

UNIVERSITY of CAMBRIDGE ENGINEERING DEPARTMENT
HOPKINSON LAB

GUIDANCE AND LOCAL RULES FOR USING AND STORING FLAMMABLE LIQUIDS

INTRODUCTION

We are not a chemistry lab and hence most of us do not have the necessary knowledge to handle hazardous chemicals. Our experience is limited to common, relatively benign materials, but we tend to use large quantities of flammable gases and liquids as fuels, cleaners and tracers. These notes aim to provide some guidance on the safe use of flammable liquids.

When working with flammable liquids, one must be careful for hazards related to:

- Fire
- Health
- Environment

You must be very familiar with the hazards associated with any material you are using and you must know what protective measures you need to take, before you start using it. You must also be aware of any emergency procedures in case of skin or eye exposure or accidental swallowing. This information must be compiled by you in the COSHH form, a copy of which should be available next to your experiment. You can learn these hazards from chemicals data sheets, from the supplier's information, and from colleagues in the lab.

A web site with information on most materials you are likely to use is <http://www.pcl.ox.ac.uk/MSDS/>

As a useful example, a set of guidelines and explanations for the possible hazards in the Cavendish Lab at Cambridge is <http://www.phy.cam.ac.uk/cavendish/hands/cops/COSHH2.pdf>

Our main distinction for the purposes of handling and storage of flammable liquids is through the *flash point*. The flash point is the temperature above which the liquid evaporates enough to create a mixture that reaches the lower flammability limit in air at atmospheric pressure. Hence, we distinguish flammable liquids into:

- **Highly flammable:** Flash point < 32 °C, such as petrol, octane, heptane, acetone, methanol, ethanol;
- **Flammable:** Flash point > 32 °C, such as diesel, oil, kerosene;

A “borderline” liquid may, on a hot summer day, become “highly flammable” from being just “flammable”; hence caution and some degree of judgement is needed in this classification and no complacency is allowed when the liquid is not deemed “highly flammable”.

PURCHASE AND REGISTRATION

Past experience shows that individuals order large amounts of fuels and liquids and this proliferation of bottles of acetone, methanol, ethanol and other highly flammable liquids led us to a point that we collectively had to store excessively large amounts. Hence, we now have a policy of centralised ordering and registration of such liquids.

If you wish to purchase or use flammable liquids (or other hazardous chemicals), you must follow the steps below:

- Inform yourself about the risks associated with their use.
- Fill a COSHH form.

- Think about the amount you need. The lab today has a storage capacity of about 50 litres for highly flammable liquids, most of which is already taken, so there is a serious limitation on how much new liquid you can bring into the lab.
- Ask Kate Graham (kag1000@cam.ac.uk) or Mike Underwood (mau20@eng.cam.ac.uk) to fill the purchase order for you, informing her/him explicitly whether the liquid is flammable or highly flammable. This step is necessary because we need to have a log of the whereabouts and amounts of the flammables we use. Kate or Mike will question you whether you really need all this amount and will put pressure on you to minimize it. Having access to the log, they will also suggest who else in the lab uses the same liquid in case they can lend some to you.

STORAGE

- Never leave bottles or containers open.
- Place container in a tray, not directly on your bench or table.
- You can store up to 2 lt of highly flammable liquids in your own specially-designed, and marked, cabinets, which should be placed securely away from heat sources (e.g. radiators). No more than one such cabinet per room is allowed. No storage of any quantity in the engine test cells or close to a combustion experiment, except in the purpose-made fuel tanks that are already there. Consult LORS before buying any new storage cabinets for flammables.
- For larger quantities, consult Mick Underwood, who may be able to store your containers in the area of the old workshop. There are two cabinets there, already almost filled to capacity.
- Storage cabinets should be kept locked. A sign with the keyholder's name should be attached on the cabinet's door.
- If there is no proper storage available, no new flammable liquid will be accepted in the lab, so please coordinate with your supervisor and Mike Underwood as early as possible.

HANDLING

- You should never use flammable liquids without ventilation, e.g. exhaust system on, windows and doors open.
- Use as small an amount as possible. Think of how dangerous the situation will be if you drop a big bottle and you spill, say, a few litres of highly flammable petrol or acetone on the floor of the lab.
- Wear gloves, lab coat, face mask, and goggles.
- Move glass containers only with the special baskets provided. There are two such baskets in the old workshop area.
- When you refill any small containers from your large ones, do so in the open area of the lab and place your containers in a tray so as to contain any spills. Do not refill bottles without a funnel (which you should reserve specially for the particular liquid).
- No handling is to take place outside normal working hours, i.e. 9-5 on weekdays, so that technicians are available in the lab to assist or intervene in case of emergency.

DISPOSAL

- Once you have finished your experiments, don't store containers for future generations. Ask Mick Underwood to dispose of your unused liquids in the proper manner.

- Keep a container clearly marked as “waste” for your waste liquids. Avoid mixing wastes, as some chemicals are incompatible. In addition, mixing different liquids makes their proper disposal a lengthier and costlier process.

SPILLAGE

If you accidentally spill flammable liquids, your actions can be different depending on whether the liquid is very volatile (“highly flammable”) or not very volatile (“flammable”). They will also depend on whether you are working in a small enclosed room or in the large open area of the lab and on the amount of liquid spilled.

For highly volatile flammable liquids (e.g. acetone, petrol, heptane), a turbulent vapour plume will be created in a matter of seconds from the spill and ***hence a flammable mixture will certainly be present somewhere*** above or below the spill. Hence ***it is imperative that no ignition source is present anywhere in the neighbourhood of the spill, which implies that you should give careful thought on where and when you handle the liquid.*** For less volatile liquids (e.g. diesel, oil), the evaporation will be slow and the creation of a flammable mixture will be slower. Hence you will have time to contain the spill.

Under all circumstances:

- ***Do not turn lights on or off.***
- ***Do not unplug or plug any electrical equipment.***
- If you are sure that switching off does not create a spark, switch off any heaters or heat-producing devices.
- If you get liquid on your face or eyes, wash thoroughly with the emergency eye solution. Inform yourself about the location of the eye wash station.
- ***Open windows and doors to increase ventilation.***
- Warn others to avoid the area of the spill.
- Report to the Chief Technician, LORS or your supervisor.

Additionally:

In the event of a small spill (i.e. up to 0.5 lt):

- Use the special spill kits provided to contain and absorb the spill.
- Dispose of the wet pads in the collection bags provided.
- Move pads and collection bags outside the lab, even by opening one of the fire exits (especially in the case of a “highly flammable” liquid).

In the event of a large spill (i.e. amount greater than 0.5 lt) of highly flammable liquids:

- Use spill kit, if this action can be taken within a few seconds from the spill.
- Press fire alarm within 30 seconds from the spill and evacuate the lab as in a proper fire situation.
- Stay around to inform the Fire Marshall.

In the event of a large spill (i.e. amount greater than 0.5 lt) of flammable liquids:

- Use spill kits to contain as much of the spill as possible. Call University Security, if after hours.

USEFUL NUMBERS

Chief Technician (Mike Underwood): 32692. E-mail: mau20@eng.cam.ac.uk

LORS (S.Scott): 332645. E-mail: sas37@eng.cam.ac.uk

Departmental Safety Officer (I.Slack): 32740. E-mail: is307@cam.ac.uk

Reception: 32600

University security: 31818

Emergency services: 1999

