

## Safe use of ducted laboratory fume cupboards

### Introduction

The Control of Substances Hazardous to Health (COSHH) Regulations require that a risk assessment must be carried out on all procedures used in the laboratories, in order to eliminate or minimise risk. Work with substances that produce/generate toxic or harmful fumes, vapours, gases, dust or chemical aerosols, should be carried out in a fume cupboard in order to eliminate or reduce the risk of exposure to an acceptable and safe level. Fume cupboards are not to be used for the containment of biological materials. Where such containment is required a microbiological safety cabinet must be used.

A fume cupboard is a means of containing or extracting hazardous fumes/vapours/aerosols away from the operator to be safely discharged to the atmosphere.

### Performance criteria

The following standards of performance in terms of face velocity are considered to represent good practice and are supported by research literature:

Face Velocity (average)	Use of fume cupboard
Minimum 0.7m/s	Radioactive Work
Minimum 0.4m/s <sup>1</sup>	Standard work with hazardous substances
Minimum 0.2m/s	Storage only

<sup>1</sup> Fume cupboards that are used for higher risk processes involving use of volatile highly toxic or special risk substances e.g. cyanide or hydrofluoric acid operations may have higher face velocities

### Before starting work in a fume cupboard

Any process involving the use of hazardous substances must have been subject to risk assessment before starting the work. In addition to considering the use of a fume cupboard it must also have considered whether it is practical to -

- Use of less hazardous materials
- Whether total enclosure of the process is required
- Reduce the quantities of the substances used.
- Reduce the amount of substance released into the airflow. E.g. use a condenser, watch glass cover etc.
- Use a slower reaction rate.
- A safe operating procedure must be available including instructions for an emergency (such as failure of the fume cupboard) and safe waste disposal.
- Ensure that the fume cupboard you are using is appropriate. [See above]

- Fume cupboards should be tested and maintained annually. Evidence that this test has been undertaken is the presence of a sticker fixed to the front of the cupboard, ensure this is present and in date.
- Confirm that the fume cupboard is working satisfactorily by a visual check of function lights, air flow gauge is in safe zone **and** by means of a tissue paper strip in the opening. For high risk operations the air velocity must be measured using a vane anemometer. The reading must be recorded in your laboratory book as appropriate.
- Check for obvious surface contamination. Clean if necessary, to avoid adverse reactions with the chemicals you intend to use.
- Ensure that you have enough space to conduct your work safely and that all unnecessary items of equipment and chemicals not required in the process are removed.
- Ensure that all items for the operation are available in the fume cupboard

## **Preparing to use the fume cupboard**

- Position equipment, apparatus, and materials in the centre and back of the cupboard to minimise disturbance to airflow. Where practical, place everything within the cupboard before starting operations.
- Equipment in the fume cupboard should be kept to a minimum and sited at least 150mm inside the plane of the sash to ensure efficient containment. Also ensure that items are kept away from the sash opening to allow instant closure in an emergency.
- Avoid placing large pieces of equipment in a fume cupboard, they spoil the aerodynamic flow and may reduce the containment of fumes. If their use cannot be avoided they should be raised up about 10cm using lab jacks, in order to allow air to pass unimpeded across the work surface and exhaust from rear of fume cupboard.
- The experimental materials must be sited at least 150 mm inside the plane of the sash to ensure efficient containment.

## **During use**

Fume cupboards should be used with the sash as low as reasonably practicable as this gives the best containment of fume/vapour and helps contain any fire or explosion that may occur.

Use the sash position to your advantage -

- Fully open, to provide access for setting up equipment,
  - Partially open, to a comfortable work height when handling the material inside the cupboard,
  - Lowered as far as is practicable, when the process is in operation and your intervention is no longer required.
- Try to avoid sudden rapid movements in front of the cupboard. These can cause turbulence that may draw the airborne hazardous material out of the cupboard.
  - Do not use naked flames as they will have a serious adverse effect on the air flow

- Perchloric acid must not be used in fume cupboard, unless fitted with wash down facility, as this presents a risk of fire, consult the Safety Office for advice.
- Chemicals must not be stored in a fume cupboard used for experimental work, they could escalate an accident
- Hotplates must be kept to a minimum and be aware that they might adversely affect the airflow. If hot plates are used, these should be placed at least 10 cm from the side of the cupboard to avoid damage to the cupboard structure.
- Any accidental spill of chemicals should be cleaned up immediately (i.e. as soon as it is safe to do so).
- If an experiment is left running out of hours, a contact name and telephone number must be prominently displayed. Do not leave potentially hazardous work unattended.

### **After use**

At the end of your experiment remove equipment and clean the surfaces. Leave the fume cupboard in a clean, tidy and safe state.

Dispose of waste in a safe appropriate manner as identified by the risk assessment.

### **Maintenance and testing**

The Control of Substances Hazardous to Health Regulations 2005 require that local exhaust ventilation systems are maintained in efficient working order and in good repair through examination and testing. Fume cupboards, ducts and associate extract equipment must be examined and tested within a 14 month cycle. In practice, this is an annual check, instigated by the Estate Office. Suitable records of the examination/testing and any repairs must be kept for at least five years and a label attached to the cupboard indicating the date of testing and the average face velocity.

Fume cupboards that are used on a daily basis should have the following tests carried out on a regular basis. The recommendation is that this should normally be weekly unless the level of use and/or degree of risk involved indicates otherwise.

- A visual check of the general state (clean, tidy, etc.)
- For new fume cupboards where there is automatic detection of low flow, a visual check to ensure that warning lights, sash alarms and airflow gauges are working.
- For older fume cupboards that do not give any indication of low flow or other problems, it is recommended that face velocities are measured using a vane anemometer [available from the Safety Office] and recorded. Any problem should then be referred to the Estate Office. A tail of tissue paper or similar attached to the sash also provides a good visual indication of whether there is and airflow.
- Weekly checks and face velocity measurements must be recorded in a log book to kept in each department for this purpose. Records must be available for inspection on demand.
- Problems with fume cupboard performance must be promptly reported to the Estate Office. Fume cupboards found to be below the standard appropriate for the type of use are to be taken out of use pending repair.

## **Factors Affecting Containment**

### **Supply air into room**

Changes to the supply air into the room can have an effect on the flow rate and containment of the fume cupboard. This includes failure of supply air, open windows and doors.

### **Location**

The location of the fume cupboard in relation to other items, walls and users in the lab can have an effect on containment. The fume cupboard should be located in accordance with BS EN14175-5 2006.

It is essential to ensure that the area immediately in front of the fume cupboard is not obstructed by large items of equipment.

### **Over crowding**

Having lots of equipment and chemicals in the fume cupboard will affect the airflow and thus the containment. Large items of equipment should not be used in a fume cupboard. Equipment should not be placed within 150mm of the front of the fume cupboard or in a situation which may cause it to block airflow at the rear.

### **User**

The user must use the fume cupboard in-line with the guidance above in order to ensure containment. Rapid and regular arm and body movements will affect containment.

### **Heat sources**

Heat sources such as Bunsen Burners and hotplates will affect the airflow within a fume cupboard and can affect containment.