



Code of Practice
Selection, installation, use,
maintenance and decommissioning
of Fume Cupboards

version 1.1

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SCOPE

SCOPE

1. This Code of Practice (CoP) describes the College standards for selection, installation, commissioning, use, maintenance and decommissioning of fume cupboards. Compliance with the College Policy on Local Exhaust Ventilation (LEV)¹ is mandatory and this CoP sets out the standards and procedures to be followed to enable the objectives of that Policy to be met.
2. For the purposes of this CoP, 'fume cupboard' is defined as an item of local exhaust ventilation with the following characteristics;
 - if installed after 1990, those marked by the manufacturer as complying with BS 7258, BS EN 14175 or BS 7989
 - if installed prior to 1990, they are enclosed on all sides with an adjustable sash to the front (either hinged or sliding), they have an integral working surface, they entrain air in through the front aperture and extract this directly or indirectly from a point at the top of the fume cupboard.
3. This CoP covers ducted fume cupboards, walk-in fume cupboards and recirculatory fume cupboards. Note that no distinction is made for 'stills cupboards'. These must fulfill the relevant selection, installation, use, performance and maintenance criteria as laid out in this CoP.
4. This CoP does not cover microbiological safety cabinets, capture hoods, downflow benches, snorkels, chemical workstations or other forms of LEV not meeting the definition of a 'fume cupboard' meeting the standards described in BS EN 14175 Part 2.

VOCABULARY

VOCABULARY

5. The following definitions are taken directly from BS EN 14175 Part 1:
 - Variable air volume (VAV) fume cupboard: Fume cupboard that provides a variable extract volume flow rate depending upon the sash opening
 - Walk-in fume cupboard: Fume cupboard where the work surface is at floor level or below.
 - Recirculatory filtration fume cupboard: Protective device able, by trapping specified pollutants, to exhaust room air back to the room
 - Sash: Adjustable protective screen between the operator and the workspace.
 - Workspace: Interior of the fume cupboard bounded by the internal planes of the work surface, sash(es), rear, side and top walls (or baffles)
 - Sash opening: Distance in the direction of sash movement between the boundaries of the opening
 - Make-up air: Air supplied to the room that replaces the air extracted from the room
 - Extract system: All ductwork and associated equipment installed between the point of connection to the fume cupboard and the point of discharge
 - Scrubber: A device installed within the extract system to enable emissions to be treated and removed prior to the extracted air being exhausted to atmosphere
 - Extract volume flow rate: Volume of air extracted per unit time from the fume cupboard.
 - Face velocity: Velocity of air passing through the area of the sash opening
 - Pressure drop: Static pressure of a fume cupboard at the point of connection to the extract system measured with respect to the static pressure of the room

LEGISLATION

SPECIFIC LEGISLATION AND NATIONAL & EUROPEAN STANDARDS

6. The Control of Substances Hazardous to Health (COSHH) Regulations require prevention or adequate control of exposure to hazardous substances. Where the risk assessment determines that LEV is required as part of the control measures employed, this must be suitably selected, used, tested and maintained and appropriate records kept.
7. BS EN 14175 represents the most recent fume cupboard standard and applies to all fume cupboards currently supplied and installed. It comprises:

¹ see www3.imperial.ac.uk/safety/policies/localexhaustventilation

LEGISLATION

- Part 1: Vocabulary
 - Part 2: Safety & performance requirements
 - Part 3: Type Test methods
 - Part 4: On-site test methods
 - Part 5: Recommendations for installation and maintenance
 - Part 6: Variable air volume (VAV) fume cupboards
8. Although BS EN 14175 does now also cover types of fume cupboard not previously covered by BS7258, such as walk-ins, VAV, horizontal sashes and low cill cupboards, it is more of a product standard with little reference to installation requirements. Hence BS7258 should continue to be referenced, particularly Part 2: Recommendations for the exchange of information and recommendations for installation.
 9. As with BS 7258, BS EN 14175 does not cover recirculating fume cupboards and these are described within BS 7989: Specification for recirculatory filtration fume cupboards.

CATEGORISATION

CATEGORISATION OF FUME CUPBOARDS

10. The College has a large number of fume cupboards and these vary in their ability to contain. Clearly it is important that the containment performance of any particular fume cupboard is therefore easily identifiable so that this information can then be incorporated within the activity risk assessment. Unfortunately there is no national, or international categorisation standard,

TABLE 1 CATEGORISATION AND CONTAINMENT CRITERIA FOR DUCTED FUME CUPBOARDS INSTALLED AFTER JULY 2008

Containment (Mean SF ₆ ppm) ¹	College Fume Cupboard Category	Substance Hazard Groups ²	Unsealed radioactive materials	Carbon nanotubes
<0.005	1	B, C, D, E	yes	yes
>0.005	F (Failed)	Unfit for use. Retest and rectify problem.		

Newly installed fume cupboards are expected to achieve a containment value of 0.005 ppm or less at commissioning as a minimum requirement.

As identified in HSE COSHH Essentials: easy steps to control chemicals. See Appendix B for further details on COSHH hazard grouping. Note that in all cases, risk assessment may identify that the proposed substance cannot be used, in the manner planned, within a particular fume cupboard.

or even pass/fail criteria for fume cupboard containment performance. The College has therefore developed its own such standard for ducted fume cupboards based on that already adopted by the Natural Environment Research Council².

11. The College categories of ducted fume cupboards (where they have been containment tested) are Category 1 and 2, where Category 1 cupboards offer the best performance. Fume cupboards that have not been containment tested are designated as Category U whilst those that have been tested, but have not achieved the lowest acceptable containment performance are categorised as F. Recirculating fume cupboards are designated as Category R and their containment performance cannot be measured using SF₆.
12. The commissioning testing that fume cupboards have undergone will differ between those installed at Imperial before, or after, July 2008. Consequently, the criteria for acceptance also differs;
 - All fume cupboards installed after July 2008 at the College have been subject to full commissioning tests, including those for containment. The acceptance criteria for these new cupboards includes a containment performance of <0.005ppm mean SF₆ leakage and therefore all fume cupboards installed after July 2008 are in Category 1 (see **Table 1**). Note that, and this applies to all fume cupboards, a Category 1 label does not

² Natural Environment Research Council 'The safe use, maintenance, and testing of laboratory fume cupboards' 2007

CATEGORISATION

TABLE 2 CATEGORISATION AND CONTAINMENT CRITERIA FOR DUCTED FUME CUPBOARDS INSTALLED PRIOR TO JULY 2008

Containment (Mean SF ₆ ppm) ¹	College Fume Cupboard Category	Substance Hazard Groups ²	Unsealed radioactive materials	Carbon nanotubes
<0.005	1	B, C, D, E	yes	yes
0.005 – 0.200	2	no D and E B and C subject to risk assessment	no	no
>0.201	F	Unfit for any application requiring local exhaust ventilation		
Not tested	U (unclassified)	no	no	no

1. Newly installed fume cupboards are expected to achieve a containment value of 0.005 ppm or less at commissioning as a minimum requirement.
2. As identified in HSE COSHH Essentials: easy steps to control chemicals. See Appendix B for further details on COSHH hazard grouping. Note that in all cases, risk assessment may identify that the proposed substance cannot be used, in the manner planned, within a particular fume cupboard.

automatically give the user the right to use any substance, in any manner, in that fume cupboard. Risk assessment is still necessary and this will look more closely at the activity and the suitability of the control measures, including that of the fume cupboard. What this 'Category 1' label does is identify to the person responsible for the cupboard its performance and the groups of substances that the College permits, subject to risk assessment, that may be used therein.

- Older fume cupboards, installed prior to July 2008, will in many instances be lacking any containment performance data having not been tested at installation. These cupboards will therefore be categorised as 'unclassified' (U) and the risk assessments for all activities undertaken within this cupboard will have to take account of the fact that its performance is unquantified. It is College policy that cupboards in category U cannot be used for work with substances in Hazard Groups B, C, D or E, unsealed radioactive sources and for work involving nanoparticles. If there is a need for the use of such substances then containment testing will be required and a pass commensurate with the levels laid out in **Table 2** achieved.
- Some older fume cupboards, once tested, will not be able to achieve the performance required to be classified as Category 1. They will however achieve a reasonable standard of containment and therefore can be used for certain work. It is College policy that work with substances in Hazard Group B and C in Category 2 fume cupboards can proceed but will have to be subject to rigorous risk assessment. This assessment will need to take particular account of the quantity and physical properties of substance involved as well as the way in which it is being used. It is essential that this risk assessment makes particular note of the fact that the cupboard to be used does not offer the highest level of protection to the operator. As such, in many cases the person responsible for the work will decide that Category 2 fume cupboards are not suitable for work with chemicals in Hazards Groups B and C.

REGISTRATION

REGISTRATION OF FUME CUPBOARDS

13. Every fume cupboard (including recirculatory units) must be registered within the Research Department and this registration must contain information on the following;
 - the person responsible for the particular fume cupboard (not just generically within the department)
 - the location of the cupboard
 - the main extract fan asset number (except where recirculating)
 - the fume cupboard asset number
 - the fume cupboard category

REGISTRATION

Imperial College
London

FUME CUPBOARD
REGISTRATION

Person Responsible: Professor Joe Black		
Building: Building A	Room: 324	FC ID: FC324/001
FC Asset Code: HCCWBA324FC0001	Fan Asset Code: HCCWBA324FAN0001	
FC Controls: VAV <input checked="" type="checkbox"/> Fan speed control <input type="checkbox"/> On/off <input type="checkbox"/> Night set back <input type="checkbox"/>		
ON-SITE CONTAINMENT TEST RESULTS (BS EN 14175-4, Sec5.10 or 14175-6) Mean SF6 concentration: <0.005ppm Date carried out: 31 July 2010		<h1>CATEGORY 1</h1>
SEE OVERLEAF FOR TEST CONDITIONS		
PERMITTED CHEMICAL HAZARD GROUPS Hazard Groups B, C, D, E NOTE: ALL ACTIVITIES MUST BE RISK ASSESSED		
PERMITTED SPECIAL USAGE AND ANY RESTRICTIONS IN USE None		

Conditions at Time of Containment Test



FIGURE 1

EXAMPLE FUME CUPBOARD REGISTRATION LABEL

This is a double-sided label with each panel of this figure representing one side of the label. This label must be shown on every fume cupboard with the top panel of this figure facing outwards in the label holder.

- the containment performance where measured
- the date of this containment test
- the conditions within the fume cupboard at the time of the test (including a photograph of the equipment/items in situ during testing)
- the COSHH hazard groups that can be used within the cupboard
- whether the cupboard is registered for work with radioactive substances, carbon nanotubes or carcinogens
- any restrictions on use

14. The registration information for all fume cupboards must be retained by the department and

REGISTRATION

this information must be available to the Safety Department.

15. Every fume cupboard must be appended with a registration label such as that shown on **Figure 1**. This must be renewed as and when any of the information listed in paragraph 13 changes.

RESPONSIBILITIES

RESPONSIBILITIES**Capital projects**

16. Responsibilities for Capital Projects are to;

- Liaise with the User and the Safety Department on selection of appropriate types of fume cupboard.
- Ensure adequate makeup air is provided for the extraction rate required and ensure that the makeup air is supplied in such a manner that it does not perturb the performance of the fume cupboard.
- Select and install fume cupboards in accordance with the relevant British Standards and this CoP.
- Ensure that the most energy-efficient fume cupboard installations are provided.
- Obtain user manuals and type-test data from fume cupboard manufacturer.
- Use competent contractors to install fume cupboards.
- Commission fume cupboards at installation in accordance with British Standards and this CoP. This must include containment testing carried out under prevailing working conditions i.e. with user equipment installed as described in the commissioning sections below.
- Provide user manuals, type test data and installation and commissioning data to Facilities Management.

Facilities Management

17. Responsibilities for Facilities Management are to;

- Ensure that, where under their control, fume cupboard installation is carried out by a competent installer and all the responsibilities laid out for Capital Projects in paragraph 16 are complied with.
- Ensure that user manuals and copies of type test data and commissioning data are provided to the Principal Investigator, usually via the Laboratory Manager or other user representatives in a timely manner.
- Maintain a central College asset list of fume cupboards, their fans and discharge stacks.
- Ensure adequate and stable make-up air is provided for fume cupboards.
- Arrange routine examination and testing of ducted fume cupboard performance in accordance with British Standards and the COSHH Regulations and keep appropriate records. Facilities Management are not responsible for testing or maintaining recirculatory fume cupboards. This is the responsibility of the research department.
- Ensure that Academic Departments are issued with reports on fume cupboard tests and that the maintenance contractor labels every fume cupboard once tested.
- Ensure that those cupboards found to have failed their tests are appropriately and clearly labelled using the signage shown in **Figure 9** and that the users are informed.
- Undertake repairs and maintenance in accordance with the Service Level Agreement.
- Operate Permit-to-Work system for access to areas to within their control e.g. plant rooms and roofs.
- Ensure that their contractors and staff comply with the Laboratory Permit-to-Work system.

Safety Department

18. Responsibilities for the Safety Department are to;

- Formulate policy and procedures on fume cupboards.
- Provide expert advice on the selection, use, testing requirements, decontamination and

RESPONSIBILITIES

other items included within this CoP.

- Provide appropriate training to College staff and students.
- Monitor compliance with this CoP and with other relevant College Policies including thorough periodic audits and inspections.

Academic Departments

19. It is the responsibility of the academic departments to;

- Consult with the Safety Department, Capital Projects and Facilities Management (as appropriate) on the selection, installation and maintenance of new fume cupboards. Under no circumstances can ducted fume cupboards be installed by Academic Department except when under the auspices of a Capital Projects or Facilities Management managed project.
- Co-operate with Capital Projects or Facilities Management on the commissioning of new fume cupboards including the provision of equipment to represent the worse-case 'prevailing working condition'.
- Ensure fume cupboards are registered and appropriately categorised.
- Ensure that fume cupboards are labelled as such.
- Use fume cupboards in accordance with best practice and, in particular, ensure that equipment, experimental apparatus and work in the fume cupboards minimises interference with the effectiveness of the fume cupboard operation.
- Ensure that fume cupboards are used in the most energy efficient manner by, for example, switching cupboards off when not in use or lowering sashes to the lowest possible level.
- Ensure only that activities appropriate to the particular fume cupboard are allowed to take place and that the conditions of the registration and categorisation are complied with.
- Provide "on-the-job" training to departmental users (to include emergency procedures).
- Co-operate with Facilities Management in the operation of the Permit-to-Work system and ensure that Laboratory Permits-to-Work are issued.
- Maintain the Registration list of all fume cupboards within their department, and the type of activities each can be used for.
- Ensure that recirculatory fume cupboards are maintained and checked in accordance with requirements of this CoP.
- Report any fume cupboard defects promptly to the Facilities Management Help Desk.
- Ensure that fume cupboards are not tampered with, especially with regards to their alarms or controls, and to take responsibility for any deliberate damage to cupboards by departmental staff and students.
- Display appropriate signage and emergency contact details where ongoing experiments are in progress.
- Ensure that storage cupboards associated with fume cupboard extract systems are appropriately checked on an annual basis and that they are labeled as having been checked.

ENERGY SAVING

ENERGY SAVING

Existing fume cupboards

20. The large number of fume cupboards at Imperial College contributes significantly to both our energy consumption and CO₂ output and In order to lessen this impact the following energy saving principles must be applied to all existing fume cupboards:

- Switch them off when not in use where it is possible to do so, and where switching these off will not lower the room air change rate to an unsuitable level.
- Close the sash at all times to the lowest point possible and completely when the operator is not working at the cupboard. This is the safest method of using a fume cupboard and in those units using a variable air volume (VAV) damper or speed controlled extract fan,

ENERGY FACTS

FIGURE 2

ENERGY FACTS**THE 800 FUME CUPBOARDS AT THE COLLEGE CONTRIBUTE SIGNIFICANTLY TO OUR ENERGY COSTS AND CO₂ PRODUCTION**

Air supplied to laboratories is heated or cooled for the comfort of the workers. This costs money and produces CO₂. Fume cupboards quickly take that air and blow it back outside.

A standard 1.5m wide fume cupboard operating at 0.5 m/sec with the sash at 0.5 m height could remove air that costs £1250 per year to heat or cool if run 24h a day, every day.

A fume cupboard of the same size but operating at 0.35 m/sec could save 30% of the energy costs compared to the 0.5 m/sec model.

A controlled extract fume cupboard (e.g. one fitted with a VAV damper) will always pull air at a constant velocity, irrespective of the sash height. So if your sash is at 0.25m, you use half the amount of air, and therefore considerably less energy than that used with the sash at 0.5m. You also improve the extent of protection afforded to the operator at the same time.

Install a 1m wide fume cupboard, instead of a 1.5m unit, and you save a further 33%.

Switch the fume cupboard off when not in use and you could save even more.

significant energy savings will be afforded, as the volume of air extracted will be altered depending upon the height of the sash. Only the air velocity through the sash remains constant.

- Do not use fume cupboards for long term storage of chemicals.

New fume cupboards

21. The following energy saving principles must also be applied when selecting new fume cupboards:

- Install low-volume fume cupboards unless the risk assessment identifies that these are inappropriate. Low-volume fume cupboards are further discussed below.
- Air supply systems to the laboratories should be designed so as to vary the volumes provided to the space depending on the fume cupboard demand. With this arrangement, when the fume cupboard is off, the supply is ramped down by the amount of air no longer required in the laboratory.
- Consider auto-sash closers and VAV controlled fume cupboards or other methods for controlling the extract volume depending upon sash height.
- Select the smallest suitable fume cupboard appropriate for the task.

*Note: the College does not support the provision of overly complicated solutions to energy issues and in general, does not support the use of networked BMS systems to control the operation of fume cupboards.

SELECTION

SELECTION OF NEW FUME CUPBOARDS

22. The need for a fume cupboard must be established by risk assessment. It is all too often assumed that the more fume cupboards a laboratory has, the better the safety within that laboratory. This is not necessarily the case. Every fume cupboard takes up space and this space may be better utilised for other things. Fume cupboards placed in traffic routes present a significant hazard to both the person using it and anyone else having to walk past. Some laboratories carry out short procedures in fume cupboards - the experimental step is carried out and the fume cupboard cleaned up and left for the next user. In this case, it is usual that very few cupboards are required. Only where there are a number of incompatible or long-lasting procedures carried out in the same laboratory, should the need for more fume cupboards arise. When designing or refurbishing new laboratory areas, the nature of the activities in the laboratory must be carefully considered along with the work patterns and whether or not greater efficiencies can be effected through the use of a smaller number of fume cupboards.

23. Fume cupboards are available in many permutations depending on their particular specification and features. It is College procedure that the process for the specification of all new fume cupboards is identified and recorded within the fume cupboard assessment

SELECTION

FIGURE 3

DUCTED V RECIRCULATORY**ADVANTAGES OF RECIRCULATORY FUME CUPBOARDS**

- Avoids the need for installation of ducting and therefore the installation costs will be significantly lowered compared to ducted installations
- Avoid problems with 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 RECIRCULATORY FUME CUPBOARDS

- Filters are specific for groups of chemicals and therefore the filter selected must be compatible with all substances to be used and the substances used must not change without first checking the 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 atmosphere rather than ducted away to a safe location
- Filters will require periodic replacement - an ongoing cost
- There may be manual handling issues when replacing heavy charcoal filters
- Redundant filters need to be disposed of as hazardous waste - an ongoing cost
- There may be safety management issues if recirculating cupboards are used in the proximity of traditional ducted fume cupboards - there is potential for confusing the two and limitations may not be recognised
- Mobility. Some models are mounted on castors for flexibility of location. There is potential for them to be moved to locations where external influences may impact upon performance without the users recognising this, thus necessitating the requirement for multiple commissioning tests in each intended location
- It is usually not possible to carry out SF₆ containment testing and therefore to establish how well the cupboard performs

template [Form FCS1](#) (see also [Appendix A](#)). This form requires a clear description of the proposed activity to be undertaken within each new fume cupboard and allows the features required to be selected accordingly. This assessment must be reviewed by the Campus Safety Manager, Faculty Safety Manager or DSO for the area in which the fume cupboard will be located. All FCS1 forms must also be reviewed by the Chief Fire Officer and the Safety Department, including where relevant, the Safety Department Radiation Protection team.

24. Once reviewed and approved, the assessment is to be included in the client brief and sent via the Project Manager or User Co-ordinator to the design team or directly to those manufacturers being asked to tender.
25. Some of the main types of fume cupboard available and the College's requirements and restrictions on their use are described below.

Ducted fume cupboards

26. Static, ducted fume cupboards are the most common type in use at Imperial. The fume cupboard forms a partial enclosure and the work area is accessed via a front aperture. Air is drawn in via the aperture, across the work area and usually around an arrangement of baffles to ensure an even flow. The contaminated air is then removed via the ducting to a safe place, usually at roof level. In the vast majority of cases, there is no filtration and the 'dilute and disperse' principle applies. In some specialist cases, there may be in-line scrubbers, washers or HEPA filtration. The whole process is powered by a fan that is not usually integral to the unit itself - it is positioned in a remote location, often the roof.
27. New ducted cupboards must comply with BS EN 14175 Part 2. This standard outlines the required dimensions, materials of construction, basic safety requirements, provision of an airflow indicator, details of electrical, gas and water services and marking and labeling requirements.

SELECTION

Recirculatory fume cupboards

28. Recirculating fume cupboards work on the simple principle of drawing contaminated air through specialised filters, thus permitting clean air to be recirculated back into the laboratory. Carbon filters are employed for removal of chemical fumes and are supplied in a range of different specifications for treatment of chemicals of particular groups or types. HEPA filters can be added for use with hazardous particulate materials. Furthermore, most cupboards are fitted with a more basic pre-filter that contains aerosols and larger particulates and extends the life of the main filter. Air is moved through the cupboard via the front aperture and the filters and is discharged by way of an integral fan housed within the body of the cupboard.
29. There are currently relatively few recirculating cupboards in use at Imperial. They are, however, an attractive proposition in that not only are their installation costs tiny in comparison to their ducted equivalents but, because they do not remove any of the conditioned air from the lab, they are also far more energy efficient. The low costs of installing and running recirculating cupboards are offset slightly by the fact that they do require regular (at least annual testing, and in most cases changing, of their filters) but nevertheless on balance these are far less costly alternatives to ducted cupboards. However, if recirculating cupboards are selected in preference to ducted cupboards, the decision should be taken with great care, since they have their limitations (see **Figure 3**). The decision must not be made simply on the grounds of cost savings - there are safety implications too. It is College policy that they are only employed for low risk work (not for use with highly toxic or radioactive substances and other substances in COSHH Hazard GRoups B-E) and assessment for suitability should include:
- careful identification of all chemicals to be used within the cupboard.
 - the quantities to be used and any procedures that may challenge the ability of the filter to cope e.g. aggressive heating and deliberate evaporations.
 - the existence of Workplace Exposure Limits for the substances in question.
 - confirmation that there are compatible filters available and that they are supplied, fitted, used, monitored and replaced in accordance with their service life.
 - educating the users on work practices, limitations and emergency procedures.
30. Note that academic departments are responsible for maintenance and statutory testing of recirculatory units. These are not covered by Facilities Management.

Low-volume fume cupboards

31. Traditionally, fume cupboards have been designed to operate at face velocities of 0.5 m/s as a minimum. Such 'conventional' fume cupboards contribute significantly to the College's energy bills and CO₂ output. In recent years 'low-volume' fume hoods have been an emerging market with innovative designs that manufacturers claim offer equivalent or better containment than the traditional versions and as these operate at only 0.3 m/sec, they can achieve significant energy savings over their conventional counterparts.
32. The College currently actively encourages users to consider the suitability of a modern low-volume fume cupboard when purchasing new ducted cupboards. However, as with any fume cupboard selection this decision must be made by risk assessment and [Form FCS1](#) must be used for this.
33. It is important to note that only fume cupboards specifically designed to run at low volumes should be run at these rates. In other words, simply turning down a conventional 0.5m/sec fume cupboard to 0.3m/sec will almost certainly erode the containment afforded.
34. The Safety Department should be contacted if further advice on the merits of low-flow fume cupboards is required.

Variable Air Volume (VAV) fume cupboards

35. VAV controlled fume cupboards can offer significant energy savings over their constant volume counterparts. The VAV damper (which can either be integral to the cupboard or within the extract ductwork) will alter the volume of air extracted depending on the size of the working aperture. In other words, the lower the sash the less volume of air is extracted whilst

SELECTION

- maintaining a constant velocity of intake air through the aperture and ensuring containment.
36. VAV controlled fume cupboards must be located in areas in which the supply area is also controlled, usually also by VAV. In a well designed system, as the sash is closed, the air extracted is lessened and consequently the supply air volume also lessened - thereby saving energy.
 37. Whilst VAV fume cupboards are an attractive option when selecting new fume cupboards, the following must be noted;
 - VAV fume cupboards should not be installed in laboratories where a constant supply volume only is achievable
 - VAV fume cupboards and their associated plant are more complicated and there are additional items requiring maintenance over some of the simpler non-VAV cupboards
 - Users must be aware of the response times of the VAV controls on the fume cupboards. This will be most noticeable when they raise the sash from the lowest to the highest position. As the damper takes time to adjust there will be a lowering in the velocity achieved at the aperture and this can lower the containment affected if the movement of the sash is too quick.
 - When selecting VAV dampers for fume cupboards, it is essential that only those that react rapidly are used.

INSTALLATION

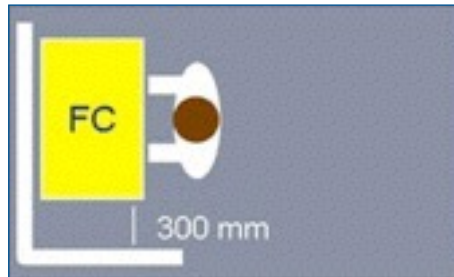
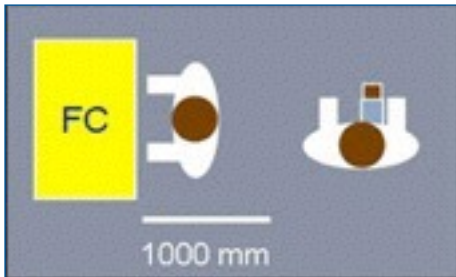
INSTALLATION**Siting**

38. To enable satisfactory performance, fume cupboards must be suitably located. The proximity of air supply equipment, fans, open windows and other physical objects such as benches, walls and doors can all have an influence on performance. All fume cupboards will be sited in accordance with BS 7258 Part 2, Section 3. Though these guidelines will provide the basic conditions for satisfactory performance, only commissioning tests will confirm whether the performance of a fume cupboard is acceptable with any given situation.
39. The diagrams in **Figures 4 and 5** are based upon BS 7258 Part 2 and outline the College policy on the siting of fume cupboards.

Fume cupboard extraction system

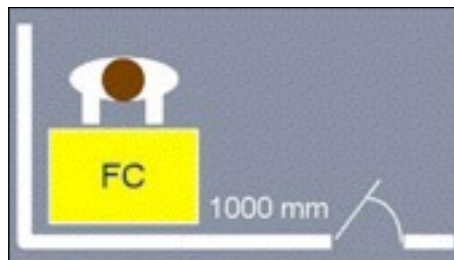
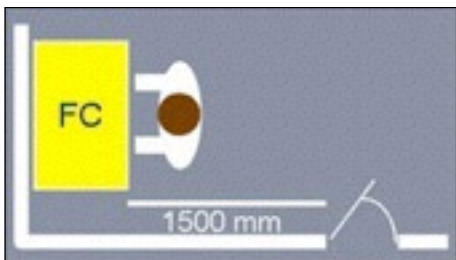
40. Design and installation of the ductwork, fans and related air handling systems within the laboratory should be in full accordance with BS 7258 Part 2, Sections 3.2 and 3.3 and the general principles described with the HSE guidance note HSG 258 'Controlling airborne contaminants at work' followed.
41. Fume cupboards shall have a dedicated extract system and must never be shared with anything other than another fume cupboard in which compatible processes will be carried out. Fume cupboard extract ducts can only be shared with other forms of local exhaust ventilation under extreme circumstances and the impact of this LEV on the fume cupboard operation (and vice versa) must be assessed by an expert before the connections are made. It will be necessary to recommission all existing local exhaust ventilation, including the fume cupboards, should such additions be made.
42. All ducted fume cupboards must be installed either as part of a Capital Projects-managed project, as a Maintenance-managed project or, with the involvement of the Campus/ Building Manager.
43. Where possible new fume cupboard installations should include new ductwork but where reuse of existing ductwork is necessary, the use of asbestos ductwork should be avoided. If asbestos ductwork must be retained because, for example, of complications arising out of the removal of the asbestos from an occupied building, the condition of the asbestos must be checked thoroughly and the connections between new plastic duct and asbestos made by competent contractor and inspected by the College's asbestos consultants.
44. Ductwork must be as straight as possible with the minimum number of bends and joins and any filters, scrubbers, dampers or air flow controllers sited so that they can be easily accessed for maintenance.

FIGURE 4
MINIMUM DISTANCES FOR NEW INSTALLATIONS
FOR AVOIDING DISTURBANCE TO THE FUME CUPBOARD AND OPERATOR

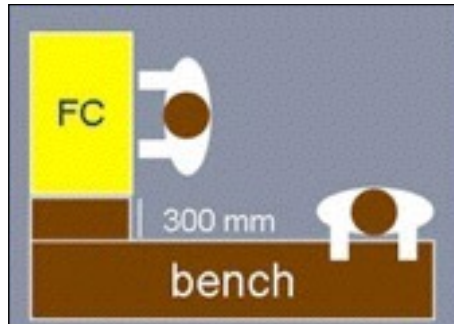
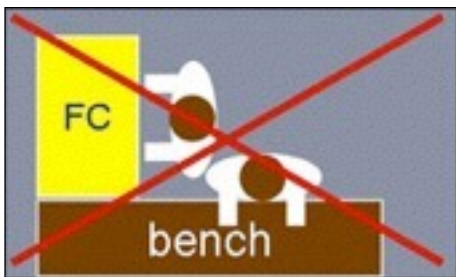


FAR LEFT: Keep pedestrian traffic away

LEFT: Locate fume cupboard clear of adjacent wall

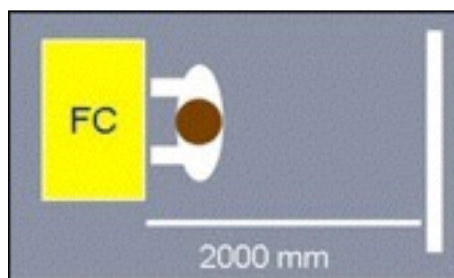
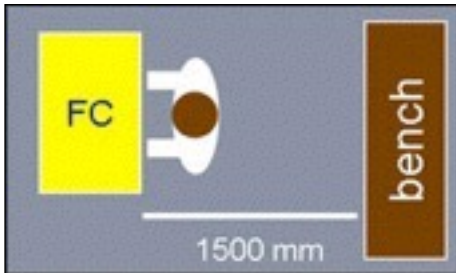


FAR LEFT and LEFT: Locate fume cupboard clear of door openings



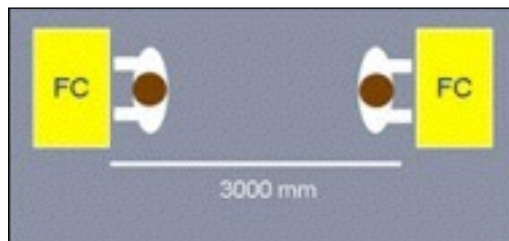
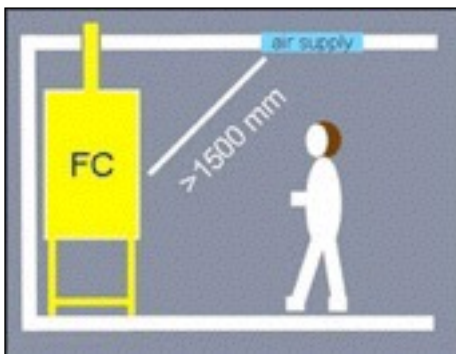
FAR LEFT: Do not limit bench space by forcing another worker to work too close to fume

LEFT: Allow adequate space for other workers



FAR LEFT: Ensure sufficient distance between front of fume

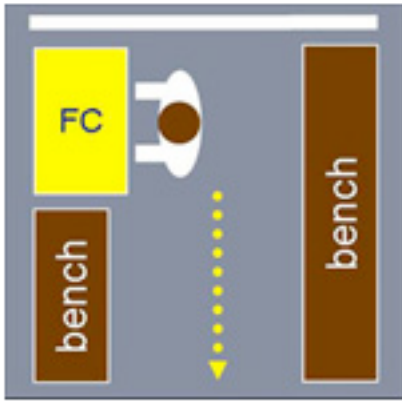
LEFT: Locate fume cupboard well clear of opposite wall



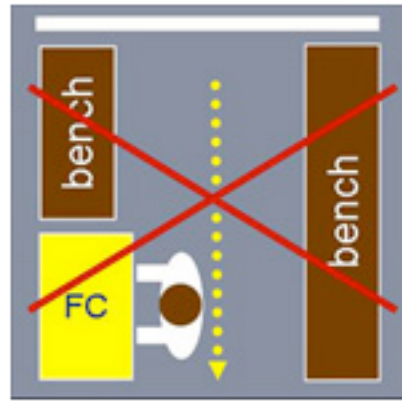
ABOVE: Keep opposite fume cupboards well clear of each other

ABOVE: Maintain sufficient distance from any air supplies

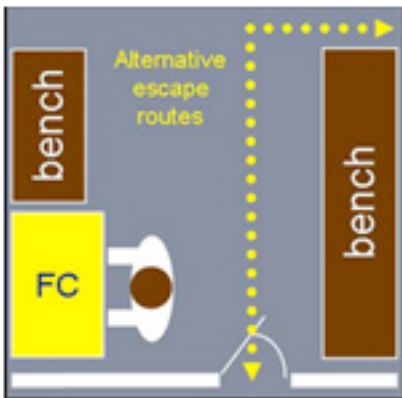
FIGURE 5
MINIMUM DISTANCES FOR NEW INSTALLATIONS
FOR MAINTAINING ESCAPE ROUTES



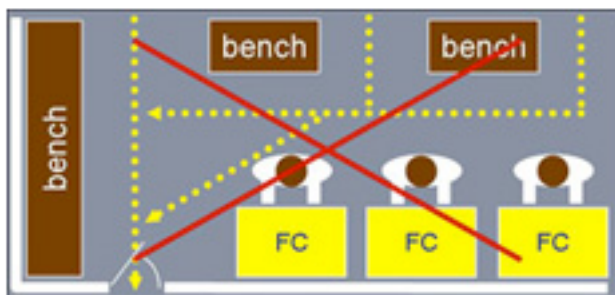
ABOVE: Locate fume cupboards in positions where there is an unobstructed escape route



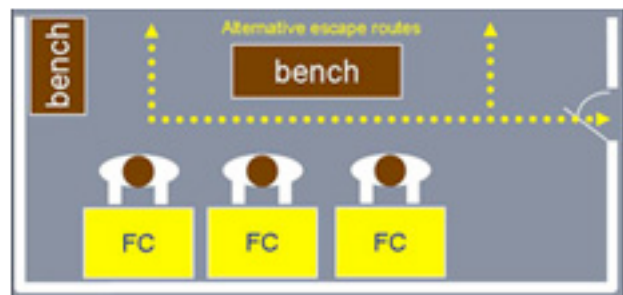
ABOVE: Do not locate fume cupboards in positions where an escape route is forced to cross the hazard area



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



ABOVE: Principal escape routes should not cross the hazard area



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

INSTALLATION

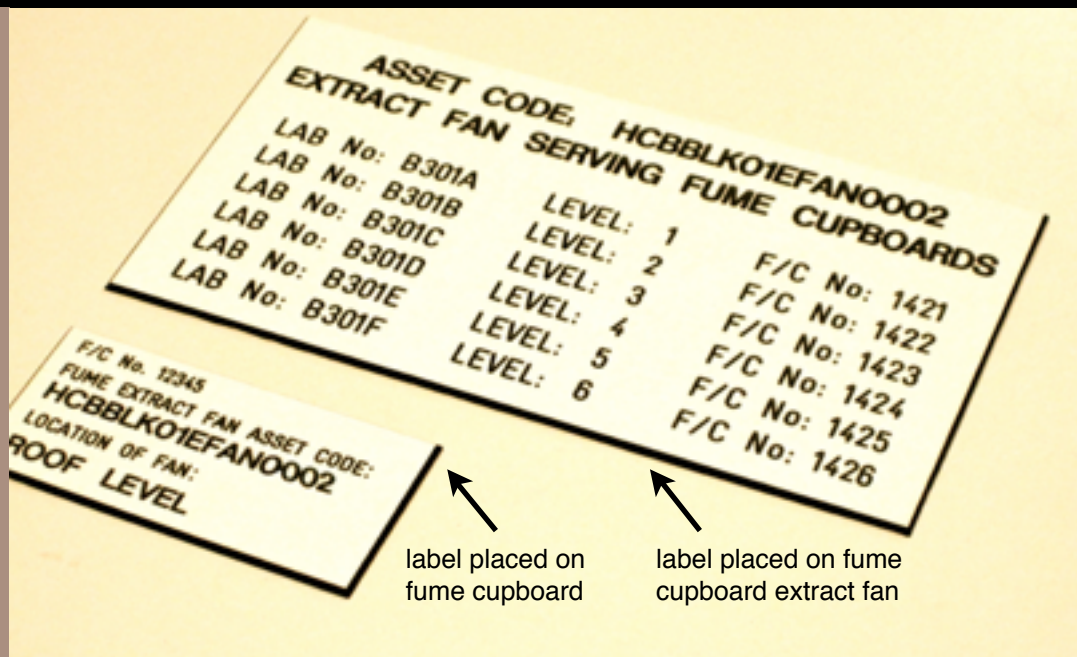


FIGURE 6

FAN AND FUME CUPBOARD ASSET TAGGING

The labels shown here must be installed on the fume cupboard and the fume cupboard fans, respectively.

45. Duct exhausts must be sited with due consideration of the surroundings. As a rule, fume cupboard exhaust ducts must not be within 3 m of any opening windows, air intake grilles or in any other position that needs to be accessed by maintenance staff or contractors.
46. In general duct terminals must be designed to create the maximum exit velocity so as to clear the surrounding area. This usually means that devices such as 'chinese hats' or T pieces must be avoided and the duct should either be terminated with a plain duct ending or one tapered to accelerate the velocities. There are exceptions to this principle and times when a protective device over the duct terminal is advisable; for example, ducts ending horizontally in very tall buildings can be susceptible to wind perturbation and as such should be protected with a suitable device.
47. Where systems are in place to regulate the amount of air extracted from the laboratory space when, for example, the sash is lowered, then systems to ensure that the duct exit velocity are maintained at all times will likely be required. These will entail the installation of bleed dampers located outside of the laboratory space, usually in the plant room, and these will allow the extract fan to run at a constant speed taking air from the plant room when it cannot take air from the laboratory.
48. Duct systems must be designed, so far as possible, so as to allow thorough visual inspection.
49. New extract ductwork and fume cupboards must be clearly labelled so as to enable contract engineers and maintenance staff to be able to identify which duct serves which cupboard. The labels used are shown in **Figure 6** and these must be positioned on each fume cupboard and on their fans, respectively.
50. Facilities Management together with the Safety Department will undertake a rolling program of identification and labeling of existing ductwork.

VAV systems

51. VAV extract systems on fume cupboards offer the potential for significant energy savings as they moderate the air volume flow rates through the cupboard as the sash is lowered. In order to provide an effective control of energy used within the laboratory then they must be combined with VAV controls on the air supply systems into the space occupied by the fume cupboard. A simple example of a VAV extract and supply system is shown in **Figure 7**. As

INSTALLATION

discussed further below, the control strategies for VAV systems must be as simple as possible as should not rely on a networked BMS.

52. VAV systems do require additional commissioning tests over those required for non-VAV controlled fume cupboards. These are discussed further within the Commissioning section of the CoP.

Fire safety

53. Fume cupboards, when used with flammable, pyrophoric or explosive substances can present a high risk of fire and fires that start in fume cupboards can be extremely difficult to extinguish and presents a potentially serious risk to persons and a possibility of extensive damage to equipment and buildings.

Compartmentation

54. Ductwork must be installed so as not to violate the fire compartmentation of the building when passing between the fume cupboard and its final discharge point. Fire dampers should be avoided and adequate fire protection provided by means of suitable treatment of the ductwork, or by enclosure of the duct within a compartmented accommodation duct or by running the ductwork outside the building. Where fire dampers cannot be avoided they should be of suitable corrosion and fume-resistant design and they should have the damper blade clear of the air flow. They must be accessible for maintenance and replacement.

Fire suppression systems

55. It is a College requirement to ensure that the need for automatic fire suppression systems is adequately assessed for all fume cupboards. Automatic fire suppression will normally be required where the fume cupboard will be used for flammable, pyrophoric or explosive substances, or where the process being undertaken could cause ignition and subsequent combustion of other materials within the cupboard. When selecting new fume cupboards, the assessment for the need for fire suppression must be recorded within the [Form FCS1](#).
56. The fire suppression selected must not only be capable of being effective against foreseeable fires but must also be compatible with the equipment or substances in use in the cupboard.

Air supply, pressures and air conditioners

57. A supply of air, usually equal to that extracted by the fume cupboard(s), must be provided in order for the cupboard(s) to perform adequately. When this air is supplied mechanically to the laboratory, steps must be taken to ensure that this supply is adequate, constant and reliable.
58. The pressure differentials between laboratories and their surrounding areas must remain as steady as possible and should not exceed 15Pa. Usually these laboratories are maintained at a pressure negative to their surroundings.
59. All make-up air, whether or not mechanically supplied, must be delivered in such a way so as to cause the minimum disruption to the cupboard airflow pattern. It is College policy that all air velocities within laboratories housing fume cupboards are maintained below 0.2 m/sec where possible. If these velocities are exceeded then the installer and the users must ensure that this high air flow is situated and directed in such a way that they never perturb cupboard performance.
60. Careful consideration must be given to the siting of fume cupboards in relation to the laboratory doors and windows as these, when opened and closed, can cause significant disruption to the airflow patterns.

Control strategies

61. Fume cupboards, and the ventilation to their location, must be controlled using the most reliable means possible. In all cases, the fume cupboard, their dampers or main extract fan must therefore not be controlled by networked BMS. It may however be advisable under certain circumstances to utilise the BMS to monitor the operation of the main extract fan or the dampers.
62. The College does not support the installation of user-based control strategies, where sensors are used to control the extract rates from the fume cupboard depending on the proximity of the user.

INSTALLATION

63. A connection strategy utilising hard wiring between supply dampers, fans and sensors should be adopted. The BMS should not be used for controlling the supply air into a laboratory housing fume cupboards except by agreement with Facilities. Where the BMS must be used, the connection strategy must utilise a single outstation and use hardwiring for connections to dampers, fans and sensors.
64. One possible control strategy is depicted in **Figure 7**. Further details on the College's standards for controlling local exhaust ventilation are provided in a Technical Policy Statement available from Capital Projects.

Recirculation of fume cupboard exhaust air into laboratory space

65. Recirculating fume cupboards must be installed with adequate space between the exhaust point and any obstruction (usually the ceiling) so as to prevent any disruption of the exhaust flows themselves (back pressure can affect cupboard performance) or of the cupboard airflow patterns at the aperture caused by high velocity exhaust air bouncing off obstructions in the laboratory.

Competence of installers

66. Capital Projects and Facilities Management must employ competent staff or contractors to install cupboards.

COMMISSIONING

COMMISSIONING AT INSTALLATION OF NEW FUME CUPBOARDS

67. The procedures described in **Tables 3, 4 and 5** for commissioning are a requirement for all

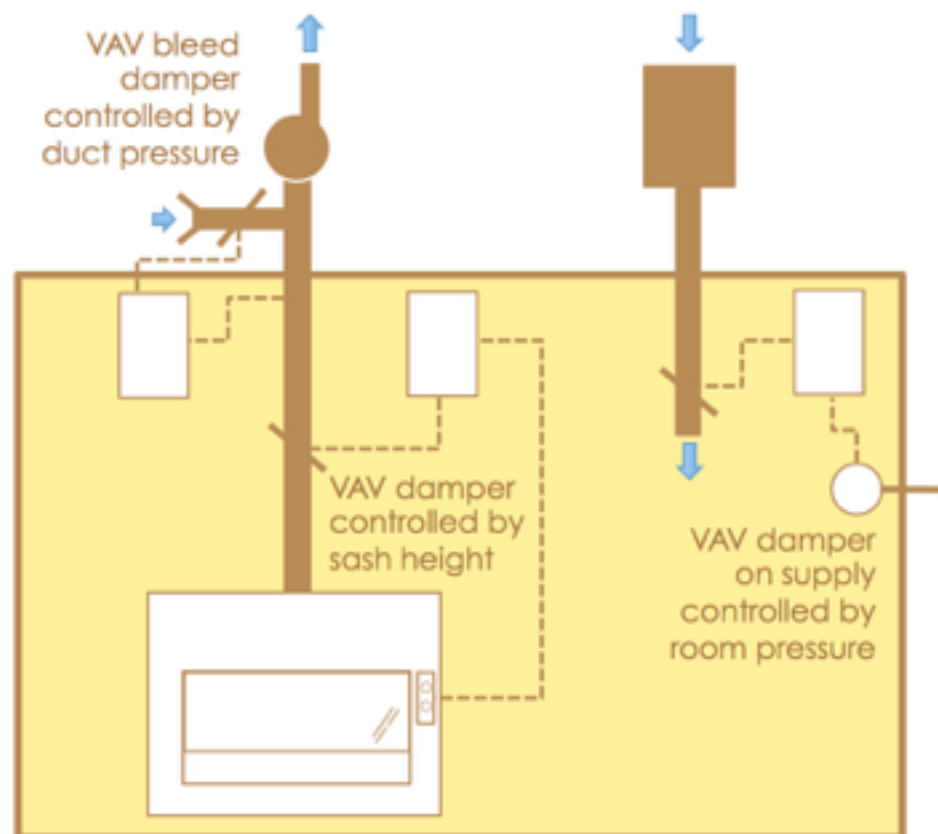


FIGURE 7

VAV CONTROL STRATEGY

ONE EXAMPLE OF A METHOD BY WHICH TO CONTROL VARIABLE AIR FLOWS IN A LABORATORY HOUSING FUME CUPBOARDS

In this particular example it would be possible to add auto sash closers to help ensure that the sash is left at the lowest position when a user is not present at the cupboard.

Note that this figure represents only one possible configuration acceptable to the College.

COMMISSIONING

TABLE 3 COMMISSIONING CHECKS FOR ALL NEW DUCTED FUME CUPBOARDS

	BS EN 14175-4:2004 reference	Test	Pass criteria
Inspections	Section 5.2	Review in accordance with BS EN	All items in Section 5.2 complete or in good condition
Type test certification for fume cupboard	Section 5.3	Review	Type tests complete and certificates available
Face Velocity	Section 5.4	Check in grid pattern specified in BS EN 14175-3:2003, 5.2.3 and 5.2.4.	According to specification
Extract volume flow rate	Section 5.5	Usually calculate from average face velocity	According to specification
Pressure drop test	Section 5.6	Measure in duct	Measurement recorded
Air flow visualisation	Section 5.7	Check with smoke	Adequate capture as judged by the service engineer
Room air velocity test	Section 5.8	Measure with anemometer	No obvious perturbation to cupboard performance and velocities in the room to exceed 0.2 m/sec
Sound pressure measurement	Section 5.11	Check at face of cupboard	Measurement recorded
Alarm system test	Section 5.9	Check high sash alarm and airflow alarm	Alarms must function correctly
Containment test	Section 5.10	Inner plane test	SF ₆ detection of <0.005 mean ppm for all fume cupboards. Fume cupboards to be used for Hazard Group D/E substances may require additional checks. These will be identified in the risk assessment.

new fume cupboards installed at Imperial College.

68. All procedures described are in accordance with the standards described within BS EN 14175-4:2004 for ducted fume cupboards, BS EN14175-6:2006 for VAV fume cupboards and BS 7989:2001 for recirculating fume cupboards. These documents must be referenced for full details of the testing arrangements.
69. The aim of the commissioning tests is to show the correct installation of the fume cupboard and to check for any adverse effects of the room airflow and of the extract system on the performance of the installed fume cupboard.
70. Before commissioning of the fume cupboard commences, the laboratory ventilation must be fully commissioned and under control. In particular, the laboratory pressure must be stable and reasonable (no more than 15Pa across each door) and the temperature level constant at design. The person arranging these tests must ensure that they have confirmed that this is the case and that documentary evidence exists.
71. For the tests described in tables 3, 4 and 5, all user equipment that may impinge on the performance of the cupboard must be installed in the lab, and where relevant, switched on. Any equipment that will be used within the fume cupboard, and that may affect the performance of the fume cupboard, must also be installed within the cupboard before commissioning begins, and where relevant, also switched on. Examples of user equipment that can effect the performance of the cupboard include, but are not restricted to;

COMMISSIONING

TABLE 4 COMMISSIONING CHECKS FOR ALL NEW DUCTED VAV CONTROLLED FUME CUPBOARDS

	BS EN 14175-4:2004 reference	Test	Pass criteria
Inspections	Section 5.2	Review in accordance with BS EN	All items in Section 5.2 complete or in good condition
Type test certification for fume cupboard	Section 5.3	Review	Type tests as laid out in BS EN 14175-6 Section 5 all completed
Face Velocity	Section 5.4	Check in grid pattern specified in BS EN 14175-3:2003, 5.2.3 and 5.2.4.	According to specification
Extract volume flow rate	Section 5.5 and BS EN 14175-6 Section 6.2	Usually calculate from average face velocity at full sash height but also taken at minimum opening and at 50% of the full sash height	According to specification
Test of set points	BS EN 14175-6 Section 5.3.4	Measure the parameter the VAV system using to control flow at full sash height and at 50% of that	Compare the measured values with the set points and report differences
Test response time	BS EN 14175-6 Section 6.4	By measuring pressure drop or volume flow rate response when opening that sash	In accordance with type test results. Response time must be recorded in the test report
Air flow visualisation	Section 5.7	Check with smoke	Adequate capture as judged by the service engineer
Room air velocity test	Section 5.8	Measure with anemometer	No obvious perturbation to cupboard performance and velocities in the room to exceed 0.3 m/sec
Sound pressure measurement	Section 5.11	Check at face of cupboard	Measurement recorded
Alarm system test	Section 5.9	Check high sash alarm and airflow alarm	Alarms must function correctly
Containment test	Section 5.10	Inner plane test	SF ₆ detection of <0.005 mean ppm for all fume cupboards. Fume cupboards to be used for Hazard Group D/E substances may require additional checks. These will be identified in the risk assessment.
Air exchange at minimum volume flow rate	BS EN 14175-6 Section 5.4.3.2 and BS EN 14175-3 Section 5.5	Measured at minimum sash opening	Measurement recorded

- large single items such as rotary evaporators or stills
- large numbers of smaller items which collectively cover more than about half the working surface
- items that create airflows e.g. vacuum pumps
- items that create heat e.g. naked flames or furnaces

72. Only where in the normal use of the fume cupboard will no large or significant items (as described in the previous paragraph) be installed, can the fume cupboard be commissioned whilst completely empty. Examples of when this may be appropriate include;

- when the fume cupboard is used only for dispensing minor quantities of materials using

COMMISSIONING

TABLE 5 COMMISSIONING CHECKS FOR ALL NEW RECIRCULATORY FUME CUPBOARDS

	BS reference	Test	Pass criteria
Inspections			The cupboard and any associated services shall receive a general inspection to include a check of fan rotation and filter seating
Type test certification	BS 7989 Section 8.7	Review	Type tests complete and certification available
Face Velocity	BS 7989 Annex D.1	Check in grid pattern specified in BS 7989 Annex D.1	According to specification
Containment test	BS 7989 Annex D.2	Check with smoke	Adequate capture as judged by the service engineer
Room air velocity test	BS EN 14175-4:2004 Section 5.8	Measure with anemometer	No obvious perturbation to cupboard performance and velocities in the room to exceed 0.2 m/sec
Alarm system test	Not described	Check airflow alarm	Alarms must function correctly
Particulate filter and seal integrity test (where fitted)	BS EN 12469	Dispersed oil particulate penetration test	<0.003% leakage to HEPA filter where fitted.
Installed gaseous phase filter test (optional)	BS 7989 Annex D.4	Challenge with test agent as described in BS	Typical filter efficiencies are normally at least 98%. See note in paragraph 83.

only small equipment such as beakers and bottles

- when the fume cupboard is used for procedures other than dispensing that involve only small quantities and sizes of equipment or material e.g. solvent washing of electrical circuit boards in a small tray

73. The test conditions must be photographed for record purposes and included in the commissioning test certificate. This picture, or at least an image of the same setup, must be included in the registration label.

Commissioning of new ducted Fume Cupboards

74. At least all checks and measurements described in **Tables 3 or 4** must be performed before handover to the users. Note that there may be additional items such as CO₂ drench systems or scrubbers that are not listed in this table but must also be commissioned fully in accordance with the manufacturer's recommendations.

Containment testing

75. An inner plane containment test must be included in the commissioning of all new ducted fume cupboards. The aim of this containment test is to verify the correct function of the fume cupboard at the place of installation by quantification of the containment under the prevailing working conditions.

76. The pass criteria for all new fume cupboards will be that no more than a mean SF₆ concentration of 0.005ppm can be detected to have been released from the cupboard at the time of testing. It is important to note that this equates to a 'containment factor' as described in BS EN 14157 of approximately 10³ meaning that it is possible that 1/1000 of every chemical particle released inside the fume cupboard could escape into the laboratory. This fact must be included in the risk assessment for the work and any involving Hazard Group D or E chemicals may require additional control measures or monitoring.

77. Under certain circumstances - for example if the fume cupboard is to be located in a disputed position or if particularly hazardous activities are to be undertaken - then the Safety Officer, or Safety Department may require that an additional robustness containment test in accordance

COMMISSIONING

with Section 5.10 of BS EN14175-4 is also carried out.

Documentation, labelling and registration

78. It is essential that those using a new fume cupboard know that it has passed its commissioning tests and that they are not allowed to use any cupboard that has not. All commissioning reports for newly installed ducted fume cupboards must be provided to the Safety Department and DSO/FSM/CSM for sign off before the fume cupboards are used. This should be co-ordinated so that these reports are provided before duty holder sign off so as to prevent delays to the handover.
79. The project manager must ensure that the commissioning report is also provided to the Lab Manager responsible for the fume cupboard and that the fume cupboard is labelled with a summary test certificate. The Safety Department will check this as part of their sign off procedure.
80. As with any new equipment, fume cupboards must be supplied with a manual describing their features and how to use the cupboards. This information will be in addition to that provided with any Operation and Maintenance manuals produced and must be provided to the user and department at handover, and not later.
81. Registration of the fume cupboard must take place by co-ordination between the Academic Department and the Principal Investigator or Lab Manager. All new fume cupboards must be registered and labelled as shown in **Figure 1** before first use of the cupboard.

Commissioning of new ducted VAV fume cupboards

82. VAV fume cupboards require a number of additional tests over those required for non-VAV controlled ducted cupboards. These essentially are required to establish the response time of the VAV when the sash is moved and to ensure that the necessary containment is provided when the sash is at full height, as well as at a lower height. Full details on the testing required is provided in **Table 4**.
83. It is essential that before commissioning of the VAV controlled fume cupboards, the performance of the remainder of the VAV air system is confirmed through full commissioning. This is particularly important on the VAV controlled air supplies and the bleed dampers on the exhaust (where fitted).

Documentation, labelling and registration

84. VAV controlled fume cupboards must be labelled as such as the test certification must include those additional tests required for such cupboards.

Commissioning of new recirculatory Fume Cupboards

85. All checks and measurements described in **Table 5** must be performed before handover to the users.

Installed gaseous phase filter test

86. If performed, to be carried out in accordance with Annex D4 of BS 7989. Note that it is not usually a College requirement for gaseous phase filters to be tested as the tests are difficult to conduct and in themselves can adversely affect the performance of the filter.

Commissioning of mobile recirculating fume cupboards

87. The performance of all fume cupboards is influenced by air movements in the immediate environment. If mobile fume

FIGURE 8 SASH HEIGHT LABEL

These labels must be installed to the immediate side of the cupboard sash and they must be positioned at exactly the correct height to correspond to the safe maximum sash height as identified during commissioning or annual testing



cupboards are to be routinely used in several locations within a laboratory, then these locations should be identified in advance as far as is reasonably practicable and the above commissioning tests carried out in each of these locations. The positioning of fume cupboards in relation to the physical environment is described in BS 7258 Part 2:1994.

Documentation, labelling and registration

88. All commissioning reports for new recirculatory fume cupboards must be forwarded to the DSO/FSM/CSM for review and sign off. The Principal Investigator and Lab Manager must ensure that the recirculatory unit is registered with the research department and this can be done at the same time as providing the commissioning report. The fume cupboard must be labelled as shown indicatively in **Figure 1** before first use of the unit.

USE

USE

Sash height

89. It is important to remember that fume cupboard sash openings, although often tested at a height of 0.5m, should always be as small as possible. If an operator is using a fume cupboard with the sash fully raised, then they will be reliant purely on air flows for protection and any physical barrier that the sash could offer will be absent. Users should therefore always use their fume cupboards with the sash in the lowest comfortable position and always lower the sash fully when leaving the fume cupboard.

User influences on fume cupboard performance

90. The following practices can cause disturbance to the air flow patterns and hence potentially affect the performance of the fume cupboard:

- Cluttered fume cupboards - the items in a fume cupboard should be kept to absolute minimum. Do not use fume cupboards to store material or equipment that is not required for the particular process being undertaken.
- Placement of items in the front 150mm of the working area - therefore this area should be kept clear.
- Placement of large items such as gas cylinders in the immediate vicinity of the fume cupboard - maintain a clear zone the width of the fume cupboard, and 1 m deep in which no large items taller than the fume cupboard base (usually 900 mm) are located.
- Rapid arm/body movements at the aperture - ensure any movement is slow and as infrequent as possible.
- Raising and lowering of the sash - minimise sash movements and ensure that any necessary movement is carried out slowly.
- The use of equipment, particularly high speed rotating machinery such as centrifuges and hot air driers (see below).
- The use of Bunsen burners. As far as possible, avoid the use of naked flames.

Alarms

91. All fume cupboards must incorporate a means of unambiguously indicating to the operator that the fume cupboard is functioning correctly. Users must be instructed on how these alarms work and what they indicate. It must also be made implicitly clear that action will be taken against anybody found to have tampered with a fume cupboard alarm. If an alarm sounds:

- It must not be muted until the cause of the problem is identified.
- Users must know what action to take. This usually involves making safe whatever you are doing (in the quickest way possible), closing the sash and informing the Laboratory Manager.

Labelling and marking

92. All fume cupboards should bear the following information:

- A certificate or label stating the date of the last inspection by an engineer and the results of that inspection.
- A record on any airflow checks that have been carried out internally between visits by an

USE

external engineer.

- Any restrictions that may be imposed on a particular fume cupboard with regard to what substances or activities it is not deemed suitable for handling. Fume cupboards used for work with radioactive substances must bear the radiation trefoil hazard warning label.
- The sash height label shown in **Figure 8** must be correctly placed on every ducted fume cupboard.

Use of chemical substances in Hazard Group D and E

93. Chemical substances in Hazard Groups D and E, as defined within COSHH essentials (see [Appendix B](#) for further details) include known carcinogens, sensitizers and substances particularly hazardous via the inhalation route. As such, their use present a high risk to the user and risk assessment will identify the use of a fume cupboard that is tested to perform to the highest standards. It is College Policy therefore that such substances are only handled within fume cupboards in Category 1. In other words, these cupboards must have been containment tested and must have a mean leakage rate of <0.005ppm SF₆ under test conditions.
94. The risk assessment for work with these substances must identify the need for additional measures, other than containment performance, such as additional labelling for fume cupboards in which carcinogens are used. It is the responsibility of the Principal Investigator to ensure that these measures are identified and implemented.

Use of biological agents

95. Fume cupboards must not be used to control exposure to infectious or potentially infectious biological agents. They are not designed for this purpose and, unlike microbiological safety cupboards, ducted fume cupboards are not fitted with HEPA filters. For work with biological agents, refer to the relevant College CoP: [Microbiological safety cupboards: selection, installation, use, maintenance and decommissioning](#).

Use of radioisotopes

96. Specific references with regard to the use of radioactive substances are made where relevant throughout this CoP.
97. Conditions in the Environment Agency Registrations and Authorisations require furniture and fittings to be designed and installed so that radioactive contamination cannot be trapped, and if contamination arises, they can be easily decontaminated. Further information on design features that enable adequate decontamination and also on radioactive emissions can be found at: [Guidance Note, IRPM-ICRP-031 - Laboratory Design Standards](#).

Use of highly corrosive substances

98. Care must be taken to select a fume hood that is made of suitable materials that are resistant to the substances being used.

Use of nanoparticles

99. The use of all nanoparticles must be risk assessed. For carbon nanotubes, the Health and Safety Executive does require HEPA filtration of air exhausted from Local Exhaust Ventilation. As the provision of such filtration on ducted fume cupboards can cause a number of significant performance and maintenance issues, it is College Policy that ducted fume cupboards shall not be fitted with HEPA filters and therefore ducted fume cupboards will not be used for work with carbon nanotubes.
100. Work with carbon nanotubes must therefore take place in one of the following;
- by preference, ducted and filtered chemical workstations specifically designed for capturing hazardous chemicals that cannot be released to the environment shall be used. Such units include cytotoxic workstations and powder handing booths. The key features of such units is that they are fitted with adequate filtration (at least H13 HEPA filtration) and that these filters can be removed and safely bagged within the cupboard under negative pressure.
 - for small amounts of carbon nanotubes, recirculating units can be considered but these

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again must be specifically designed with the properties described for the ducted units above. These will however require the addition of a second, independently testable, H13 or better, HEPA filter.

Changes to laboratory use and processes

101. Fume cupboards designed, installed and commissioned in accordance with BS EN 14175 should be suitable for the vast majority of general chemistry work. However, laboratories change hands and processes evolve and it is important under such circumstances that the suitability of existing fume cupboards are reviewed. If, for example, work with radioisotopes or certain processes involving perchloric or hydrofluoric acid are envisaged whereby wash-downs or scrubbers may need to be installed, then the categorisation and commissioning record of the fume cupboard must be considered.
102. In certain circumstances, where no containment data exists (i.e. where a fume is in Category U), and the work to be carried out therein is to increase in risk and is to involve for example the use of chemicals in COSHH Hazard Group D or E, then containment testing will be required, and the pass criteria described in Table 2 exceeded. The costs for this containment testing will fall to the research department but should be carried out using an approved contractor. The Safety Department can be contacted to discuss such contractors.
103. Where containment data does exist but the conditions of use or the type of equipment to be used in the cupboard is going to change significantly from the test conditions shown on the registration label, then the fume cupboard must be retested for containment. The costs for this testing will again fall to the research department but should be carried out using an approved contractor.

Cleaning and housekeeping

104. Avoid clutter and keep the work area as tidy as possible. Ensure that there is enough space to conduct the work safely.
105. Do not use the fume cupboard as a permanent storage area. The likelihood of an accident is increased and a fire following a spill could quickly involve other dangerous substances inside the fume cupboard. Flammable solvents, concentrated acids and alkalis should be suitably segregated into cupboards fitted with bund trays bearing appropriate signage. Cabinets used for flammables should be fire rated. Many newly installed fume cupboards come supplied with fire rated cupboards situated below that benefit from extraction at the rear - these are the preferred option, though it should be recognised that extraction is only provided as long as the fume cupboard is on.
106. When decanting chemicals, put the lids back on containers immediately after use.
107. Clean up spillages in the fume cupboard promptly (see below).
108. Periodically, clean down the worktop and the walls of the fume cupboard.

Use of equipment in fume cupboards

109. Do not install equipment too close to the front of the fume cupboard - ensure that it is set back at least 150mm from the plane of the sash.
110. Do not install equipment in a position where it may obstruct exhaust vents or baffles.
111. Do not install equipment in a position that requires the operator to put their head inside the fume cupboard in order to manipulate it, particularly once an experiment is in progress.
112. If possible, employ equipment that is fitted with feet or another means of raising it slightly above the level of the worktop. This will enable air to flow beneath it and reduce turbulence.
113. Adequate supervision is required where any continuous process is being applied. It may be necessary to take rapid action should a process boil over, a flask crack or the cooling water fail.
114. Avoid using naked flames and substitute these with safer alternatives such as DrySyn blocks.
115. Where heating processes have been applied, allow equipment and glassware to cool before removing.
116. Spark proof equipment should be selected wherever possible, however, many commonly

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used items of equipment such as heating mantles, hot plates and stirrers may not be available in ignition-protected form. Users should therefore be aware that, in the event of a flammable atmosphere being present, turning off an electrical switch in the immediate vicinity may provide enough of a spark to cause ignition. Electrical equipment should therefore be isolated from a safe location.

117. When commissioning tests are undertaken, ensure that the containment test is carried out with any large items of equipment in place in and around the fume cupboard.

Ventilated storage cupboards

118. Many fume cupboards have associated ventilated cupboards for the storage of chemicals, usually solvents or acids. These are in most cases ventilated via a flexible hose that connects in with the main fume cupboard duct.

119. The testing of the performance of these storage cupboards is not included within FMs responsibilities and as such it is up to the research department to ensure that these are operating correctly. The following checks should be carried out at least annually;

- check general condition of the storage cupboard particularly the integrity of the shelving, any bunding and the paintwork.
- ensure that there is a net inflow of air into the cupboard. This can be done using a smoke puffer or piece of light paper or tape.

120. These checks must be recorded.

Emergencies

121. Avoid sitting at the fume cupboard - this may restrict movement and delay reactions in the event of an emergency. Many fume cupboards have furniture situated beneath - therefore, in addition, it is often ergonomically undesirable.

122. If the ventilation system fails for any reason (as evidenced by alarms and air flow gauge), immediately stop working. If possible, quickly make safe what you are doing - replace lids on containers and terminate any ongoing processes.

123. Pull sash as low as possible and move away from the fume cupboard. Warn other workers that there is a problem with the ventilation and place appropriate warning signage.

124. Report the problem to your supervisor or the Laboratory Manager.

125. Deal with spillages immediately. Employ appropriate absorption materials and subsequently dispose of the product as hazardous waste. Many fume cupboards have a lip at the front that will assist in preventing spilt liquid dripping out. If the fume cupboard has an integral sink and the spillage is water miscible and of low toxicity, it may be possible to flush the spillage to drain with copious amounts of water.

126. Treat fires in fume cupboards with extreme caution. Where automatic fire suppression systems are not installed, the use of high pressure CO₂ extinguishers may spread flames, blow fragile equipment over and eject items out of the fume cupboard. Only tackle fires if the correct fire fighting equipment is available and you have been trained in its use. Otherwise, close the sash and if possible turn off the fume cupboard, then immediately summon the emergency services via the appropriate route for your building or campus.

127. Contingency plans for dealing with emergencies involving radioactive substances should already be documented in the radiation Local Rules.

ROUTINE MAINTENANCE AND PERFORMANCE TESTING OF DUCTED FUME CUPBOARDS

128. Regulation 9 of COSHH requires thorough examination and testing of local exhaust ventilation plant at least once every 14 months (in practice, this is normally assumed to be annually). Imperial College employs external contractors to fulfill this duty with regard to fume cupboard testing. This is administered by Facilities Management.

129. As the performance of fume cupboards is directly related to the stability and reliability of the supply make-up air provided into the laboratory space, it is essential that the supply plant receives the appropriate levels of service and maintenance. This is provided by Facilities Management in accordance with their service level agreement with the academic

ROUTINE MAINTENANCE AND TESTING OF DUCTED CUPBOARDS

**ROUTINE
MAINTENANCE
AND TESTING OF
DUCTED
CUPBOARDS**

departments. Planned preventative maintenance schedules for this plant are kept by Facilities Management, as are records of the maintenance provided.

130. This CoP focuses on the testing and maintenance of the fume cupboard itself. Some of these units will be installed with additional features such as CO₂ drench systems or scrubbers. It is essential that the department ensures that these are appropriately maintained and tested according to the manufacturer's specifications and that records of these are kept.

Preparation for Examination and Testing

131. Lab Managers or Departmental contacts will be notified by the Building Manager or their delegate at least 2 weeks in advance of the date when the service engineer will be visiting to carry out the maintenance and testing described below.
132. The fume cupboards to be tested must be made safe to ensure that there is no risk to maintenance engineers or their equipment. The steps taken to make fume cupboards safe 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 so as to remove chemical residues. In all cases, the front of the cupboard, particularly the aerofoil must be cleaned
 - any pipework or tubing protruding the front of the cupboard should where possible be removed, and where not possible secured.
133. Before the engineer enters the laboratory they must be issued with a Permit-to-Work along with any specific instructions on procedures or precautions they must take whilst in the laboratory. It is essential that the laboratory is made as safe as is possible. Engineers have been instructed not to enter areas that they consider to be unsafe and that when it is not possible to test a fume cupboard because for example, the cupboard had not been cleared of equipment, these will be immediately labelled as not tested with the warning notice indicating that the fume cupboard has not been tested. If more than 14 months since the last test then this mean that the fume cupboard must be taken out of commission and those responsible for the fume cupboard must ensure that it is not used until tested and passed.
134. The Permit-to-Work must make specific reference to all the fume cupboards to be tested.
135. Where fume cupboards have been used for ionising radiation work, the Radiation Protection Supervisor (RPS) must also sign off the Permit-to-Work.
136. Service engineers will wear appropriate PPE (as a minimum, laboratory coat and safety spectacles) when undertaking maintenance and testing.

Examination and Testing of the Fume Cupboard Unit

137. Fume cupboards shall be examined to include the items below. These are also as stipulated in the contractor Scope of Works;
- A visual / physical check of the sash mechanism and a check of the sash stop and alarm function.
 - A check of the visual / audible flow rate indicator and associated sensors.
 - A check of the condition of the baseplate and rear and side walls.
 - A check of the condition of all the services to the fume cupboard including controls and lighting. Electrical sockets to be checked for polarity, earth and functionality.
 - A check of the water taps and gas taps (where present) to ensure that they are clean and leak free.
 - A check and clean of the 'fluff' filter where this exists and it is practical and safe to do so.
 - Face velocity airflow tests carried out with a thermal anemometer with sash set to normal working height. In order to achieve a pass, the airflow velocity measured must meet the following criteria:
 - The mean velocity at any grid point shall be >80% of overall mean velocity (BS 7258

ROUTINE MAINTENANCE AND TESTING OF DUCTED CUPBOARDS

Part 1 Section C.1.3).

- The overall mean velocity must be within 10% of the velocity achieved either at commissioning (where data exists) or at the last annual performance test. If it appears to the contractor that the velocity measured at the last test was inappropriate then this must be flagged to the Building Manager in the daily summary.
- An airflow visualisation check (smoke pencil) in accordance with BS EN 14175 Section 5.7.2.
- Upon completion of testing, a label shall be attached to each fume cupboard indicating at least:
 - Name of contractor conducting test.
 - Date of test.
 - Volume flow rate (m/s).
 - Average face velocity.
 - Airflow visualisation using smoke.
 - Height of sash at time of test.
 - Label will indicate either PASS or FAIL status.
- Where a fume cupboard fails the test criteria, an additional label shall be placed on the sash window (see **Figure 9**). On no account can a failed fume cupboard be used until remedial measures have been taken to address the problem and it has been retested.

Imperial College
London



Unit has failed to meet performance requirements and is out of service until further notice.

Please contact Building Manager for assistance.

FIGURE 9

'FAILED' SIGNAGE

PLACED UPON THE SASH OF CUPBOARDS THAT HAVE FAILED THEIR ANNUAL TESTING

The test engineer must adhere this sign to the sash of cupboards that have failed their annual testing or that it has not been possible to test.

Examination of the Fans and Ducting

138. In addition to the fume cupboard itself, the associated fans and ductwork will also be examined and this will include the following;

- A check that the extract fan motor does not overheat and a test for worn bearings. Bearings shall be lubricated as necessary.
- A check for excessive noise and the state of flexible couplings (where access is possible).
- A check that the anti-vibration mountings are free.
- A check that the pulleys are tight.
- A measure of the fan motor speed and electrical current flowing through the motor.
- A check for build up of deposits in the fan housing and an inspection of the impellers for wear.
- A check of the stability and condition of discharge stack (where access is possible).
- An inspection of the condition of the extract ducting (where access is possible).
- In circumstances where it is unclear as to which extract relates to which fume cupboard, the relationship shall be established by the release of smoke pellets within the fume cupboard. The extract / fan shall be suitably labelled to enable identification.

Documentation and Labelling

139. In advance of annual testing, the College shall furnish the maintenance service provider with type test data and / or original commissioning data for fume cupboards where such data exists. This shall serve as the baseline performance data where a fume cupboard is

TABLE 6 PERMITS-TO-WORK, EQUIPMENT DECONTAMINATION AND AREA CLEARANCE CERTIFICATES

	Which form?	Signed by whom?
Routine maintenance and testing of fume cupboard	Laboratory Permit-to-Work	Lab Manager
Routine maintenance and testing of fume cupboard but investigative works required to ductwork or fans external of the lab	Laboratory Permit-to-Work for access to lab FM Permit-to-Work for access to plant	Lab Manager FM PTW issuer
Works to cupboard ductwork or plant	Laboratory Permit-to-Work for permission to shut down cupboard FM Permit-to-Work for access to plant	Lab Manager FM PTW issuer
Fume cupboard decommissioned and removed from active lab for disposal	Permit-to-Work for removal works and Equipment Decontamination Certificate affixed to cupboard	Lab Manager
Fume cupboard decommissioned and left in vacated lab for disposal	Equipment Decontamination Certificate affixed to cupboard and Area Clearance Certificate for laboratory	Lab Manager
Fume cupboard decommissioned and removed from active lab for transfer and reinstatement in another lab	Permit-to-Work for removal works and Equipment Decontamination Certificate affixed to fume cupboard	Lab Manager

ROUTINE MAINTENANCE AND TESTING OF DUCTED CUPBOARDS

undergoing annual testing for the first time. Where this data is unavailable, the airflow velocities from the previous annual test must be available for consultation.

- 140. The service provider shall label each fume cupboard immediately upon completion of testing. If the fume cupboard has failed its testing then the label must be supplemented by the signage shown in **Figure 9**.
- 141. At the end of each testing day, the service provider shall issue a summary of completed tests and status of the fume cupboards tested to the Building Manager. This will identify any fume cupboards of concern and any that were unavailable or inaccessible for testing.
- 142. The service provider will issue electronic copies of test certificates and test summary results within one week of each building completion. These will be issued to the Building Manager, Assistant Building Manager, Maintenance Manager and Supervisor.
- 143. Building Managers/Assistant Building Managers shall be responsible for identifying the contact personnel for each fume cupboard within their building and for immediately forwarding copies of the test certificates on to those individuals.

Repairs and remedial works

- 144. Any repairs and remedial works required to fume cupboards or their extract systems must be arranged by Facilities Management. If such works are not identified as part of the annual service and performance test, users must report defects via the Helpdesk.

Re-testing of containment

- 145. Re-testing of containment in cupboards that have previously been tested for containment (either at installation or later) shall be carried out in the following circumstances;
 - when the conditions of use have changed significantly through either changes in the type of equipment used in the cupboard or in the items being placed outside of the cupboard, and these latter being of the type and in such location that they could affect the performance of the cupboard. This would apply to any item taller than 900mm placed within 1m of the front of the aperture.
 - following major works and according to the conditions described in paragraphs 145-147.

- 146. Containment testing can be arranged via Facilities Management and where, relevant, the

ROUTINE MAINTENANCE AND TESTING OF RECIRCULATORY CUPBOARDS

department will be recharged for this testing.

ROUTINE MAINTENANCE AND PERFORMANCE TESTING - RECIRCULATORY FILTRATION FUME CUPBOARDS

147. Recirculating fume cupboards are also subject to maintenance and testing under COSHH. Under College policy, these cupboards are considered to be departmental equipment rather than part of the building infrastructure. As such, maintenance is not administered by Facilities Management and remains the responsibility of the department to organise. Maintenance shall be in accordance with Annex B of BS 7989.

Preparation for examination and testing

148. As for ducted fume cupboards (see above).

Examination and testing of the fume cupboard

149. The checks will include for the following on an annual basis;

- Visual inspection of overall condition including inspection of the sash mechanism, pre-filter condition and inspection of the bodywork for damage or corrosion.
- Electrical safety to include Portable Appliance Testing
- Airflow velocities shall be monitored and recorded every 14 months (annually, in practice)
- Containment shall be visualised using a smoke pencil to determine the flow movement at the face of the cupboard
- Filters must undergo a suitable challenge test and / or replacement at intervals as recommended by the manufacturer / supplier. HEPA filters will need to be integrity checked at least annually using the same test methodology as that prescribed for Microbiological Safety Cabinets.

RECOMMISSIONING FOLLOWING MAJOR WORKS

RECOMMISSIONING OF DUCTED FUME CUPBOARDS FOLLOWING MAJOR WORKS

150. It will be necessary in certain circumstances for significant works be undertaken to fume cupboards or to the laboratories in which they are housed. When these works could alter the performance characteristics of the cupboard then recommissioning will be required.

151. Examples of the type of works that must be considered and will necessitate recommissioning include but are not limited to;

- alterations to laboratory HVAC system that affect the air balance within the room
- alterations to the fume cupboard ductwork or extract plant and control dampers
- changes to the cupboard fabric that could result in different air flow patterns

152. When the fume cupboard concerned was originally installed after July 2008 and has been fully commissioned at installation, then the recommissioning following major works must be in full accordance with **Tables 3** or **4**, as relevant.

TRANSFER OF OWNERSHIP & DECOMMISSIONING

TRANSFER OF OWNERSHIP OR DECOMMISSIONING

153. All reasonably practicable measures to clean and decontaminate the fume cupboard should be undertaken as part of the handover or decommissioning process. It is the responsibility of the Principal Investigator to ensure that any fume cupboard used in the course of their research is made safe before its abandonment (when vacating an area) or, removal of the fume cupboard or part thereof.

154. All waste materials, chemicals, items of equipment and consumables must be removed from the fume cupboard.

155. Accessible surfaces such as the worktop, walls and any sinks must be cleaned as best as possible with a suitable detergent. Since fume cupboards are not designed for work with biological agents, there should be no requirement for disinfection.

156. Carefully check sinks for the presence of solid objects such as sharps and remove and suitably dispose if found.

157. Flush sinks and waste pipes with copious quantities of water. This will help dilute and disperse any contaminants that may be present in the pipes and catchpots.

158. If the fume cupboard has been used for radiation work (either recently or historically), the Safety Department Radiation Protection team must be consulted so they can agree on the requirement for any monitoring or decontamination that may be required.
159. Filters must be removed from recirculating fume cupboards.
160. Filters removed from recirculating fume cupboards must be disposed as hazardous waste via the Helpdesk.
161. Once cleaned and decontaminated, the fume cupboard must be clearly labelled as such by completing and attaching an Equipment Decontamination Certificate.
162. Measures should be taken to ensure that the fume cupboard is secured and not used again once a Decontamination Certificate has been issued.
163. Documentation requirements are summarised in the table below:
164. Removal and final disposal of associated elements such as ducting and waste pipes is covered in the College CoP 'Decontamination of equipment and areas'.
165. Any decommissioned fume cupboard may be disposed as non-hazardous waste if it is known to have been effectively decontaminated and any other hazardous components such as electrical components removed. The latter must be disposed of in accordance with the WEEE Regulations.
166. If a fume cupboard is moved for re-use at another College location, it should be packaged in a way that protects it from damage in transit.

MONITORING PERFORMANCE AND COMPLIANCE

MONITORING PERFORMANCE AND COMPLIANCE WITH THIS COP

167. it is essential that all those who use, maintain or test, or are responsible for those that use, maintain or test fume cupboards, must have a clear understanding of the requirements of this CoP.
168. The Safety Department provide training on the key aspects of this to both Academic Departments and to Facilities Management. Academic Departments, and in particular, their Principal Investigators, must ensure that those at risk i.e. those undertaking the work, are explicitly clear as to how to use a fume cupboard safely and in the manner that will best ensure that is performing at its best possible level.
169. The Academic Departments must ensure that the safe use of fume cupboards is monitored appropriately and how often this is done must be established on the basis of risk, with those undertaking the highest risk work being subjected to the closest and most frequent scrutiny.
170. Facilities Management must ensure that their own performance in complying with this CoP is subject to ongoing checks and that these checks are recorded and acted upon where deficiencies are found.
171. The Safety Department will conduct periodic reviews through audit or inspection on both the Academic Departments and Facilities Management.

APPENDIX A - FUME CUPBOARD SELECTION ASSESSMENT - FORM FCS1



FORM FCS1
FUME CUPBOARD SELECTION ASSESSMENT

This form is intended to document the risk assessment process that must take place in order to determine the specification of new fume cupboards. It also ensures that the brief provided to manufacturers is clearly presented and that the user's requirements are detailed.

As fume cupboards are responsible for a significant amount of energy consumption, this process is now also in place to ensure that all new fume cupboards installed at Imperial College are specified so as to be as energy efficient as possible.

All new fume cupboards purchased by Imperial College shall comply with the following British Standards:

- For ducted fume cupboards: BS 14175-2: 2003 Safety and performance requirements.
- For recirculating fume cupboards: BS 7969: 2001 Specification for recirculatory filtration fume cupboards.

This assessment must be approved by the relevant Departmental, Campus or Faculty Safety Officer/Manager and when a cupboard is to be used for radiation work, also by the Safety Department Radiation Protection Team.

Once completed and reviewed this form must be submitted to the relevant Project Manager or User co-ordinator.

Name of person in control of the work carried out in this fume cupboard

Name:	Section/Institute/Dept/:
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Location of cupboard

Room:	Building:
Campus:	Fume cupboard reference:

Work to be conducted within the fume cupboard

What will the fume cupboard mainly be used for? *Open processes **Enclosed processes

* Open processes - predominantly open apparatus, deliberate evaporations (particularly those involved with heating) etc.
 ** Enclosed processes - predominantly routine transfers and enclosed apparatus / equipment etc.

What hazardous substances will be used?

Flammables Corrosives Radioisotopes Carbon nanotubes Explosives

Substances in COSHH Hazard Groups B, C, D or E (see College Fume Cupboard Code of Practice or [COSHH Essentials](#))

Do the processes to be undertaken have any of the following properties?

Distillation Naked flames High heat production Can be perturbed by fume cupboard airflows?

Cable or pipework connections to outside of the cupboard Fans or external moving parts?

Large items of equipment? Very dusty processes

If any of the above properties do apply to your process, provide details:

Fume cupboard features (answer all questions and select all those applicable)

Size (width in mm):	<input type="checkbox"/> Ducted or <input type="checkbox"/> recirculating	<input type="checkbox"/> Walk-in or <input type="checkbox"/> conventional
<input type="checkbox"/> Sink:	If required, specify size (mm) and any special features:	
<input type="checkbox"/> Water:	If required, specify type and any special features:	
<input type="checkbox"/> Power:	If required, specify type and any special features:	
<input type="checkbox"/> Other services:	If required, specify type and any special features:	
<input type="checkbox"/> Scaffolding :	If required, specify size (mm) and any special features:	
<input type="checkbox"/> Ventilated solvent storage:	Approximate quantity of flammable liquid to be held in the laboratory:	
	BS476 cabinet: <input type="checkbox"/> Minimum standard	BS14470 Pt.1 cabinet: <input type="checkbox"/> Higher standard
	Size: Other chemicals requiring ventilated storage?	
<input type="checkbox"/> HEPA filter required:	If required, state reason:	
<input type="checkbox"/> Other filter required:	If required, state reason:	
<input type="checkbox"/> Worktop material:	Material required:	

<input type="checkbox"/> All other interior wall/ceiling material:	Material required:
<input type="checkbox"/> Lead lining:	If required, detail where required and thickness:
<input type="checkbox"/> Reinforced structure:	If required, state reason:
<input type="checkbox"/> Seamless interior with rounded corners:	If required, state reason:
<input type="checkbox"/> Dedicated duct runs required:	If NOT required, state what these can be shared with:
<input type="checkbox"/> Drain material specification:	If particular required, provide details:
<input type="checkbox"/> Dedicated drainage straight to stack:	If required, state reason:
<input type="checkbox"/> Drain catchpot or trap:	If not required or with any special features, please detail these:
<input type="checkbox"/> Fire suppression systems:	<p>Fire suppression systems should be installed for all new fume cupboards where a fire risk may exist. If fire suppression systems are not required then explain why:</p> <p>If a fire suppression system is required, are any of the following systems incompatible with the materials that may be used within the cupboard?</p> <p><input type="checkbox"/> FM-200 <input type="checkbox"/> CO2 <input type="checkbox"/> dry chemical powders <input type="checkbox"/> foam</p>
<input type="checkbox"/> Other features required:	
Extract ductwork (<input type="checkbox"/> n/a if recirculating cupboard is required)	
Standard ductwork will be made from PVC. If this is not acceptable, select one of the following:	
<input type="checkbox"/> Polypropylene	<input type="checkbox"/> GRP clad polypropylene
<input type="checkbox"/> Stainless steel	<input type="checkbox"/> other
If anything other than PVC is required, please provide details:	
Energy saving features	
In-flow velocity:	<i>Note that the default is 0.35m/sec. If higher is required specify the velocity and explain why required:</i>
Confirm the nature of the HVAC air supply system:	
<input type="checkbox"/> Mechanically ventilated	<input type="checkbox"/> Naturally or passively ventilated
Will the fume cupboard need to be run overnight or for long periods of time during the day without a worker at the cupboard?	
<input type="checkbox"/> Yes <input type="checkbox"/> No	
Can the fume cupboard be switched off when not in direct use? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Is this HVAC system being refurbished or replaced as part of this fume cupboard installation? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, provide name of the Project Manager:	
Can any of the following energy saving measures NOT be considered?	
<input type="checkbox"/> Auto-sash closers with Variable Air Volume controls	<input type="checkbox"/> Auto-sash closers with fan-speed controller
<input type="checkbox"/> Variable Air Volume controls with manual sash	<input type="checkbox"/> Fan-speed controller with manual sash
If any of the above cannot be installed please provide an explanation:	
Approvals	
Note that whilst signatures are not required on this form it remains the responsibility of the person completing this to ensure that those persons named below have reviewed this assessment	
Person completing this form	
Name:	Section/Institute/Dept:
	Date:
Safety Officer (DSO/FSM/CSM)	
Name:	Dept/Faculty/Campus:
	Date:
Radiation Protection Team (for cupboards in Controlled Areas)	
Name:	Position:
	Date:

APPENDIX B - COSHH HAZARD GROUPING

The hazards associated with chemicals and products have been allocated into one of five groups, A to E, by the R-phrases given in the Chemicals (Hazard Information for Supply) Regulations (CHIP), and by analogy in the H-statements in the CLP/ GHS (Classification, Labelling and Packaging of Substances and Mixtures Regulations/Global Harmonised System). The table below gives the ranges assigned to each group and the associated R-phrases or H-statements. The rationale for this grouping is described in *Brooke, IM, Ann Occup Hyg. 1998 42(6):377-90, A UK scheme to help small firms control health risks from chemicals: toxicological considerations.*

HAZARD GROUPS, RISK PHRASES AND HAZARD STATEMENTS				
Substance Hazard Groups	CHIP Risk Phrases (existing)		CLP/GHS Hazard Statements (being phased in)	
E	R42	May cause sensitisation by inhalation	H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
	R45	May cause cancer		
	R46	May cause heritable genetic damage	H340	May cause genetic defects
	R49	May cause cancer by inhalation	H341	Suspected of causing genetic defects
			H350	May cause cancer
D	R26	Very toxic by inhalation	H330	Fatal if inhaled
	R40	Limited evidence of carcinogenic effect	H351	Suspected of causing cancer
	R60	May impair fertility	H360	May damage fertility or the unborn child
	R61	May cause harm to the unborn child	H361	Suspected of damaging fertility or the unborn child
	R62	Possible risk of impaired fertility		
	R63	Possible risk of harm to the unborn child	H362	May cause harm to breast-fed children
			H372	Causes damage to organs through prolonged or repeated exposure
			H373	May cause damage to organs through prolonged or repeated exposure
C	R23	Toxic by inhalation	H331	Toxic if inhaled
	R37	Irritating to respiratory system	H335	May cause respiratory irritation
			H370	Causes damage to organs
			H373	May cause damage to organs through prolonged or repeated exposure
B	R20	Harmful by inhalation	H332	Harmful if inhaled
			H371	May cause damage to organs

Risk Phrases currently allocated under Chemicals (Hazard Information and Packaging for Supply) Regulations (CHIP).
Corresponding Hazard Statements as proposed under Classification, Labelling and Packaging of Substances and Mixtures Regulation (CLP) adopting the Globally Harmonised System (GHS).

APPENDIX C - ACADEMIC DEPARTMENT COMPLIANCE CHECKLIST

The following checklist is provided so as to provide those within the Academic Departments that are responsible for the safe use of their fume cupboards, or their lab managers, an outline of some of the key points within this CoP. It is not intended to be comprehensive and to look at every aspect of the CoP, just to some of the key items. These questions will, in a similar guise, also be used as part of the College Safety Department audits.

The correct answers to these questions are in all cases 'yes', or where appropriate 'N/A'. If you have to answer 'No' or 'Don't know' to any question then this must be rectified and your DSO/FSM/CSM or member of the Safety Department consulted.

#	QUESTION	ANSWER			
		Yes	No	N/A	don't know
1	Is all work carried out in your laboratory(ies) risk assessed and has the need for a fume cupboard been included within this assessment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Is all work that should be done within a fume cupboard, carried out in one?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Are all members of your group clear on the differences between fume cupboards, laminar flow booths and microbiological safety cupboards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Are users clear on the restrictions of what can be used within recirculating units?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Are all fume cupboards categorised and registered?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Are all fume cupboards compliant with BS EN14175 and clearly labelled as such?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Are all fume cupboards installed in full compliance with this CoP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Are all fume cupboards turned off when not in use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	When selecting new fume cupboards will their energy consumption be considered?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	For ducted fume cupboards, do you know that all extracts are positioned so as not to present a hazard to others?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Are all air conditioners or air supply grilles within the laboratory positioned so as not to cause disruption to the fume cupboards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Is the fume cupboard labelled with a test certificate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Was this test carried out within the last 12 months?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Are all users trained in the use of the fume cupboard and is a record of this kept?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Is a radiation trefoil sign displayed if ionising radiation work is used in the cupboard?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Is all ionising radiation work carried out in the fume cupboard registered with the Safety Department?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Is the fume cupboard kept clean and users instructed to leave it in a tidy state?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Have the fume cupboards been tested for containment performance under conditions representative of their use? For example, was any large equipment normally in the fume cupboard, installed at the time of the test?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Are fume cupboards used in manner appropriate for the containment test?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Are the fume cupboard rendered safe to work on through decontamination prior to a Permit-to-Work being issued?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Are users clear on the requirement for Permits-to-Work before allowing engineers to access their laboratories and fume cupboards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Are users clear on the requirement for decontamination certification before allowing fume cupboards to be removed from the laboratory?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX D - FACILITIES MANAGEMENT COMPLIANCE CHECKLIST

The following checklist is provided so as to provide those responsible for maintenance of fume cupboards an outline of some of the key points within this CoP. It is not intended to be comprehensive and to look at every aspect of the CoP, just to some of the key items. These questions will, in a similar guise, also be used as part of the College Safety Department audits.

The correct answers to these questions are in all cases 'yes', or where appropriate 'N/A'. If you have to answer 'No' or 'Don't know' to any question then this must be rectified and your DSO/FSM/CSM or member of the Safety Department BioSafety Team consulted.

#	QUESTION	ANSWER			
		Yes	No	N/A	don't know
1	Has this CoP distributed to all Maintenance Team Leaders?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Are all relevant FM staff members aware of the general principles of this CoP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Have all relevant FM staff members attended the Safety Dept course on 'Fundamental Principles of Local Exhaust Ventilation for Maintenance and other support staff'?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Are all fume cupboard ducts external of the research laboratories labelled so as to allow quick and accurate identification of which ducts serve which cupboards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Are all Maintenance staff instructed to report any damage or faults they may suspect or identify to any ductwork that does or could serve an item of Local Exhaust Ventilation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Are the ductwork, controls and fans to your fume cupboards labelled so as to allow clear identification of which duct serves which cupboard?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Are FM PTW issuers clear that should any work be required to the fume cupboard extract systems located outside of the laboratory, the PTW must be signed off by the Lab Manager as well as the PTW issuer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Are FM clear on the requirement for decontamination certificates before removing fume cupboards for either relocation or disposal?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Are FM clear that any filters must be removed from the fume cupboard before disposal of the cupboard?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Are FM contractors labelling fume cupboards with test results immediately after testing?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Are FM ensuring that test certificates are issued in accordance with the requirements of this CoP?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX E - USER TRAINING AND COMPETENCY CHECKLIST EXAMPLE

The following list covers the minimum level of training that all fume cupboard users should be provided with. It is essential that those responsible ensure levels of competency before authorising their staff or students to work alone at the cupboard. A record of this training must be maintained and this page can be used for that purpose.

#	SUBJECT	ITEM COVERED	COMPETENCY ASSESSED
1	This CoP has been issued	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
3	Control panels, alarms and indicators - what they all mean	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
4	How to turn the fume cupboards on and off	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
5	The importance of lowering the sash to the lowest position possible when working at the cupboard	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
6	The importance of shutting the sash whenever the operator does not need access to within the cupboard	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
7	Local rules on whether the fume cupboard are left on or off	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
8	Permitted equipment allowed within the cupboard	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
9	Local rules on restrictions on use of particular cupboards	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
10	Dealing with waste within the fume cupboard	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
11	Restrictions on what work can be carried out in recirculation fume cupboards	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
12	Dealing with spillages within the fume cupboard	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
13	Routine cleaning of the cupboard after use	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>
14	Principles of engineer airflow and containment testing	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/> N/R <input type="checkbox"/>

BOTH TRAINER AND TRAINEE HEREBY AGREE THAT THE ABOVE TRAINING HAS BEEN FULLY COMPLETED AND THAT ALL THE POINTS IDENTIFIED ABOVE AS HAVING BEEN TAUGHT AND UNDERSTOOD, HAVE IN FACT BEEN COMPLETED.

POSITION	NAME	SIGNATURE	DATE
Trainer			
Trainee			

Selection, Use and Maintenance of Fume Cupboards

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