

## 4.15E Storage Guidelines for Dangerous Goods

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### Overview

This guideline focuses on the storage of dangerous goods. Dangerous goods of different classes cannot be stored together. They 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.

One of the first questions to answer is 'Are you storing more than minor quantities of dangerous goods

### Minor storage

The underlying the underlying concept behind Minor Storage is that quantities below a certain level are so small or scattered that they present little real risk or, if flammable, do not significantly contribute to a building's fire load. Neither would they unduly hinder with the activities of the emergency personnel. So if quantities can be kept below minor storage limits then the requirements are not as stringent. This could mean that storage can exist scattered (safely) throughout the laboratory without having to purchase an Australian Standard approved cabinet.

The following table is from AS:2243.10 - Safety in Laboratories (Storage of Chemicals).

If you are storing **more** than the quantities listed below for any of the dangerous goods classes then you are storing more than minor storage quantities for that class.

Class	Max. per 50m <sup>2</sup>	Max. Container Size	Where to store?
Class 3	10 L	5	Labelled laboratory cupboard
Class 4.1, 4.2, 4.3 Class 5.1, 5.2	10 L or Kg	10*	Labelled laboratory cupboard
Class 6.1	PG I 10 L or Kg Other 50 L or Kg	PG I – 10 L or Kg Other 20 L or Kg	Labelled laboratory cupboard
Class 8	Liquids 20 L Solids 50 Kg	20 L or Kg	Labelled laboratory cupboard
Hazardous Substances	200 L or Kg	Liquids - 5L Solids – 20 Kg	Labelled laboratory cupboard

\*Note from author: It would be advisable to keep the package size for these classes as low as possible; 10 L or Kg of these could pose significant risk for some substances.

So from the above table, if you have more than 4 Winchester bottles of any flammable liquid (eg. Ethanol), then those bottles need to be stored in an Australian Standard approved cabinet.

These maximum limits per area are more conservative than the limits for minor storage allowed in the individual Australian Standard for each dangerous good. For example in AS1940: Storage and Handling of Flammable Liquids, the minor quantity limit allowed for laboratory situations is 50 L per 50 m<sup>2</sup>. This limit does not take into account the fact that, in many laboratories, each class (or at least most classes) of dangerous goods could be present. It is possible that a value somewhere between 10 and 50 L could be selected depending on the risk assessment for the individual situation.

**Possible Scenario:** Well ventilated laboratory with no sources of ignition and the only other type of dangerous goods being stored is 20 Litres of Class 8 corrosives.

**Scenario option** A reasonable approach could be to use 25L of flammable liquid as the cut off point for minor storage in this scenario.

### Decanting and mixing

Dedicated areas should be provided for measuring out chemicals.

### General requirements for storage of Dangerous Goods

The area where dangerous goods are stored should be:

- Well ventilated and well lit.
- Separated from ignition sources.
- Secured from the public (including students).
- Protected from temperature fluctuations and direct sunlight.
- Shelving/cupboards should:
  - Be constructed of chemically resistant materials.
  - Provide a lip at the front of the shelf.

Secondary containment (eg. spill trays) should be considered for liquid dangerous goods stored outside of a chemical storage cabinet.

If an AS approved cabinet is being used for storage, the quantities stored in the cabinet must be less than 100L unless the cabinet is a licensed DG depot (usually not possible in a typical lab because of the proximity to electrical cables). This is usually not a problem as it is virtually impossible to store in excess of 100L. NB solvents must be stored in winchesters and the bund part of the cabinet is not used for storage.

### Flammable liquid storage

- The maximum capacity for any individual storage cabinet is 250L.
- Walls floor door and roof must be double sheeted steel with a space of at least 40mm between walls
- The cabinet bottom must form a liquid tight compound at least 150mm deep.

- Cabinet door must be self-closing, close fitting and shut by catches at more than one point.
- Signage to include No smoking and no ignition sources in 50mm + lettering
- Not more than 250L stored within any 250sq m of floor area
- Not more than 250l stored in any 10m linear distance
- Cabinets must be at least 5m apart
- Cabinets must be at least 3m from any source of ignition
- Cabinet location must not jeopardise safety in the event of an emergency exit.
- Vent openings shall be provided with a means of permanent closure when venting is not required
- Cabinet venting systems must be terminated at least 3m from a source of ignition, at least one metre from an opening and at least 3 metres above ground inhibit
- Tanks shall be designed , constructed and have markings that comply with AS 1692 or equivalent standard

### General guidelines on separation distances

The relevant AS need to be referred to and dependant on volumes the distances vary

Relevant AS on the storage, handling and safe use of chemicals include AS/NZS 2243.2 (Chemical aspects) AS/NZS 2243.10(Storage of Chemicals), AS 4332 (Storage and handling of gases in cylinders) and AS/NZS 2982.1 (Laboratory design and construction) and AS 1940 The storage and handling of flammable and combustible gases AS 1692.

The minimum spacing for biological safety cabinets shall be as specified in AS/NZS 2647

The minimum spacing for fume cabinets shall be as specified in AS/NZS2243.8

As a general “rule of thumb” the following separation distances seem reasonable within the University context.

- 3m away from exits and not in egress paths
- 5 metres away from other DG depots, offices and public areas
- 3m between flammable liquid depots and ignition sources – no decanting ( ground level to 1m above ground level)
- 8m between flammable liquid depots and ignition sources – decanting ( ground level to 1m above the ground)
- The separation of Class 2.1 (flammable gases) from ignition sources will vary dependant on the properties of the gas, volume and storage pressure.

- Physical distances can be reduced by using fire and vapour proof barriers.

### Collection depots.

A specific section of the depot should be set aside for the storage of laboratory wastes prior to their collection. A responsible person should be appointed to oversee the security of the waste chemicals and ensure that precautions are taken to eliminate sources of ignition from the area. The collection depot should display suitable hazard warning signs. Safety equipment and spill kits must be maintained at the collection depot.

Chemical waste must be separated from other waste such as; paper and glass, sharps, broken glass, biological waste, cytotoxic chemicals, animal carcasses, radioactive products and drugs of addiction.

STORAGE OF DANGEROUS GOODS: Which classes can be stored together?

OK: these can go together. SP: SeParated by SPace. FS: Fire Separation - physically separated in a fire. NO! means NO!

CLASS	Description & Example												
	Flammable Gas e.g. butane, acetylene	OK	OK	FS	FS	FS	FS	NO!	FS	NO!	NO!	FS	FS
	Non-flammable compressed gas e.g. nitrogen, argon	OK	OK	OK	OK	SP	SP	FS	SP	SP	FS	SP	SP
	Oxidising gas e.g. oxygen	FS	OK	OK	FS	NO!	FS	NO!	NO!	SP	FS	FS	FS
	Toxic gas e.g. carbon monoxide	FS	OK	FS	OK	FS	FS	FS	FS	SP	FS	SP	SP
	Flammable liquid e.g. ethanol, hexane	FS	SP	NO!	FS	OK	FS	FS	FS	NO!	NO!	FS	SP
	Flammable solid e.g. naphthalene	FS	SP	FS	FS	FS	OK	FS	FS	NO!	NO!	FS	SP
	Spontaneously combustible e.g. zinc powder, potassium sulfide	NO!	FS	NO!	FS	FS	FS	OK	FS	NO!	NO!	FS	SP
	Dangerous when wet e.g. sodium, maneb	FS	SP	NO!	FS	FS	FS	FS	OK	NO!	NO!	FS	FS
	Oxidising agent e.g. sodium nitrate, potassium dichromate	NO!	SP	SP	SP	NO!	NO!	NO!	NO!	SP	FS	FS	FS
	Organic peroxide e.g. peracetic acid, hardeners	NO!	FS	FS	FS	NO!	NO!	NO!	NO!	FS	SP	NO!	FS
	Poison e.g. aniline, antimony	FS	SP	FS	SP	FS	FS	FS	FS	FS	NO!	OK	SP
	Corrosive e.g. sodium hydroxide, acetic acid	FS	SP	FS	SP	SP	SP	SP	FS	FS	FS	SP	SP

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