1 Introduction

Control of Substances Hazardous to Health Regulations (Local Exhaust Ventilation Systems) and the Provision and use of workplace equipment Regulations

The above regulations require the maintenance of control measures and protective equipment provided to give protection from Chemical Fumes, Biological agents, Dust, Paint fumes or Smoke etc.

These systems, e.g. fume cupboards, microbiological safety cabinets, glove boxes and extract systems, must be maintained in an efficient state and in good repair. Specialist extract such as microbiological cabinets must be examined and tested at suitable intervals, in the case of general local exhaust ventilation they must be thoroughly examined and tested once every 14 months.

In the case of dry brazing, grinding or polishing of metals, more than 12 hours per week, they must be tested every six months.

(See University of Sussex Safety Procedures and Guidance document for the Implementation of the Control of Substances Hazardous to Health Regulations SPG-23-09.)

The risk assessment for any activity that require LEV must ensure that:

- You are using the correct LEV for the work. This document gives guidance on use and testing of LEV but the supervisor of the activity is responsible for ensuring correct safety equipment is being used.
- It is maintained and tested (the supervisor of the laboratory/equipment is responsible for ensuring their equipment is maintained, they are supported in this by the technical staff and the Safety office but the responsibility for the activity, the risk assessment and any resulting control measures rests with the instigator/supervisor of the activity)
- Users are familiar with the correct operating procedures (the supervisor of the laboratory/equipment is responsible for ensuring their staff and students are trained, they are supported in this by the technical staff and the Safety office but the responsibility for the activity, the risk assessment and any resulting control training lies with the instigator/supervisor of the activity)

Operator check list:-

- Does the flow indicator or flutter tape show that the equipment is working correctly and/or has a current “in date” test label fitted
- If appropriate check any filters that are fitted are clean and unblocked
- Check that the airflow is not obstructed.
- Is harmful dust, vapour, fumes being removed (remember some are invisible and have no smell)
- Are there any signs it is not working correctly, i.e. noises, vibration, smells, dust settling
- Inform your supervisor if you think anything is wrong with the system
Types of LEV

The following are examples of systems that provide LEV:

1. Fume cabinets ducted and re-circulating
2. Microbiological cabinets ducted and re-circulating
3. Fixed or trunked systems e.g. for local bench or machine ventilation
4. Extract canopies e.g. for welding and spraying.
5. Portable units e.g. for soldering or welding
6. Laminar flow cabinets for clean, sterile work or weighing chemicals

2 Fume cupboards, ducted and re-circulating.

Fume cupboards are designed to prevent exposure to harmful chemicals from their fumes and vapours. They are not designed for use with micro-organisms, microbiological safety cabinets must be used for this purpose.

There are three categories of fume cupboards at University of Sussex. A, B, & C

- A  Highly Toxic, Carcinogens and radioactive work
- B  Standard chemical work
- C  Chemical Storage only

The required face velocities are:

- 0.75ms for Type A cupboard at opening, up to the indicated safe working height.
- 0.50ms for type B cupboard at opening, up to the indicated safe working height.
- 0.20ms for type C cupboard at opening, up to the indicated safe working height.

Testing

The face velocity must be measured using a rotating vane anemometer at six positions with the sash at the appropriate height (500mm), see figure 1. An anemometer can be borrowed from the University Safety Office to check operation. Ensure the aperture is not obstructed and the air flow is not compromised by doors, windows or other equipment nearby.

If the required face velocity cannot be achieved at 500mm, then the sash can be lowered below 300mm in order to meet the correct value.

It is suggested that the correct operational sash height in mm for containment is marked on the sides of the cabinet using coloured tape (e.g. insulation tape). If this last point is not carefully observed, operators may not achieve containment and excess turbulence could result in fumes being swept back out of the cabinet and into the workplace. The fume cupboard, it must be remembered, will only give effective containment if operated at this height or below.

If, despite measuring the face velocities at lower sash heights, the fume cupboard still fails to meet the requirements, it must not be used. A notice must be placed on the sash informing users of this and suitable
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Repairs or maintenance initiated. Some fume cupboards can, and should be, locked off if found to be malfunctioning.

The University Safety Office and EFM manage a contract for the maintenance of fume cupboards. Records of Fume cupboard testing must be kept by the Safety Office for 5 years.

Also any fume cupboard that is fitted with wash down or scrubbing systems will require that these functions are checked for operation on a regular basis at the time of air velocity checks. For wash down these should be tested before the use of a substance that may require the wash to be used to ensure that the water supply is functioning.

Users who obtain new equipment must ensure that it is registered with the Safety office and EFM.

Figure 1

Operating procedures for Fume cupboards

Does and don’ts:-
- **Do not** sit in front of the fume cupboard with face below the level of the open sash, they are designed so the operator is in a safe position while standing at the cupboard or on a high stool.
- **Do not** obstruct the opening with equipment this causes air turbulence which reduces the effectiveness of the cabinet.
- **Do not** store other chemicals in the fume cabinet work area.
- **Do** check before starting that the fume cupboard operation indicator shows the system is safe to use
- **Do** keep chemical quantities and apparatus to a minimum
- **Do** keep the sash at the lowest possible working height and within the safe working height
- **Do** close the sash when you are away from the fume cupboard

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All of the above categories of microbiological containment cabinets must be tested every 6 months by an approved, certified contractor. These should include an annual test for operator protection as well as twice yearly volumetric airflow rate measurements.

The manager/supervisor of these microbiological systems must arrange these tests before systems are put into use, keep copies of the test certificates at the site of the work and provide copies to the University Safety Office.

When users are purchasing microbiological safety cabinets or arranging maintenance work they should always check the cabinets and the associated installation and servicing complies with the British Standard specifications.

Operating procedures for microbiological cabinets

Before use check:
- The laboratory doors and windows are closed
- Wear protective clothing,
- Check the cabinet is clean
- Clear the workspace inside the cabinet
- Allow air flow to stabilise turn on for 10 minutes before use
- Check the airflow indicator to ensure it is operating correctly (0.6m/s)
- Have the appropriate disinfection materials at hand

When working ensure:
- Material in the cabinet is kept to a minimum
- In the event of an alarm of air flow failure, power failure or fire alarm put lids on flasks and close the cabinet front.
- Do not work at the edges of the cabinet keep the work to the centre of the cabinet
- Do not obstruct the air inlets
- Treat and dispose of waste inside the cabinet

When you finish:
- Remove waste and treat according to waste procedures
- Remove samples, correctly sealed, to suitable storage
- Disinfect the cabinet work areas
- Close the cabinet front
- Do not turn off directly, leave air flow running for 10 minutes
The cabinet will require periodic decontamination and fumigation by an approved method.

3 Fixed or trunked systems

These systems are often used in workshops over machine tools used for machining wood or other materials that give off dust or where cooling/lubricating oils give off smoke or for areas that are used for soldering or welding. See figure 3 for example.

These systems should be tested every 14 months in accordance with the COSHH LEV regulations. (We advise annual testing.)

Guidance on air velocities at the entry point to the hood vary for different applications but a rough guide is:

- Vapours (e.g. steam, solvents) 5 m/s
- Fumes (e.g. oil, paint, smoke) 7.5 m/s
- Dust (e.g. wood dust) 10 m/s

These systems should be tested using a rotating vane anemometer at the entry point to the extract duct. An anemometer can be borrowed from the University Safety Office for this purpose. Supervisors of areas where these systems are installed should check they are tested as part of their regular safety inspections. If they do not have the facilities to test themselves that should contact their Schools safety coordinator.

Stickers with test date, retest date, tester name and air flow speeds achieved should be attached to the extract hood or the power switch where it is visible to any user. If a system fails the test a do not use label must be affixed to the power switch and a repair must be arranged.

Suitable labels are provided in appendix 1 that can be printed onto self adhesive sheets for this purpose.

Figure 3
Operating procedures for Flexible extract systems

- Check that the system to be used is operational and has a valid test sticker before starting work.
- Place the extract the other side of the work area from the operator so that fumes etc are drawn away for the operator.
- Adjust the extract so that it is as close as possible to the source of fumes etc.
- Ensure the extract does not obstruct or interfere with any moving part of the machinery or comes into contact with heat sources.
- Ensure that the extract does not interfere with any safety guards.
- Ensure that the extract does not obscure the vision of the operator.
- Check there is no buildup of flammable dust in the ducting particularly if to be used for welding/soldering.

4 Extract canopies

These systems are effective for welding and soldering areas, and also to be found over equipment such as autoclaves etc for ventilation of steam.

They can be used for paint spraying if the air flow is high and they have enclosed or partially enclosed sides.

Smoke tends to spill out of the sides of open canopies, see figure 4, if the airflow is low or the area is not contained with sides, see figure 5.
Air flow at the extract point from the hood should be 5 ms minimum and at least .5 m/s at the point of work.

These systems should be tested using a rotating vane anemometer at the entry point to the extract duct. An anemometer can be borrowed from the University Safety Office for this purpose. Supervisors of areas where these systems are installed should check they are tested as part of their regular safety inspections. If they do not have the facilities to test themselves that should contact their Schools safety coordinator. An additional test if there are concerns about the air flow at the point of work is to use a smoke generator, *a jos stick will suffice if smoke generator is not available*, at the point of work to ensure smoke is pulled away from the face of the operator.

Stickers with test date, retest date, tester name and air flow speeds achieved should be attached to the extract hood or the power switch where it is visible to any user. If a system fails the test a do not use label must be affixed to the power switch and a repair must be arranged. Suitable labels are provided in appendix 1 that can be printed onto self adhesive sheets for this purpose.

**Operating procedures for hood/canopy extract systems**

- Check that the system to be used is operational and has a valid test sticker before starting work.
- Keep work to the centre of the area below the hood.
- Check during operation that the smoke is being extracted and not leaking into the room.

5 **Portable units**

Portable units are many and varied which designed for particular applications. These usually have activated carbon filters or Hepa type filters to trap particles.

The most common if for electronic/electrical soldering work, they can be attached to the soldering iron tip or free standing, see example in figure 6.

Where significant use of a soldering iron is undertaken then these units should be provided as part of the risk assessment for the activity.
Where dusty operations are undertaken such as powder modeling, 3D printing or sanding, and there is no fixed installed extract available because the location is temporary or because of building design extract ducting is impracticable, then the risk assessment should consider a bench top extractor an example is shown in Figure 7 below.

Operating procedures for portable extract systems

- Check that the system to be used is operational before starting work.
- Check the filters are clean and fitted correctly before commencing work.
- Keep work as close to the point of extraction as possible.

6 Laminar flow hoods/cabinets

Laminar flow hoods are available as horizontal, vertical or reverse laminar flow, the first two types provide product protection only and must not be used when working with any form of biohazard or chemical hazard as any potentially hazardous aerosol that is created will lead to exposure of the operator and the environment. Horizontal-flow clean-air bench used for cell cultures can expose the researcher to aerosols of allergenic or infectious materials, vertical-flow clean-air bench also blows air out into the room. See figure 8 below as an example of a laminar flow cabinet.
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These cabinets or hoods are often used over microscopes to maintain a stable environment and to keep the sample uncontaminated.

Reverse flow cabinets, sometimes known as powder containment cabinets, are used to

If used to provide operator protection then these cabinet should be tested for functionality on an annual basis

Operating procedures for laminar flow cabinets

- Check that the system to be used is operational before starting work, flow indicator if fitted should read no less than 0.5m/s
- Check the filters are clean and fitted correctly before commencing work.
- Keep work as close to the centre of the cabinet or area under the hood as possible.
# Appendix 1

### LEV Test

**For Air speed required for this system**
Check in the University Safety Procedure
/Guidance SPG-1-09.

- **Test Date**: 
- **Next test due**: 
- **Tested by**: 
- **Air speed achieved**: 
- **Passed**
- **Failed**

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**For Air speed required for this system**
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