Guidance Sheet 1: Chemical Storage

This Guidance sheet describes the procedures established under the Dangerous Goods *(Storage and Handling) Regulations 2012* and relevant standards for the safe storage of laboratory chemicals in Department of Education and Training (the Department) schools.

The information provided is of a general nature and more specific advice may be required for particular circumstances. The Department’s **OHS Advisory Service** can be contacted on **1300 074 715** for additional advice or support.

**Segregation Guidelines for Minor Storage**

Dangerous goods need to have sufficient distances between them to eliminate the risk of fire, explosion, or accumulation of toxic gases or vapours from a leak or spillage, etc. The risk obviously increases with the quantity of dangerous goods being stored. In order to prevent unwanted reactions from occurring in a storage area, incompatible chemicals should be separated and stored in compatible groups.

Incompatible Classes of dangerous goods must be segregated to prevent any dangerous reactions. Segregation may be achieved by the use of an impervious barrier or by the separation distance sufficient to prevent contamination (a distance of 1.5 metres should be sufficient in most circumstances).

**Minor Storage** refers to quantities stored in the one location below the Placarding Quantity listed in Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2012*.

Refer to Table 2 Statutory Quantities on Page 7 of this Guidance sheet for further information.

The following segregation guidelines should be followed with minor storage:

* All chemicals must be stored in their respective Classes; taking into account incompatibilities within a class, such as concentrated acids and bases in Class 8 except as indicated on the relevant Safety Data Sheet (SDS), dangerous goods should be segregated based on the [Recognising Dangerous Goods Segregation Chart.](https://www.worksafe.vic.gov.au/resources/recognising-dangerous-goods)
* Wherever possible, dangerous goods and hazardous substances must be stored in original containers and labelled as supplied. It is prohibited to use drink or food containers (discarded or new) to store chemicals. If transferred to or kept in other containers, these must be compatible, suitable for the purpose and labelled containers including lids, caps and seals, must be checked regularly for deterioration and replaced when necessary.

## Further guidance

For further guidance on the storage of chemical classes, please refer below to Storage guidelines for Minor Storage.

## Storage Guidelines for Minor Storage

|  |  |
| --- | --- |
| **Chemical type** | **Summary** |
| **Fire risk Dangerous Goods**  Class/ Division 2.1, 3, 4.1, 4.2, 4.3, 5.1, 5.2 or C1 Combustible Liquids. | Fire risk Dangerous Goods may contribute to the risk of fire either by adding to the fuel load or by increasing the ease and rate of combustion. Fire risk Dangerous Goods must be stored at least 5 metres from any potential source of ignition or heat if not stored in specialised chemical storage cabinet.  This distance may be measured around any intervening vapour barrier. |
| **Class 2 Gases** | Class 2 materials, other than aerosols and compressed air, must not be stored indoors.  Particular care is required with Division 2.1 Flammable Gases and Division 2.3 Toxic Gases. |
| **Division 4.3 Dangerous When Wet** | Must be in a moisture proof cupboard or Dangerous Goods cabinet, which must not contain plumbing fixtures or any liquids. |
| **Division 5.2 Organic Peroxides** | These chemicals are highly reactive and flammable and must be stored in a cool place, at least 3 metres from all other Dangerous Goods and shielded from all heat sources.  No organic peroxides for which an emergency temperature is specified in the list of currently assigned organic peroxides in the Australian Dangerous Goods Code, or that has a self-accelerating decomposition temperature (SADT) of 50°C or less should be kept in Department schools and workplaces. Only organic peroxides assigned to UN Numbers 3102–3110 inclusive are permitted. |
| **Division 6.1 Toxic Substances** | Due to their extreme toxicity, both potassium and sodium cyanide should, so far as is practicable, be removed from use in Department schools and workplaces. Any inorganic cyanide must be kept under lock and key and at least 5 metres from any acid storage.  Permits are required for substances that are Scheduled Poisons of sections 2,3,4,8 & 9 in the Commonwealth Standard for the Uniform Medicines and Poisons and Schedule 7 poisons in the Standard where they are listed in the Victorian Poisons code under heading “Part 2 – list of substances that are not for general sale by retail”.  Chemicals in this division may also have requirements under the Drugs, Poisons and Controlled Substances Act administered by the Department of Human Services (DHS). |
| **Class 7 Radioactive Materials** | Must be stored in separate, suitably labelled, containers or compartments within a locked metal container. This locked metal container must be permanently labelled to indicate that it contains radioactive substances.  Chemicals in this class are regulated under the Health (Radiation Safety) Regulations which are administered by DHS. Reference should also be made to the DHS Radiation Safety Unit Guidelines for the Disposal of Radiation Sources, the current NHMRC/ARPANSA Code of Practice for the Safe Use of Radiation Sources in Secondary Schools and current Department advice on these documents. |
| **Class 8 Corrosive Substances** | Includes acids and bases/alkalis Concentrated strong acids and bases/alkalis should be stored at least 1.5 metres apart or separated by an impervious barrier, and provided with separate spill retention. Acids must be at least 5 metres from any inorganic cyanides of Division 6.1. |

## Laboratory Quantities

Approved Dangerous Goods cabinets must be used to store chemicals above the specified quantity levels as listed in Table 1. Laboratory Storage as taken from *AS 2243.10 Safety in laboratories Part 10: Storage of chemicals*.

Physical barriers or procedural measures should so far as is practicable, prevent exposure to hazardous substances. Nonetheless, suitable

personal protective equipment must be available and must and must always be worn when handling all hazardous substances and dangerous goods.

At least one fire extinguisher must be provided near every location where science chemicals are stored. The minimum rating is 3A 60 B (E) Dry Chemical.

Each extinguisher must be located such that it is immediately accessible in an emergency, along an exit route.

## Table 1: Laboratory Storage

Table 1 specifies the quantities of hazardous chemicals permitted to be stored in a laboratory other than in a chemical storage cabinet. (Source: *AS/NZS 2243.10: Safety in laboratories, Part 10 – Storage of Chemicals*).

**Quantities of dangerous goods and hazardous substances permitted to be stored in a laboratory other than in a chemical storage cabinet.**

| **Type of substance or Class of dangerous goods** | **Maximum per 50 m2 kg or L** | **Maximum pack size kg or L** | **Conditions for storage** | **Alternative storage options** |
| --- | --- | --- | --- | --- |
| **Class 3 primary or sub risk** | 10 | 5 | Labelled standard laboratory cupboard or in small amounts throughout the laboratory | AS 1940 or AS/NZS 3833 |
| **Combustible liquids** | 50 | 20 | Labelled standard laboratory cupboard or in small amounts throughout the laboratory | AS 1940 or AS/NZS 3833 |
| **Classes 4.1, 4.2, 4.3, 5.1 or 5.2 (see Note 1)** | 20 but less than 10 of any one Class | 10 | Labelled standard laboratory cupboard or for Classes 4.1, 4.3 and 5.1, in small amounts throughout the laboratory | AS/NZS 5026 for Classes 4.1, 4.2 & 4.3  AS 4326 for Class 5.1  AS 2714 for Class 5.2 |
| **Class 6.1** | PG I 10 (Note 2)Other 50 | Packing Group (PG) Ι 10 (Note 2) Other 20 | Labelled standard laboratory cupboard or in small amounts throughout the laboratory | AS 4452 or AS/NZS 3833 |
| **Class 8** | 20 for liquids 50 for solids | 20 | Labelled standard laboratory cupboard or in small amounts throughout the laboratory | AS 3780 or AS/NZS 3833 |
| **Class 9 and aerosols** | 50 for liquids 100 for solids | 5 for liquids 20 for solids | Labelled standard laboratory cupboard or in small amounts throughout the laboratory | AS 4681 or AS/NZS 3833 |
| **Maximum aggregate quantity** | 200 | - | - | - |
| **Hazardous substances** | - | 5 for liquids 20 for solids | Labelled standard laboratory cupboard or in small amounts throughout the laboratory | - |

## Notes:

1. The quantities for Class 5.1 stated in the Table are the total amount of active ingredient present, rather than the actual volume or mass to allow for the very wide differences between concentrations of active ingredient in peroxides and hypochlorites that are commonly used in laboratories.
2. Packing Group (PG) - A series of three hazard groups into which dangerous goods are designated in the ADG Code, in decreasing order of hazard in Roman Numerals ‘Ι’ (great danger), ‘ΙΙ’ (medium danger) and ‘ΙΙΙ’ (minor danger).

## Laboratory Cupboards

As indicated in Table 1, the following precautions should be observed when storing chemicals in a designated laboratory cupboard:

* the storage of hazardous chemicals shall be compatible with the chemicals held in the laboratory cupboard
* labelling the laboratory cupboard to indicate the contents
* fitting the laboratory cupboard with spill trays on its shelves
* storing the chemicals in such a manner that leaks cannot affect other substances in the cupboard
* the maximum holding capacity of the shelving in the cupboard is not exceeded (do not overload shelves).

**Chemical Storage Cabinets**

For chemicals that are required to be stored in chemical storage cabinets (refer to Table 1 Laboratory Storage) the following storage arrangements should be made:

* Most flammable liquids or solids (Class/Divisions 3, i.e. paints, solvents, kerosene, and turpentine) can be stored together in a flammable liquids cabinet that complies with *AS1490*. Liquids must not be stored above powders and solids and, if in glass bottles, must be stored at lower levels.
* Class 4 Dangerous Goods in solid form (i.e. Flammable Solids, Spontaneously Combustible Solids and Dangerous When Wet divisions) must be stored separately in appropriately designated cabinets that comply with *AS/NZS 5026: The Storage and Handling of Class 4 Dangerous Goods.*
* Oxidizing Agents (Division 5.1) should be kept in a cabinet that complies with *AS 4326.*
* Organic Peroxides (Division 5.2) should be stored in compliance to *AS 2714*.
* Toxic Substances (Division 6.1) should be stored in compliance to *AS/NZS 4452*.
* Corrosive Substances (Class 8) should be stored in cabinets that comply to *AS 3780*, with separate cabinets for concentrated Acids and Bases (Alkalis).

Compatible goods of mixed classes can be kept in a cabinet that complies with *AS/NZS 3833.*

## Spill Containment

* Packages must be kept on surfaces that are resistant to their contents if spilt.
* Packages > 1.5 kg or 1.5 L should not be stored on shelves higher than 1.5 metres.
* Except when stored in specialised Dangerous Goods cabinets, containers for liquids should be stored on impervious spill trays and, if glass, must not be on shelves more than 1 metre above the floor. Spill containment facilities such as a spill kit must be provided in the storeroom, unless all liquids are stored in cabinets or on shelves with built in spill retention i.e. drip trays
* When a subsidiary risk is listed for a chemical, the storage requirements of both the relevant Dangerous Goods Class/Division and the Subsidiary Risk must be followed.
* Suitable absorption materials should be readily available for dealing with spills. Any dangerous goods or hazardous substance spill must be cleaned up immediately, taking appropriate precautions for the hazards of the material.
* Spill procedures should be predetermined, and personnel trained in their application. (Refer to Guidance Sheet 4 Chemical Spills Management for further information).

## Ventilation

The purpose of ventilation is to create and maintain a safe working atmosphere in an area where chemicals are stored and handled. Ventilation is achieved by the introduction or recirculation of air by natural or mechanical means.

A safe working atmosphere is characterised by:

* sufficient oxygen levels for breathing
* concentrations of hazardous gases, vapours, mists, fumes and dusts are within relevant exposure standards
* concentrations of flammable gases, vapours, mists, fumes and dusts are below 5% of their lower explosion limit, and voidance of the build-up of heat and extremes of temperature.

The different types of ventilation available include:

## General or Natural Ventilation

General or natural ventilation has limitations and should only be considered for airborne contaminants of low toxicity or nuisance odours. Natural ventilation also requires external walls through which the specified openings can be provided.

## Local Exhaust Ventilation

Where minor storage quantities of chemicals are being stored or handled local exhaust ventilation should be installed as a minimum for specific hazardous processes to capture airborne contaminants at the source. Mechanical ventilation may also be used for minor quantities.

Local exhaust ventilation removes airborne contaminants from the environment before they reach the breathing zone of a person working in the area. Typically, local exhaust ventilation would include fume cupboards, ducts attached to woodworking equipment, in welding bays and engine exhausts and vents in photography areas. There are specific design requirements for Local Exhaust Ventilation depending on the chemical nature and quantity of airborne contaminant being produced. Expert advice should be sought prior to installing, or when maintaining local exhaust ventilation.

## Mechanical Ventilation

Where quantities of chemicals being stored exceed minor storage, mechanical ventilation is required. If installed, mechanical ventilation should meet the following requirements:

* Separate fresh air supply and exhaust ducts shall be installed within the room on opposite walls at a distance between them of no more than 5 metres.
* If a single fan system is installed, the fan should be in the exhaust duct
* If the ventilation system incorporates fans on both the supply and exhaust ducts, the capacity of the fans shall be adjusted so that the fan on the exhaust duct is greater.

## Physical Requirements

* The system should be capable of exhausting 0.3 m3 per square metre of floor area per minute or 5 m3 per minute, whichever is greater, and the air velocity at the air supply outlet shall exceed 300 metres per minute.
* Any intake or exhaust duct shall terminate in open air at least 2 metres from any opening into a building, or 4 metres from the outlet of any chimney or flue and 3 metres above the ground.
* The system shall be designed so that it operates either continuously or whenever work is being carried out in the area or whenever a person is in the area.

Expert advice should be sought prior to installing mechanical ventilation.

## Ventilation for Chemical Storage Cabinets

Generally ventilation of chemical storage cabinets should not be required unless it is determined to be an essential risk control measure. Cabinet ventilation is not an alternative to vapour-tight closure of all stored containers. If ventilation is required, the cabinet should be vented to the outside atmosphere in a manner that prevents vapours, fumes or dusts from re-entering the building (refer to Figure 1 below). The ventilation ducting should provide at least the same level of fire protection as the cabinet walls and be resistant to vapours, fumes or dust in the cabinet.

## Set-up for Ventilation of Flammable Liquid Storage Cabinet Figure 1:Set-up for Ventilation of Flammable Liquid Storage Cabinet

It is recommended that chemical storage cabinets or chemical storage rooms have the following attributes:

* lockable to prevent unauthorised entry into the store and use of the chemicals
* the number of access keys should be limited to those employees that use the chemicals in the store
* outdoor storage of gas bottles is secure to prevent unauthorised access and use
* provision of trays to contain spills or leaks and enable disposal
* good lighting and ventilation for the comfort and safety of the user
* clear bench space and in-service fume cupboards for decanting, mixing, cleaning etc.
* appropriate signage indicating the nature of the hazard contained
* ensure routes are kept clear at all times for ease of access and egress

## Placarding Quantities

* Storage in excess of Minor Storage is subject to the *Dangerous Goods (Storage & Handling) Regulations 2012*, requiring a stringent approach to hazard identification, risk assessment and control.
* Placarding will be required and if further thresholds are exceeded, an Emergency Services Manifest and notification to WorkSafe of the Dangerous Goods stored will be required.
* Refer to Table 2 Statutory Quantities for Placarding requirements.

## Table 2 Statutory Quantities

This table references the Placarding, Manifest and Fire Protection Quantity as listed in Schedule 2 of the *Dangerous Goods (Storage and Handling) Regulations 2012.*

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | | **Description of Dangerous Goods** | **Packing Group** | **Placarding Quantity** | | | **Manifest Quantity** | **Fire Protection Quantity** | | |
| **1** | **Class 2.1** | | N/A | | 500 L | | 5 000 L | 5 000 L | |
| **Class 2.2 Subsidiary Risk 5.1** | | N/A | | 2 000 L | | 10 000 L | 20 000 L | |
| **Class 2.2** | | N/A | | 5 000 L | | 10 000 L | 20 000 L | |
| **Class 2.3** | | N/A | | 50 L | | 500 L | 2 000 L | |
| **Aerosols** | | N/A | | 5 000 L | | 10 000 L | 20 000 L | |
| **Cryogenic Fluids** | | N/A | | 1 000 L | | 10 000 L | 20 000 L | |
|  |  | |  | |  | |  |  | |
| **2** | **Class 3, 4.1, 4.2, 4.3, 5.1, 5.2, 6.1 or 8** | | Ι | 50 kg or L | | | 500 kg or L | 2 000 kg or L |
| ΙΙ | | 250 kg or L | | 2 500 kg or L | 10 000 kg or L | |
| ΙΙΙ | | 1 000 kg or L | | 10 000 kg or L | 20 000 kg or L | |
| Ι+ΙΙ+ΙΙΙ\* | | 1 000 kg or L | | 10 000 kg or L | 20 000 kg or L | |
| \*Ι+ΙΙ+ΙΙΙ= Mixed Packing Groups in in a single Class with the quantity of each Packing Group below the specified quantity for the Packing Group. | | | | | | | | |
|  |  | | | | | | | | |
| **3** | **Class 9** | | ΙΙ | | 10 000 kg or L | | 10 000 kg or L | 20 000 kg or L | |
|  | | ΙΙΙ | | 5 000 kg or L | | 10 000 kg or L | 20 000 kg or L | |
| ΙΙ + ΙΙΙ\* | | 5 000 kg or L | | 10 000 kg or L | 20 000 kg or L | |
| \*ΙΙ + ΙΙΙ= Mixed Packing Groups in Class 9 with the quantity of each Packing Group below the specified quantity for the Packing Group. | | | | | | | | |
| **Item** | **Description of Dangerous Goods** | | **Packing Group** | | **Placarding Quantity** | | **Manifest Quantity** | **Fire Protection Quantity** | |
| **4** | **Mixed Classes of dangerous goods** where none of the Classes, types or Packing Groups (if any) present exceeds the quantities specified for the relevant quantity in Items 1, 2 and 3 of this Table. | | N/A | | | 5000 kg or L-  The quantity only applies where the Placarding Quantity for an individual Class that is present is 5000 kg or L. | 10 000 kg or L | 20 000 kg or L | |
| 2000 kg or L-  The quantity only applies where the Placarding Quantity for all Classes present is 2,000 kg or L or less. |  |  | |
| **5** | **C1 combustible liquids** stored and handled with fire risk dangerous goods where none of the Classes, types or Packing Groups (if any) present exceeds the relevant quantities in Items 1, 2 or 3 of this Table | | N/A | | | 1 000 L | 10 000 L | 20 000 L | |
| **6** | Goods too dangerous to be transported that are not kept in a laboratory | | N/A | | | 0 kg or L | 0 kg or L | 0 kg or L | |
| **7** | **C1 combustible liquids** in bulk stored and handled in isolation from other dangerous goods. | | N/A | | | 10 000 L | 100 000 L | 100 000 L | |
| **C1 combustible liquids** stored and handled in packages in isolation from other dangerous goods. | | N/A | | | 50 000 L | 100 000 L | 100 000 L | |
| **C1 combustible liquids** in bulk and in packages stored and handled in isolation from other dangerous goods provided the quantity in bulk is 10 000 L or less. | | N/A | | | 50 000 L | 100 000 L | 100 000 L | |

## Related references

*Dangerous Goods (Storage and Handling) Regulations 2012*

*Code of practice for the storage and handling of dangerous goods 2013*

*AS 1940:2017: The storage and handling of flammable and combustible liquids*

*AS/NZS 2243.10: Safety in laboratories. Part 10– Storage of chemicals*

*AS 2714:2008: The storage and handling of organic peroxides*

*AS 3780-2008: The storage and handling of corrosive substances*

*AS/NZS 3833:2007: The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers*

*AS 4326-2008: The storage and handling of oxidising agents*

*AS/NZS 4452:1997: The storage and handling of toxic substances*

*AS/NZS 5026:2012: The storage and handling of Class 4 Dangerous Goods*