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The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

POLICY AND GUIDELINES

THE DESIGN INSTALLATION AND ONGOING MAINTENANCE & TESTING OF LOCAL EXTRACT VENTILATION

Contents

1 Introduction & Scope

This document has been written to ensure that the University complies with The Control of Substances Hazardous to Health (COSHH) Regulations 2005 and in accordance with HSE Guidance 'Controlling Airborne Contaminants at Work – A Guide to Local Exhaust Ventilation, HSG 258.

Local Extract Ventilation (LEV) is the name given to equipment used to protect an operator from hazardous substances including dusts, chemicals or micro-organisms. LEV can take a variety of forms depending on the type of contaminant /process that it is to control exposure to. Appendix I shows a variety of different types of LEV that may be in use within the University to control exposure and therefore that will fall within the scope of this policy.

Contaminants which require exposure control may be in the form of gas, vapour, mist, dust/powders, and nano materials and can include chemical substances [carcinogens, mutagens, toxins, flammable solvents] and micro-organisms.

2 Legislation

The requirements for control of exposure to dusts, chemicals and micro-organisms is detailed in The Control of Substances Hazardous to Health Regulations 2004 (COSHH) which set out a hierarchy for the means to control risk as follows:

In order of priority:

1. Eliminate the use of a harmful product or substance and use a safer one.
2. Use a safer form of the product, e.g. paste rather than powder or a substance of lower risk
3. Change the process to emit less of the substance
4. *Enclose the process so that the product does not escape*
5. *Extract emissions of the substance near the source*
6. Reduce the number of people exposed
7. Provide personal protective equipment (PPE) such as gloves, coveralls and respiratory protective equipment (RPE). [**Note** that PPE is the last resort and should not be considered as a substitute for the other control measures outline above. RPE may be appropriate for emergency response situations or in addition to LEV to control residual risk.]

Where it has not been possible to reduce risks using control approaches 1-3 above, LEV may therefore be used in combination with an enclosure to meet the requirements of the COSHH Regulations.

The need for LEV should be identified as a result of risk assessment of the entire process. This will include considering the following:

- Hazardous properties of the substances and any intermediates involved
- Physical properties of the substances/intermediates
- The quantities used
- Experimental procedures that may increase risk [e.g. aerosol generation]
- Equipment required for the process and its maintenance
- Foreseeable future changes to the process

A risk assessment will be required in the following circumstances:

- Introducing a new process using one or more hazardous substances
- Changing an existing process to use more hazardous substances
- Purchasing new equipment or employing new techniques
- Re-siting or re-locating an existing process/equipment that uses extraction

- Re-using existing ventilation equipment for a different purpose than it was designed for.

3 Responsibilities

The Head of School or management unit has ultimate responsibility for safety within the School or facility. The Head of the Research Group/Principle Investigator (PI) is responsible for the safety of staff or students working with the process and consequently has responsibility for ensuring that any LEV identified as required by risk assessment is

- fit for purpose – i.e. designed, installed and commissioned by competent persons
- used correctly
- subject to thorough examination, testing and routine maintenance (TExTM) by competent persons [as required by the COSHH Regulations].
- subject to ongoing monitoring checks locally at suitable frequency as determined by risk assessment

A preliminary risk assessment should be carried out for the process by the process owner (Principal Investigator and/or Head of the Research Group). Appendix II will assist in ensuring that the relevant information is provided. This assessment must then be made available to the School Safety Officer (SSO) who may draw on advice from the Safety Office in order to establish the correct means of controlling exposure. This information will also form the basis of the information that will be provided to the LEV designer. The result of this initial assessment could indicate that no additional extract is required and that natural ventilation will suffice or it may identify the need for some form of LEV.

4 Design

Where LEV is identified as being required it must be designed by a professional company that is competent in designing LEV systems and be able to provide evidence of this. Suitable evidence would include membership of the following bodies:

- Chartered Institution of Building Services Engineers (CIBSE) www.cibse.org.
  The main professional engineering body offering qualifications and membership to ventilation engineers.

- Building and Engineering Services Association www.b-es.org/ (formerly Heating and Ventilating Contractors' Association (HVCA) www.hvca.org.uk).
  The main representative organisation for companies installing ventilation systems including LEV.

- British Occupational Hygiene Society (BOHS) www.bohs.org.
  For help with process and source assessment and LEV design and specification, as well as qualifications in designing and testing LEV. For general advice on choosing LEV systems.

- Safety Assessment Federation (SAFED) www.safed.co.uk.
  Represents many insurance companies doing independent engineering inspection and certification of machinery and equipment including LEV systems.

- Independent National Inspection and Testing Association (INITA) www.inita.org.uk.
  Represents companies doing independent engineering inspection and certification of machinery and equipment including LEV systems.

- Solids Handling and Processing Association (SHAPA) www.shapa.co.uk. Represents the major employers in LEV manufacturing

The designer should

- Be a specialist in the supply of LEV to laboratories and research institutions
- Have successfully applied LEV to similar processes or activities
- Be able to provide references, testimonials or examples showing successful installation of LEV systems
- Be able to offer independent advice

The process owner (PI/Head of Research Group) will provide the designer with details of the work to be done and information about any environmental or fire and explosion requirements including safety data sheets and hazard information, SOPs and details of all the plant and equipment to be used. The designer or process owner should produce a drawing of the area and the processes to be controlled.

The designer should visit the site to see the processes and any other extract equipment in the vicinity as these may affect the operating characteristics of the design or the equipment already installed. If the design for the new equipment is to be incorporated into part of the existing extraction systems, this must not compromise the effectiveness of the existing system nor allow contaminants to spread to other areas if the main extract system is not operational. The design must take account of the supply and make up air systems as these can significantly affect the operation and containment capabilities of the LEV system.

5 Specification:

The specification produced by the designer should:

Describe the process, the contaminant, its hazards and the sources to be controlled, and how stringent the control needs to be. The important chemical and flammable properties of substances and products appear in the Safety Data Sheet;

Require indicators to be fitted to show that the system is working properly;

Require the LEV to be easy to use, check, maintain and clean, taking account of other risks, e.g. accessibility, skin contamination, and waste removal and filter changing without spreading contamination;

Specify that the supplier provides training in how to use, check and maintain the LEV system;
Require the supplier to provide a user manual that describes and explains the LEV system, how to use, check, maintain and test it, along with performance benchmarks and schedules for replacing parts;

Require the supplier to provide a logbook for the system to record the results of checks and maintenance.

6 Supply

Having specified a design the specification may be sent to a number of suppliers approved for the supply and installation of the equipment and to provide the information, documentation and training specified in the design. The designer may also act as a supplier. Suppliers are to:

- Be a specialist in the supply of LEV to laboratories and research institutions
- Have successfully applied LEV to similar processes or activities
- Be able to provide references, testimonials or examples showing successful installation of LEV systems
- Be members of a suitable trade association and subject to independent assessment such as the Building and Engineering Services Association (formerly HVCA)

The suppliers (or designer's) more detailed specification should:

- provide technical drawings of the system;
- state the type of hood for each source, its location or position, face velocity, static pressure;

- include information on any constraints, e.g. the maximum number of hoods in use at any one time;
- describe the ducts – material, dimensions, transport velocity (if appropriate) and volume flow rate;
- include details of how the airflows in different branches of the LEV will be balanced;
- describe any air cleaner – specification, volume flow rate, and static pressure ranges at inlet, outlet and across the cleaner;
- describe the fan or other air mover – specification, volume flow rate, static pressure at inlet, and direction of rotation of fan;
- describe how and where extract air is to be discharged safely out of the building or
- for systems that return air to the workplace, provide information on air cleaner efficiency and sensors;
- describe the indicators and alarms to be provided in the system;
- provide information on the installation requirements;
- provide adequate training in using, checking and maintaining the LEV system;
- provide both a user manual and a logbook.

7 Installation

The designer may also build and install the system or this may be carried out by another suitably competent organisation.

The contractor chosen to install the equipment must provide a suitable risk assessment and method statement for the work and appropriate risk assessments. The operatives carrying out the work must be suitably trained and competent and must have undergone Estate Office Contractor Training. In addition they must receive suitable safety induction training for the building where they are working from the School Safety officer or other nominated individual before work commences.

On installation, the supplier should test the LEV to ensure it is working according to the specification and that any necessary balancing of the airflows has taken place. The supplier will provide commissioning records to demonstrate that the equipment is effective.

8 Commissioning Performance Tests

Following installation it will be necessary to carry out various commissioning and performance tests to:

- Verify that the system has been installed as per the initial design and
- Verify that the system meets the specified technical performance
- Verify that the system provides adequate control of the contaminants
- Provide benchmark readings for subsequent examinations and tests

This LEV commissioning report should be undertaken by a company other than the designer/supplier of the LEV. This report together with the suppliers ‘user manual’ is the basis for the ongoing annual TexTM

A copy of the commissioning report, user manual and log book must be given to the safety officer for inclusion in the School safety system.

9 Documentation

Following successful commissioning and performance tests the following documentation must be provided by the supplier to the end user.

A report that includes:

- diagrams and a description of the LEV, including test points;
- details of the LEV performance specification;
- results, such as pressures and velocities at stated points;
- calculations;

- written descriptions of the commissioning, the tests undertaken, and the outcome. Where necessary, this should include air sampling results;
- a description of how operators should use the system so it works effectively.

A 'user manual' with a general specification of what the LEV system is designed to control and how it achieves control. It should include:

- a description of the system with diagrams;
- drawings as installed
- performance information from commissioning;
- a description of checks and maintenance and replacement schedules, including frequency;
- a listing of replaceable parts (and part numbers);
- a detailed description of the specific statutory 'thorough examination and test' requirements and exposure targets;
- signs of wear and control failure;
- a description of how operators should use the system so it works effectively.

A logbook that includes:

- schedules for regular checks and maintenance;
- records of regular checks, maintenance, replacements and repairs;
- checks of compliance with the correct way of working with the LEV system;
- the name of the person who made these checks.

Relevant sections of this information provided should be incorporated into the Standard Operating Procedure (SOP) for the process.

10 Training

Technical staff and operators must be trained by the supplier in how the LEV works and how to check and maintain it.

Training should cover the basics of:

- the harmful nature of the substances used
- how exposure may occur
- how the LEV system works
- methods of working that get the best out of the LEV
- how to check the LEV is working
- the consequences of the LEV failing
- what to do if something goes wrong

11 Thorough Examination, Testing & Maintenance [TExTM]

The COSHH Regulations require that LEV systems provided to control exposure must be subject to thorough, examination testing and maintenance at intervals to ensure that they remain effective at all times. These tests must be carried out in accordance with any relevant British Standard or other Technical Standard by a competent contractor. Suitable evidence of competence would be attainment of the BOHS P601 Module: Initial appraisal and through examination and testing of LEV systems'

11.1 Testing frequency

The maximum time between such tests is considered as 14 months for most systems which in practical terms is taken to mean annually. However if the wear and tear on the system is such that it is liable that effectiveness will degrade between tests, or if the LEV is used to control exposure in very high risk processes [e.g. processes using Hydrofluoric acid] the tests should be carried out more frequently.

11.2 Preparation for TExTM

The LEV owner and examiner will need to co-operate to ensure that risk are minimised for both the examiner and any local workers who may be affected by the work of the examiner. LEV should be cleaned by the owner as far as reasonably practicable and suitable documentation provided to the examiner to this effect. See Entry into Hazardous Areas policy.

Where residues that may be harmful to the examiner cannot be effectively removed then the examiner must be informed accordingly about this and any PPE requirements to protect the examiner.

11.3 Information

Wherever possible the examiner should be provided with the following information:

- Commissioning report & figures
- User manual
- System logbook
- Confirmation there have been no changes to LEFV/layout or process since last test.

On completion of the tests the examiner will attach the a test label to each LEV system/ hood which shows the date the test was undertaken, date of next test and the name of the examiner. They must also provide a written report for the local Safety Officer. Where a LEV system fails the test the examiner must label the LEV accordingly and also verbally inform the local Safety officer/technical manager that the equipment has failed.

11.4 University Arrangements for LEV Testing;

Currently the Estate Office arrange for annual TExTM for ducted fume cupboards in all areas except embedded units in hospitals [QMC & CH], which are organised by NUHT Estates.

Testing of all other LEV [recirculating FCs, Microbiological Safety Cabinets- ducted & recirculating, capture hoods, receiving hoods] is arrange and managed locally by Schools/departments

11.5 Routine checks at suitable intervals [daily/weekly/monthly] as determined by risk assessment must be undertaken by a suitable trained worker. The nature of the routine tests will depend on the type of LEV but must be defined in the log book and results recorded. The results of test measurements such as face velocities should be compared to the data provided at annual TExTM and any loss of performance or other defects reported immediately to the appropriate manager and the equipment taken out of use.

12 Decommissioning

Where LEV is no longer required and needs to be removed consideration must be given to the decontamination of the equipment. The extent and type of decontamination required will depend on the nature of substances extracted by the system and the accessibility to the various parts of the system. Decontamination of the LEV may be undertaken internally, by suitably competent contractors or a combination of both. A suitable risk assessment must be undertaken and information about the nature and quantities of substances used must be made available to those undertaking this process.

Where decontamination of any part of the system is undertaken in house, this must be confirmed in writing to the contractor who will carry out the decommissioning works.

13 References

HS (G) 258 - **Controlling airborne contaminants at work**
A guide to local exhaust ventilation (LEV)

INDG 408 - **Clearing the air**
A simple guide to buying and using local exhaust ventilation (LEV)

L5 - The Control of Substances Hazardous to Health Regulations 2004

14 Appendices

APPENDIX I **Typical Examples of LEV that may be found in UoN**

Fully/partial enclosing cabinet e.g. re-circulating/ducted Microbiological Safety Cabinet or recirculating fume cupboard		Receiving hood/canopy (low velocity)		Hand held tool extraction system	
Capturing hoods (high velocity)		Glove box		Vehicle exhaust extraction system	
Downdraught tables e.g. dissection table.		Transportable extraction system e.g. Nilfisk		Welding fume extract system	
Weigh-safe 'type' system [Note that this type of equipment is not suitable for controlling exposure to hazardous substances - use for nuisance dust only]		Fixed extraction system e.g. woodworking machinery		Ducted/extracted chemical storage cupboards	
Solder fume extract system		Spray booth		Wall/window mounted fans specifically provided to extract contaminants	

Appendix II: INFORMATION REQUIRED FOR PROVISION AND DESIGN OF LOCAL EXHAUST VENTILATION

School/Dept/ Research group			
Responsible PI		**School/Div Safety Officer**	

The following information must be supplied by the PI to the SSO/DSO in order to ensure that LEV is the correct means of controlling exposure and to provide the designer with the necessary information to ensure the LEV will be fit for purpose

Proposed location of work	
Name and brief description of the Process(es) to be undertaken.	

Details of Risk Phrases [RP] and Hazard Statements [HS] and Workplace Exposure Limits [WEL] are contained within the Material Safety Data Sheets [MSDS] which is supplied with the substance. Appendix I gives more detail of the RP & HS. The MSDS [section 9] also contains information on physical properties of liquids [e.g. flammability]

Solid substances used in the process	RP/HS	WEL	Dustiness[low/med /high]	Is the particle size of the substance <100nm in 1 or 2 dimensions [give detail]	Is the material a respirable fibre as defined in * note below [give detail]	Typical quantities used in process
Does the process involve vigorous mixing /shaking in open/partially open vessel - if YES give details	**Details**					

***Note The World Health Organisation defines a respirable fibre as an object with a length >5μm, width 3μm and a length:width (aspect) ratio >3:1**

Liquids	**RP/HS**	**WEL**	**Boiling point**	**Temp of reaction**	**Vapour pressure**	**vapour density [relative to air]**	**Flammability [F/HF/EF]**	**Explosive limits**	**Typical quantities used in process**	**Volume of room**

Does process involve having large items of equipment which need to be accommodated within the enclosure - if YES give detail - where possible provide associated documentation - e.g. brochure/manual	**Details**
Does the process involve vigorous mixing /shaking in open/partially open vessel - if YES give details	**Details**

Gases **[include gases used in the process and any waste gases produced by the process.**	**RP/HS**	**WEL**	**Flammability [F/HF/EF]**	**Explosive limits**	**vapour density [relative to air]**	**Rate of release of process gases and waste gases**	**Volume of room**

Does process involve having large items of equipment which need to be accommodated within the enclosure - if YES give detail - where possible provide associated documentation - e.g. brochure/manual	**Details**

R	CHIP R-phrases	H	CLP-GHS Hazard (H) statements
20	Harmful by inhalation	300	Fatal if swallowed
21	Harmful in contact with skin	301	Toxic if swallowed
22	Harmful if swallowed	302	Harmful if swallowed
23	Toxic by inhalation	304	May be fatal if swallowed and enters airways
24	Toxic in contact with skin	310	Fatal in contact with skin
25	Toxic if swallowed	311	Toxic in contact with skin
26	Very toxic by inhalation	312	Harmful in contact with skin
27	Very toxic in contact with skin	314	Causes severe burns and eye damage
28	Very toxic if swallowed	315	Causes skin irritation
34	Causes burns	317	May cause an allergic skin reaction
35	Causes severe burns	318	Causes serious eye damage
36	Irritating to eyes	319	Causes serious eye irritation
37	Irritating to respiratory system	330	Fatal if inhaled
38	Irritating to skin	331	Toxic if inhaled
39	Danger of very serious irreversible effects	332	Harmful if inhaled
40	Limited evidence of a carcinogenic effect	334	May cause allergy or asthma symptoms or breathing difficulties if inhaled
41	Risk of serious damage to the eyes	335	May cause respiratory irritation
42	May cause sensitisation by inhalation	336	May cause dizziness or drowsiness
43	May cause sensitisation by skin contact	340	May cause genetic defects (route if relevant)
45	May cause cancer	341	Suspected of causing genetic defects (route if relevant)
46	May cause heritable genetic damage	350	May cause cancer (route if relevant)
48	Danger of serious damage to health by prolonged exposure	351	Suspected of causing cancer (route if relevant)
49	May cause cancer by inhalation	360	May damage fertility or the unborn child (effect if known, route if relevant)
60	May impair fertility	361	Suspected of damaging fertility or the unborn child (effect if known, route if relevant)
61	May cause harm to the unborn child	362	May cause harm to breast-fed children
62	Risk of impaired fertility	370	Causes damage to organs (organ if known, route if relevant)
63	Possible risk of harm to the unborn child	371	May cause damage to organs (organ if known, route if relevant)
64	May cause harm to breastfed babies	372	Causes damage to organs through prolonged or repeated exposure (organ if known, route if relevant)
65	Harmful: may cause lung damage if swallowed	373	May cause damage to organs through prolonged or repeated exposure (organ if known, route if relevant)
66	Repeated exposure may cause skin dryness or cracking	EU66	Repeated exposure may cause skin dryness or cracking
67	Vapours may cause drowsiness and dizziness	EU70	Toxic by eye contact
68	Possible risk of irreversible effects	EU71	Corrosive to the respiratory tract