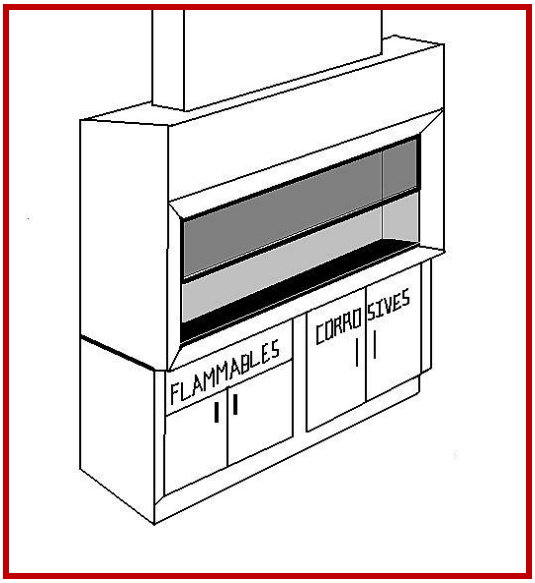
Health and Safety Services

University of Reading

Safety Guide 46
Part 4

Work Equipment

Local Exhaust Ventilation



Governance Directorate

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1. Scope

Safety Guide 46 Part 1 Management and Safe Use of Work Equipment describes the procedures for purchasing, using and maintaining all types of equipment used at work, including local exhaust ventilation (LEV). This Guide, Part 4, gives more detail on the specific requirements that apply to LEV systems. This should be read in conjunction with Part 1 and with relevant sections of Safety Guide 28, The Assessment and Control of Hazardous substances (COSHH). Particular reference should be made to Safety Guide 28 Part 6, Microbiological Safety Cabinets.

2. Introduction

The primary purpose of an LEV system is to remove or dilute a hazardous substance from the immediate work place, and hence prevent people inhaling airborne contaminants that could cause short or long term damage to health. The hazardous substance may be gases, dust and particulates, aerosols, vapours, fume, mist or other airborne contaminants. The LEV system will not eliminate the hazard, it just moves it to another location, nor will the LEV protect against contact hazards.

There are basically two types of LEV, capture or extract:

- capture systems are normally small local systems designed to provide point extraction. They remove the substance from the point of generation, to a filter pack or a capture container. An example would be a welding operation with a telescopic trunk leading to a filter drum;
- an extract system is normally a larger system, often built into the building, and will normally be from a fume cupboard or booth. The system will normally reduce the risk by dilution of the substance before venting it to the atmosphere.

The principal legislation is the Control of Substances Hazardous to Health Regulations 2002 (as amended) (COSHH) and supported by the Provision and Use of Work Equipment Regulations 1998 (PUWER). See Safety Guide 28 for further information on COSHH, and HSE guidance, *Controlling airborne contaminants at work*, Ref 1. for detailed guidance on the design, management and use of LEV systems.

In laboratories where there are microbiological hazards, the use of safety cabinets is mandatory where there may be exposure to aerosols of viable biological agents. Safety cabinets are a form of LEV and are subject to the requirements for regular examination and testing specified by COSHH – see Safety Guide 28 Part 6.

3. Responsibilities

3.1. Fixed systems

Schools/Units that use **fixed** LEV systems and Facilities Management Directorate (FMD) have a joint responsibility for LEV systems. 'Fixed' implies systems that are integral to the structure of the building, from the point of capture in a fume hood, to the ducting, fans and motors, power supplies and stacks/vents.

FMD are responsible for:

- arrangements for maintenance, inspection, thorough examination and repair.
- ensuring that the results of inspections and tests are communicated to the Schools that use those systems. This includes marking of systems with test pass/fail labels.
- specification of new systems that are supplied through FMD.
- the provision of documentation e.g. engineering schematics, performance standards, O&M manuals, users manuals, for new systems supplied through FMD.

Schools/Directorates/Units are responsible for:

- checking with FMD that the LEV systems that they use are included in the register of items maintained/inspected by FMD;
- using LEV systems in accordance with the user manual/operating instructions;
- checking that work undertaken in linked systems i.e. that discharge through common ducting/stacks, does not give rise to the mixing of incompatible substances;
- ensuring that work undertaken in LEV systems such as fume hoods is consistent with the level of protection/control provided by that system e.g. flow rates are adequate to protect the worker;
- training or users in correct operating procedures. This includes selection of the correct fume hood or cabinet for the proposed work, and recognising when systems are operating effectively or are out of test;
- providing information about the type of work and risks from substances/materials used in the LEV system to FMD on request, so that risks to FMF maintenance staff, contractors and engineering inspectors can be assessed and managed;
- making safe any LEV systems before maintenance work is undertaken (i.e. removing hazardous substances, decontamination, fumigation where necessary. Tasks such as electrical isolation is the responsibility of FMD).

FMD will consult the 'user' School/Unit about the necessity for approving repairs/maintenance following a formal inspection or examination. This is because in some circumstances the School may decide to take equipment out of use, or restrict the type of work that can be undertaken with it, rather than having it repaired.

3.2. 'Mobile' systems

Mobile systems are those which cannot be regarded as part of the infrastructure of the building e.g. microbiological safety cabinets which are stand-alone and not connected to ducting within the building. Where there is any doubt, the School/Unit and FMD must agree on responsibilities.

4. Requirements for LEV systems

The need for LEV must be as part of a COSHH assessment; it is to be considered when other means have failed to reduce the hazard. Under the COSHH regulations there is a Hierarchy of Control, as follows:

- eliminate the use of the hazardous substance wherever possible;
- replace it with a less hazardous substance;
- enclose the process to reduce the potential for exposure to the hazardous substance;
- control the exposure of the substance at source using engineering means (such as local exhaust ventilation - LEV);
- provide adequate protective equipment (such as respiratory protective equipment - RPE).

LEV has the following drawbacks:

- it is a mechanical system and therefore prone to failure;
- it only extracts from the point of source and is therefore dependent on proper set up and control;
- it only moves the hazard from the work location to another area i.e. vented to atmosphere at high level (possibly on the roof of the building) or to a filter pack – making the filter pack then a hazardous waste product to be disposed of.

LEV must be installed where airborne workplace exposure limits (WELs) (see Ref. 2 EH40 Workplace Exposure Limits, EH40/2005 Table 1) are still exceeded by the process after other controls have been put in place.

4.1. System procurement

HSE publication HSG258 section 5 (Ref. 1) gives detailed guidance on the procurement process that must be followed when buying LEV systems. This includes the need for the employer i.e. the University, to identify:

- other elements of the process that contributes to controlling exposure;
- operator's working practices;
- the nature of the contaminants, and how they may be generated;
- exposure limits, and any appropriate benchmarks for performance of the LEV e.g. a fraction of a WEL.

The system specification must include the need for:

- indicators to show that the system is working effectively;
- the LEV to be easy to use, clean, check and maintain;
- the supplier to provide training to University staff in operational and maintenance procedures;
- the supplier to provide a user manual that describes and explains the LEV system, including how to use it, check, maintain and test it, along with performance benchmarks;
- the supplier to provide a logbook for the system to record the results of scheduled checks and maintenance.

4.2. System design

The principles of good design for different types of LEV are given in sections 6 and 7 of HSG258 (Ref. 1). Competent persons must be engaged to undertake system design. An appropriate qualification is *P601 Initial Appraisal and Thorough Examination and Testing of Local Exhaust System,* British Occupational Hygiene Society (Ref. 3). Other routes are via UKAS and CIBSE (see Ref. 1).

4.3. Installation and commissioning

Commissioning is proving that an LEV system is capable of providing adequate control. Commissioning should cover both 'hardware' checks and work practices and include:

i. verifying that the system is installed as designed;
ii. showing that the LEV system meets the specified technical performance;
iii. demonstrating that the system adequately controls contaminants;
iv. reporting readings as benchmarks for subsequent examination and tests.

The LEV commissioning report, together with the user manual, is the basis of the statutory thorough examination and test (see section 4.5).

4.4. Documentation

LEV systems need both a 'user manual' and a system 'logbook' or equivalent record system.

A user manual should include:

i. simple 'getting started' instructions for users;
ii. detailed technical information for service providers and maintenance/repair engineers.

An LEV system logbook (or equivalent) should contain schedules and forms to keep records of regular checks, maintenance and repair, in accordance with predefined schedules. These may include daily, weekly and monthly checks for each item in the LEV system, including both hardware and operator's working practices.

Both documents must be kept up to date and be readily available for reference by users or maintainers.

4.4.1. Existing systems

Where existing systems do not have any documentation, the School/Directorate and FMD should agree how to obtain expert advice from the supplier, engineering inspector, or an occupational hygienist so that procedures for inspection, maintenance and use can be prepared. It is possible that the report of the annual thorough examination and test (see section 4.5 below) will provide the basis for a system logbook. As a minimum existing LEV systems with no documentation must show effective control, and have performance data measured and recorded.

Further information on user manuals and system logbooks is given in section 9 of Ref. 1.

4.5. Thorough examination and test

All LEV systems must have a statutory 'thorough examination and test' by a competent person to comply with COSHH. The timescale between examinations is 14 months; in practice it is best to plan for annual examinations. Where wear and tear may lead to degradation of the system, more frequent examinations and tests may be required. The objective of the testing is to find any significant defects and to have them remedied to regain control.

System examiners must be competent e.g. via British Occupational Hygiene Society (BOHS) and equivalent. They will normally be an engineering inspector.

Schools/Directorates must ensure that the inspector is informed of any risks from the system under test, such as health risks from residues within the system, and safety risks from the mechanical parts of the LEV, work at height, electricity etc. A Permit to Work may be required, depending on the LEV system.

The inspector must provide a record of the results, including any remedial actions required. Any systems that fail must be clearly identified and if necessary isolated or locked off to prevent use. Such repairs as required to achieve an acceptable level of control must be undertaken before the system is brought back into use. All examination and test reports must be kept for at least five years (by FMD for fixed systems, and by the owning department for mobile systems, unless the department can readily access the results by other means e.g. on-line).

Guidance:

Current practice is that where the 'annual' inspection and test is carried out by the University engineering inspector (currently RSA), the test results are sent to MSD for onward transmission to the School/Unit. MSD also retain a copy. In future Schools/Units will able to access data through an on-line web based system. RSA have confirmed that the annual thorough examination and test will provide performance data for existing systems and engineers can advise on whether or not performance is acceptable for the type of work being undertaken.

The examiner must attach a test label to each hood when tested. This should state test date and next test date. Where the system fails, the examiner must instead attach a 'fail' label (generally red) to the hood.

5. Operational use

All users must be trained in safe operation of the LEV system. Without an understanding of the aim and design parameters, operators cannot use the equipment effectively, thereby risking their health as well as the health of those around them.

Users of extract systems must assess the system holistically. It is common for fume cupboards in a laboratory complex to share an extract system using balanced flow systems; in such cases all the fume cupboards will eventually flow through the same stack. The potential for vapours, fumes and dusts to intermingle in an extract system must be considered, and the potential for incompatible materials to mix must be removed by planning and communication with other users. If there is a potential to

intermix, all hoods/canopies/enclosures etc within the total system must be marked with adequate warnings.

Operational rules and instructions must be clear, relevant and understood by all who may be affected by the contaminant being extracted. Depending on roles, they should cover the following points:

- how to achieve and check for acceptable airflow and control;
- identification of trained employees or contractors appointed to carry out checks, maintenance and repairs, including alarm testing;
- training requirements for operators, supervisors and managers, in the use, checking and maintenance of the system;
- the frequency of checks, maintenance and replacement schedules in the user manual must be adhered to;
- for materials with acute toxicity effects, how to recognise that the system has failed e.g. alarms and airflow indicators, and emergency actions to take if the extract fails;
- if the process changes, the LEV system must be re-commissioned and the users re-trained. Consideration must also be given to the possible need to 'clean' the system of any residues from previous uses;
- arrangements for the annual thorough examination and test;
- procedures for implementing promptly any recommendations in the test report, unless the system is to be 'downgraded' or taken out of use;
- any LEV equipment with a red 'fail' label must not be used;
- all LEV systems must be clearly marked with a valid test/re-test date, as positive indication that it is 'in test';
- in mixed or shared extract stack systems, an assessment of the need to restrict the use of certain substances must be undertaken to prevent the mixing of incompatible substances in the extract stack;
- fume cupboards should never be used to store substances; the potential for an electrical or mechanical failure leading to a build up of toxic or otherwise hazardous substances is too great.

Records of all training, including refresher training, must be kept and only those trained are authorised, in writing, to use the system. This applies to all users (whether staff or students). See the suggested training topics below:

Guidance: Suggested training topics for use of LEV systems

Training should cover the basics of:

- The harmful nature of the substances being used or generated
- How exposure might occur
- How the LEV system works
- Methods of working that get the best out of the LEV
- How to check the LEV is working
- How to recognise that there may be a problem
- The consequences of the LEV failing
- What to do if something goes wrong

Suggested checks and maintenance for LEV systems (from INDG 408)	
Operator	Make daily checks, report faults.
Supervisor, technician	Make weekly and monthly checks, identify the need for repairs, correct deviations from the standard operating procedure, record findings and actions.
Senior technician, Area Health and Safety Co-ordinator, Building Manager	Identify problems, receive regular reports from the supervisor/technician, check that maintenance and testing is undertaken by FMD, confirm arrangements for 'thorough examination and test' with FMD.
FMD MSD	Arrange maintenance and repair, inspections and thorough examinations for fixed systems. Make results available to users. Take systems out of use if they fail inspections/tests.

6. References

1. *Controlling airborne contaminants at work. A guide to local exhaust ventilation (LEV).* HSG258, HSE, 2008.
2. *EH40 Workplace Exposure Limits,* EH40/2005, HSE, 2005.
3. *P602 Basic Design Principles of Local Exhaust Ventilation Systems*. British Occupational Hygiene Society.
4. *P601 Initial Appraisal and Thorough Examination and Testing of Local Exhaust Systems.* British Occupational Hygiene Society.