Supplemental information

Chemical management in research laboratories.

Part 1 Storage and inventory management.

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List of storage cabinets which were available for the Chemistry Department in the new building (2018). - p. 2

Best practice guidance for chemical storage –Department of Chemistry[1] - p. 3

Guidance for chemical cold storage and Emergency Response Procedures (ERP) - Department of Chemistry[1]- p. 27

[1] All supplementary materials are accurate as of 4 of November 2021. Please contact fonssafety@ic.ac.uk for the most up to date advice.

List of storage cabinets which were available for the Chemistry Department in the new building (2018).

The numbers of different types of storage cabinet available are listed below. Note - this does not include the chemical stores or other types of storage:

- Fire rated cabinets (30 and 90 minute): 203
- Non fire rated storage cabinets: 167
- Corrosive rated storage cabinets: 21

Best practice guidance for chemical storage – Department of Chemistry

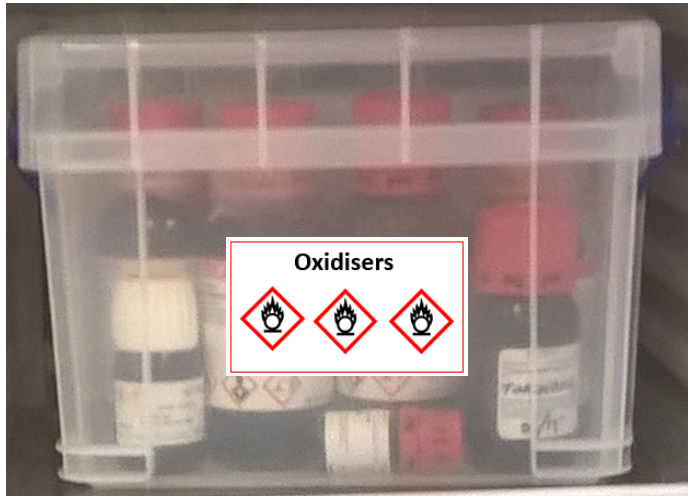
(See appendix for a printable version)

The storage guidelines used in this document are based on **H-phrases**.

Please consult the chemical SDS sheet for other storage requirements and H-phrases.

Storage Guidance for Best Practice

All chemicals and samples must be placed in **chemically resistant secondary containment** of at least 110% volume of the largest container being stored, or 25% of the total volume, whichever is largest. This allows for easy identification in shared storage spaces and provides spill containment.



Store solids above liquids i.e. top shelf solids, bottom shelf liquids.

Secondary containment of 110% of largest container

Storage Guidance for Best Practice

All chemicals should be stored based on the **PRIMARY HAZARD***. Use the flow chart provided to determine the primary hazard and storage recommendations.

*Chemicals hazardous by inhalation are prioritised for storage under ventilation.

For example… This guide places **flammability above corrosive properties**. Therefore glacial acetic acid and acetic anhydride should be stored in **flammable cabinets** but not with inorganic acids. **Acetic anhydride is fatal by inhalation** and therefore flammable cabinet for its storage should be **ventilated**.

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

1.1 Product identifiers
Product name : Acetic anhydride

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Flammable liquids (Category 3), H226
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 2), H330
Skin corrosion (Category 1B), H314

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

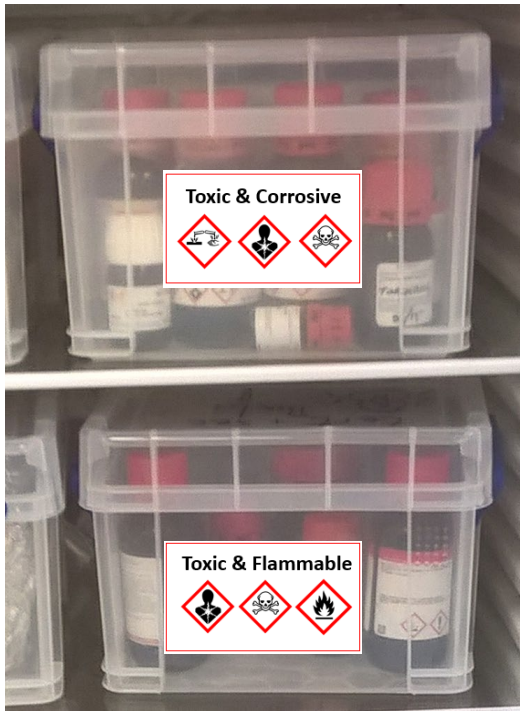
Signal word Danger

Primary Hazard

Hazard statement(s)
H226 Flammable liquid and vapour.
H302 Harmful if swallowed.
H314 Causes severe skin burns and eye damage.
H330 Fatal if inhaled.

Definition of Terms

Separation:

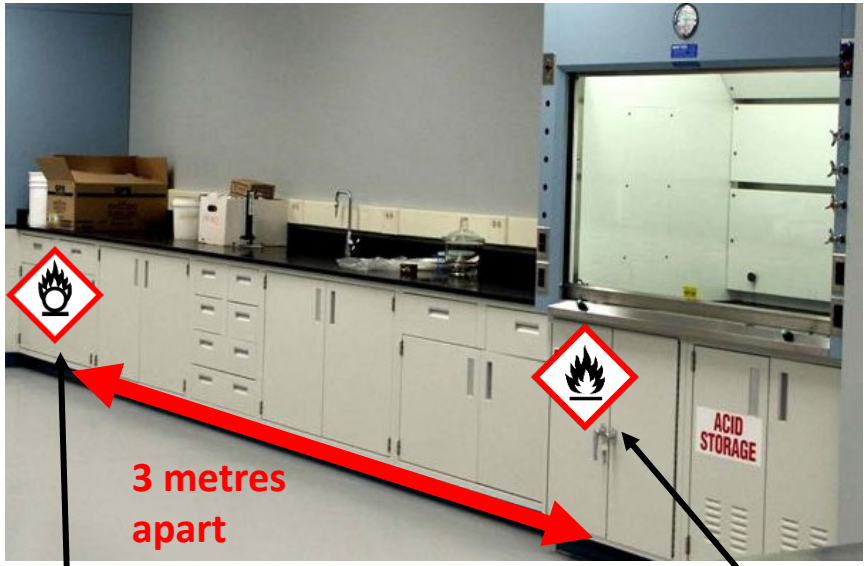


Chemicals stored in same location, but **separated** into different boxes or shelves

Segregation:

Chemicals **segregated** into different locations based on hazard

Isolation:



Oxidising chemicals cupboard

Flammable solvent cabinet

Chemicals **isolated** in different locations at least 3m apart

Please note: The requirement for refrigerated storage takes precedent over the following guidelines – Please consult the Chemical Cold Storage guidelines for further details.

Storage Guidance for Best Practice

! Chemicals, such as Sodium azide (NaN_3) and cyanide salts, which are incompatible with other chemicals, should be stored based on their individual properties and must be **separated*** from other chemicals in this location.

! Purchase of some chemicals may be subject to Department approval, such as Explosive compounds and HF. Storage guidance will be provided at time of approval.

*See page 4 for definition of terms

Note on Peroxide Forming Chemicals

A number of laboratory solvents undergo auto-oxidation in normal storage conditions to form unstable and potentially dangerous peroxide by-products. This process is accelerated by light and heat and occurs when susceptible materials are exposed to atmospheric oxygen. **These compounds have the hazard phrase EUH019**.

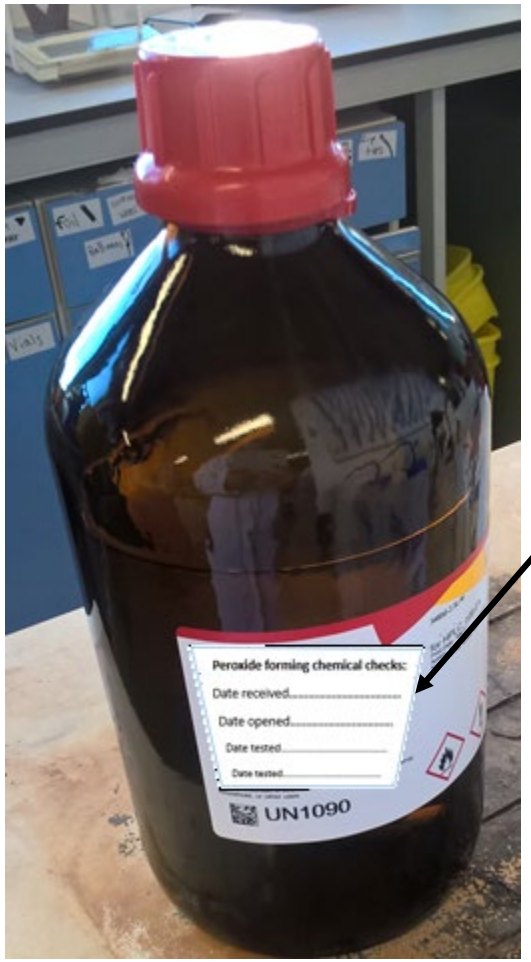
These chemicals do not need a separate storage location, however you must follow guidance in the SOP 2.10 for peroxide forming chemicals (https://imperiallondon.sharepoint.com/sites/fons/faculty/safety/SitePages/Chemistry-Department-Approved-SOPs.aspx) including:

Test for peroxides at least every 12 months, in case of List A chemicals every 3 months (peroxide testing strips available from VWR).

You must update "expiry date" on LabCup with the due date of the next test!

Good practice is to record and sign container with the date of delivery, date of opening and date of peroxide testing.

Follow this link to determine whether the peroxide forming chemical being used is list A, B or C: https://doi.org/10.1016/S1074-9098(01)00247-7



Bottle signed and dated for receipt, opening and checks

Explosive Compounds (H200-H205)

- Permission from the Head of Department is required for purchase and work with compounds with risk phrases H200 – H205.

- Contact the FoNS Safety team (fonssafety@imperial.ac.uk) for specific guidance.

Storage Location 1 – High Health Hazards "poison" cabinets for controlled substances

Chemicals to be stored under lock and key if they are on any of the list of controlled chemicals, such as:

Controlled Drugs List;
Misuse of Drugs Act Schedule 2
Chemicals Weapons Schedule 2
Drug Precursors category 1
Schedule 5 pathogens and toxins

These chemicals will be usually flagged up in LabCup!

The examples listed below represent some of these chemicals that are currently used in the Department, however it is not exhaustive.
e.g.
Cadmium or cadmium compounds; 2-chloroecetophenone (532-27-4); Chromium(VI) compounds; diethyl sulphate (6467-5); dimethyl sulphate (77-78-1); glutaraldehyde (111-30-8); platinum compounds; hydrazine (302-01-2); organic isocyanates; mercury and mercury compounds; 4,4'-methylenedianiline (101-77-9); osmium tetroxide (20816-12-0); pentacarbonyliron (13463-40-6); phosgene (75-44-5); subtilisins (1395-21-7 or 9014-01-1); trimellitic anhydride (552-307); vanadium pentoxide(1314-62-1).

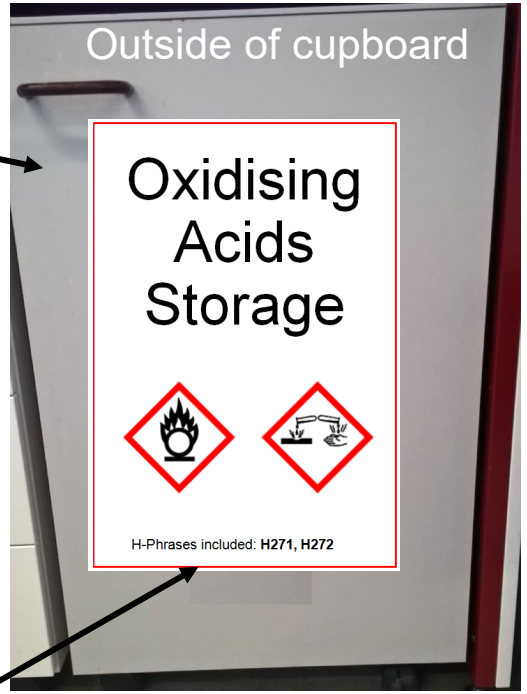
Suggested LabCup inventory location name:

Haz-vent
Vent – FC XX
High health hazard – vent

Storage Location 2 – Oxidising Acids

These chemicals should be:
- Stored in a **dedicated corrosive cupboard** and **isolated** from flammables
  - (e.g. Nitric acid ≥65% and Perchloric acid ≥50%).

Dedicated cupboard made from resistant material



Appropriate hazard signage displayed

FOR EXAMPLE:

Sodium carbonate/bicarbonate used to absorb vapours and spill neutralisation

Appropriate size spill containment

Nitric acid bottles only on top shelf

Perchloric acid bottles only on bottom shelf

Suggested LabCup inventory location name:
- Oxacid-FC XX (if ventilated)
- Oxacid-nonvent
- Flam30-FC XX
- Flam30-nonvent
- Polywood-nonvent

Storage Location 3 – Other Oxidising Compounds

These chemicals should be:
- Stored in a **dedicated metal cabinet isolated from flammables.**
- Separated based on other hazards.

Dedicated metal cabinet

Appropriate hazard signage displayed

FOR EXAMPLE:

Suggested LabCup inventory location name:

Oxidisers-FC XX
Oxidisers-nonvent
Flam30-FC XX
Flam30-nonvent
Polywood-nonvent

In secondary containment

Separated based on other hazards

Storage Location 4 – Air/Water Reactive Compounds

These chemicals should be:
- Ideally stored in a **glove box,** or if not possible, a **dedicated metal cabinet.**
- Separated based on other hazards.

Dedicated metal cabinet

Appropriate hazard signage displayed

FOR EXAMPLE:

Where possible use desiccators as secondary containment

Suggested LabCup inventory location name:

Flam30 (90)-FC XX
Flam30 (90)-nonvent
Vent cab-desiccator
Glovebox-box 1

In secondary containment

Solids above liquids

Storage Location 5 – Flammable Compounds

Flammable chemicals should be stored in accordance with the flow chart below:

1) Is it extremely flammable (H224)?

Yes → Where possible store in a **ventilated 90min rated flammable cabinet.** If space does not allow, store in a **ventilated 30min flammable cabinet.**

No

2) Is it highly flammable (H225) or flammable (H226), **and** either **hazardous by inhalation*** or smelly?

Yes → Store in a **ventilated 30min flammable cabinet** as a minimum.
If space in a **ventilated** 90min flammable cabinet is available, prioritise storage of H225 over H226 there.

No

3) Is it highly flammable (H225) or flammable (H226)?

Yes → Store in 30min rated flammable cabinet as a minimum.
If space in a higher rated cabinet is available (i.e. 90 min flammable cabinet or ventilated 30min cabinet), these should be used in preference. Prioritise the higher hazard (H225) in the higher rated cabinets (90min).

!

In ventilated cabinets Flammable Organic Acids and Flammable Basic Amines must be **separated**.
In non-ventilated cabinets Flammable Organic Acids and Flammable Basic Amines must be **segregated.**
Only flammables below 500ml and that are not hazardous by inhalation* can be stored on benches or shelves.

*see Appending for list of H-phrases associated with inhalation hazard

Storage Location 5 – Flammable Compounds continued…

FOR EXAMPLE:

Ideally, store a 90 minute rated, ventilated flammable cabinet. This example shows a 30 minute rated ventilated cabinet.

Appropriate hazard signage displayed

Suggested LabCup inventory location name:

Flam30 (90)-FC XX
Flam30 (90)-nonvent
Metal solvent cabinet – FC XX
Metal solvent cab- nonvent

< 50 L of flammable solvent stored in one cabinet

Appropriate size spill containment (built in to cabinet in this case)

Please note: refer to the information on peroxide forming chemicals for details of additional storage requirements

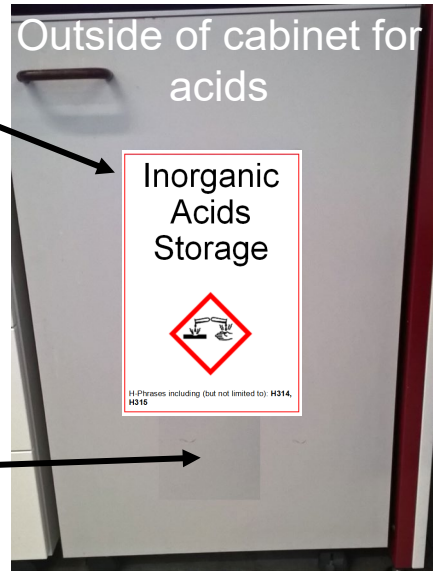
Storage Location 6 – Non-oxidising Corrosive Chemicals

These chemicals should be:
- Stored in a dedicated **corrosive cabinet**.

In ventilated cabinets Acids and Bases must be **separated (different shelves/boxes)**.
Acids and Bases must not be stored together in non-ventilated cabinets.

Cupboard made from resistant material

Appropriate hazard signage displayed



Corrosive chemicals hazardous by inhalation should be stored in ventilated cabinets.

See Appending for list of H-phrases associated with inhalation hazard.

Suggested LabCup inventory location name:

Acid-base-vent-FC XX
Corrosive-nonvent
Acid cabinet-FC XX
Acid cab – nonvent
Bases-FC XX
Bases - nonvent

Non-oxidising inorganic acids only, separate based on other hazards

Sodium carbonate/ bicarbonate used to absorb vapours and spill neutralisation

Appropriate size spill containment

Storage Location 7 – Chemicals with Respiratory Hazards

Fatal, toxic and harmful by inhalation (H330, H331, H332) – **always under ventilation**!
If ventilated storage is not available store **other** inhalation hazards (H333-H336) sealed with Parafilm or in an air-tight secondary containment.
Liquids >500 mL (DCM, Chloroform etc.) should be stored in a **ventilated metal cabinet.**
Liquids ≤ 500 mL and all solids hazardous by inhalation can be stored in **glass-fronted ventilated cabinets (see location 8)**.

Metal cabinet →

Appropriate hazard signage displayed →

FOR EXAMPLE:

Suggested LabCup inventory location name:

Hazardous-vent-FC XX
Hazardous-nonvent
Flam30 – FC XX
Flam30 – nonvent

Appropriate size spill containment (built into cabinet in this case).

Separate reagents based on other hazards if required.

Storage Location 8 – All Other Hazardous Chemicals*

***(that do not meet requirements 1-7)**

Ventilated (glass-fronted) cabinets should be used for storage of chemicals such as:

- Solids hazardous by inhalation*
- Liquids ≤500 mL hazardous by inhalation*
- Non-flammable powders
- Smelly compounds
- Non-flammable solid bases
- Lockable cabinets containing controlled chemicals (see location 1).

Suggested LabCup inventory location name:

ventcab
Glassfronted vent cab
Tall vent cab
Polywood tall vent

*see Appending for list of H-phrases associated with inhalation hazard

Low Hazard Chemicals

Chemicals with no respiratory hazards and do not fit requirements 1-8 can be stored:
- in **non-ventilated cupboards** or on **shelves above the work benches** e.g. brine solution
- in ventilated cabinets if space allows
- with other compatible chemicals

Containers of prepared solutions and decanted chemicals must be labelled with the contents, date of preparation and appropriate GHS warning symbols

FOR EXAMPLE:

Low hazard chemicals stored on shelves – secondary containment not necessary for these items

A limited number of frequently used corrosive and flammable chemicals **not representing a respiratory hazard (not fatal, toxic and harmful by inhalation)*** at volumes of less than 500 mL(g) (such as wash bottles) may be stored on shelves/benches, however numbers must be kept to a minimum. Chemicals which may be hazardous by inhalation and those with no known route of exposure should be in sealed secondary containers or at least parafilmed.

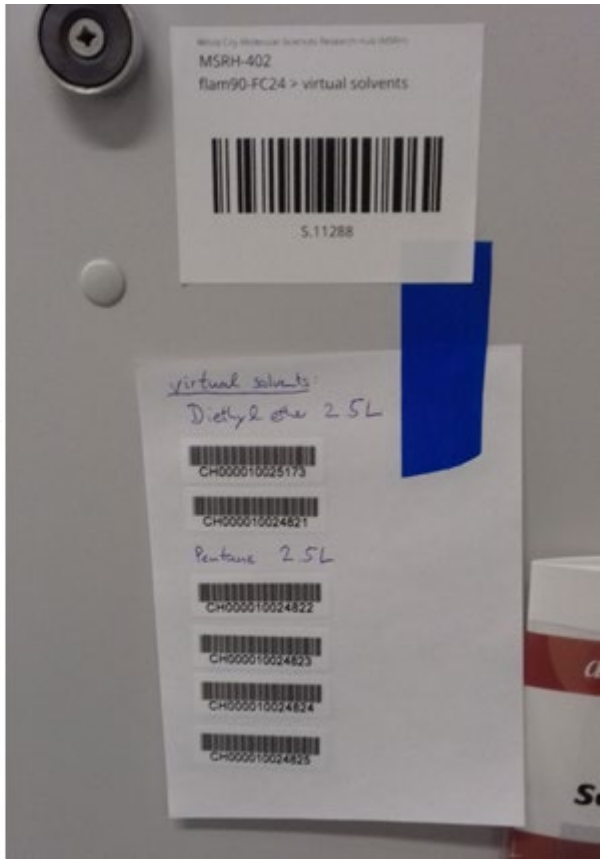
Suggested LabCup inventory location name:
- Shelf bay XX
- Shelf A box X
- Rack YY (in chem store room)
- Metal cabinet non vent
- Non-vent cab

*see Appending for list of H-phrases associated with inhalation hazard

Registering Frequently Ordered Chemicals on LabCup

Solvent stocks which are used up so frequently that they are re-ordered every week or two can be **registered once** on LabCup as **virtual bottles.**

All chemicals must be registered on LabCup to ensure that it provides an accurate estimate of the volume and location of hazardous substances in the building, for use in the event of a fire for example.



To register your virtual bottles:
(see photos for an example)

1. Instead of sticking barcode labels to the physical bottles, stick a number of barcodes equal to the number of bottles that you usually stock to the inside of the cabinet where you store them.
2. Register these reagents on LabCup.

- Next time you order more bottles, there is no need to change anything on LabCup.
- If you decide to increase or decrease the number of bottles you stock, add or remove a virtual bottle barcode, on the door and on LabCup.

Personal Sample Storage

Personal samples should be:

- Stored in appropriate secondary containment
- Placed in the appropriate storage location based on the properties
- Containers of prepared solutions and decanted chemicals must be labelled with the contents, date of preparation and appropriate GHS warning symbols
- Research samples should be labelled with a **unique identifier and the date of preparation** as a minimum. Ideally, labels should also contain the chemical structure if possible. A record of the stored samples should be kept.
- As projects finish review samples that have been placed in storage and dispose of any that are no longer required as chemical waste.

Example of correctly labelled research sample

Storage in Departmental Chemical Store Rooms

The guidance below should be followed when using the Departmental Chemical Store rooms at MSRH:

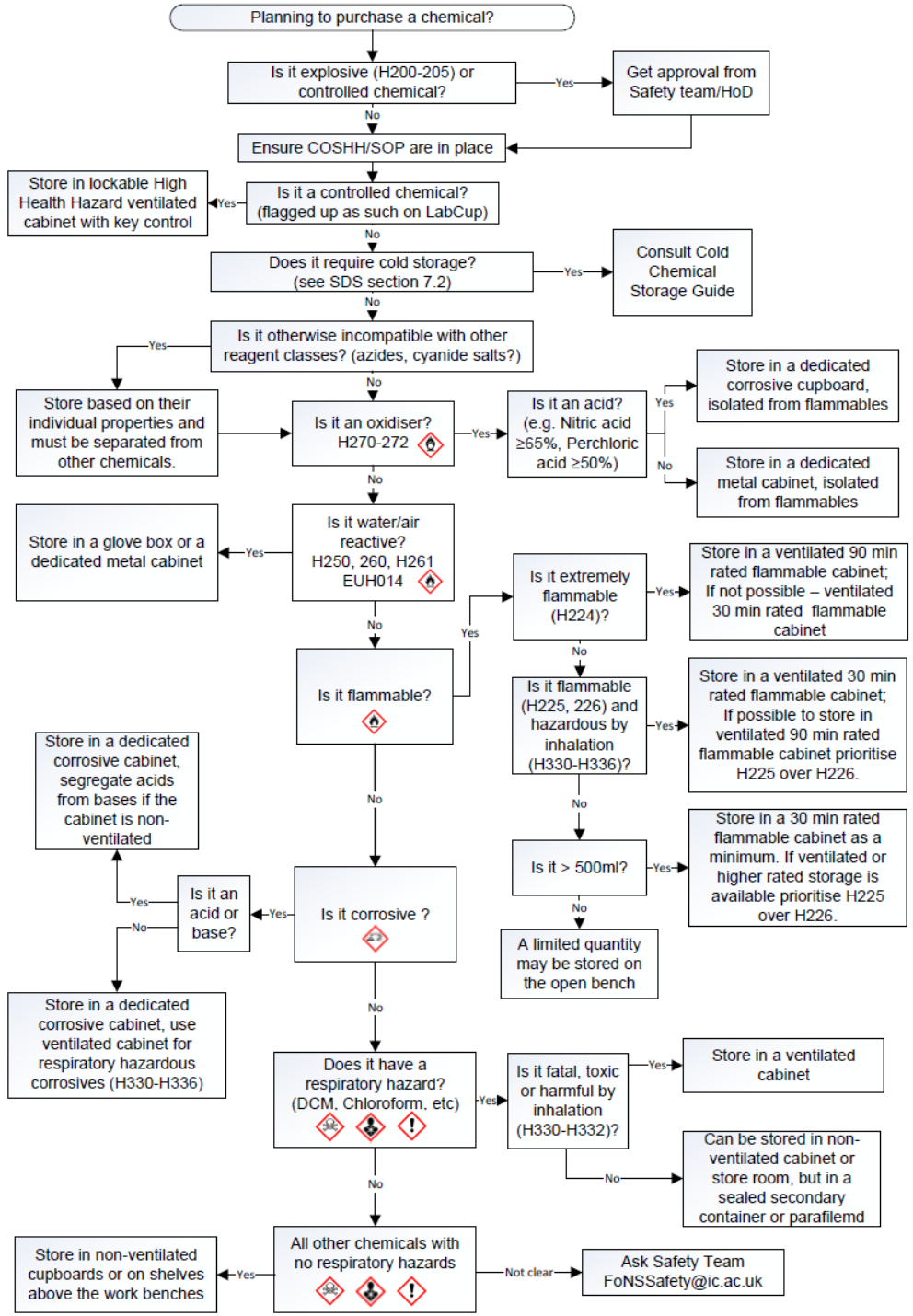
- **Do not store** lachrymators or smelly chemicals and chemicals hazardous by inhalation (NO FATAL, TOXIC or HARMFUL by inhalation)* in Chemical Store rooms as the rooms are accessed by researchers and they are exposed to the atmosphere in the room.

- Flammable and water/air reactive chemicals must be stored according to the principles set out in this guidance, i.e. in appropriately ventilated and rated cabinets (for flammable containers > 500 mL and ALL water/air sensitive), separated from each other.

- Oxidising chemicals must be **isolated** from flammables (i.e. at least 3m apart) and in most store rooms this is not possible, therefore it is advisable to store oxidisers in dedicated cabinets within the labs.

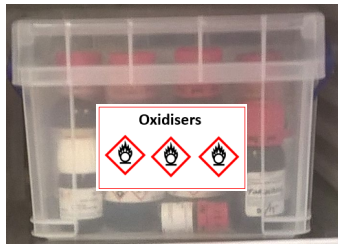
*see Appending for list of H-phrases associated with inhalation hazard

Appendix – Printable Quick Reference Guide


Planning to purchase a chemical?
Is it explosive (H200-205) or controlled chemical?
Yes
Get approval from Safety team/HoD
No
Ensure COSHH/SOP are in place
Store in lockable High Health Hazard ventilated cabinet with key control
Yes
Is it a controlled chemical? (flagged up as such on LabCup)
No
Does it require cold storage? (see SDS section 7.2)
Yes
Consult Cold Chemical Storage Guide
No
Is it otherwise incompatible with other reagent classes? (azides, cyanide salts?)
Yes
Store based on their individual properties and must be separated from other chemicals.
No
Is it an oxidiser? H270-272
Yes
Is it an acid? (e.g. Nitric acid ≥65%, Perchloric acid ≥50%)
Yes
Store in a dedicated corrosive cupboard, isolated from flammables
No
Store in a dedicated metal cabinet, isolated from flammables
No
Store in a glove box or a dedicated metal cabinet
Yes
Is it water/air reactive? H250, 260, H261 EUH014
No
Is it flammable?
Yes
Is it extremely flammable (H224)?
Yes
Store in a ventilated 90 min rated flammable cabinet; If not possible – ventilated 30 min rated flammable cabinet
No
Is it flammable (H225, 226) and hazardous by inhalation (H330-H336)?
Yes
Store in a ventilated 30 min rated flammable cabinet; If possible to store in ventilated 90 min rated flammable cabinet prioritise H225 over H226.
No
Is it > 500ml?
Yes
Store in a 30 min rated flammable cabinet as a minimum. If ventilated or higher rated storage is available prioritise H225 over H226.
No
A limited quantity may be stored on the open bench
No
Is it corrosive ?
Yes
Is it an acid or base?
Yes
Store in a dedicated corrosive cabinet, segregate acids from bases if the cabinet is non-ventilated
No
Store in a dedicated corrosive cabinet, use ventilated cabinet for respiratory hazardous corrosives (H330-H336)
No
Does it have a respiratory hazard? (DCM, Chloroform, etc)
Yes
Is it fatal, toxic or harmful by inhalation (H330-H332)?
Yes
Store in a ventilated cabinet
No
Can be stored in non-ventilated cabinet or store room, but in a sealed secondary container or parafilemd
No
All other chemicals with no respiratory hazards
Not clear
Ask Safety Team FoNSSafety@ic.ac.uk
Yes
Store in non-ventilated cupboards or on shelves above the work benches

Chemical Storage Guidance

All chemicals must be placed in **chemically resistant secondary containment** of at least 110% of largest volume, or 25% total volume, whichever is larger.



All chemicals should be stored based on the **PRIMARY HAZARD** as specified by GHS H phrases (see SDS).

All chemicals hazardous by inhalation should be stored under ventilation or in exceptional cases parafilmed.

Store solids above liquids i.e. top shelf solids, bottom shelf liquids.

Peroxide forming chemicals (EUH019)

! Add an expiry date on LabCup and test for peroxides at least every 12 months, in case of List A chemicals every 3 months (peroxide testing strips available from VWR).

! Record and sign container with the date of delivery, date of opening and date of peroxide testing.

Must be stored under ventilation:

H330: Fatal if inhaled
H331: Toxic if inhaled
H332: Harmful if inhaled

If not stored under ventilation, should be **stored in sealed secondary container or parafilmed**:

H333: May be harmful if inhaled

H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled

H335: May cause respiratory irritation

H336: May cause drowsiness or dizziness

H350i: May cause cancer by inhalation

EUH071: Corrosive to respiratory tract

If not stored under ventilation, should be **stored in sealed secondary container or parafilmed**:

H340: May cause genetic defects
H341: Suspected of causing genetic defects
H350: May cause cancer
H351: Suspected of causing cancer
H360: May damage fertility or the unborn child
H360D: May damage the unborn child
H360F: may damage fertility
H361: Suspected of damaging fertility or the unborn child
H361d: Suspected of damaging the unborn child
H361f: Suspected of damaging fertility
H362: May cause harm to breast-fed children
H370: Causes damage to organs
H371: May cause damage to organs
H372: Causes damage to organs through prolonged or repeated exposure
H373: May cause damage to organs through prolonged or repeated exposure

Additionally, any fine powders (i.e. a consistency of flour rather than of table sugar) regardless of hazard should be considered hazardous by inhalation (e.g. fine silica **IS** hazardous by inhalation).

Guidance for chemical cold storage and Emergency Response Procedures (ERP) - Department of Chemistry

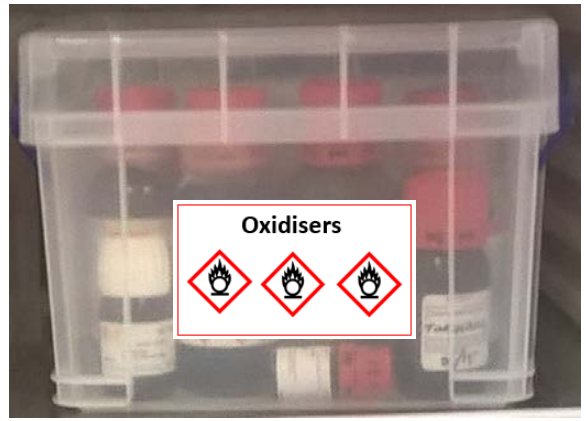
This guide includes information on:

- Chemicals and samples requiring storage below room temperature.
- Guidance on Emergency Response Procedures (ERP) for cold rooms, fridges and freezers.

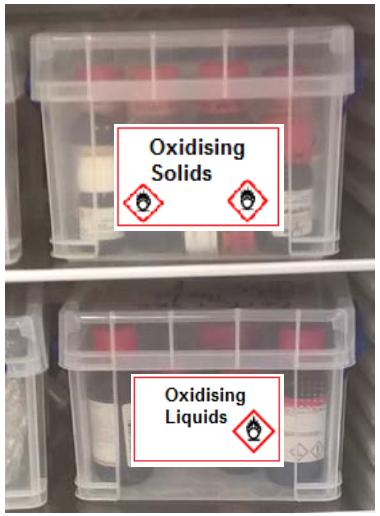
Please consult the chemical SDS sheet for other storage requirements and H-phrases.

Storage Guidance for Best Practice

- All chemicals and samples must be placed in **chemically resistant secondary containment** of at least 110% volume of the largest container being stored, or 25% of the total volume, whichever is largest. This allows for easy identification in shared storage spaces and provides spill containment.



- **Store solid chemicals above liquids if possible.** This reduces the risk of contamination in the event of a spill.



Storage guidance for Best Practice

! Information on storage requirements can be found either on the chemical container or in section 7 of the Safety Data Sheet supplied with the chemical.

! Chemicals requiring cold storage should be stored in secondary containment with **compatible compounds** only i.e. store oxidants together and isolated from flammables.

E.g.

SIGMA-ALDRICH sigma-aldrich.com

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006
Version 5.4 Revision Date 06.04.2018
Print Date 06.04.2018

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking.Take measures to prevent the build up of electrostatic charge.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

Recommended storage temperature 2 - 8 °C

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

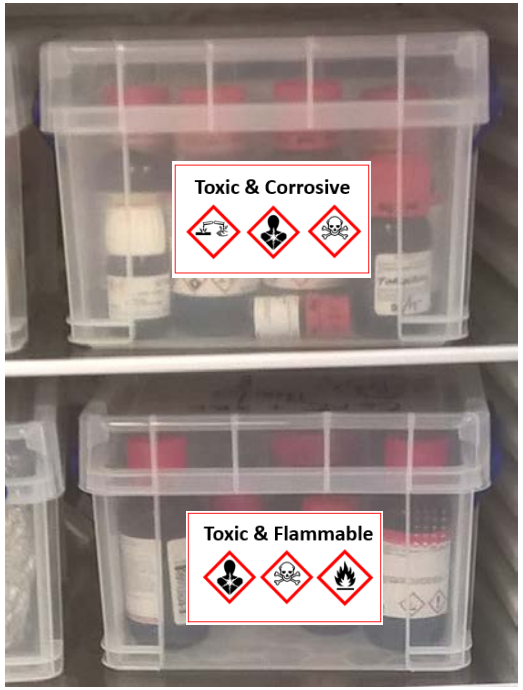
Definition of Terms

Please note: the definition of segregation and isolation for fridges, freezers, and cold rooms differ to those in the general chemical storage guide.

Separation:

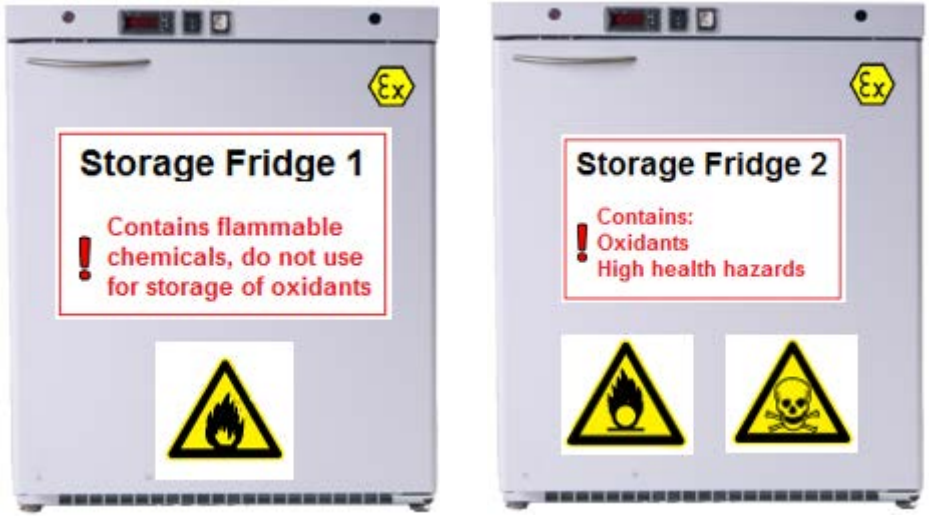
Chemicals stored in same location, but **separated** into different boxes

Segregation:



Chemicals **segregated** into different storage locations within the same fridge/cold room i.e. on different shelves

Isolation:



Chemicals **isolated** in different fridges/freezers or within designated areas in cold rooms e.g. flammable and oxidising chemicals must be isolated

Guidance on Choosing Fridges and Freezers for Chemical Storage

Explosive atmospheres can be caused by flammable gases, mists or vapours. If there is enough of the flammable substance mixed with air, then all it needs is a source of ignition to cause a fire or explosion.

ATEX rated storage devices (suitable for potentially explosive atmospheres) are **spark proof** and have no electrical sparking devices, relays, switches, or thermostats that could ignite flammable vapours inside the unit.

These refrigerators are more costly than the household refrigerator types but they must be purchased if you are planning on storing flammables in the refrigerator.

Electrical items that meet the requirements of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (ATEX) will display the above symbol or the words 'Spark Proof'.

For further details, please see: http://www.hse.gov.uk/fireandexplosion/atex.htm

Cold Storage flow chart

Does the label/SDS state that the chemical requires **storage below room temperature**?

No → Consult '**Best Practice guidance for Chemical Storage – Department of Chemistry**' document and follow hazard priority flow chart to determine appropriate storage location.

Yes ↓

Is the chemical:
Highly volatile? Lachrymatory? Smelly?
An inhalation hazard*?

Yes ↓

Store in stand-alone Fridge or Freezer

The risk of exposure to chemicals with respiratory hazards is lower when these are stored in fridges and freezers rather than in cold rooms. This is because they contain a smaller volume of air and are stored in well ventilated lab spaces, allowing for dispersal of dangerous atmospheres.

Fridges and freezers must be ATEX rated for storage of flammables.

Chemicals should be double contained (secondary containment should only be opened in a fume cupboard).

No ↓

Store in a cold room

Cold rooms have closed air-circulation systems and are not appropriate for storage of the chemical types stated above.

Chemicals should be separated by H-phrase and stored in secondary containment.

Cold rooms in Building C are ATEX rated.

*see Appending for list of H-phrases associated with inhalation hazard

Guidance on Fridge/Freezer Storage

- Chemicals hazardous by inhalation*
- Highly volatile (boiling point <20°C, especially if corrosive)
- Lachrymatory or smelly

should be kept in **stand alone fridges and freezers** to minimize the volume of dangerous atmospheres.

These should be:

- **Separated** based on other hazards.
- Stored together in secondary containment with **compatible chemicals only.**
- **ATEX rated** for storage of flammable/air or water sensitive chemicals.

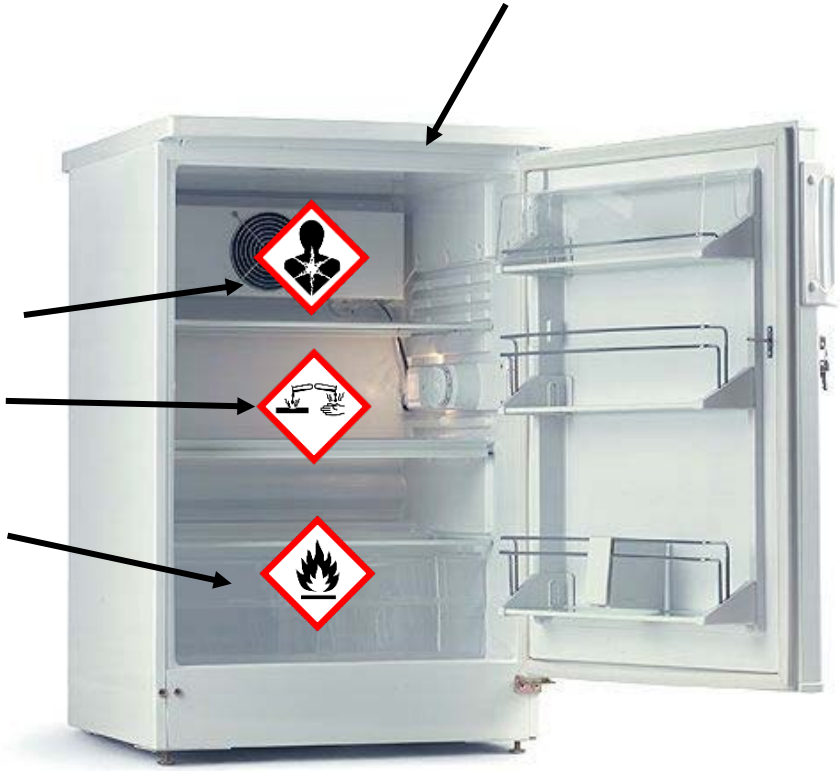
Incompatible chemicals should be located in **different fridges/freezers.**

! Lachrymatory and smelly chemicals should be double contained if necessary.

E.g.

Chemicals separated by hazard and stored on dedicated shelves.

Oxidants should be stored in a different fridge/freezer to flammables!



Please note: Rooms designed for housing tall/upright fridges and freezers are located in MSRH on levels 1, 2 & 3.

*see Appending 3 for list of H-phrases associated with inhalation hazard

Guidance on Cold Storage Rooms

There are 3 cold rooms available for chemical storage in White City. These will be shared between all groups and are located on **levels 3, 5 and 6**.

Please note: There is one further cold room on level 3, which has ventilation and should be used for **biological work only**.

Cold rooms do not have air changes, but recirculate the air, making them unsuitable for storage of chemicals that are either:

- **Hazardous by inhalation*: (e.g. Phosgene, Osmium tetroxide)**
- **Highly volatile compounds (e.g. boiling point <20°C and those with higher boiling points if they are corrosive)**
- **Lachrymatory (stated in section 2.3 of SDS)**
- **Smelly (e.g. Sulphur compounds)**

Chemicals of this nature **must not be stored in a cold room** as this may result in the generation of an atmosphere that is either hazardous to health or damaging to the refrigeration mechanism/pipework of the cold room.

All other chemicals requiring cold storage can be stored in cold rooms. These should be **separated** based on hazards.

*see Appending for list of H-phrases associated with inhalation hazard

Guidance on Cold Storage Rooms Continued

In order to maximise segregation and separation of incompatible chemicals within cold storage rooms, **designated storage zones** are pre-allocated for:

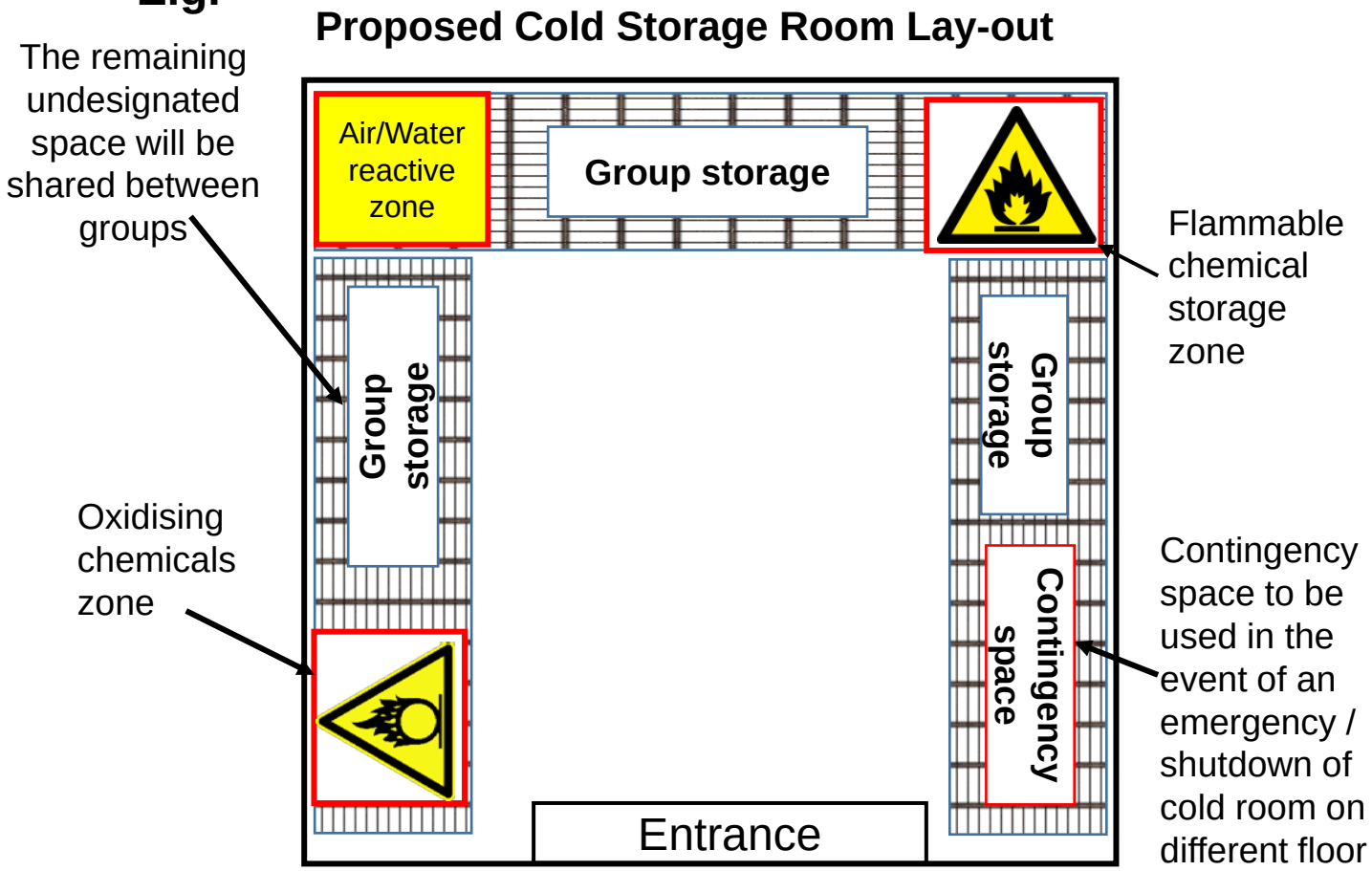
- Oxidising compounds
- Flammable compounds
- Air/Water reactive compounds
- Contingency space (see note below)

Groups should store chemicals of these types in labelled secondary containment (e.g. ‘really useful’ box) within the designated zones.

No cardboard is allowed in Cold Rooms as it encourages mould growth!

E.g.

Proposed Cold Storage Room Lay-out



Please note: An area/shelf in each cold room will be designated as contingency space in the event of cold room failure on another floor. This area should not be used for storage. See slide on Emergency Response Procedures for more details.

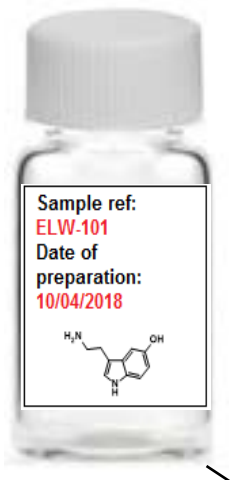
Cold storage of research samples

Research samples should be:
- Stored in fridges/freezers or cold rooms based on the chemical properties of the chemical produced.
- Separated by hazard group.

Research samples that require cold storage should be labelled with a **unique identifier and the date of preparation** as a minimum. Ideally, labels should also contain the chemical structure if possible.

A record of the stored samples should be kept and a **copy included** in a plastic wallet inside the secondary containment box.

As projects finish review samples that have been placed in storage and dispose of any that are no longer required as chemical waste.



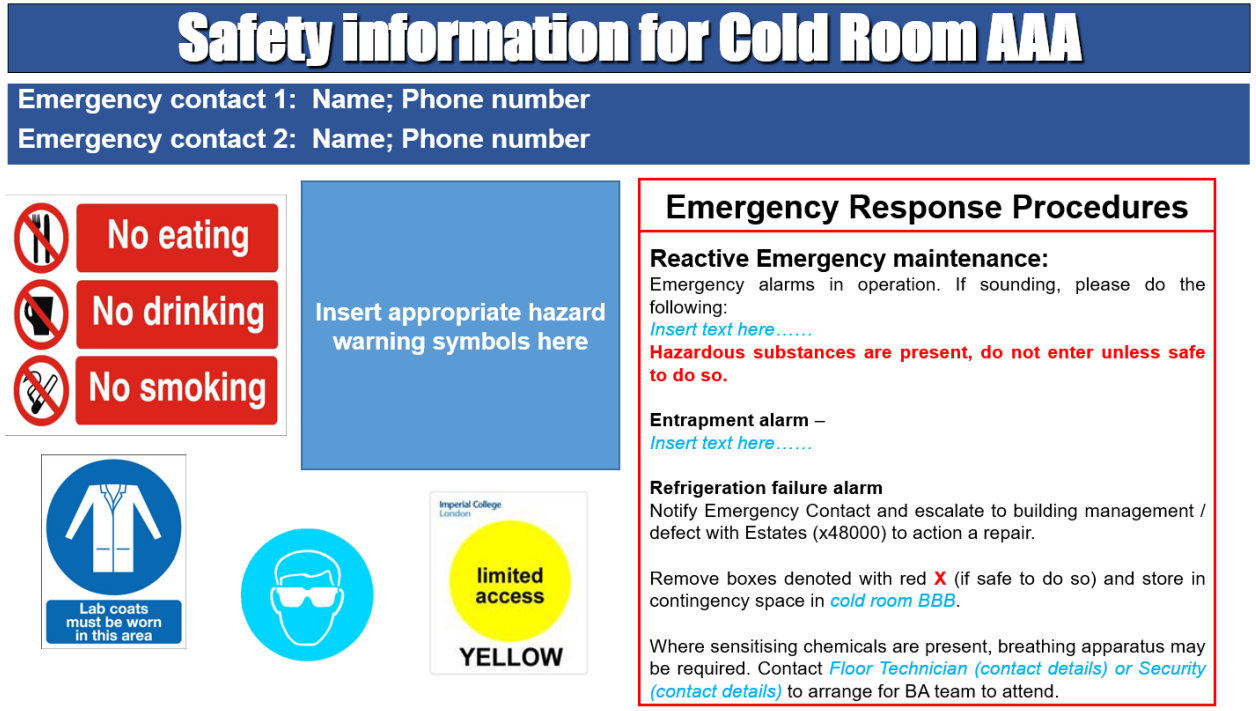
Sample ref	Date of preparation	Compound name	Structure
ELW-101			
ELW-102			
ELW-103			
ELW-104			
ELW-105			
ELW-106			

Emergency Response Procedures (ERP)

Due to the nature of the hazardous chemicals contained within cold storage rooms and stand alone fridges/freezers, it is essential that a documented **Emergency Response Procedure (ERP)** is prepared by groups jointly with the local floor technician, who will act as the main point of contact.

This should outline all necessary steps to be undertaken in the event of a refrigeration failure or sounding warning alarm.

The ERP should be displayed outside the entrances to cold rooms and on fridge/freezer doors.



Emergency response procedures will vary depending on the risks associated with the particular chemicals being stored.
For shared storage spaces, ERPs should be developed with input from all groups using the area.

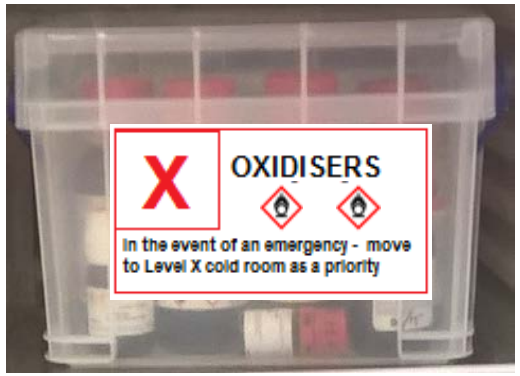
ERPs Continued

As a minimum, groups are expected to:

Identify chemicals that are particularly hazardous if not kept cold i.e. may spontaneously combust

Located in each cold room, there will be one shared box for each hazard class (highlighted with a red **X**) in which these chemicals should be stored.

In the event of a cold room failure, these boxes will be prioritised for removal to an alternate cold room contingency space. E.g.

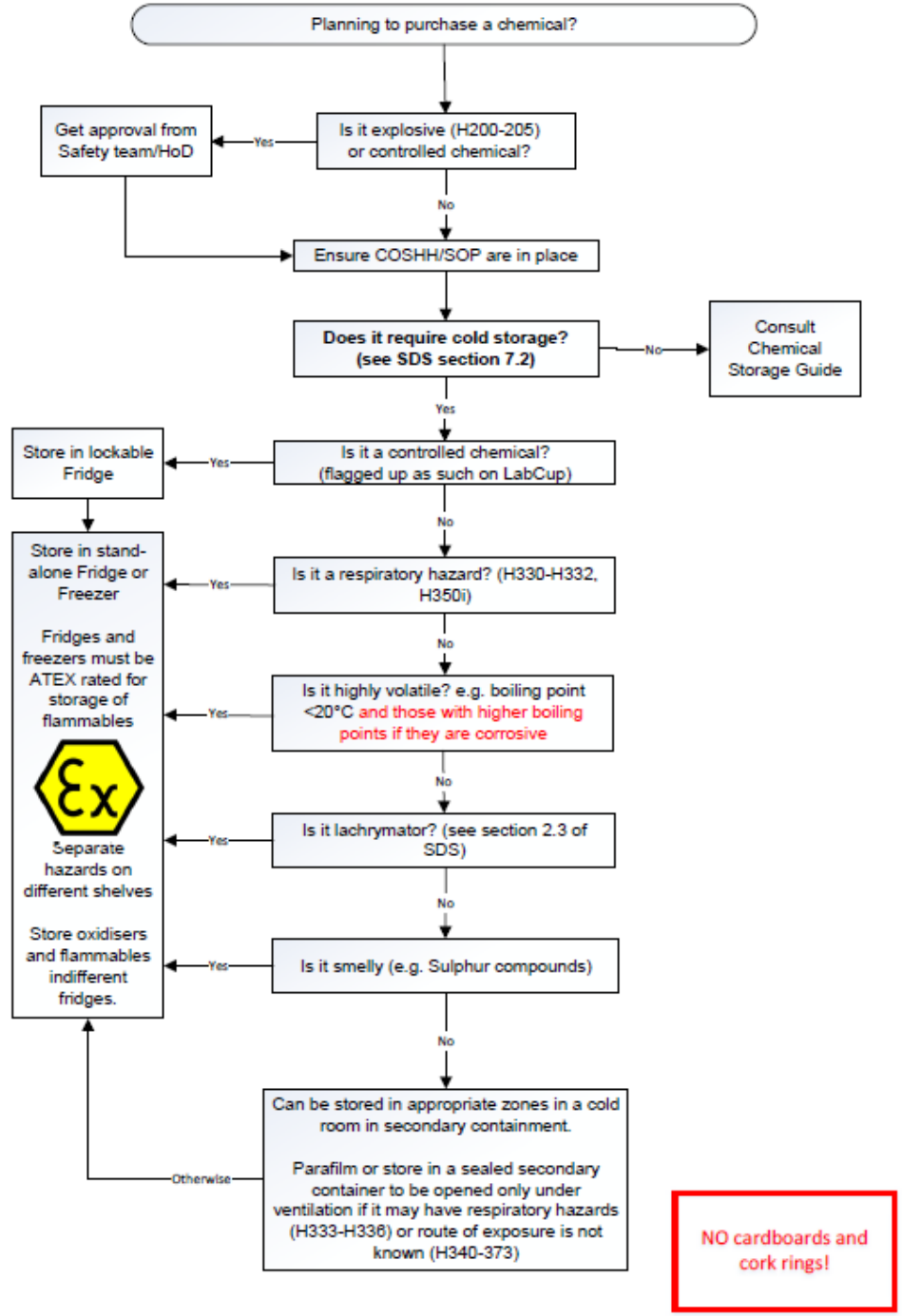


Nominate at least one emergency contact.

The contact details of the nominated persons will be included on the entrance to the cold room and they will be the main point of contact in the event of an emergency.

(For shared cold room, one person should be nominated as primary contact, with at least 2 secondary contacts – see Appendix 2 for door signage template).

Appendix 1 – Printable Quick Reference Guide


Planning to purchase a chemical?
Is it explosive (H200-205) or controlled chemical?
Yes
Get approval from Safety team/HoD
No
Ensure COSHH/SOP are in place
Does it require cold storage? (see SDS section 7.2)
No
Consult Chemical Storage Guide
Yes
Is it a controlled chemical? (flagged up as such on LabCup)
Yes
Store in lockable Fridge
No
Is it a respiratory hazard? (H330-H332, H350i)
Yes
No
Is it highly volatile? e.g. boiling point <20°C and those with higher boiling points if they are corrosive
Yes
No
Is it lachrymator? (see section 2.3 of SDS)
Yes
No
Is it smelly (e.g. Sulphur compounds)
Yes
No
Store in stand-alone Fridge or Freezer
Fridges and freezers must be ATEX rated for storage of flammables
Separate hazards on different shelves
Store oxidisers and flammables indifferent fridges.
Can be stored in appropriate zones in a cold room in secondary containment.
Parafilm or store in a sealed secondary container to be opened only under ventilation if it may have respiratory hazards (H333-H336) or route of exposure is not known (H340-373)
Otherwise
NO cardboards and cork rings!

Appendix 2 – Example emergency response procedure signage

Safety information for Cold Room AAA

Emergency contact 1: Name; Phone number

Emergency contact 2: Name; Phone number, Emergency contact 3: Name; Phone number

Insert appropriate hazard warning symbols here

Emergency Response Procedures

Reactive Emergency maintenance:

Emergency alarms in operation. If sounding, please do the following:

Insert text here……

Hazardous substances are present, do not enter unless safe to do so.

Entrapment alarm –

Insert text here……

Refrigeration failure alarm

Notify Emergency Contact and escalate to building management / defect with Estates (x48000) to action a repair.

Remove boxes denoted with red **X** (if safe to do so) and store in contingency space in *cold room BBB*.

Where sensitising chemicals are present, breathing apparatus may be required. Contact *Floor Technician (contact details) or Security (contact details)* to arrange for BA team to attend.

Appendix 3 – Hazardous by inhalation, respiratory hazards

CANNOT be stored in coldroom:
H330: Fatal if inhaled
H331: Toxic if inhaled
H332: Harmful if inhaled

Should be stored in lab fridge/freezer, but **can be stored in coldroom in a sealed secondary container which is to be opened only under ventilation or parafilmed**:

H333: May be harmful if inhaled

H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled

H335: May cause respiratory irritation

H336: May cause drowsiness or dizziness

H350i: May cause cancer by inhalation

EUH071: Corrosive to respiratory tract

Can be stored in coldroom in a sealed secondary container which is to be opened only under ventilation or parafilmed:

H340: May cause genetic defects
H341: Suspected of causing genetic defects
H350: May cause cancer
H351: Suspected of causing cancer
H360: May damage fertility or the unborn child
H360D: May damage the unborn child
H360F: may damage fertility
H361: Suspected of damaging fertility or the unborn child
H361d: Suspected of damaging the unborn child
H361f: Suspected of damaging fertility
H362: May cause harm to breast-fed children
H370: Causes damage to organs
H371: May cause damage to organs
H372: Causes damage to organs through prolonged or repeated exposure
H373: May cause damage to organs through prolonged or repeated exposure

Additionally, any fine powders (i.e. a consistency of flour rather than of table sugar) regardless of hazard should be considered hazardous by inhalation (e.g. fine silica **IS** hazardous by inhalation).