Flammable & combustible liquids - storage and handling

1. Regulations and standards for flammable & combustible liquids

Under the Dangerous Goods Safety Management Act 2001 the storage of flammable and combustible liquids are considered to be a significant public safety and environmental risk and requires licensing with Local Government. An occupier of a site must hold a licence to store Flammable and combustible liquids if the quantity stored exceeds the minor storage exemption limits stated in Australian Standard 1940-2004 ‘Storage and Handling of Flammable and Combustible Liquids.’

AS1940 sets out the storage requirements for minor quantities and storage in cabinets, package stores and tanks. There are additional regulations and standards that apply to specific activities or areas (e.g. AS 2982 Laboratory construction and design, AS2243.2 Safety in Laboratories: Chemical aspects and AS 2243.10 Safety in Laboratories: Storage of chemicals).

The classes of liquid covered by the Building (Flammable and Combustible Liquids) Regulations are principally defined in terms of their flash point with some exceptions being provided for potable and viscous liquids. The “flash point” of a liquid is the lowest temperature of the liquid at which the vapour above it can be ignited by an ignition source.

**Flammable liquids**
- **Packaging group I & II** liquids with a flash point < 23°C.
  (e.g. acetone, diethyl ether, ethanol, ethyl acetate, petrol, toluene)
- **Packaging group III** liquids with a flash point ≥ 23°C and ≤ 61°C.
  (e.g. n-butanol, kerosene, mineral turpentine, xylene)

**Combustible liquids**
- **Class C1** liquids with a flash point > 61°C and ≤ 150°C.
  (e.g. distillate, ethylene glycol)
- **Class C2** liquids with a flash point > 150°C.
  (e.g. cooking oil, glycerol, lubricating and hydraulic oils)

2. Licensing of flammable & combustible liquids storage

Storage in quantities more than the limits set for minor quantities require the University to obtain a licence for this storage from the local authority.

*Minor quantities are defined for different occupancies in table 2.1 of AS 1940-2004 The Storage and Handling of Flammable and Combustible Liquids*

The University of Queensland has a licence for its major sites. Renewal of licences will be undertaken by the University administration. Heads of Institutes, Schools, Centres and Divisions responsible for particular buildings or areas are required to:

- Ensure compliance with the Regulations and AS 1940 by
  - obtaining and maintaining any special storage facilities or equipment required,
  - implementing necessary safe working procedures, and
  - reporting to the OH&S Unit any significant difficulties or deficiencies with respect to the storage and handling of flammable or combustible liquids;
• Limit quantities of flammable and combustible liquids to the lowest practical levels; and
• Provide accurate details of inventory to the OH&S Unit when required.

3. Material safety data sheets (MSDS) & labels
Before using a flammable liquid, a copy of the MSDS should be obtained. A risk assessment should be undertaken based on a review of the MSDS and the intended use of the material. The control measures indicated by the risk assessment should be followed.

All containers of flammable and combustible liquids must be labelled with the following:
• the name of the material,
• the appropriate risk and safety phrases, and
• for flammable liquids, the class label.

4. Storage of flammable and combustible liquids
Minor quantities of flammable and combustible liquids may be stored on open shelves or work benches. However, as storage in an enclosed space provides a high level of protection in the event of fire, it is recommended that the quantities stored in the open be kept to a minimum. Flammable and combustible liquids should not be stored on the floor.

The following minor quantities limits are provided for guidance within the University of Queensland:

<table>
<thead>
<tr>
<th>Location</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>5 litres / floor (level)</td>
</tr>
<tr>
<td>Laboratories</td>
<td>10 litres / 50 m² floor area</td>
</tr>
<tr>
<td>Workshops</td>
<td>100 litres</td>
</tr>
</tbody>
</table>

Where the quantities stored exceed the minor quantities limits, flammable and combustible liquids must be stored in an approved flammable liquids cabinet. Specific areas requiring a flammable liquids cabinet should contact the OH&S Unit for assistance.

The maximum quantity that may be stored in a flammable liquids cabinet is 250 litres. Within a radius of 10m, measured from any one cabinet, the cabinet storage capacity aggregated for all cabinets in that radius shall not exceed 250L or 250kg (AS2243.10). The radius shall be measured horizontally through intervening walls, unless those walls are able to prevent the spreading of a fire of the magnitude that could be expected to result from the contents of the cabinet(s). Institutes, Schools, Centres and Divisions should not keep quantities in excess of this limit. Where significant volumes of flammable liquids are used, a purpose designed 500L store can be built (as per the requirements specified in AS1940). These stores need to be approved by the local council (e.g. Brisbane City Council). Alternatively, arrangements may be able to be made with the University Chemical Store to provide prompt deliveries for standard orders of class 3 substances.

The Universities preferred approach to chemical stores is for mixed class stores designed in accordance with AS2243.10.

All newly refurbished laboratories with new installations of flammable solvent cabinets must be mechanically ventilated in accordance with AS1940. There is no requirement for venting of cabinets containing other classes of dangerous goods.
5. Flammable substances and hazard zones

The use of flammable liquids, gases or dusts has the potential to create an explosive working environment. Where the use of these substances is an expected occurrence, hazard zones must be assessed in accordance with AS/NZS 60079.10: 2004 – Electrical apparatus for explosive gas atmospheres - Classification of hazardous areas or AS/NZS 61241.10:2005 – Electrical apparatus for use in the presence of combustible dust – Classification of areas where combustible dusts are or may be present.

The extent of zoning can be affected by the type and quantity of flammable substances (including by-products of processes e.g. methane) as well as the choice of controls and their implementation e.g. ventilation, housekeeping and chemical storage.

6. Safe working procedures for minor quantities

Where flammable liquids are kept on benches or shelves or in cupboards in quantities less than the limits set for minor quantities, the Australian standard AS 1940 requires the following minimum safe working procedures to be followed:

- Flammable and combustible liquids must be stored away from ignition sources (e.g. flames, electrical equipment, grinding and cutting operations) and excessively hot locations

- All containers must be kept closed when not in use (including containers for waste liquids).

- When carrying containers of flammable and combustible liquids care must be taken to minimise the possibility of spillage and fire. Properly designed carriers should be used for ‘Winchester’ sized containers (2 to 4 litres).

- Any action to open or decant from a container of flammable liquid must be carried out in a well ventilated area and sufficiently distant from any potential ignition source so as to ensure safety having due regard to the quantity being handled.

- Combustible wastes or residues must not be kept or left in areas where flammable or combustible liquids are stored or decanted.

- Materials that might interact dangerously with flammable and combustible liquids must be stored separately from them. In particular oxidising agents must be stored separately.

- All people handling flammable and combustible liquids must be familiar with their hazardous properties and the necessary safety procedures for handling them.

- Any spillage must be cleaned up immediately.

- The quantity of flammable and combustible liquids should be kept to a minimum. In particular the number and size of containers kept on open benches or shelves should be kept as low as practical taking account of day-to-day requirements.

- Special safety cans for flammable liquids may be purchased for areas where there is a high level of use.
• Flammable and combustible liquids must not be stored or used where they may jeopardise escape from a room or building in the event of a fire.

• Where the quantities of flammable liquids stored is greater than 100 litres:

  A fire extinguisher appropriate to class B fires must be provided (dry chemical or carbon dioxide).

  Where the quantities of flammable liquids stored is greater than 100 litres, a warning sign must be displayed (as illustrated).

7. Procedures for larger quantities

Where flammable and combustible liquids are used in larger quantities (ie quantities greater than minor quantities) the procedures outlined above should be followed together with the additional requirements set out in Australian standard AS 1940 for the quantities being used.

8. Waste flammable & combustible liquids

Waste flammable and combustible liquids are subject to the same requirements set out above - in particular the need to store 10 litre and 20 litre plastic drums within a flammable liquids cabinet. [Refer to the University of Queensland Chemical waste procedures for further information.]

Reviewed by the Occupational Hygiene Advisers – September 2010.