



Laboratory Best Practice

# Module 3

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Health & Safety  
**Essentials**

Registered charity number 207890

# Equipment

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This section looks at selecting the correct work equipment for the task, as hazards may be introduced if the wrong equipment is selected, used or if the correct equipment is modified so that it is no longer suitable.

Ensure that work equipment is:

- in good working order and in good repair
- safe for use and maintained in a safe condition
- inspected to ensure that it is correctly installed and that it does not deteriorate

Only those persons who have had adequate information, instruction and training should use the equipment.

**All laboratory persons need to be aware of how to safely shut off all work equipment.**

## Glassware

- Examine all glassware for scratches, cracks and sharp edges before using. Even a small scratch can cause a failure if used under vacuum.
- Ensure that the apparatus is supported adequately for the intended operation, and the size of the system is sufficient to contain any foaming, should it occur.
- Work equipment constructed from glass needs special consideration when used above or below atmospheric pressure. The stored energy involved means that any breakages will be accompanied by flying glass, so items such as glass vacuum desiccators should be protected with a wire framework or cage. Admit air carefully and gradually before opening.
- Never carry Winchester bottles by the neck; always use an approved carrier for them.
- When inserting glass rods, glass tubing or thermometers through bungs or other seals, use a cut- or puncture-resistant cloth or gloves to protect your hands. Lubricate the items to reduce the risk.
- Make sure that condenser systems are well secured and check the water flow and the fittings regularly. Use a flow indicator.

## 'Personal Protective Equipment' (PPE)<sup>2</sup>

- Store your laboratory coat in a suitable location and wear it correctly with the coat fastened during practical work. Make sure the coat is regularly laundered and in good condition, as ripped clothing could cause a hazard by becoming entangled in equipment.
- Wear gloves when handling chemicals. They should be of a suitable material to offer protection from the substance in use. Information is contained in the safety data sheet (SDS) on suitable gloves. Consider the acceptable permeation rate, break-through time and degradation resistance. Be careful not to contaminate surfaces, doors, equipment, bottles, taps, switches or controls by handling them with contaminated gloves. Take the gloves off to touch these surfaces. Wash hands and gloves regularly.
- Disposable gloves are very practical and should be used where appropriate where appropriate (i.e. as identified in the risk/COSHH assessment). Disposable gloves are only splash resistant so consult manufacturers' charts to check 'breakthrough times'. Discarded gloves may be classified as hazardous waste for disposal purposes.
- Respiratory protection may be required for some handling operations to offer further protection from the hazardous substance. Seek specialist help when selecting respiratory protections as it's not as straightforward as it appears.
- You should have received training on how to wear a respirator, how to maintain it correctly and how to look for faults. You should also know how to fit it to your face correctly to form a good face seal.
- Full-face visors afford extra protection to the eyes and the face when carrying out hazardous operations.



## Ventilation: Fume cupboards

- Keep the sash closed when you are not actively working in at the fume cupboard. In the event of an explosion, the sash acts as a shield and it also provides containment in the event of fire.
- Fume cupboards (and local extraction ventilation) require a thorough statutory examination and testing at least every 14 months by a competent ventilation engineer. You should also have flow indicators fitted and complete regular checks must be carried out to ensure that there is a sufficient flow rate to protect the operator from exposure. Generally, fume cupboards are designed to operate with a linear flow velocity of  $0.5 \text{ ms}^{-1}$  and some specifically designed 'low-flow' fume cupboards with a linear flow velocity of  $0.3\text{-}0.5 \text{ ms}^{-1}$ .
- It is important to understand the limitations of the fume extraction and assessing (in your COSHH assessment) if the fume cupboard is a suitable engineering control for the intended process. In some specific cases, the fume cupboard will be unable to provide the containment required, for example, handling larger than standard (e.g.  $>1\text{g}$ ) quantities of a highly hazardous substance (with a high risk of exposure), which has a very low workplace exposure limit ( $<10 \text{ ppb}$ ) and low threshold limit value. In such cases greater control would be required, for example, the hazardous substance should be handled in a glove box.
- You should be able to isolate all systems from outside the fume cupboard (e.g. such as electricity and gas).
- Fume cupboards offer additional protection. They should be used for hazardous operations or for other risks derived from handling energetic materials or equipment under pressure vacuum. If you need to grind materials or sieve powders, or weigh hazardous materials, then this may also need to be completed in a fume cupboard. Some fume cupboards are recirculating and rely on a filter to remove noxious chemicals before returning the air to the lab: the correct filter must be installed for the work you are doing. Note: these fume cupboards are limited in their capacity to trap noxious materials and their employment should be justified in the COSHH assessment.
- Where there is a risk of fire inside a fume cupboard, especially during out of hours' periods, it is common practice to fit an automatic fire extinguishing system linked to the building's fire alarm. Should a fire occur the fire extinguishing system prevents the spread of fire by extinguishing the source.

## Electrical equipment

- The hazards associated with electrical equipment include electric shock/electrocution or the generation of an ignition source. In principle, using lower voltage equipment, such as 'battery powered' equipment, is preferable to using mains operated equipment. Where mains operated equipment must be used, consider the location/use and its effect on the handling of substances or carrying out experiments.
- Keep electrical equipment away from flammable materials and from water.
- The equipment must be maintained regularly by a suitably qualified person.
- All electrical equipment must undergo regular Portable Appliance Testing (PAT), at least annually or every 6 months for hand-held equipment such as hot air guns.
- Check for any signs of wear, damaged cables or flexes, sockets and protective casings prior to use.
- Make sure that you can safely isolate all electrical equipment, ideally from outside the fume cupboard, and that no water points or rubber connections for hoses that carry water are allowed to leak onto electrical plugs or switches.
- If you are storing flammable materials in a fridge, then make sure that the fridge is rated for flammable atmospheres, i.e. it is 'spark free'. Storerooms and fridges require regular inspection.

