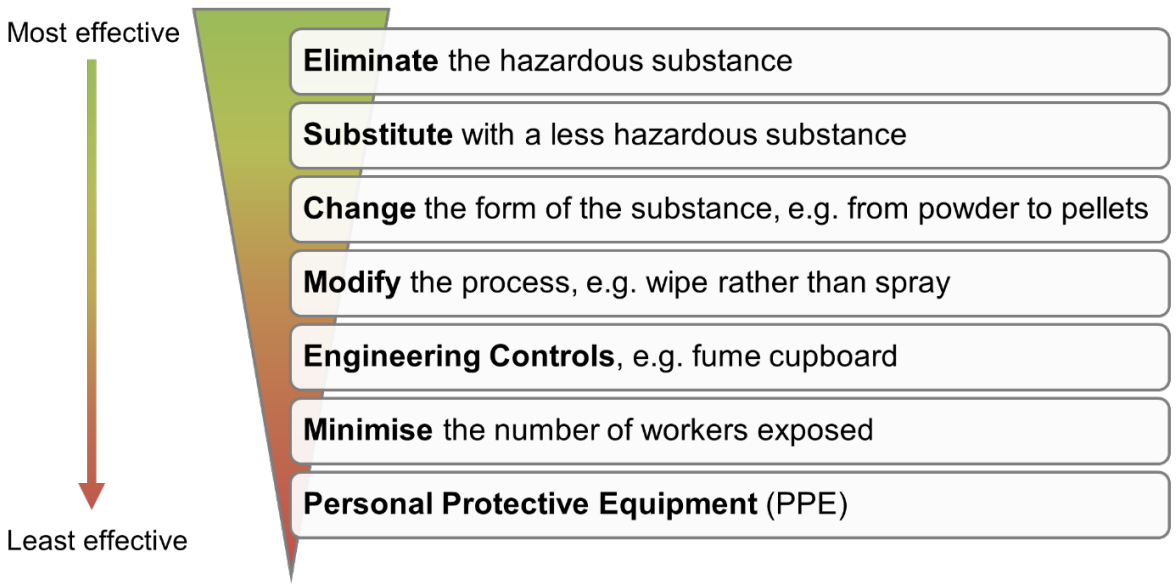


Figure 5: COSHH hierarchy of control.

5. PROCUREMENT AND RECEIPT

The lack of routine oversight of purchasing chemicals means that hazardous substances can be purchased without specific safety-related approval.

Personnel who approve purchases are responsible for ensuring that:

- A suitable and sufficient risk assessment (see Section 4) is in place before approving chemical purchases.
- All chemicals arriving on site are listed on the local chemical inventory (see Section 3) and that an up-to-date safety data sheet is available.

Requirements for all personnel purchasing chemicals:

- Before purchasing a chemical, identify whether there is a less hazardous alternative available and consider using this instead.
- Consider asking other groups or departments if they have any spare stock of the chemical you want to use.
- Purchase the minimum quantities required for your work to avoid stockpiling unused chemicals. Storage of large quantities of chemicals can be problematic, and disposal of unwanted chemicals is expensive.
- Make sure there is suitable, adequate and secure storage available for all chemicals you purchase.
- When chemicals you have purchased arrive in Stores, collect them in a timely manner, suitably label them (see Section 3.3), and store them safely and securely.
- If you want to purchase a Schedule 1 poison, you must discuss the proposed use and risk assessment with HSBS before proceeding with the purchase.
- No member of the Institute is permitted to purchase Schedule 5 toxins without prior authorisation from Security and provision to the supplier of the Institute's URN (unique reference number) from the National Counter-Terrorism Security Office (NaCTSO).

6. STORAGE

6.1. General Considerations

- All chemicals being stored must be captured on the local inventory (see Section 3).
- Stock or bulk chemicals (e.g. concentrated acids, absolute ethanol) should be stored in a dedicated chemical cabinet appropriate to the nature of the substance and segregated from incompatible substances.
- Cabinets and bulk chemical stores must display correct signs to indicate the nature of the hazard present (advice can be sought from HSBS if required).
- Bulk chemical stores or compounds must be restricted to access by authorised personnel only.

6.2. Segregation by Hazard Type

The compatibility of substances to be stored together must be checked to minimise the likelihood of dangerous reactions occurring. Appendix 10 shows a chemical compatibility guide to assist users to ensure chemicals are adequately segregated (based on their primary hazards).

6.2.1. Corrosives

These substances carry the ‘corrosive’ pictogram and are often highly acidic or basic (alkaline). Examples include sulphuric acid, hydrochloric acid, nitric acid, sodium hydroxide, and potassium hydroxide.

Acids and alkalis may be stored together in an acid resistant cabinet containing a suitable spill tray to contain any leaks or spillages. They must be stored on separate shelves, and in separate spill trays if possible. Organic and inorganic acids must be kept apart. It is important to note that accidental mixing of concentrated materials will generate large quantities of heat and fumes and so where possible, acids and alkalis should be stored in separate cabinets.

Figure 6: Example corrosives cabinet

Consideration must be given to the effects of acid fumes on any metal in the fittings and construction of the container. The use of ventilated cabinets is recommended where possible, allowing the removal of fumes at source. All containers / bottle tops must be suitably sealed to avoid unnecessary leakage of fumes.

6.2.2. Flammables

These substances carry the ‘flammable’ pictogram and may be described in the SDS as ‘flammable’, ‘highly flammable’ or ‘extremely flammable’ depending on their flashpoint and boiling point. Examples include ethanol, toluene, and hexane.

The main hazard is the vapour above the liquid, which is very susceptible to ignition by naked flames, sparks, etc. Precautions therefore must be taken to prevent contact between ignition sources and concentrated vapours from flammable liquids.

Flammable solvents must be stored in specialised flammable substance cabinets, clearly labelled and positioned away from doors or other means of escape from the rooms. **No more than 50 litres total of flammable liquid may be kept in any one room to reduce the risk of a serious fire**. Reasonable quantities of flammable solvents and reagents may be kept in an open workshop or laboratory in suitable closed vessels of volume not exceeding 500 ml.

Figure 7: Example flammables cabinet

Flammable solvents must never be stored with oxidising agents (e.g. hydrogen peroxide, nitric acid), reducing agents and concentrated acids (e.g. hydrochloric and sulphuric acids). The safety data sheet should always be consulted if further information is required on storage and chemical incompatibilities of a particular chemical substance.

6.2.3. Oxidising Agents

These substances carry the ‘oxidising’ pictogram. Examples include peroxides, nitrates, and perchlorates.

Oxidising agents can intensify combustion and increase the flammable range for chemicals causing them to ignite more readily. They must be stored separately from other substances, in particular combustible solvents and other organic compounds. Ideally, they should be stored in a metal cabinet or bin and be separated from any combustible materials e.g. wooden shelves, paper or fabric.

6.2.4. Halogenated Solvents

These substances are organic solvents that contain halogens: chlorine (Cl), fluorine (F), bromine (Br) or iodine (I). They may carry various pictograms, depending on the nature of the hazard(s). Examples include chloroform, trichloroethylene, bromoethane, and dichloromethane. The incompatibility section

of the SDS should be checked carefully to ensure these substances are not mixed with incompatible substances.

Halogenated solvents are best stored in ventilated cabinets separately from flammable solvents. This is because violent reactions can result from the mixing of certain flammable and halogenated solvents. They can be stored in metal cabinets or bins if ventilated storage is not available.

6.2.5. Noxious Substances

These substances produce a very strong-smelling vapour which can be unpleasant or irritating. They may carry various pictograms, depending on the nature of the hazard(s). Examples include mercaptans and amines.

Ventilated cabinets should be used to store such chemicals to ensure any vapours are extracted as quickly as possible. If a ventilated cabinet is not available (or the substance must be stored in a fridge, e.g. beta-mercaptoethanol) then containers of noxious substances must be stored in a tightly sealed secondary container and only opened in a fume cupboard. Under these circumstances it can be acceptable to use a fume cupboard for storing noxious substances provided that the fume cupboard is used only for this purpose and not used to undertake any experimental activity.

6.2.6. Poisons & Toxins

These substances carry the 'toxic' pictogram. Examples include hydrogen cyanide and botulinum toxin. See Appendices 2 and 3 for full lists. Specific legal requirements apply to these substances; users must seek advice from HSBS before purchasing.

Where the toxicity is the primary hazard, these substances must be kept in a locked cabinet, specific for the purpose, in a designated laboratory area. A designated responsible person should hold the key or a Traka cabinet be used, and a log book must be kept to accurately record when a poison or toxin is used, how much and by whom.

Figure 8: Example poisons cabinet

6.2.7. Prescription Only Medicines (POMs) and Controlled Drugs

No POMs or controlled drugs (except individuals' personal prescription medicines) are allowed on site without permission. If any department other than Animal Services (who already have the required processes in place) needs to use these substances, consult HSBS in the first instance.

Drugs, medicines and drug precursors must be stored securely in locked cupboards with access controlled by authorised keyholders. A detailed inventory of storage and use of controlled drug compounds must be accurately maintained. In some cases, there may be a requirement to store some substances at reduced temperature in which case a refrigerator / freezer fitted with a suitable lock should be used.

6.2.8. Carcinogens, Mutagens, Teratogens & Reproductive Toxins

These substances carry the 'health hazard' pictogram. Examples include formamide, cisplatin, and lead acetate. Note that some of these substances may also be cytotoxic or cytostatic (e.g. cisplatin).

These substances should be kept securely in a cabinet with only authorised persons accessing them.

6.3. Storage in Fridges, Cold Rooms and Freezers

Containers must be able to withstand the conditions without cracking, distorting or shattering. Tubes, bottles, etc. containing chemicals should be placed inside or on something that will prevent accidental

spillage or leakage (e.g. box, tray).

Chemicals that give off flammable vapours, such as ethanol, can form explosive air/vapour mixtures in fridges. Spark-free fridges must therefore be used for storage of these substances.

7. USE

7.1. General Guidance

This section provides general guidance for controlling exposure to hazardous substances during use, following the hierarchy of control in section 4.2.2. Sections 7.2 – 7.8 provide additional guidance for specific types of hazardous substance.

- If the substance cannot be **eliminated** or **substituted** for something less hazardous, then **modify the process** so that there is less likelihood of exposure. For example, use pipettes or dispensers to transfer liquids rather than pouring from one container to another to limit the amount of aerosol produced; use 'safer sharps' to minimise the likelihood of entry via a puncture wound.
- **Isolate** the worker from the hazardous substance, using total or partial enclosure (e.g. a spray booth), or using local exhaust ventilation (LEV) equipment such as a fume cupboard or capture hood to remove airborne contamination.

NOTE: If a hazardous chemical is to be used in a biological safety cabinet (BSC), its quantity must be limited. This is because BSCs are not designed to capture gases and vapours that may be harmful, and because some BSCs on site recirculate into the room this can result in exposure of users to the harmful vapours. BSCs are not built to safely handle large volumes of flammable vapour, and some substances when aerosolised (e.g. acids) can damage the HEPA filter.

- Use personal protective equipment (**PPE**):
    - In the laboratory, PPE should consist of **as a minimum** a fully-fastened Howie-style laboratory coat and gloves conforming to EN 374 (NB: disposable gloves give limited chemical protection. Chemical-resistant gauntlets may be more suitable for some chemicals or activities; HSBS can advise).
    - In a workshop, plant room, or other non-laboratory area, PPE used must be identified via risk assessment to ensure it is suitable for the area and task as well as the substance(s) in use.
    - If a chemical could splash or spray into eyes, safety eyewear conforming to EN 166 should be worn.
    - Where there is an inhalation hazard, respiratory protective equipment (RPE) should be worn and HSBS can advise on suitable types.
    - All PPE must be suitable for protection against the substance in use. HSBS can assist users in identifying PPE appropriate to the task and substance.
- Ensure that robust written **procedures** are in place for activities involving chemicals.
- Maintain high standards of **housekeeping** and **hygiene** (i.e. hand washing)**.**

7.2. Flammable and Oxidising Substances

In addition to the general guidance, ensure the following is considered when using these substances:

- Do not mix them.

- Ventilation: an adequate flow of air will ensure that any vapours given off from a spill or leak, or released from any process, will be rapidly dispersed, thereby minimising the likelihood of combustion.
- Ignition: all sources of ignition must be minimised or, preferably, removed from the area where flammable and oxidising substances are being used. Ignition sources can be varied and include sparks from electrical equipment or welding and cutting tools, hot surfaces, static discharge, open flames from Bunsen burners, smoking materials, etc.

7.3. Corrosive and Irritant Substances

The general controls in section 8.1 will usually be sufficient for **small** quantities of **dilute** corrosive and irritant substances.

Hand protection: where larger quantities and/or concentrated forms of a substance are used, disposable or reusable gloves that provide a greater level of protection against chemicals than general-use nitrile gloves are recommended. The safety data sheet should be consulted to determine the most appropriate glove material for the substance. Long-cuff gloves or gauntlets are appropriate where hands could foreseeably be immersed in the substance (e.g. the Plowright dunk tank) or where wrists need to be covered.

Eye protection must be worn when handling corrosives in a way that could result in splashes or sprays to the eye.

Where corrosive substances are to be diluted in water, add the corrosive substance to the water.

7.4. Toxic Substances (Including Cytotoxic / Cytostatic Drugs)

It is expected that these substances will be subject to a separate, specific risk assessment due to the severity of potential health effects and the need to robustly control exposure. This will identify the procedures and PPE required to adequately safeguard users.

All workers using toxic substances must be aware of the typical symptoms of poisoning. Depending on the material, medical attention for an exposure may be required even if the exposure did not seem excessive. With some chemicals, symptoms of a severe exposure can be delayed.

7.5. Carcinogens, Mutagens, Teratogens, and Reproductive Toxins (CMRs)

COSHH has an absolute requirement for the following measures to be implemented:

- Enclosing the process (e.g. using a fume cupboard) unless this is not reasonably practicable.
- Ensuring contaminated surfaces are cleaned when work has finished.
- Using signage to alert others that carcinogens are in use.
- Storing, handling, and disposing of carcinogens safely, including using closed and clearly labelled containers.

NOTE: Health surveillance is required for a small number of substances and health records should be kept for workers handling carcinogens. Advice should be sought from HSBS for any work where carcinogens are in use.

7.6. Substances Hazardous to the Environment

Prevention of release (e.g. through leakage, spillage, or incorrect disposal) is the most effective control measure, followed by swift and appropriate response to accidental release.

Substances stored and used in external areas (e.g. diesel) will usually be subject to specific risk assessment in order to ensure that the risk of ground, air and water contamination from leaks and spills is reduced to as low as reasonably practicable.

7.7. Sensitisers (Including Asthmagens)

As far as possible, procedures must be put in place that minimise the formation or emission of sensitisers. For example, wetting floors and surfaces before wiping down, rather than dry sweeping which can generate a substantial amount of airborne dust. Such procedures should be documented in local methods.

If working in a fume cupboard or biological safety cabinet is not practicable (e.g. work with large animals), personal protective equipment can be used. Gloves should always be worn, and where there is a risk of inhalation, RPE should be used, and this must be face fit tested (HSBS provide this service). Users must always consider others working in the area, ensuring that their exposure is minimised as far as reasonably practicable; if required, they too should wear PPE and/or RPE.

NOTE: If a risk assessment shows that a respiratory sensitiser (e.g. animal allergen) is not contained and/or controlled sufficiently by engineering measures, or there is reliance on RPE for control, it is likely that respiratory health surveillance will be required. Similarly, health surveillance may be required for work with a skin sensitiser. HSBS can provide advice and guidance on health surveillance for workers exposed to these substances.

7.8. Schedule 1 Poisons

Use of any Schedule 1 poison (see Appendix 2) is always subject to a specific risk assessment, completed with assistance and approval from HSBS.

In addition to the general control measures described above and those for toxic substances, Schedule 1 poisons are subject to the following controls, required by law. Poisons must be:

- Kept in an impervious, suitably strong container that is fully, correctly, and legibly labelled.
- Stored in a cupboard or cabinet reserved solely for poisons and kept locked. Access to the key or code must be restricted to authorised users only (e.g. by using a Traka cabinet).
- Stored in a secure, access-controlled room.
- Listed on an inventory or register, and their usage logged on this.

7.9. Inadvertent Mixing of Incompatible Chemicals

Where there is a foreseeable risk of mixing two or more incompatible chemical substances – for example, where multiple substances are in use in the same area, or when discarding waste substances – steps must be taken to prevent this as far as possible. Consideration should be given to:

- Workflow and workspace layout, i.e. setting out the workspace so that chemical containers are segregated and used in a logical manner (e.g. work ‘flows’ from left to right).
- Accurate, comprehensive, and legible labelling of all containers.
- Ensuring users can tell containers apart, e.g. by use of colour coding.
- Never mixing substances – even waste substances – unless users are certain that it is safe to do so (advice should be sought from HSBS if in any doubt).
- Storing waste containers in a manner that reduces the likelihood of mixing them up, e.g. in a dedicated cabinet or on the same shelf every time.
- Training users in these practices and recording this training.

8. MOVEMENT AND TRANSFER

8.1. Onsite Movement and Transfer

Moving chemicals around site or between rooms or buildings carries a risk of exposure and harm to personnel as a consequence of a leak or spillage, most likely due to inappropriate or inadequate packaging or unsuitable transportation methods. Environmental harm can also be caused if the substance is released into the ground, air, or water.

The transport of hazardous chemicals, including waste, within and between buildings and laboratories needs to be managed to minimise the potential for release from inadvertent spills, drops or collision events. The precautions implemented should be proportionate to the inherent hazard associated with the hazardous material. As a minimum all containers should be securely lidded when transporting outside the laboratory.

In addition:

- Bottles must never be carried by their tops.
- Carriers, baskets, or lidded buckets that are capable of providing proper support can be used for transporting larger bottles (e.g. 1L or 2.5L Winchesters).
- Trollies are available around site for transporting chemicals. Chemicals should be secured in a secondary container such as a plastic box.
- Chemicals with a significant health risk such as toxics, carcinogens, or mutagens must be transported in secure robust secondary containers.
- The outside of chemical containers must be checked and cleaned down if necessary prior to transport.
- Transport containers must be suitably labelled to identify their contents.
- Personnel transporting chemicals must make themselves aware of the location of the nearest available spill kit for use in the event of an incident during transport and ensure they are familiar with its use, or else carry spillage materials with them.

8.2. Offsite Transfer

If chemicals are to be transported offsite, either in personal vehicles or via courier, advice should be sought from the Institute's Dangerous Goods Safety Adviser (DGSA) by contacting HSBS@pirbright.ac.uk.

9. DISPOSAL

Hazardous chemical waste may include solvents, oils, reaction by-products, washings, chemicals that are out of date or unwanted, biocides, and cleaning products. It may also include chemically contaminated equipment, consumables, containers, sharps, and spillage media.

There is an established and appropriate route of disposal for all types of chemical waste on site. This includes:

- Discharge to drain (and, in Plowright and the ISOs, to treatment in the effluent treatment plant (ETP)).
- Autoclaving.
- Offensive ('tiger bag') waste stream.

- Specialist disposal by a licensed contractor via HSBS.

9.1. Discharge to Drain

The Institute's Trade Effluent Consent permits discharge of only 'waste liquids arising from floor washings and washing of laboratory equipment'. In general therefore, only small quantities (typically 500ml or less) of the following should be discharged to drain, with copious amounts of running water to ensure adequate dilution. The list is not exhaustive; if users are at all unsure then guidance from HSBS should be sought:

- Dilute acid solutions (not including hydrofluoric acid)
- Dilute alkaline solutions (not including ammonia)
- Non-toxic, dilute, water soluble alcohols in small amounts
- Non-toxic, water soluble inorganic salts (e.g. sodium chloride, sodium citrate)
- Small quantities of detergent used for cleaning
- Disinfectant solutions at the working concentration only
- Hypochlorite (bleach) solutions at the working concentration only (NOT within Plowright or ISO SAPO4 containment areas, as they can corrode ETP components)
- TAE / TBE buffer at the working concentration only (not including stock / concentrated solutions)

NOTE: Although it may be acceptable to wash small quantities of the above substances to drain with copious amounts of water, it is not acceptable to deliberately dilute bulk waste chemicals for the purposes of disposal. Any large quantity of waste should be retained safely for disposal via an approved contractor.

NOTE: Remember that even dilute solutions of incompatible substances may react violently if they come into contact within the drainage system potentially producing flammable or toxic products (e.g. Virkon will react with bleach to produce toxic chlorine gas). Care should be taken to ensure that the risks are properly assessed before disposing of any substance via the drainage system.

Some dilute, aqueous chemical solutions below the relevant threshold levels for discharge (and therefore qualifying as being non-hazardous) may be permitted. The table below sets out the absolute maximum concentrations for chemicals of each hazard classification to qualify as non-hazardous according to Technical Guidance WM3:

To dispose of these, they need to be at a **concentration of 0.1% or less:**	To dispose of these, they need to be at a **concentration of 1% or less:**
Very toxic substances (H300, H310, H330, H301, H311, and H331)	Toxic substances (H302, H312, H332)
Carcinogens, mutagens and reproductive toxins (Category 1 or 2)	Corrosive substances listed as causing burns
Corrosive substances listed as causing severe burns	Eye, skin and respiratory irritants
Substances hazardous to the environment	Harmful substances
NOTE: A substantial number of substances are NEVER PERMITTED to be disposed of down the drain. Users must ensure they check Appendix 9 for the list of these substances.	

Table 2: Absolute maximum concentrations for chemicals to be classified as non-hazardous

9.2. Autoclaving

In general, it is not advisable to autoclave chemicals as they can react under heat and pressure and combust, explode, and/or form hazardous fumes, all of which could harm autoclave operatives and/or damage the autoclave. If autoclaving is identified as the most appropriate waste treatment (for example, certain chemically-contaminated liquid wastes arising from activities in a CL3 laboratory, or empty chemical containers), then this must be justified and controlled via risk assessment. Always seek advice from HSBS if unsure.

9.3. Offensive Waste Stream

Only non-hazardous, solid chemical or chemically-contaminated waste may be placed into the offensive ('tiger stripe') waste stream. This includes non-hazardous chemicals (e.g. agarose, calcium citrate, glucose) and empty non-hazardous plastic chemical containers.

Empty plastic containers of irritant chemicals (i.e. displaying the exclamation mark pictogram) with low levels of residual contamination may be disposed of as offensive waste. Examples include irritant salts, some antibiotics and enzymes, etc. Other empty hazardous chemical waste containers should be disposed of according to Section 9.4 below. *NB: Glass chemical containers can usually be rinsed / washed and recycled as clean glass, provided that the label is removed.*

NOTE: This stream does not apply within SAPO4 containment areas or within CL3 laboratories.

9.4. Specialist Disposal by a Licensed Contractor

If none of the previous disposal routes can be used, chemical waste must be disposed of via a licensed waste contractor. **Chemical waste must be packaged in an appropriate container** (see below) **and clearly and legibly labelled** (see Section 2.3) **in order for it to be accepted by the contractor**. For waste originating from a non-SAPO4 laboratory, pre-printed self-adhesive labels are available from HSBS.

HSBS collect and store chemical waste arising from laboratories in a store pending collection by a licensed contractor. Small amounts of chemical waste arising from EMS activities may also be accepted, although for large volumes (e.g. waste oil or diesel) or large quantities of waste, a special collection is usually arranged either by EMS directly or via the Environment Officer.

9.4.1. Arranging a Chemical Waste Collection by HSBS

NOTE: Due to limited storage capacity, HSBS can only collect small amounts of chemical waste. For large amounts (e.g. drums of waste diesel), a special collection can be arranged.

To arrange a collection by HSBS:

- Complete RISK-FORM-7 (available on Q-Pulse).
- Send this to the HSBS inbox: HSBS@pirbright.ac.uk.
- A member of HSBS will contact you to arrange a date and time for collection (and fumigation if within the Plowright SAPO4 contained area).

NOTE: While awaiting a collection, chemical waste must be stored safely, and segregated with due regard to chemical compatibility / properties in order to prevent the likelihood of reactions occurring in storage. Follow the guidance in Section 6.

9.4.2. Containers for Chemical Waste

Containers must be suitable for the type of waste. The following guidelines should be followed:

- Glass bottles (e.g. empty Winchester bottles) can be used for most chemicals.

- Plastic bottles are suitable for acids and alkalis. Do not put aggressive solvents such as ether or dichloromethane, or mixtures containing aggressive solvents (e.g. acetone), in plastic containers unless the container is made of high density polyethylene (HDPE) **and is known to be suitable**.
- Steel drums are suitable for non-acidic organic solvents, neutral aqueous solutions and oils but are NOT suitable for acids or alkalis.
- Chemically-contaminated consumables (e.g. tips and tubes from phenol extractions) may be collected into a sealable jar or pot such as an empty media pot or Dispojar. If large amounts of such waste are generated, HSBS can provide blue 30L burn bins (Figure 9) to keep in the work area.
- Containers designed for solids MUST NOT be used for liquids.
- Empty pipette tip boxes are **not** suitable containers.

Figure 9: 30L blue burn bin

The integrity of the container must be checked prior to use or disposal. It must be:

- Sound – i.e. have no cracks, chips, or punctures. Remember, old plastic containers and lids may have degraded and become fragile, especially if exposed to sunlight for long periods.
- Securely fastened / sealed - containers without secure lids (e.g. stoppered flasks) will NOT be accepted for disposal.
- Leak proof. Containers that show signs of leakage will NOT be accepted for disposal.

10. EMERGENCY PROCEDURES

This section contains general guidance for responding to:

- Fires involving chemicals.
- Spillages of liquid chemicals of **up to 2.5 litres**.
- Spillages of concentrated liquid disinfectants of **up to 5 litres.**
- Spillages of solid chemicals (e.g. powder, granules, pellets).
- Chemical exposure of personnel.

For larger spills (e.g. from multiple containers, drums, IBCs, etc.), reference must be made to **SEC-MAN-2 Incident Management Plan**. For large environmental spills (e.g. large amounts of diesel, oil, etc.) where there is a risk of ground or water contamination, advice must be sought from the Environment Officer or HSBS.

NOTE: This guidance does not replace specific spillage or first aid guidance given in SDSs or COSHH risk assessments, where these are in place for specific activities or chemicals. It is intended to provide general guidance suitable for most chemical spillages that are likely to occur at Pirbright.

10.1. General Fire Safety Procedures

In the event of a fire involving a chemical, follow the usual fire evacuation procedures for the building. It is not advisable to attempt to tackle a chemical fire, due to the risk of spreading the fire or using an unsuitable extinguisher.

10.1.1. Fire in a Fume Cupboard

In the unlikely event of a fire in a fume cupboard, close the sash of the cupboard, switch off the extraction fan and raise the alarm using the nearest call point. Normal fire evacuation procedures should then be followed.

10.2. Spillage Management

Spillage clean up materials (e.g. paper towels, spillage granules) and/or spillage kits (usually used in external areas and containing booms, pads, drain covers, and disposal bags) should be readily available in all areas where chemicals are in use. The exact materials required will depend on the nature and quantities of substances present, and users must make a judgement on the type and quantity of materials needed in the area and for the work.

When dealing with a spillage, personnel must wear PPE appropriate for the task and the chemical(s) in use, as defined in the activity risk assessment or COSHH risk assessment (where in place). In the laboratory, this will be a minimum of a fully fastened Howie-style laboratory coat and gloves suitable for the chemical(s) in use. In other areas, e.g. the engineering workshop or laundries, this is likely to be site workwear or overalls and gloves. Safety eyewear must be worn if there is any risk of chemical entering the eyes.

In the event of any chemical spillage, it is important to consider the amount spilled, location of the spillage and nature of the substance before taking action.

10.2.1. Guidance for Responding to a Spillage Within Primary Containment

For a chemical spillage within primary containment, such as a fume cupboard, glove box or biological safety cabinet (BSC), the user must make a judgement as to the appropriate response by considering the nature of the chemical, the amount spilled, whether the equipment is hard ducted or recirculating, etc. In many circumstances, it is likely to be a straightforward case of using suitable absorbent materials to clean up the spill and disposing of these as hazardous chemical waste.

If in any doubt, follow the guidance for spillages outside primary containment which ensures safety of personnel in the area while an appropriate response is considered.

10.2.2. Guidance for Responding to a Spillage Outside of Primary Containment

For a spillage inside a building but outside of primary containment, the following steps should be taken:

- Remove any contaminated clothing and PPE and move away from the spillage.
- If the substance is flammable, turn off any heat-generating equipment (e.g. Bunsen burner, welding set) if safe and possible to do so.
- Warn people in the area and initiate an evacuation if deemed necessary (e.g. in the event of a large spillage, the substance is hazardous by inhalation, there is a foreseeable risk of fire, etc.). Prevent entry to the area, e.g. using barrier tape and signage.
- Request first aid assistance and/or emergency medical assistance (e.g. ambulance) if required. Refer to section 10.3 for further general advice on exposure response.
- Decide what action to take from a position of safety. Seek assistance from HSBS if unsure – HSBS keep a stock of spillage clean up materials and can assist in arranging for a specialist response team if required.
- If the spilled material could activate a fire alarm, affect biocontainment, impact upon business continuity, etc. then the Facility Coordinator, Duty BSO and/or HSBS should be made aware.

- If / when it is safe to do so:
    - Don appropriate PPE, including respiratory protective equipment (RPE) if required (NB: anyone using tight-fitting RPE must be face fit tested for the respirator in use).
    - Ventilate the area if required and if possible, e.g. opening windows if this possible and can be done without crossing the spill area, or turning on boost extract fans.
    - Contain larger spillages to prevent spread and/or escape to drains, e.g. by use of booms.
    - Clean up liquid spills using absorbent materials. Some liquids, such as disinfectants, can be mopped up and the resulting liquid dispensed to drain.
    - Solid substances (e.g. powder, pellets, etc.) should be scooped, swept or scraped up. Exposure to harmful dusts must be prevented by using a dust suppressant; users must be aware of which suppressant(s) is/are suitable for the substance.
    - Clean the area to remove residues using a suitable substance (refer to the safety data sheet for incompatible materials).
    - Place used spillage materials and contaminated items (except clothing – see below) into a suitable waste container. In most cases, a hazardous waste bag is appropriate, and spillage kits should contain heavy-duty bags for this purpose. Offensive waste ('tiger stripe') or autoclave bags can also be used – consider double-bagging to prevent the bag tearing and releasing the contents, particularly if there is a large amount of waste or for highly hazardous chemicals. Close, label and store the bag safely. If the chemical is volatile, the bag can be placed in a fume cupboard to allow vapours to be safely extracted while awaiting final disposal.
    - Remove and dispose of PPE used during the clean-up into a separate bag.
    - Collect up any contaminated clothing into another bag for treatment. Clothing will be laundered on site if possible.
    - Contact HSBS to arrange disposal of the waste materials.
- Spillages must be reported via the incident reporting system.
- If a spill kit is used, it must be re-stocked before being stored back in its usual place.

Appendix 5 contains a printable version of the above that can be displayed / used as an aide memoire in spillage kits.

10.2.3. Environmental Spillage

Chemical spillages can occur outside a building during transport of chemicals between buildings, when filling a fuel bowser from a storage tank, in the event of damage to IBCs stored outside, etc. As well as having the potential to harm personnel, such environmental spillages have the potential to contaminate air, land and water and must be prevented as far as possible.

- Ensure personnel are safe – follow the guidance in Section 10.3 if necessary.
- If it is safe and possible to do so, prevent the spillage from spreading and entering soil or water by blocking drains, using spill booms, etc.
- Ensure personnel are removed from the area and decide how to proceed from a position of safety. Consult HSBS and/or the Environment Officer if assistance is required.

- A specialist spillage response team may be required to attend site to clean up the spill. HSBS and/or the Environment Officer can assist with arranging this.

Oil spill kits are provided around site at locations where oil and fuel spillages could occur. These are managed by the Environment Officer who should be approached for advice on when and how to use them.

All environmental spillages must be notified to HSBS and the Environment Officer as soon as it is safe and practicable to do so, as a report to the HSE, Environment Agency or other regulatory body may be required.

As with indoor spillages, environmental spillages must be reported via the incident reporting system.

10.3. Exposure Response

Before using any hazardous substance, particularly for the first time, the safety data sheet must be consulted to ensure an appropriate response in the event of exposure. This is particularly important for substances that are toxic and/or have workplace exposure limits (WELs). Where the safety data sheet details exposure responses that are different or more robust than those detailed below, a specific risk assessment may be required.

10.3.1. Guidance for Responding to Exposure of Personnel

The following immediate response is likely to be appropriate in most circumstances.

Appendices 6 and 7 contain a printable version of this guidance that can be displayed and/or used as an aide memoire in first aid kits.

Inhalation:

- Remove the casualty to fresh air if it is safe to do so (i.e. they are not unconscious or injured such that they are immobile, or it would be unsafe to move them).
- Contact a first aider for assistance if required.
- They may recover, however if their condition does not improve or worsens, call for an ambulance and provide the emergency crew with the safety data sheet.
- If the casualty is non-responsive or unconscious but is breathing normally, place them in the recovery position.
- If the casualty is unconscious and not breathing normally, administer cardio-pulmonary resuscitation (CPR) if safe to do so and you are confident. Mouth-to-mouth resuscitation should only be performed with a mouth shield, otherwise only use chest compressions.

Ingestion (swallowing):

- DO NOT induce vomiting, unless recommended on the safety data sheet and in a fully conscious casualty.
- Remove the casualty to fresh air if it is safe to do so.
- Contact a first aider for assistance if required.
- Seek medical advice immediately. NHS 111 can be called who are able to consult the National Poisons Information Service (NPIS) for advice.
- If the casualty's condition does not improve or worsens, do not hesitate to call for an ambulance and provide the emergency crew with the safety data sheet.

Skin contact:

- Decontaminate skin as rapidly as possible to minimise any absorption and subsequent systemic effects.
- Diphoterine should be used in the event of phenol exposure and, if readily available, for any other chemical exposure (see Appendix 8).
- Otherwise, wash the affected area with soap and water.
- Seek medical attention if the substance is readily absorbed through the skin or a large area of skin is affected, and certainly where there has been a reaction in the skin (e.g. redness, swelling, itching, blistering).
- Heavily contaminated clothing should be removed quickly, but in a manner that avoids contaminating other areas of the casualty's skin that has not been affected.

Eye contact:

- Flush the eye(s) immediately with either:
    - Water from a tap or eyewash hose. Continue flushing for 15 minutes, lifting the eyelids occasionally if possible.
    - Bottled eye wash. Use at least one full 500ml bottle per eye.
    - Diphoterine (not with water or eye wash as these decrease the effectiveness of Diphoterine).
- If the casualty is wearing contact lenses and can easily remove them, they should do so.
- Medical attention should be sought in all cases of eye contact and is particularly important if the substance is readily absorbed through mucous membranes, if there is a reaction in the eye (e.g. redness, itching, soreness, swelling) or if vision is affected (e.g. blurriness, loss of vision).

Injection (sharps):

- Encourage bleeding, but do not massage or suck the site of the injury.
- Wash the area with soap under warm running water but do not scrub.
- Cover the site with a sterile dressing.
- Medical advice should be sought if the substance is known to have systemic effects, e.g. toxicity, carcinogenicity, target organ damage, or in the event of a reaction at the injury site such as swelling, itching, redness or blistering.
- Be aware that skin punctures can also present an infection risk if pathogens are present, e.g. virus on a needle, bacteria on a rusty nail. If in any doubt, arrange for the casualty to receive medical attention.

In all cases of exposure, if the casualty's condition does not improve or worsens, do not hesitate to call for an ambulance and provide the emergency crew with the SDS.

All cases of exposure must be reported via the incident reporting system.

11. MAINTENANCE

11.1. Maintenance of Equipment

To ensure that all control measures adequately prevent and control exposure to the worker there is a requirement to ensure that they are appropriately maintained and in good condition.

- Equipment should not be used if it is not within its service period (e.g. fume cupboards and biological safety cabinets must have an in-date validation certificate).
- A visual inspection of all equipment to be used should take place prior to work commencing.
- Where any defects are found with the equipment then it should not be used, and the defect should be reported in the appropriate fashion to arrange for repairs to be carried out.
- Equipment must be kept in a good, clean condition and appropriately stored if applicable. For example, fume hoods should be left in a clean and tidy state and not overcrowded as to affect the air flow within them.
- Equipment used must be suitable for use and for the purpose and conditions in which it is to be used.

12. REFERENCES

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RISK-POL-4	Risk Policy
RISK-COP-1	Risk & Assurance Handbook
RA000756	Chemical Management Operational Risk Assessment (OpRA)
HSBS-SOP-2	Occupational Health Surveillance Process
RISK-FORM-7	Chemicals for Waste Disposal
RISK-FORM-29	Chemical Inventory Template
RISK-GUIDE-18	Safe Working with Cyanides
RISK-GUIDE-19	Safe Working with Phenolic Substances

13. APPENDICES

Appendix 1	Do I Need a Separate Risk Assessment?
Appendix 2	Schedule 1 Poisons List
Appendix 3	Schedule 5 Toxins List
Appendix 4	Cytotoxic and Cytostatic Medicines List
Appendix 5	Chemical Spillage Flowchart
Appendix 6	Exposure Response Flowchart
Appendix 7	Sharps Injury Response Flowchart
Appendix 8	Using Diphoterine
Appendix 9	Substances That Must Not be Released to Drain
Appendix 10	Chemical Storage Guide

Appendix 11 Chemical Waste Label Template

14. GLOSSARY

BSC	Biological safety cabinet
COSHH	Control of Substances hazardous to Health Regulations 2002
CTSA	Counter Terrorism Security Adviser
SDS	Safety data sheet

14.1. APPENDIX 1: Do I Need a Separate Risk Assessment?

14.1.1. Aspects to Consider

To determine whether a separate risk assessment is required, users will need to apply their judgement by considering the following aspects of the chemical and the activity and determining if they have been adequately addressed by RA000756. The table overleaf can be used to record details for each of these if desired, to assist with the decision-making process and facilitate any further discussion with HSBS.

Users may also consider using the HSE's COSHH Essentials e-tool, which can be useful in giving an indication of how dangerous a chemical is within the context of the activity undertaken (note that this only covers health hazards).

- The **hazardous properties** (including the health effects) of the chemical. These are displayed as hazard warning pictograms on the chemical container and stated on the safety data sheet (SDS) as hazard statements. Chemicals with hazard statements such as *H310: Fatal in contact with skin* or *H331: Toxic if inhaled* are likely to require more attention than those with hazard statements such as *H316: Causes mild skin irritation* or *H335: May cause respiratory irritation*.
- The potential **route(s) of entry** into the body and the likelihood of exposure via that route. For example, skin contact with a chemical may be more likely to occur than swallowing it, therefore a chemical that is toxic in contact with skin may be more of a concern than one that is toxic if swallowed.
- The **form** and **nature** of the substance. For example, is it a fine powder that can easily become airborne and therefore inhalable, or a liquid that can splash? Does it produce a flammable vapour or a noxious odour?
- **How much** of the chemical is being used. In general, the larger the volume, amount or quantity, the greater the risk associated not only with handling and use, but also with leaks and spills. Some chemicals (such as those found in kits) are highly hazardous but present in such small amounts or such a low concentration that the risk is minimal.
- The way the chemical is **handled and used**. Is it poured directly from a bottle, or measured out with a dispenser or pipette? Does it have to be transported between rooms or across site? Is it mixed with other chemicals? Does it have a defined waste route?
- The **temperature** at which the chemical is used. Some chemicals become more reactive or hazardous when heated, for example.
- The **frequency** and **duration** of the task. Activities carried out frequently can increase the likelihood of exposure, but conversely can become familiar and routine. A new activity that workers are not familiar with can pose greater risks than one they carry out regularly.
- The **people** who could be at risk – not only staff and students, but also contractors and visitors. Consider the risk to vulnerable persons such as young people or pregnant workers, as well as how many people could be exposed.
- Any relevant **workplace exposure limit**, that defines the concentration above which workers must not be exposed.
- The **controls** that are already in place. Consider the engineering controls that may be available, such as fume cupboards, safety cabinets and other local exhaust ventilation, as well as the procedural controls in place such as safe working procedures, training and PPE.

- How to deal with **leaks**, **spills** or **exposure**. Can general emergency procedures be applied, or are there specific responses? For example, rooms where phenolic substances are used should have Diphoterine available nearby; the exposure response for cyanide is to administer oxygen therapy.

If, after considering these aspects, users determine that their activity is covered by RA000756 (together with the Chemical Code of Practice and associated guidance sheets), then no separate risk assessment is required.

If users believe that their activity is an outlier, a risk assessment must be prepared. HSBS can offer advice and guidance on how to proceed with this if required.

NB: There are likely to be some groups or users who wish to write a separate risk assessment for their activity, or to maintain existing assessments (e.g. for accreditation purposes), which is entirely acceptable.

14.1.2. Once a Decision Has Been Made

Users must remember that a risk assessment is only the beginning of the risk reduction process. The findings of any risk assessment – whether the Chemical Management OpRA or a separate one – must be implemented via, for example, clear communication, written procedures and training. This will ensure that all users are aware of the precautions required to carry out an activity safely, and also ensures consistency of approach.

Activity & Chemical(s)	
Hazardous properties	
Form / Nature	
Amount / Volume	
Handling	
Temperature	
Frequency & Duration	
Personnel at Risk	
Workplace Exposure Limit	
Controls	
Risk Assessment Status	☐ Covered by RA000756 ☐ Separate RA required

14.2. APPENDIX 2: Schedule 1 Poisons List

The following substances are listed in Part 1 of Schedule 1 of the Poisons Act 1972 and the Poisons List Order 1982. These substances have specific storage and handling requirements. Their purchase and use must be authorised and is subject to a specific, approved risk assessment.

- Aluminium phosphide
- Arsenic and its compounds (other than calcium arsenites, copper acetoarsenite, copper arsenates, copper arsenites, lead arsenates)
- Barium salts (other than barium sulphate, barium carbonate and barium silicofluoride)
- Bromomethane
- Chloropicrin
- Fluoroacetic acid; its salts; fluoroacetamide
- Hydrogen cyanide; metal cyanides, other than ferrocyanides and ferricyanides
- Lead acetates; compounds of lead with acids from fixed oils
- Magnesium phosphide
- Mercury, compounds of, the following: nitrates of mercury; oxides of mercury; mercuric cyanide oxides; mercuric thiocyanate; ammonium mercuric chlorides; potassium mercuric iodides; organic compounds of mercury which contain a methyl (CH3) group directly linked to the mercury atom
- Oxalic acid 10% w/w
- Phenols (phenol; phenolic isomers of the following: cresols, xylenols, monoethylphenols); compounds of phenols with a metal, 60% w/w of phenols or, for compounds of phenols with a metal, the equivalent of 60% w/w of phenols
- Phosphorus, yellow
- Strychnine; its salts; its quaternary compounds
- Thallium and its salts

14.3. APPENDIX 3: Schedule 5 Toxins List

The following substances are listed in Schedule 5 of the Anti-terrorism, Crime and Security Act 2001. It is not expected that these substances will be used on site. Purchase and use must be authorised and subject to a specific, approved risk assessment.

- Abrin
- Botulinum toxins
- Clostridium perfringens toxins
- Clostridium perfringens enterotoxins
- Conotoxin
- Modeccin toxin
- Ricin
- Saxitoxin
- Shiga and shiga–like toxins
- Staphylococcal enterotoxins
- Tetrodotoxin
- Viscum Album Lectin 1 (Viscumin)
- Volkensin toxin

14.4. APPENDIX 4: Cytotoxic and Cytostatic Medicines List

The following is a list of medicines that due to their cytotoxic or cytostatic properties are deemed to be hazardous (and therefore must be disposed of via the 'purple route').

This list is intended as a guide and is not exhaustive. Check the safety data sheets for further guidance if unsure as to the cytotoxic and cytostatic properties of any substances or speak to your supplier.

A		
Actinomycin	Aldesleukin	Alemtuzumab
Alitretinoin	Altretamine	Amsacrine
Anastrozole	Arsenic Trioxide	Asparaginase
Azacitidine	Azathioprine	
B		
Bacillus Calmette-Geurin Vaccine (BCG)	Bevacizumab	Bexarotene
Bicalutamide	Bleomycin	Bortezomib
Botulinum Toxin (Botox)	Busulfan	
C		
Capecitabine	Carboplatin	Carmustine
Cetrorelix Acetate	Cetuximab	Clorambucil
Chloramphenicol	Chlormethine Hydrochloride	Choriogonadotropin Alfa
Ciclosporin	Cidofovir	Cisplatin
Cladribine	Clofarabine	Clorambucil
Coal Tar containing products	Colchicine	Crisantaspase
Cyclophosphamide	Cytarabine	
D		
Dacarbazine	Dactinomycin	Danazol
Dasatinib	Daunorubicin HCl	Decitabine
Denileukin	Dienostrol	Diethylstilbestrol
Dinoprostone	Dithranol containing products	Docetaxel
Doxorubicin	Dutasteride	
E		
Epirubicin	Ergometrine/Methylergometrine	Estradiol
Estramustine Phosphate Sodium	Estrogen-Progestin Combinations	Estrogens, Conjugated
Estrogens, Esterified	Estrone	Estropipate
Etoposide	Exemestane	
F		
Finasteride	Floxuridine	Fludarabine
Fluorouracil	Fluoxymesterone	Flutamide
Fulvestrant		
G		
Ganciclovir	Ganirelix Acetate	Gemcitabine
Gemtuzumab Ozogamicin	Gondaotrophin, chorionic	Goserelin (Zoladex)
H		
Hydroxycarbamide		
I		
Ibritumomab Tiuxetan	Idarubicin	Ifosfamide
Imatinib Mesilate	Interferon Alfa-2b	Interferon containing products

Irinotecan HCl		
L		
Leflunomide	Letrozole	Leuprorelin Acetate
Lomustine	Lymphoglobuline	
M		
Medroxyprogesterone	Megestrol	Melphalan
Menotropins	Mercaptopurine	Mesena
Methotrexate	Methyltestosterone	Mifepristone
Mitomycin	Mitotane	Mitoxantrone HCl
Mycophenolate Mofetil		
N		
Nafarelin	Natalizumab	Nilutamide
O		
Oestrogen containing products (see also Estrogen)	Oxaliplatin	Oxytocin (including syntocinon and syntometrine)
P		
Paclitaxel	Paraldehyde	Pegaspargase
Pemetrexed Disodium	Pentamidine Isethionate	Pentostatin
Perphosphamide	Pipobroman	Piritrexim Isethionate
Plicamycin	Podoflilox	Podophyllin
Podophyllum Resin	Prednimustine	Procarbazine
Progesterone containing products	Progestins	
R		
Raloxifene	Raltitrexed	Ribavirin
Rituximab		
S		
Sirolimus	Streptozocin	
T		
Tacrolimus	Tamoxifen	Temozolomide
Teniposide	Testolactone	Testosterone
Thalidomide	Thioguanine	Thiotepa
Thymoglobulin	Tioguanine	Topotecan
Toremifene Citrate	Tositumomab	Trastuzumab
Treosulfan	Tretinoin	Trifluridine
Trimetrexate Glucuronate	Triptorelin	
U		
Uramustine		
V		
Vaccines (Live)	Valganciclovir	Valrubicin
Vidarabine	Vinblastine Sulfate	Vincristine
Vindesine	Vinorelbine Tartrate	
Z		
Zidovudine		

14.5. APPENDIX 5: Chemical Spillage Flowchart

ACTION IN THE EVENT OF A CHEMICAL SPILLAGE

Remove all contaminated clothing and PPE and move away from the spillage

↓

Alert colleagues: everyone should move away from the area while determining an appropriate response

↓

Evacuate people / **move** to a safe area if necessary (refer to risk assessment and/or safety data sheet) and restrict access if required

↓

Request first aid assistance if required

↓

Decide what to do next from a position of safety

↓

If required, obtain advice from HSBS

↓

If / when safe to do so:

- Don appropriate PPE, including respiratory protective equipment if required
- Contain the spillage to prevent spread and/or escape to drains
- Clean up the spill using absorbent materials (e.g. paper towels or items from spill kit)
- Clean the area with an appropriate substance to remove residues
- Place used materials into a hazardous waste bag, close with tape or cable tie
- Label and store safely
- Contact HSBS to arrange collection of the waste

↓

Report the spill (via the 'Report an Incident' link on The Bull or via Q-Pulse) and **re-stock** the spill kit if used

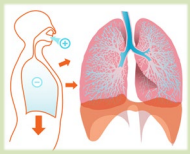
14.6. APPENDIX 6: Exposure Response Flowchart

ACTION IN THE EVENT OF PERSONAL EXPOSURE

Remove all contaminated PPE and clothing as quickly as possible, avoiding transferring contamination to unaffected areas of the person

Request first aid assistance if required

INHALATION



Remove the person to fresh air if safe to do so. If unconscious and not breathing normally, administer CPR (chest compressions only)

SKIN CONTACT

Apply Diphoterine if available, **OR** flush with water for at least 15 minutes (not both)

EYE CONTACT

Flush with water for at least 15 minutes, **OR** use bottled eye wash (at least 1 x 500 ml bottle per eye), **OR** apply Diphoterine (not with water)

INGESTION

Do not induce vomiting. Remove the person to fresh air if safe to do so. If unconscious, administer CPR (chest compressions only)

Call for an ambulance if:

- The person is unconscious, unresponsive, fitting, or not breathing
- The person is conscious, but their condition does not improve or worsens

Otherwise:

- Encourage / arrange for the person to have a medical check-up

⚠ **Ensure the safety data sheet is available for medical personnel**

Report the exposure via the 'Report an Incident' link on The Bull or via Q-Pulse

14.7. APPENDIX 7: Sharps Injury Response Flowchart

ACTION IN THE EVENT OF A SHARPS INJURY INVOLVING CHEMICALS

BLEED IT

Gently squeeze the wound to encourage bleeding

DO NOT SUCK THE WOUND

WASH IT

Wash with soap under warm running water

COVER IT

Cover the wound with a sterile dressing

Ensure medical advice is obtained if:

- The substance is known to have systemic effects, e.g. toxicity, carcinogenicity, target organ damage
- There is a reaction at the injury site such as swelling, itching, redness or blistering

⚠ **Ensure the safety data sheet is available for medical personnel**

Report the exposure via the 'Report an Incident' link on The Bull or via Q-Pulse

14.8. APPENDIX 8: Using Diphoterine for Skin or Eye Contact

Using Diphoterine is straightforward; remove the cap and spray the **whole contents** onto the affected area (Diphoterine can be used on the eyes). Diphoterine is most effective if used within 1 minute of contamination.

14.9. APPENDIX 9: Substances That Must Not be Released to Drain

Certain substances used in research are likely to cause serious environmental damage or other harmful effects if released into the drainage system. The substances below **must not** be disposed of down the drain in any quantity under any circumstances.

- Calcium carbide
- Oils, petroleum spirit or any other volatile / flammable organic solvent
- Schedule 1 poisons (see Appendix 2)
- Ethidium bromide solutions (as DNA stain or for other purposes). Decontamination kits are available commercially which efficiently remove ethidium bromide from solution
- Mineral, silicon and synthetic oils
- Substances likely to give rise to fumes or strong odours (e.g. mercaptans)
- Halogenated hydrocarbons
- Halogen substituted phenolic compounds
- Thiourea and its derivatives
- Solutions containing any concentration of the following elements:
    - Antimony
    - Arsenic
    - Chromium
    - Selenium
    - Tellurium
- Organohalogen, organophosphorus or organonitrogen pesticides, and triazine herbicides
- Metal phosphide compounds (e.g. aluminium phosphide)
- Elemental phosphorus
- Poisonous organosilicon compounds
- Spent photographic solutions
- Picric acid and picrate compounds

Note: *The above list is not exhaustive. Any highly toxic, ecotoxic, flammable / explosive or highly reactive substance should be prevented from entering the drainage system.*

- Substances classified as being priority substances for control due to their potential to cause serious environmental damage. Many of these substances formerly appeared on the UK Red List of the most dangerous substances for the environment:
    - 1,2-dichloroethane
    - 3-Chlorotoluene
    - Alachlor
    - Aldrin, Dieldrin, Endrin
    - Anthracene
    - Atrazine
    - Fenitrothion
    - HCH (gamma-hexachlorocyclohexane)
    - Hexachlorobenzene
    - Hexachlorobutadiene
    - Isodrin
    - Isoproturon

- Azinphos-methyl
- Benzene
- Brominated diphenylether
- Cadmium and its compounds
- Carbon tetrachloride
- Chlorfenvinphos
- Chloroalkanes (C10-C13)
- Chloroform
- Chloroprene
- DDT
- Dichloromethane
- Dichlorvos
- Di(2-ethylhexyl)phthalate
- Diuoron
- Endosulfan
- Lead and its compounds
- Malathion
- Mercury and its compounds
- Naphthalene
- Nickel and its compounds
- Nonylphenols
- Octylphenols
- Pentachlorobenzene
- Pentachlorophenol and its compounds
- Polychlorinated biphenyls (PCBs)
- Simazine
- Tributylin compounds
- Trichlorobenzene (all isomers)
- Trifluralin
- Triphenyltin compounds

14.10. APPENDIX 10: Chemical Storage Guide

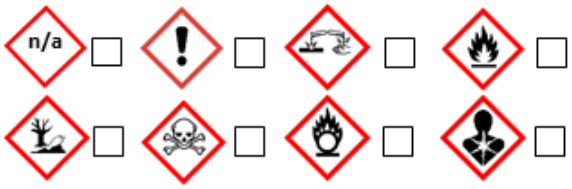
Chemical Segregation by Chemical Group	Class	1	2	3	4	5	6	8
Explosive	1.0 Explosive		Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Segregate From
Compressed gases	2.1 Flammable	Segregate From	Keep Apart	Segregate From or Keep Apart	Segregate From	Segregate From	ISOLATE	Keep Apart
	2.2 Non Toxic Non flammable	Segregate From	Keep Apart	Keep Apart	Segregate From	Segregate From	Segregate From	Keep Apart
	2.3 Toxic	Segregate From	Segregate From or Keep Apart	Keep Apart	Segregate From	Segregate From	Segregate From	Keep Apart
Flammable liquids	3	Segregate From	Segregate From	Keep Apart		Segregate From	Segregate From	Keep Apart
Flammable solids	4.1 Readily combustible	Segregate From	Segregate From	Keep Apart	Segregate may not be necessary	Segregate From	Segregate From	Keep Apart
	4.2 Spontaneously combustible	Segregate From	Segregate From	Keep Apart	Keep Apart	Segregate From	Segregate From	Keep Apart
	4.3 Dangerous when wet	Segregate From	Segregate From	Keep Apart	Keep Apart	Segregate From	Segregate From	Keep Apart
Oxidising substances	5.1 Oxidising substance	Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Keep Apart
	5.2 Organic peroxide	Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Segregate From	Keep Apart
Toxic	6	ISOLATE	Segregate From	ISOLATE	ISOLATE	Segregate From	Segregate From	Keep Apart
Corrosive	8	Keep Apart	Keep Apart	Keep Apart	Keep Apart	Keep Apart	Keep Apart	

14.11. APPENDIX 11: Chemical Waste Label Template

CHEMICAL WASTE

Name:..... Date:.....

Building:..... Room:.....

Hazard 

Chemical Name (state conc. if possible)	Vol / Wt