University of

Safety Code of Practice 49: Part 1

3rd Edition, May 2014

User guide to safe use of

LABORATORY FUME CUPBOARDS

Contents

SUMMARY

Fume cupboards are used widely in laboratories and are designed to capture and remove air-borne hazardous substances generated during laboratory experiments (e.g. gases, vapours, aerosols and particulates/dust). It is essential that users understand how to use them effectively, and that they are maintained, inspected and tested by competent persons.

Work with substances that produce/generate toxic or harmful fumes, vapours, gases, dust or chemical aerosols should be carried out in a fume cupboard to eliminate or reduce the risk of exposure to an acceptable and safe level.
Schools must identify the location of each ducted fume cupboard under their control, and ensure these are registered with Estates and Facilities (E&F).
Schools must maintain copies of records of system inspections, tests and maintenance.
Schools must take any fume cupboard that fails an inspection or test out of use immediately, and must ensure that it is clearly marked as such.
Users must be trained in correct use, including selection of the correct cupboard for the proposed work; function of alarms and gauges; correct sash height; avoiding air flow disturbance; emergency procedures; and good housekeeping.
Fume cupboards use significant amounts of energy. Users must be trained in how their appropriate operation, in line with health and safety guidance, can reduce energy use and contribute to a more comfortable working environment.
E&F must arrange for statutory inspections and tests of ducted fume cupboards, as required under the Control of Substances Hazardous to Health Regulations (COSHH), and in accordance with the relevant British Standards (see Safety Code of Practice 50).
Schoo

INTRODUCTION

Fume cupboards are used widely in laboratories and are designed to capture and remove air-borne hazardous substances generated during laboratory experiments (e.g. gases, vapours, aerosols and particulates/dust). Work with substances that produce/generate toxic or harmful fumes, vapours, gases, dust or chemical aerosols should be carried out in a fume cupboard to eliminate or reduce the risk of exposure to an acceptable and safe level.

For the purposes of this CoP, a fume cupboard consists of an enclosed compartment with a sash at the front, a current of air is pulled through the front of the opening, across the experiment and away from the user to prevent the inhalation of hazardous materials. The extract air is either ducted away from the point of use to an external discharge point, or is recirculated through a filter.

Fume cupboards must NOT be used for the containment of biological materials. Where such containment is required a microbiological safety cabinet must be used.

This CoP does not cover capture hoods, downflow benches, snorkels, and other forms of Local Exhaust Ventilation (LEV).

Many fume cupboards are designed to run continuously and the room air intake is balanced to account for this. Some other fume cupboards may be switched off after being emptied and cleaned, but this must only be done in laboratories where this does not impact on other safety considerations, such as room pressure regimes. This should be indicated in the lab risk assessment or local rules.

Guidance:

Switching off a fume cupboard can save approximately £1,000/year per cupboard (based on 2012 energy prices). Increasingly, cupboards are fitted with energy efficient controls which save energy, reduce laboratory heat loss and maintain constant air flow rates.

RESPONSIBILITIES

Schools/departments

General management responsibilities are set out in Safety Guide 46 Part 4 Local Exhaust Ventilation. With respect to fume cupboards, Schools/Departments must ensure that:

A responsible person(s) is designated to have overall control of the fume cupboards in their area.
All ducted fume cupboards are registered with Estates and Facilities (E&F) for servicing, maintenance and inspection (including any new installations supplied through E&F Projects).
Fume cupboards are used in accordance with the user manual/operating instructions.
Work undertaken in the fume cupboard is consistent with the level of protection/control provided by that system e.g. flow rates are adequate to protect the worker, the correct type of fume cupboard is used.
Users are trained in correct operating procedures. This includes selection of the correct fume hood or cabinet for the proposed work, and recognising when systems are operating effectively or are out of test. See section 6 for training requirements.
A system is established to:

Record the location of each fume cupboard

Record the results of each examination and test, plus details of any maintenance undertaken
Report defects in ducted systems to E&F
Take timely action on reports from E&F identifying the need for maintenance, or requiring that the system is taken out of use pending repair, maintenance, or replacement.

A log book is maintained which records basic information on usage, so that risks to E&F maintenance staff, contractors and engineering inspectors from substances/materials used in the fume cupboard can be assessed and managed.
The fume cupboard is made safe before maintenance work is undertaken (i.e. removing hazardous substances, decontamination, fumigation where necessary. Tasks such as electrical isolation are the responsibility of E&F).
Recirculating fume cupboards are maintained in a safe condition by the School, including the requirement for a competent engineer to carry out a 'thorough examination and text' at least every 14 months.
Ensure that fume cupboards are used in the most energy efficient manner, consistent with safety requirements.
Display appropriate signage and emergency contact details where ongoing experiments are in progress.

Before using a fume cupboard, users must first assess whether there is a safer way to do the work which will eliminate or reduce the risk of exposure to hazardous materials. Only if the hazard cannot be eliminated or reduced by alternative methods should the work go ahead in a fume cupboard.

Users

Users must:

Attend any training required to ensure that they are competent to use a fume cupboard
Use the cabinet in accordance with the manufacturer's instructions and their training
Promptly report any faults and as far as possible make safe before closing the cabinet and posting a 'Faulty –

CHEMICAL FUME CUPBOARDS

Types of fume cupboard

Table 1 summarises the most common types of fume cupboard.

Table 1: Summary of the main types of fume cupboards

Extract or Ducted Fume Cupboards - Extract or ducted fume cupboards are far the most common type of fume cupboard at the University. They function by drawing in laboratory air into the fume cupboard, thus containing and diluting the contents before discharging them to the environment, usually without filtration, three meters above roof level.

Ventilation

In most cases fume cupboards are ducted to roof discharge stacks. It is common for fume cupboards in a lab complex to share an extract system with all the fume cupboards will eventually flow through the same stack. The potential for vapours, fumes and dusts to intermingle in an extract system must be considered. If there is a potential for harmful chemicals to intermix in the extract system the School, in consultation in E&F and H&S Services, may need to limit the quantities of certain materials used in this system. Where this applies all fume cupboards in the system must be clearly labelled.

SAFE USE

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 less hazardous materials
Change the process to eliminate the production of hazardous substances
Totally enclose the process
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
Apply simple controls such as fitting lids

Ensure you are using the correct type of fume cupboard.

Check that the fume cupboard has a test sticker fixed to the front of the cabinet to confirm that it has been tested/examined within the last 14 months, and has passed the test. Check that the retest date has not been passed. Do not use the fume cupboard if it is outside the 14 month period.
Confirm that the fume cupboard is working satisfactorily by a visual check of function lights, air flow gauge is in safe zone (normally above 0.5 m/s, see Table 2) 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, and the reading must be recorded in the log book. If the indicators show that the airflow is not satisfactory, do not use the fume cupboard, and report it to your AHSC or laboratory manager.
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.
Where practical, ensure that all items for the operation are available in the fume cupboard.
If using flammable materials, check that you know the location of the nearest suitable fire extinguisher.

If using flammable liquids above their flash point, avoid direct heating by bunsen burners, and take particular care to minimise spills. If practical, place electrical equipment where it will not be splashed from a spill.

PREPARING TO USE THE FUMECUPBOARD

Position equipment, apparatus, and materials in the centre and back of the cupboard to minimise disturbance to the airflow. Do not obstruct the rear baffle.
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. Keep items 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 to be exhausted 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

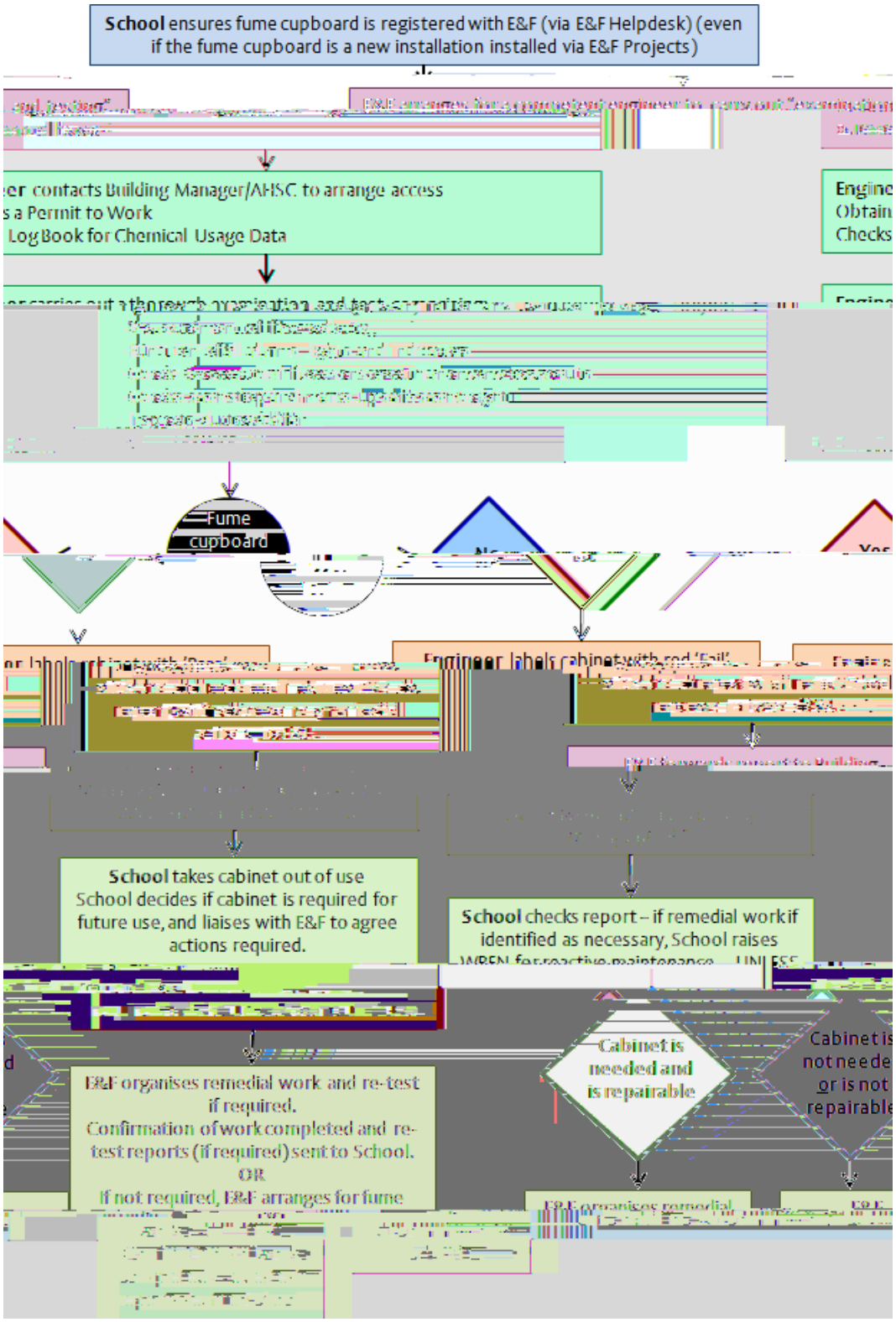
Fume cupboards should be used with the sash as low as reasonably practicable as this gives the best containment of fume/vapour and helps contain any fire or explosion that may occur. The maximum height when working at the fume cupboard should be 0.5m, and where reasonably practicable should be lower.
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, including when stepping away for any period of time.

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 your local Area H&S Coordinator 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 and back of the cupboard to avoid damage to the cupboard structure.
Any accidental spill of chemicals must 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

Appendix 1: Flow chart of ducted fume cupboard thorough examination and testing process



15	Routine cleaning of the cupboard after use					
16	Principles of airflow, performance testing and containment testing					
17	Who to report to if the fume cupboard is 'out-of-test'					
18	Do not use if the fume cupboard is 'out-of-test', does not have any indication of test status, or has a red 'fail' label					

19 Operating fume cupboards in an energy effici g7j2.09 4tin

Mutagenic, Other serious health risks	effects R40: Limited evidence of a carcinogenic effect

Appendix 4: Version control

VERSION	KEEPER	REVIEWED	APPROVED BY	APPROVAL DATE
X.X	H&S	Every four years	XXXXX	XX/XX/XX
X.X	H&S	Annually	XXXXX	XX/XX/XX