Chemical Storage Areas

The chemicals that are not in use in the laboratories shall be stored in separate chemical storage areas.
Pressure bottles shall be stored in special storage areas (see labelling).

The quantities of chemicals stored in the chemical cabinets in the individual laboratories must not exceed the quantities required by the current experiment. Chemical cabinets must be well-ventilated and labelled 'EX'. Cabinets used for storing chemicals must be constructed with the purpose of chemical storage. The transfer of chemical liquids between containers in chemical cabinets is prohibited.

Maximum quantities of stored material

- A maximum of 50 units of storage per laboratory.
- A total maximum of 800 units of storage in the fire section to which the laboratory belongs.
- The total maximum of 800 units of storage includes storage areas attached to or located in the laboratories.

Units of storage and classification of liquids
Flammable liquids are classified into three classes - I, II, and III – according to their flash point:

- Class I: flash point < 21° C
- Class II: 21° C ≤ flash point ≤ 55° C
- Class III: 55° C < flash point ≤ 100° C

1 unit of storage equals
1 litre of a class I liquid, or
5 litres of a class II liquid, or
50 litres of a class III liquid.

Storage of chemicals.

- **Store chemicals in ventilated chemical cabinets**
- **Chemical liquids must only be transferred between containers or dispensed in the fume cupboards**
- **Pressure bottles must be stored in the designated storage areas**
- **The labelling of containers must be controlled and, if relevant, updated**

If these conditions for storage of chemicals are complied with, the risk of a dangerous explosive atmosphere occurring is limited to chemical cabinets (zone 2).

Make sure you and your colleagues are safe!

This leaflet gives instructions on the correct and safe handling and storage of flammable liquids and gases.
The purpose of the instructions is to protect you against fire and explosion during laboratory work at the University of Southern Denmark.
The conditions for such work are drawn up in accordance with the rules on the protection of employees against a dangerous explosive atmosphere laid down by The Danish Emergency Management Agency and the Danish Working Environment Authority.

The conditions at SDU have been assessed in collaboration with:

University of Southern Denmark

NIRAS

Danger of Fire and Explosion

Safety guidelines for the handling of flammable liquids and gases in laboratories

Instructions

Identify hazards in connection with the experiment to be carried out;

Choose the lab type which suits your experiment;

Follow the conditions of the laboratory and the fundamental rules for handling and storage

Fundamental rules for handling and storage

- Open handling of flammable liquids is prohibited outside fume cupboards
- Flammable liquids must only be available in connection with ongoing experimental set-ups
- Flammable liquids must be stored in well-ventilated chemical cabinets (zone 2)
- Fixed gas-consuming devices (e.g., gas chromatography systems) must be connected to a pressure-proof gas installation approved by the building department.
- Bunsen burners must be inspected immediately before use.
- Pressure bottles (e.g. reserve bottles) must be stored in special storage areas constructed for that particular purpose.
- Pressure bottles that are in use may be stored in the laboratory. If the pressure bottles are used with intervals exceeding 2 weeks, they must be stored in special storage areas constructed for that particular purpose.

Zone 2 areas

- A dangerous explosive atmosphere occurs only rarely and in short periods in zone 2 areas. Often the dangerous atmosphere is a result of leaks, spills, and the like. Such an atmosphere in the form of gas, steam, or fumes is created because of evaporation and gas leaks.
- Sources of ignition must be removed from zone 2 areas. This is ensured by way of EX-labelling electric equipment  II 3 G
- The entrance to zone 2 areas are marked  .

Type 1 laboratory

The least hazardous experiments shall be carried out in Type 1 laboratories.

Conditions for work in Type 1 laboratories

- The maximum quantity of flammable liquid to be handled is 1 litre per experiment
- Maximum capacity of open containers is 1 litre.
- Flammable gas must only be used in connection with
- Temporary manual dispensing of a maximum of 1.0 litres of flammable gas at 1 atm to a container/carboy in a fume cupboard. The gas must be used immediately after dispensing so as to eliminate the explosion-prone atmosphere as quickly as possible. If this is not possible, the experiment must be carried out in a Type 3 laboratory. Open fire or hot surfaces in the stone cup**b**oards are prohibited, and the ventilation must be fully turned on.
- In the event of ventilation failure the experiment must be terminated to limit leaks and spills (e.g., by putting lids on containers and closing fume cupboards).
- Experiments may be carried out without monitoring - also during nights and weekends!

Work involving flammable liquids in Type 1 laboratories:

- **Work only in fume cupboards**
- **Use a maximum of 1 litre in open containers**
- **If possible, avoid open handling of flammable liquids**
- **Do not connect flammable gases to experimental set-ups**
- **Be cautious when heating flammable liquids**
- **Remove any flammable liquids not in use**

If the conditions for carrying out safe experiments in Type 1 laboratories are complied with, the risk of a dangerous explosive atmosphere occurring is limited to chemical cabinets (zone 2).

Example

Experiments using a maximum of 1 litre of flammable liquid in several open containers. The largest open container must have the capacity to hold 1 litre. The experiment must be carried out in a fume cupboard without monitoring. Evaporation will not lead to a dangerous explosive atmosphere.

Type 2 laboratory

More hazardous experiments shall be carried out in Type 2 laboratories.

Conditions for work in Type 2 laboratories

- Open handling of flammable liquids must be limited to a maximum of 3 litres per experiment
- Maximum capacity of open containers is 5 litres.
- Flammable gas must only be used in connection with
- Temporary manual dispensing of a maximum of 1.0 litres of flammable gas at 1 atm to a container/carboy in a fume cupboard. The gas must be used immediately after dispensing so as to eliminate the explosion-prone atmosphere as quickly as possible. If this is not possible, the experiment must be carried out in a Type 3 laboratory. Open fire or hot surfaces in the stone cupboards are prohibited, and the ventilation must be fully turned on.
- In the event of ventilation failure the experiment must be terminated to limit leaks and spills (e.g., by putting lids on containers and closing fume cupboards). The electricity to the fume cupboard's socket must be cut off (by manually switching it off).
- The person responsible for the experiment must monitor the experiment - also during nights and weekends!

Work involving flammable liquids in Type 2 laboratories:

- **Work only in a fume cupboard**
- **Use a maximum of 5 litres in open containers**
- **If possible, avoid open handling of flammable liquids**
- **Do not connect flammable gases to experimental set-ups**
- **Be cautious when heating flammable liquids**
- **Remove any flammable liquids not in use**

If the conditions for carrying out safe experiments in Type 2 laboratories are complied with, the risk of a dangerous explosive atmosphere occurring is limited to chemical cabinets (zone 2).

Example

Experiments using a maximum of 5 litres of flammable liquid in several open containers. The largest open container must have the capacity to hold 5 litres. The experiment must be carried out in a fume cupboard. Experiments must be monitored by the head of the research lab who can terminate the experiment in the event of accidents, ventilation failure and the like, thereby preventing evaporation and, over time, the occurrence of a dangerous explosive atmosphere.

Type 3 laboratory

The most hazardous experiments shall be carried out in Type 3 laboratories.

Conditions for work in Type 3 laboratories

- Flammable gas must only be used in connection with
- Temporary manual dispensing of flammable gas at 1 atm to a container/carboy in a fume cupboard. The gas must be used immediately after dispensing so as to eliminate the explosion-prone atmosphere as quickly as possible. Open fire or hot surfaces in the stone cupboards are prohibited, and the ventilation must be fully turned on.
- Temporary experimental set-ups to which flammable gas is connected must only be placed in fume cupboards
- Experiments can run without monitoring - also during nights and weekends

Work involving flammable liquids and gases in Type 3 laboratories:

- **Work only in a fume cupboard**
- **If possible, avoid open handling of flammable liquids**
- **Do not connect flammable gases to experimental set-ups**
- **Be cautious when heating flammable liquids**
- **Remove any flammable liquids not in use**

If the conditions for carrying out safe experiments in Type 3 laboratories are complied with, the risk of a dangerous explosive atmosphere occurring is eliminated, because the ventilation in fume cupboards and chemical cabinets is kept operating by power supply back-up.

Example

The ventilation kept in operation at all times prevents the occurrence of a dangerous explosive atmosphere, even though work is carried out involving bigger quantities of flammable liquid and/or flammable gases in the fume cupboard. Because the ventilation is kept in operation at all times, experiments need not be monitored due to risk of explosion. However, there will always be fumes ignitable at liquid surfaces, so caution is required!