University of Reading

Safety Code of Practice 49:Part 2

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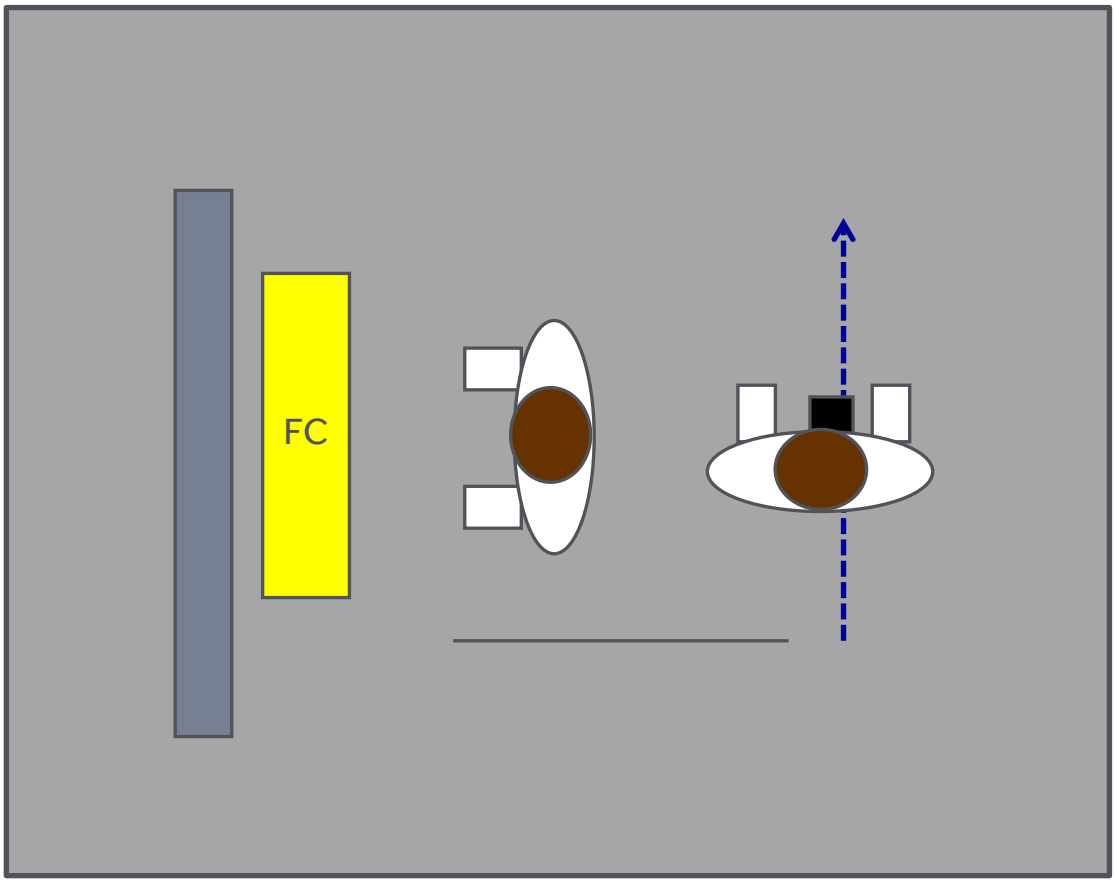
FUME CUPBOARDS: SELECTION, INSTALLATION, MAINTENANCE AND DECOMMISSIONING



Contents

1 SCOPE

This Safety Code of Practice (CoP) describes the University of Reading standards for selection, installation, commissioning, use, maintenance and decommissioning of fume cupboards. This includes fume cupboards, walk-in fume cupboards, and recirculatory fume cupboards. It is intended for laboratory managers, Estates and Facilities, inspection and test contractors and suppliers.

This CoP EXCLUDES microbiological safety cabinets, capture hoods, down flow benches and other forms of Local Exhaust Ventilation (LEV).

- This CoP should be read in conjunction with:
- Safety Guide 28 "The Assessment and Control of Hazardous substances (COSHH)".
- Safety Guide 46 "Management and Safe Use of Work Equipment" which describes the management systems required to purchase, use and maintain all types of equipment used at work.
- Safety Guide 46 Part 4 "Local Exhaust Ventilation" which summarises the legal and management requirements for selecting, installing and using all types of LEV.
- Safety Code of Practice 49 "Safe use of laboratory fume cupboards".

For the purposes of this CoP, a 'fume cupboard' is defined as an item of local exhaust ventilation with the following characteristics:

- If installed after 1990, marked as complying with BS7258, BS EN 14175 or BS 7989
- If installed before 1990, they are enclosed on all sides with an adjustable sash to the front (hinged or sliding), with an integral work surface, and with air entrained in through the front aperture and extracted either directly or indirectly from a point at the top of the fume cupboard.

2 SUMMARY OF THE COSHH REGULATIONS IN RELATION TO FUME CUPBOARDS

Suitable LEV systems must be installed where airborne workplace exposure limits are still exceeded after other controls have been put in place (HSE publication EH40 Table 1 gives workplace exposure limits).

The fume cupboard must be correctly specified and designed to ensure it provides the level of protection necessary. It must be serviced and maintained to ensure that it remains effective.

Fume cupboards must be subjected to a thorough examination and test at least every 14 months so as to demonstrate that performance is still within the design parameters. Any cupboard that fails this examination must not be used for work with hazardous materials until it has been repaired or replaced.

3 RESPONSIBILITIES

3.1 Duties on Heads of Schools and department managers

Safety Guide 46 Part 4 section 3.1 summarises manager's general responsibilities for LEV systems. In addition, with specific reference to the selection and maintenance of fume cupboards, Schools and Departments must:

- Before any new fume cupboard is specified or installed, complete a risk assessment that describes the processes for which the installation will be used (see LEV selection form on H&SS website) and consult with Estates and Facilities (E&F) and Health and Safety Services (H&SS) about the selection, installation and maintenance. E&F must not to undertake work unless they have been provided with a completed form.
- Check with E&F that ducted fume cupboards that the School uses are included in the register of items maintained/inspected by E&F.
- Co-ordinate with E&F to ensure that ducted fume cupboards are given a 'through examination' at least every 14 months.
- Provide information about the type of work and risks from substances/materials used in the fume cupboard to E&F, so that risks to E&F maintenance staff, contractors and engineering inspectors can be assessed and managed (generally achieved by maintaining a fume cupboard logbook – see CoP 49 Part 1).
- Make safe any fume cupboard before maintenance work is undertaken, and issue a Permit-to-Work/Permit to work in Labs (i.e. removing hazardous substances, decontamination, fumigation where necessary. Tasks such as electrical isolation is the responsibility of E&F).
- Establish a system to record:
    - The location of each fume cupboard (ducted and recirculatory)
    - The results of every examination and test, plus details of any maintenance taken
- Have a management system to report any defects in ducted fume cupboards promptly to E&F, to act on service or test reports from E&F and ensure that cupboards are taken out of service where system failures have been identified.
- With respect to recirculating fume cupboards (which are the responsibility of the School/ Department) arrange for competent engineers to carry out a 'thorough examination' at least every 14 months. The School must ensure that items on the report are acted on and a competent engineer is employed to carry out reactive maintenance.
- Ensure that fume cupboards are used in the most energy efficient manner, consistent with safety requirements.
- Display appropriate signage and emergency contact details where on-going experiments are in progress.

3.2 Estates and Facilities responsibilities

E&F will:

- Design to meet the standards referenced in this Code of Practice, and the identified needs of the client School/Department.
- Design and maintain fume cupboard installations in the most energy efficient manner, consistent with safety requirements.

- Maintain a record of the location of all ducted fume cupboards, with identification/asset tags.
- Apply a risk-assessment based approach to determine the maintenance programme for fume cupboards, taking into account the substances in use.
- Arrange for, and maintain a record of, all maintenance and inspection of ducted fume cupboards.
- Inform Schools/Departments of any ducted fume cupboard that requires remedial work or which fails an inspection.
- Arrange for remedial work to be carried out on ducted fume cupboards, after confirmation from the School that the fume cupboard is required.
- Decommission any ducted fume cupboards that fail a thorough examination and test and which are not repaired.

Section 11 refers to the information to be provided for handover/commissioning.

4 RELEVANT STANDARDS

The relevant standards to be followed by the University of Reading for the manufacture, installation, commissioning and testing of fume cabinets are as follows:

- Ducted cabinets - BS EN 14175 Fume Cupboards, in particular Part 2 *Safety and Performance Requirements*, and Part 4 *On-site test methods* (but excluding cupboards used for work with radioactive materials). Where noted in this CoP, BS7258-2: *Recommendations for the exchange of information and recommendations for installation,* is also relevant.
- Recirculating - BS 7989:2001. Specification for recirculatory filtration fume cupboards

5 FUME CUPBOARD PERFORMANCE CRITERIA

All fume cupboards have differing characteristics which must be matched to the materials in use within them. The following requirements apply:

Low volume fume cupboards

Low volume fume cupboards are now available on the market that operate at only 0.3 m/sec, compared to the more traditional 0.5 m/sec face velocity. These have significant energy savings and reduced CO_2 output. However if it is proposed to install a low volume cupboard, this must be risk assessed, using the form on the H&SS website, and H&SS must be consulted.

Ducted fume cupboards

These operate by extracting hazardous airborne materials to a point above the building, where it is diluted with atmospheric air. The British Standards do not give fixed performance criteria for different types of work undertaken in a fume cupboard. Therefore the University of Reading has adopted the criteria set out in Table 1 below, which are, in accordance with HSE control guidance sheet 201 "Fume cupboard" and are considered to represent good practice.

Recirculating fume cupboards

These operate by drawing air into the fume cupboard and exhausting it though a set of filters (usually a particulate pre-filter and a carbon filter) before the air is passed back into the laboratory.

They are designed to reduce the airborne concentration of a defined range of chemical vapours, fumes, smells and dusts in the air to acceptable levels. The filters are only suitable for specific chemicals. Therefore, recirculating fume cupboards must not be used for some applications, see requirements set out in section 6.2.2.

Fume cupboard face velocities

Although no maximum face velocity has been set for either type of fume cupboard, very high flow rates may cause turbulence and reduce the effectiveness of containment. Therefore if the face velocity is more than 1.0 m/sec, a competent person should check whether or not containment is effective.

Table 1 Performance criteria for fume cupboards

Type of work	**Minimum Face Velocity (at sash opening height of 500mm)**
Ducted fume cupboards	
Standard work with hazardous substances	0.5 m/s ±20%
Work with radioactive materials:	0.7 m/s ± 20%
High performance/low flow fume cupboards	0.3 m/s ± 20%
Variable airflow volume fume cupboards	0.5 m/s ±20% (at minimum, 50% maximum and maximum sash opening heights)
Recirculating fume cupboards	
Standard work with hazardous substances	0.5 m/s ± 20%
In all cases the maximum permissible face velocity is 1 m/sec.	
Low airflow alarms should be fitted and set to alarm at 0.42 m/s (visual and audio).	
Recommended transport velocity for fume cupboard ductwork Fume cupboards used for vapours, smoke and fumes 10 m/s Fume cupboards used for light-medium dusts and powders 15 m/s	

6 DESIGN AND SELECTION

6.1 School requirements

It is essential that fume cupboards are matched to proposed use, especially when specifying a new installation. Therefore Schools/Departments need to be able to identify:

- The types and quantities of hazardous materials that they intend to use or generate
- The key properties of these materials
- The potential risk to operators from airborne hazardous materials
- The short and long term Work Exposure Limits (WELs) for airborne chemical substances to be used, and hence how much control will be required

- Lower explosion limit (LEL) of any highly flammable liquids to be used (with the aim of ensuring that the concentration in the body of the fume cupboard and any ductwork does not exceed 10% of the LEL)
- Compatible and incompatible materials of construction of the fume cupboard
- Requirements for electrical, gas, water and other services

A form for describing the proposed activity to be undertaken within each new fume cupboard is available on the H&SS website.

E&F are responsible for identifying and checking:

- The general details of the building in which the fume cupboard will be installed, the location of exhaust ducting on roofs, the location of the laboratory, and the intended siting within the laboratory
- The locations of doors, windows, other fume cupboards and LEV systems, other laboratory furniture, ventilation grilles, diffusers or other air moving equipment, and extract ducting
- Details of laboratory make-up air and room ventilation systems
- Any limits on noise levels
- Details of existing services such as mechanical, electrical, plumbing and drainage

The E&F Project Manager should collate all this information and make it available to prospective designers/suppliers.

6.2 Design of fume cupboards and associated extract systems

Designers must take account of:

- The client's requirements for current proposed use and predicted future use
- Provision of laboratory make-up air
- Appropriate extract rate
- Prevention of reverse flow and air disturbance
- Risk from flammable substances, including the airflow needed to dilute the concentration of highly flammable vapours to a safe level, prevention of the spread of fire and smoke and building fire compartmentation
- Prevention of hazardous mixing of incompatible substances
- Fume filtration
- Fume scrubbing
- Heat recovery
- Energy efficiency solutions compatible with safety requirements
- Resistance to chemical attack and physical conditions of use
- Noise level
- Condensate collection
- Washdown and drainage
- Transport velocities (air velocity required to ensure collected particles remain airborne and are not deposited along the extract system)
- Siting of discharge flue at sufficient height to minimise the risk of fumes being drawn into the building through open windows or intake grilles
- Discharge velocity
- Access for maintenance, inspection and cleaning

It must not be possible for a laboratory to be contaminated with hazardous materials from the fume cupboard or associated ductwork (caused by failure of any parts of the system i.e. make up air, opening and closing of doors or windows, failure of other fume cupboards or back pressure from other rooms).

See BS EN 14175-2:2003 and BS EN 14175-3: 2003 for more information on design issues.

Consideration must be given to energy saving solutions, including:

- Ability for users to switch off when system is empty of hazardous materials and not in use.
- Variable Air Volume (VAV) controls to regulate face velocities at different sash heights, aligned with variable controls to make-up air supply
- Auto sash controllers to regulate face velocities, aligned with VAV solutions
- Fan speed controllers with manual sashes where auto sashes are not feasible
- Sash-"open" warning systems where auto sash closure is not feasible
- The appropriateness of heat recovery solutions
- The appropriateness of high performance fume cupboards

Guidance:

Each fume cupboards costs approximately £1,800/year to run (based on 2012 prices), therefore energy savings can be significant, but must be considered in the context of safety requirements.

Further information on energy saving solutions can be obtained from the University Energy Manager, Campus Services.

6.2.1 Ducted cabinets

Ducted cabinets are suitable for:

- Radioactive materials
- Flammable liquids and solvents
- Toxic materials

They are not suitable for work with:

- Biological agents
- Nanoparticles/nanotubes (due to the need for filters to be fitted, which can adversely affect performance)
- Pilot plant scale quantities of hazardous substances
- Larger quantities of incompatible materials which could mix within common extract ducting

6.2.2 Re-circulatory cabinets

Proposals to install re-circulatory cabinets must be considered on a case-by-case basis. While they have some inherent advantages, primarily energy efficiency, they are not suitable for all applications.

Advantages of re-circulatory fume cupboards

- Avoids need for ducting, with lower installation costs.
- Avoids problems of having insufficient 'make-up air' to compensate for air extracted from the laboratory by ducted cupboards.
- Energy cost savings by avoiding discharging cooled or heated air to atmosphere.

- Mobility (some models).

Disadvantages of re-circulatory fume cupboards

- Filters are specific for groups of chemicals and hence the filter selected must be compatible with all substances to be used.
- Substances used must not change without first checking compatibility with the filter.
- Filters may not be available for work with some substances.
- Filters will become saturated after continual use or in the event of a significant spillage. If breakthrough occurs, hazardous substances will be recirculated into the laboratory.
- Filters will require periodic replacement, with associated costs.
- HEPA filters are required for hazardous particulates, including nanoparticles.
- Redundant filters need to be handled and disposed of as hazardous waste, with associated safety requirements and on-going costs.
- Requirement for enhanced user education to enable them to recognise the limitations of re-circulatory cabinets.
- If recirculating cabinets are used in proximity to traditional ducted cabinets, users may be confused and limitations may not be recognised.
- If the cabinet is mobile, and is moved, performance may be compromised by external influences such as air flow. Each move will require a commissioning test.

University of Reading requirements

Recirculating fume cupboards must not be used for:

- Highly toxic chemicals.
- Regular use of toxic and/or flammable solvents in large quantities.
- Radioactive substances.
- Any substance for which the filters are not specified.
- Small molecules such as nitrogen, carbon monoxide or hydrogen.
- Boiling off large quantities of solvents or acids.
- High heat loadings, where internal surfaces are heat sensitive plastics.
- Unventilated work areas.

In addition, careful evaluation needs to be given before they can be used for work with carbon nanotubes or other nanotechnologies. Schools/Departments should consult Health & Safety Services.

7 SITING AND INSTALLATION OF NEW CABINETS

7.1 Siting

In general, the guidance given in BS7258-2 :1994 should be followed, supplemented by BS EN 14175-5.

7.1.1 Within the laboratory

To enable satisfactory performance, fume cupboards must be located where airflow will not be disrupted. The proximity of air supply equipment, fans, open windows and other physical objects such as benches, walls and doors can all affect performance.

All fume cupboards should be sited in accordance with BS 7258 Part 2, Section 3. BS EN 14175-5 may also be referred to for general guidance. The diagrams in Appendix 1 Figures 1 and 2 are based upon BS 7258 Part 2 and outline the University's requirements for siting of fume cupboards.

These guidelines will provide the basic conditions for satisfactory performance, however commissioning tests are required to confirm whether the performance of a fume cupboard is acceptable with any given situation.

Guidance:

Existing installations may not always conform to these guidelines for siting. Where there is doubt about effectiveness, testing may be required to confirm a satisfactory level of user protection. See section 10.5.

7.1.2 Extraction system

Design and installation of the ductwork, fans and related air handling systems within the laboratory should be in accordance with BS 7258 Part 2, sections 3.2 and 3.3. and the general principles described in the HSE guidance note HSG 258 'Controlling airborne contaminants at work.'

7.1.3 Dispersal of contaminants

Ducted cupboards rely on the 'dilute and disperse' principle to remove contaminated air from the workplace and exhaust it to open air, normally at roof level. They must not create a hazard at the point of dispersal (the exit/dispersal point) and contaminated air must not be drawn into the building through open windows, ventilation systems etc. The normal location for exhausts is 3m above roof level, or 125% of the building height above ground, whichever is the greater.

Ducted units must have the exhaust fans sited as far away from the cupboard as practicable. This is usually on the roof of the building. This ensures that if the ducting develops a leak then air will be sucked into the duct. If the ducting was under positive pressure any air in the duct would leak out into the building along with possibly dangerous contaminants.

7.1.4 Labelling

All controls, power supplies, and ductwork must be labelled so that users and maintenance staff can clearly identify which services and ductwork serves which fume cupboard.

8 COMMISSIONING

Before first use the system must be formally commissioned and test results recorded so as to be able to demonstrate the correct performance of the entire system, and to check for any adverse effects of the room airflow and of the extract system on the performance of the installed fume cupboard.

8.1 Ducted fume cupboards

Commissioning procedures shall be in accordance with BS EN 14175-4:2004 for ducted fume cupboards. The following inspections and tests will be carried out:

- Visual inspection (see 5.2 of BS EN 14175-4)

- Face velocity (see 5.4 of BS EN 14175-4 and 5.2 of BS EN 14175-3). Performance to be in accordance with the agreed design specification and Table 1 of this Code of Practice.
- Extract volume flow rate test (see 5.5 of BS EN 14175-4)
- Pressure drop test (see 5.6 of BS EN 14175-4)
- Air flow visualisation (smoke test) (see 5.7 of BS EN 14175-4)
- Room air velocity test (see 5.8 of BS EN 14175-4)
- Alarm system test (see 5.9 of BS EN 14175-4)
- Containment test (see 5.10 of BS EN 14175-4) to a standard of less than 0.005 ppm
- Sound pressure measurement (see 5.11 of BS EN 14175-4)
- Commissioning and testing of any other systems installed with the fume cupboard, such as scrubbers or fire extinguishing systems.

In addition to the tests above, on site testing of variable air volume fume cupboards should include:

- Extract volume flow rate at the minimum opening and at 50% of the test sash position.
- Test of set points (see 5.3.4 BS EN 14175-6)
- Test of response time (see 6.4 BS EN 14175-6)

All user equipment that may impinge on the performance of the cupboard must be installed in the lab, and where relevant, switched on during the commissioning tests. Any equipment that will be used within the cupboard, and which may affect its performance, must also be installed and switched on.

8.2 Re-circulatory fume cupboards

Commissioning procedures shall be in accordance with BS 7989:2001 for recirculating fume cupboards. The commissioning tests required include:

- Visual inspection
- Face velocity
- Containment test
- Room air velocity test
- Alarm system test

PLUS

- Particulate filter and seal integrity test (where fitted) in accordance with BS EN 12469, with a leakage rate of <003% leakage to HEPA filter where fitted
- Installed gaseous phase filter tests (optional)

If mobile re-circulatory fume cupboards will be moved within a laboratory, commissioning tests should be carried out at each location, where practical, to confirm satisfactory performance.

9 INFORMATION TO BE SUPPLIED AT INSTALLATION

9.1 Commissioning records

9.1.1 Ducted fume cupboards

The commissioning records must be provided to E&F and to the School/Department before first use of the fume cupboard. Commissioning results must be available for reference with the user manual or system logbook.

9.1.2 Recirculating fume cupboards

The commissioning records must be provided to the School/Department before first use of the fume cupboard. Commissioning results must be available for reference with the user manual or system logbook.

9.2 Product manual

All new installations must be supplied with a product Operation and Maintenance manual, as defined in BS EN14175-2:2003, and other information to include:

a) Description of main construction parts and materials for the fume cupboard and any associated extract systems
b) Installation instructions
c) Drawings showing the complete final installation
d) General operating and safety instructions
e) Maintenance and cleaning instructions and spare part list
f) Type test report
g) The results of the commissioning tests undertaken by the installer, and any proposed amendments to the purchaser's requirements

PLUS, for re-circulatory fume cupboards:

h) Limitations on the suitability of the fume cupboard and filters
i) Filter retention capacities
j) Recommendations on the frequency and methods of monitoring the filters
k) Recommendations on the procedures for changing the filters safely, including manual handling, PPE and safe disposal

After installation, the fume cupboard should bear a plate in a permanently exposed position on which the following is clearly and indelibly marked by the installer:

a) The installer's name or readily identifiable mark (if different from that of the vendor)
b) The vendor's name or readily identifiable mark
c) The date and reference number of the certificate of compliance specified in clause 9 of BS 7258-1:199
d) The face velocity(ies) specified by the purchaser
e) The face velocity measured during commissioning
f) The extract volume rate
g) The date of the tests when the face velocity(ies) were measured
h) Limitations of use (including types of material or activities for which it is, or is not, suitable)
i) Serial number.

In addition, the sash height must be marked.

All information must be supplied at handover, and not later. The fume cupboard must not be used until this information has been supplied, and users have been trained in correct performance.

9.3 User manual

The School/Department must be provided with sufficient documents, information and training from the supplier so as the user understand how to operate the fume cupboard correctly, as well as the limitations of the system.

A user manual must be provided, including the general operating and safety instructions and maintenance and cleaning instructions. This is in addition to the Operation & Maintenance Manual.

9.4 Registration with E&F

All new ducted fume cupboard installations must be registered with E&F Maintenance. This is the responsibility of the School/Department (even where E&F Projects have been responsible for procurement, installation and commissioning).

10 THOROUGH EXAMINATION, TEST AND MAINTENANCE

A thorough examination is required at least every 14 months, in accordance with COSHH.

Competent persons must design, maintain and carry out the 'thorough examination' and be qualified to BOHS P601 & 2 or equivalently qualified. For ducted systems, selection of the competent person is the responsibility of E&F. For recirculating systems, the responsibility lies with the School.

10.1 Preparation for thorough examination and test

E&F must advise Building Managers when test engineers are due to carry out maintenance and testing. The fume cupboards must be made safe by the School to ensure that there is no risk to the engineers or their equipment. This will include:

- Removing all items where possible
- Sealing chemicals
- Removing all sharp items such as needles or glass pipettes
- Wiping down the interior of the fume cupboard to remove any chemical residues.
- Where practical, removal of any tubing or pipework protruding from the front of the cupboard
- Making available records of fume cupboard usage (fume cupboard log book - see CoP 49 Part 1) to include all processes and materials used.

The Laboratory Manager must issue a Permit-To-Work to authorise work. This must specify the laboratories to be visited and the specific fume cupboards to be tested. Any specific instructions or precautions must be identified.

A Roof Access Permit may also be required.

The general laboratory must be made safe, with enough clear access for the engineer. Where either the fume cupboard or the laboratory has not been adequately cleared, the engineer is under instruction not to enter or not to undertake testing. Any fume cupboard not tested and out-of-test must be labelled by the engineer as 'Not tested, do not use'. The School will be required to take it out of use until it has been tested and passed.

Where fume cupboards have been used for ionising radiation work, the Radiation Protection Supervisor (RPS) must also sign off the Permit-to-Work.

10.2 Personal Protective Equipment

Any person carrying out fume cupboard testing must wear appropriate PPE - as a minimum this will be laboratory coat and enclosed footwear. Gloves and safety glasses should be worn if indicated by laboratory rules and risk assessment, based on the records of fume cupboard usage. In some cases respiratory protection may be required, in which case it is the engineer's responsibility to assess the correct type and to provide it.

10.3 Examination and test requirements

See Safety Guide 46 for general requirements regarding inspection and test of LEV systems.

The University performance criteria to be verified during thorough examination and testing of fume cupboards are set out above in Section 5, Table 1.

Thorough examination and test for a standard ducted fume cupboard will consist of:

- Face velocity test to the relevant performance standard, and with reference to type-test reports and commissioning reports
- Extract volume flow rate test
- Pressure drop test (across fan and any air-purification systems installed)
- Air flow visualisation (smoke test)
- Alarm system test (audible and visual flow rate indicators and associated sensors), where fitted
- Visual inspection, including:
    - visual/physical check of the sash mechanism
    - check of the sash stop and alarm
    - check of the condition of the baseplate and rear and side walls
    - check of the condition of all services to the fume cupboard, including power sockets, controls and lighting
    - check of the water taps and gas taps (where present) to ensure they are clean and leak free
- Verifying the accuracy of the airflow indicators, *which must be within ±15% of mean face velocity*

Where the fume cupboard is used for work with highly toxic volatile materials, carcinogens, or substances that could cause irreversible damage to health, in circumstances where there are doubts about the effectiveness of containment, a containment test should be carried out to a standard of 0.005ppm.

In addition to the fume cupboard itself, the associated fans and ductwork must also be examined. This will include the following:

- Check that the extract fan does not overheat
- Check on the extract fan bearings

- Check for excessive noise
- Check that the anti-vibration mountings are free (where accessible)
- Check that the pulleys are tight
- Measure of the fan motor speed
- Check for build-up of deposits in the fan and housing
- Check of the impellers for wear
- Check on the condition and stability of the extract stack and ducting (where access is possible)
- That the correct exhaust duct is identified, and that the extract fan is suitably labelled to enable identification.

10.4 Record of examination and test

The test engineer must provide a record in respect of each thorough examination and test of the fume cupboard, containing the following details:

a) The name and address of the employer responsible for the plant
b) The identification and location of the cupboard, and the process and hazardous substance concerned
c) The date of the last thorough examination and test
d) The conditions at the time of test and whether this was normal or special conditions
e) Information about the fume cupboard which shows:

   i. its intended operating performance for adequately controlling the hazardous substance
   ii. whether the system is still achieving the same performance
   iii. if not, the adjustments or repairs needed to achieve that performance

f) The methods used to make a judgement at (e)(ii) and (e)(iii), e.g. visual, pressure measurements, air flow measurements, dust lamp, air sampling, tests to check the condition and effectiveness of the filter
g) The date of examination and test
h) The name, job title, e.g. senior engineer, and employer of the person carrying out the examination and test
i) The signature, or other acceptable means of identifying the person carrying out the examination and test
j) The details of repairs carried out or needed. The effectiveness of the repairs should be proved by a re-test to be organised by E&F.

All fume cupboards must be labelled with the results of the most recent examination and test, and with a retest date.

If a fume cupboard fails, a test the engineer must affix a red 'fail' label immediately and inform the School (normally the Building Manager), in addition to sending the test results to E&F. The School must ensure that all users understand that cupboards marked with a red 'fail' label must not be used.

If the test engineer is not able to access any areas, the Building Manager must be informed and the cupboards in that area must not be used.

E&F are responsible for forwarding the written results of tests to the Building Manager. Where remedial work or repair is required, the School should confirm to E&F that the fume cupboard is required, or not. If the fume cupboard is to remain in use, it is E&F's responsibility to decide exactly what remedial work is required, taking into account the test engineer's recommendations (bearing in mind that engineering judgement may be required).

If the fume cupboard is not fit for use, it must not be used, and it must be labelled as above and unambiguously taken out of commission, either until it has been satisfactorily repaired, or fully decommissioned.

Where flow rates have been adjusted, E&F are responsible for ensuring that the room intake air is balanced.

Appendix 2 summarises the process for thorough examination and test of DUCTED fume cupboards.

10.5 Examination and test of re-circulatory fume cupboards

Recirculating fume cupboards are also subject to maintenance and testing under COSHH regulations. These cupboards are considered to be School/departmental equipment. As such, maintenance and testing must be organised by the School.

The test requirements are the same as for ducted fume cupboards, with the addition of an integrity check for HEPA filters. Other filters should be tested and/or replaced at intervals as recommended by the manufacturer.

10.6 Maintenance

- E&F are responsible for identifying maintenance requirements and for arranging maintenance and repair. Maintenance requirements will be defined by reference to the Manufacturer's O&M manual, where available.
- Apply a risk-assessment based approach to determine the maintenance programme (planned, planned preventative or reactive) for fume cupboards, taking into account the substances in use and the consequences of failure of containment.
- After any maintenance works which might affect fume cupboard performance, a face velocity measurement and a smoke pencil test should be carried out by a competent person. Major modifications to the fume cupboard or extract system may require full-recomissioning, including containment testing.

11 CHANGE OF USE

If the use of a laboratory or a process changes, the suitability of the fume cupboard must be reviewed. For some types of work e.g. work with radioisotopes, perchloric or hydrofluoric acids additional wash-downs or scrubbers may be required, while work with nanoparticles may require special HEPA filters (fitted to a recirculating system).

12 DECOMMISSIONING OR MOTHBALLING

The option to decommission or mothball is the responsibility of the School/Department. The difference between them is:

- Mothball: the facility is retained for future use with services still available, but made safe so that it cannot be used in the interim i.e. isolated from any ducting, for example with a blanking plate, utilities and, if fitted, the waste discharge/sink capped to prevent fumes or smells being drawn into the room when the waste trap dries out. The mothballed fume cupboard must be clearly labelled 'Do not use, out of commission'.

Decommissioned: the facility will not be required in the future and it is either removed completely, or physically disconnected from all services so that it cannot be used again. All utilities must be stripped out or physically disconnected and capped back to a safe point. Complete removal of the entire unit is preferred if possible, but if not, it must be locked off to prevent accidental usage.

In both cases the unit will be removed from the maintenance register.

The School/ Department must take all reasonably practicable measures to clean and decontaminate fume cupboards as part of the handover or decommissioning process. It is the responsibility of the Laboratory Manager to ensure that any fume cupboard is made safe before vacating the area.

All waste and redundant materials must be removed. Accessible surfaces must be cleaned with a suitable detergent. Sinks should be flushed with copious amounts of water.

Filters must be removed from recirculating fume cupboards and disposed of as hazardous waste, in accordance with a safe system of work.

Once cleaned and decontaminated, the fume cupboard must be labelled as such. Measures must be taken to ensure that the fume cupboard cannot be used, and that hazardous materials cannot be placed or stored in it. As described above, this should include locking off and isolation.

E&F must arrange for a competent person to decommission and remove ducted fume cupboards. The School/Department must arrange for safe decommissioning and removal of recirculating systems.

Any decommissioned fume cupboard can be disposed of as non-hazardous waste if it is known to have been effectively decontaminated. If there is a risk that it remains contaminated, materials should be handled and disposed of as hazardous waste.

13 FURTHER ADVICE AND INFORMATION

HSG258 *Controlling airborne contaminants at work*. HSE 2012.
http://www.hse.gov.uk/pubns/priced/hsg258.pdf

EH40/*2005 Workplace exposure limits*. HSE 2011, ISBN 978 0 7176 6446 7.

BS EN 14175 *Fume Cupboards*, in particular Part 2 *Safety and Performance Requirements*, Part 3 *Type test methods*, and Part 4 *On-site test methods* (but excluding cupboards used for work with radioactive materials).

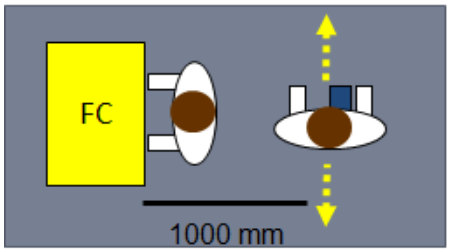
BS7258-2: *Recommendations for the exchange of information and recommendations for installation,*

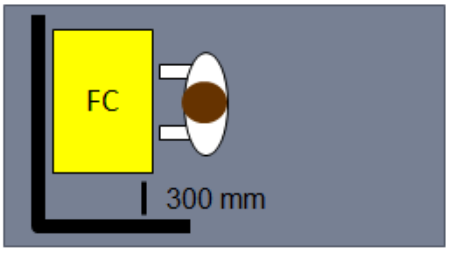
BS 7989:2001. *Specification for recirculatory filtration fume cupboards*

NERC guidance on *The safe use, maintenance, and testing of laboratory fume cupboards*, December 2007

Appendix 1: Siting of new ducted fume cupboards

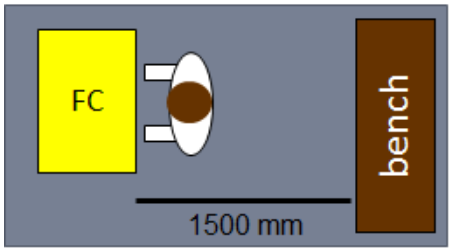
Figure 1 Minimum distances for new installations to avoid disturbance to the fume cupboard and operator

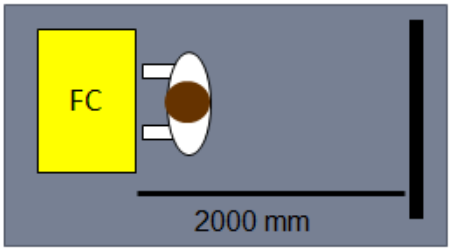




FAR LEFT: Keep pedestrian traffic away

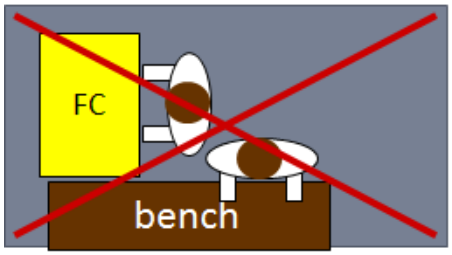
LEFT: Locate fume cupboard clear of adjacent wall

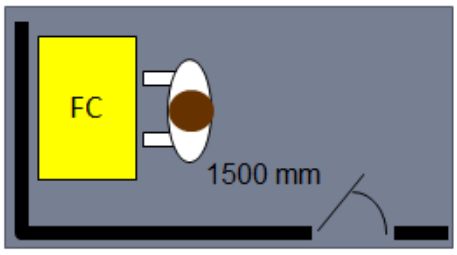




FAR LEFT: Ensure sufficient distance between front of fume cupboard and bench opposite

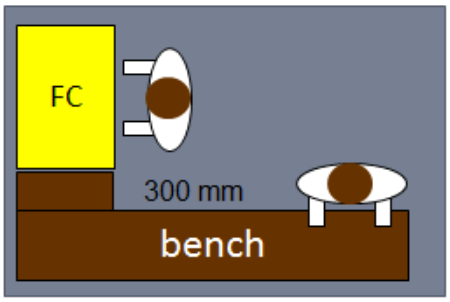
LEFT: Locate fume cupboard clear of opposite wall

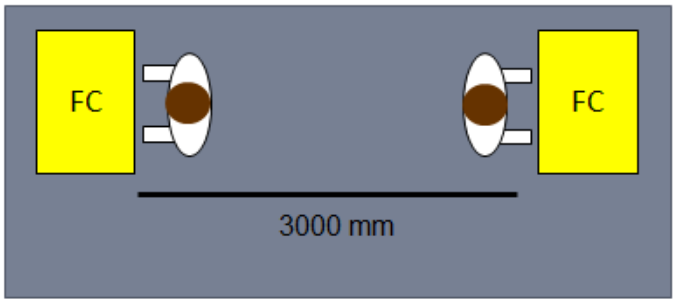




FAR LEFT: Do not have another worker at an adjacent bench

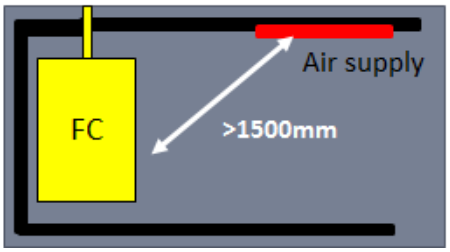
LEFT: Locate fume cupboard clear of door openings





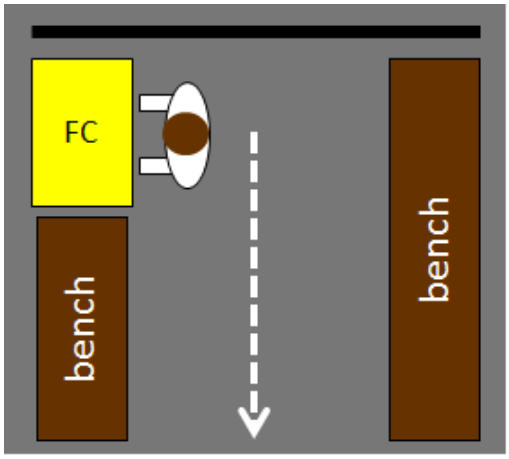
ABOVE LEFT: Allow adequate space for other workers

ABOVE: Keep opposite fume cupboards well clear of each other

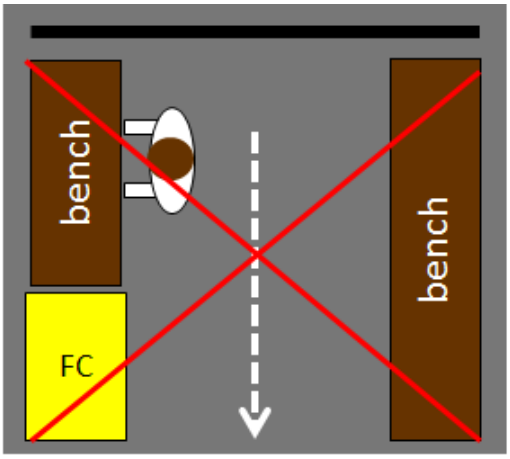


LEFT: Maintain sufficient distance from any air supplies

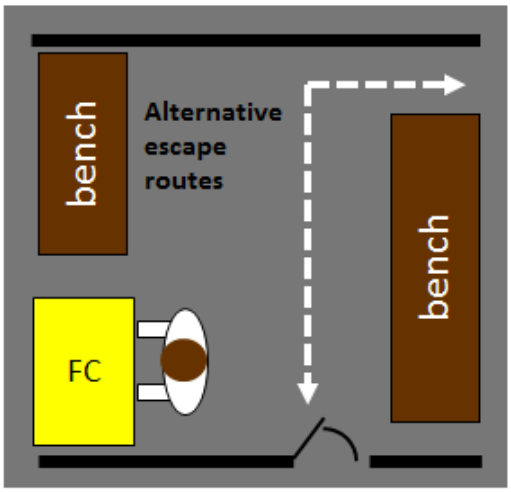
Figure 2 Minimum distances for new installations for maintaining escape routes



ABOVE: Locate fume cupboards in positions where there is an unobstructed escape route

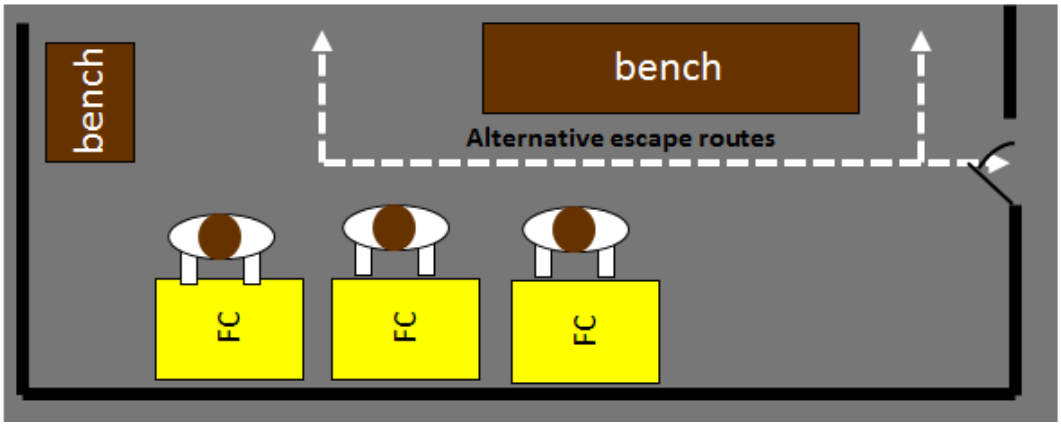


ABOVE: Do not locate fume cupboards in positions where an escape route is forced to cross the hazard area

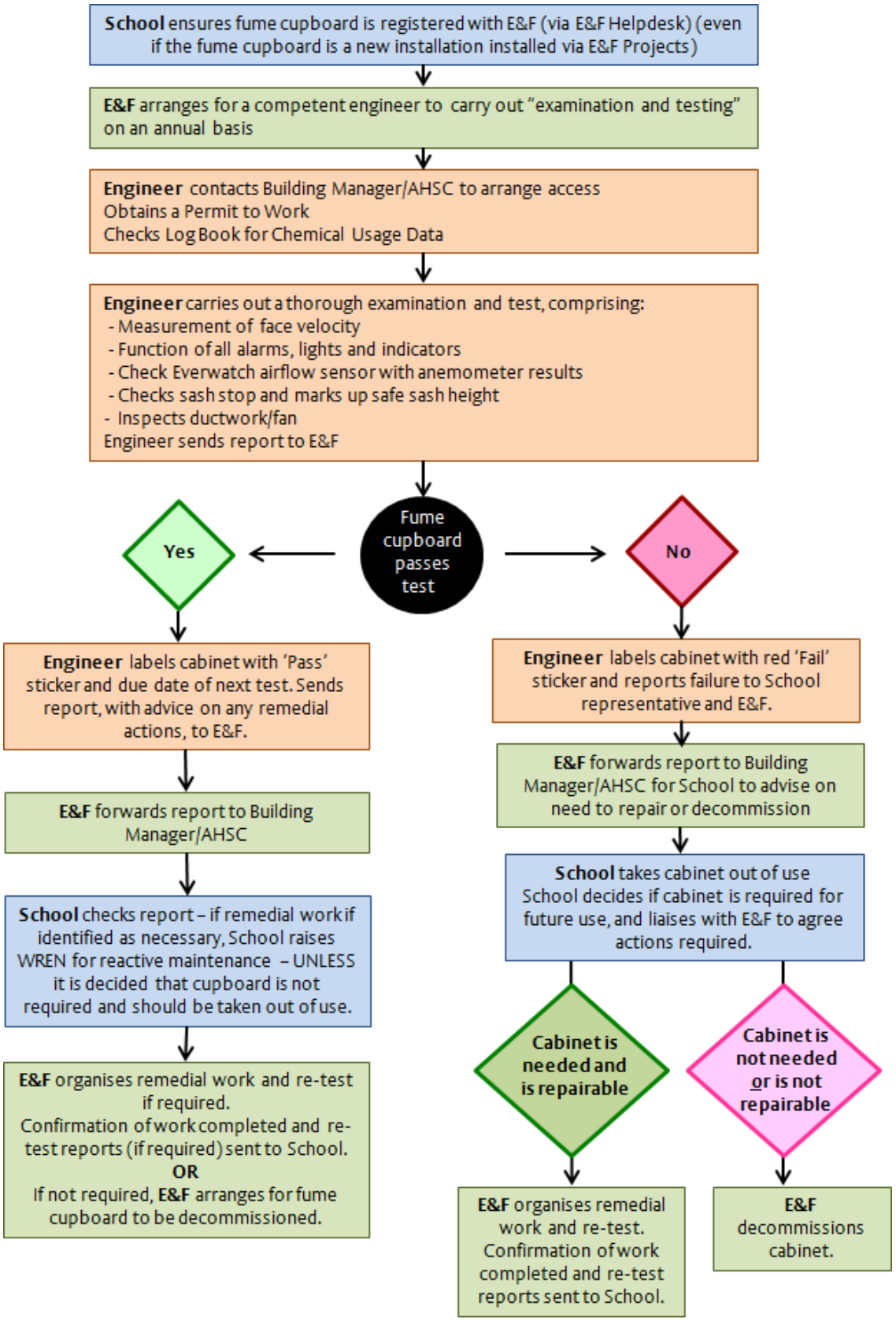


LEFT: Provide alternative escape routes if one route has to pass close to the hazard area

BELOW: Provide alternative escape routes from hazard area in laboratories that have more than one fume cupboard



Appendix 2: Flow chart of ducted fume cupboard examination and testing process



Appendix 3: 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