The routine maintenance and inspection of local exhaust ventilation (LEV)

This document details the standards for inspection and maintenance that should be achieved for all local exhaust ventilation owned and operated by the University. The requirements are based on best practice and when met will ensure the University meets its legal obligations to provide and maintain safe equipment and a safe working environment.

It is outside the scope of this document to provide detailed guidance for specific testing methods or maintenance activities. The inspection and maintenance required to ensure systems continue to perform to an acceptable standard will be detailed in the user manual for each system. Staff undertaking the routine maintenance and inspection of LEV systems may need additional information, instruction and training. Equipment to measure air flow and measure the concentration of contaminants in air will be necessary.

Summary of requirements
- Local exhaust ventilation is maintained in an efficient state, in efficient working order and in good repair at all times.
- Annually, as a minimum, the Head of Technical Services will check to ensure that Technicians maintain a comprehensive manual for LEV systems in their area.
- A suitable log book and user manual, containing the commissioning details, is available for each LEV system at its location.
- Competent people are identified to carry out the routine maintenance and inspection of each LEV system and have been provided with the training and equipment necessary to carry out these duties.
- The results of all maintenance and inspections are recorded and the records kept for the period specified in the H&S document retention schedule (see intranet pages for details).
- All staff using and operating LEV have sufficient information, instruction and training to do so.

Related Documents
- UAL Health and Safety Standard ‘The inspection and maintenance of work equipment’
- ‘INDG 408 Clearing the air – a simple guide to buying and using local exhaust ventilation’ HSE
- ‘HSG 258 Controlling airborne contaminants at work – A guide to local exhaust ventilation’ HSE 2011

Related legislation
- The Control of Substances Hazardous to Health Regulations 2002
- The Provision and Use of Work Equipment Regulations 1998
- The Management of Health and Safety at Work Regulations 1999
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Introduction.
1. Local Exhaust Ventilation is complex machinery that requires careful installation, commissioning and on-going maintenance and inspection. LEV should never be modified by anyone other than a competent LEV engineer or designer.
2. LEV will only be installed when there is a significant risk to health from airborne contaminants; dust, mist, fume, vapour or gas. To control these risks LEV must be maintained in an efficient state, efficient working order and in good repair at all times.
3. The Control of Substances Hazardous to Health Regulations 2002 (COSHH) requires that all LEV is subject to a thorough examination and test at specified frequencies (see appendix 1). LEV will also require regular inspections and routine maintenance in addition to the thorough inspection and testing to ensure the equipment is working as intended.
4. A well-designed and implemented regime of maintenance and inspection should identify any faults with the LEV system and prevent equipment failing the thorough inspection and test.
5. In addition to routine maintenance and inspection of LEV systems periodic measurements of the level of contaminant in the air should also be carried out. This should be done at least every 12 months.

Principles of an LEV system.
6. LEV is an engineering control system to reduce exposure to airborne contaminants such as dust, mist, fume, vapour or gas in a work place. Most systems have the following components.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Hood</td>
<td>This is where the contaminant cloud enters the LEV</td>
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<tr>
<td>Ducting</td>
<td>This conducts air and the contaminant from the hood to the discharge point</td>
</tr>
<tr>
<td>Air cleaner or arrestor</td>
<td>This filters or cleans the extracted air. Not all systems need air cleaning</td>
</tr>
<tr>
<td>Air mover</td>
<td>The 'engine' that powers the extraction, usually a fan</td>
</tr>
<tr>
<td>Discharge</td>
<td>Releases the extracted air to a safe place. Usually to a collection bag, filter or the atmosphere.</td>
</tr>
</tbody>
</table>
7. To work efficiently the velocity of the air at both the hood and in the ducting must be maintained within the design parameters. To ensure this each part of the system has to be working properly with minimal damage, loss of power or function. Routine maintenance and inspection, in addition to the thorough examination and inspections, is the only way to ensure the system remains in good working order.

**User manuals and log books**

8. All LEV systems must have a log book and user manual. The user manual will include commissioning details. The manufacturer should provide these documents when handing over the system. If these documents are not available they must be replaced as they are essential to identifying suitable inspection and maintenance regimes. Replacement documents must be prepared by a competent person i.e. an LEV engineer or an occupational hygienist specialising in LEV. The original supplier may also be able to provide replacement documents.

**User manual**

9. A comprehensive user manual should be in two parts; the first section provides simple getting started instructions. The second section provides detailed technical information for operators and maintenance/ repair engineers. The detailed technical information usually includes:
   - The purpose and description of the LEV system, including diagrams and drawings.
   - How to use the LEV.*
   - The schedule, frequency and description of checks, maintenance and replacement including signs of wear and control failure.*
   - A detailed description of the specific statutory ‘thorough examination and test’ requirements and benchmarks.
   - The performance information from commissioning.
   - A listing of replacement parts (and numbers).

* The content of these sections of a user manual are most relevant to this document and are expanded in Table 1 below.
Table 1: Technical information included in the User Manual

<table>
<thead>
<tr>
<th>How to use LEV</th>
<th>Inspection checks and maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>The details of operation and use could include:</td>
<td></td>
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<tr>
<td>• Identification of adjustable controls that affect the system’s performance e.g., dampers.</td>
<td></td>
</tr>
<tr>
<td>• The position of hoods, sash openings etc., for optimum performance.</td>
<td></td>
</tr>
<tr>
<td>• Operator practice, including positioning of process equipment and methods of working.</td>
<td></td>
</tr>
<tr>
<td>• Other factors affecting LEV performance such as draughts from open doors and the use of additional fans for cooling.</td>
<td></td>
</tr>
<tr>
<td>The details of checking and maintenance should include:</td>
<td></td>
</tr>
<tr>
<td>• Ductwork condition, especially flexible ducts.</td>
<td></td>
</tr>
<tr>
<td>• Mechanical integrity, e.g. corrosion, damage, seals, dampers, sash suspensions etc.</td>
<td></td>
</tr>
<tr>
<td>• Cleanliness of hoods, especially canopies and duct interiors.</td>
<td></td>
</tr>
<tr>
<td>• Operation of monitors, air flow indicators etc.</td>
<td></td>
</tr>
<tr>
<td>• Pressure relief or inerting systems, if applicable.</td>
<td></td>
</tr>
<tr>
<td>• Test for leakage.</td>
<td></td>
</tr>
<tr>
<td>• Illumination in booths and hoods.</td>
<td></td>
</tr>
<tr>
<td>• Noise levels.</td>
<td></td>
</tr>
<tr>
<td>• Alarm systems operating correctly.</td>
<td></td>
</tr>
<tr>
<td>• Water quality, if appropriate.</td>
<td></td>
</tr>
<tr>
<td>• Make-up air without draughts or blockages.</td>
<td></td>
</tr>
<tr>
<td>• List of spare parts required.</td>
<td></td>
</tr>
</tbody>
</table>

LEV system log book
10. All LEV systems must have a log book and the log book should be kept up to date. The log book contains:
| 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. |

What should be included in a routine inspection?
11. The user manual and log book will detail what inspection checks should be carried out and the frequency of these checks. These will have been determined by the designer of the LEV system or, if being prepared for an existing system, an LEV engineer or an occupational hygienist specialising in LEV.
12. The recommendations in the user manual and log book should always be followed unless it can be shown that there is a more suitable process for ensuring, as far as is reasonably practicable, the equipment is in an efficient state, in efficient working order and in good repair at all times. These three requirements have slightly different meanings.
Efficient state | General safe condition of the equipment
---|---
Efficient working order | Everything that might have a bearing on safety is working as it should
Good repair | Appropriate repairs and maintenance have been done to the correct standard

**Examples of what should appear in the log book’s checklists include the daily, weekly and monthly checks for each component of the system. For example the:**
- Hoods, including airflow indicators, physical damage and blockages.
- Ducts, including damage, wear and partial blockage.
- Dampers – position.
- Air Cleaner, including damage, static pressure across the cleaner and failure alarms.
- Air mover, including power consumption and changes in noise and vibration.
- Maintenance carried out.
- Replacements made.
- Planned and unplanned repairs.
- Operator’s use of LEV – check they are following the correct procedures.
- Space to report the results of each check against item.
- Signature and date.

**Specific examples include:**
- Clearance time for booth.
- Receiving hood position, particularly for moveable hoods.
- Capturing hood and working zone within the capture zone.
- Operator making sure the source is well within a partial enclosure.
- Clutter obstructing LEV.
- Checking the fan noise and keeping the impellers clean.
- Fan bearing replacement.
- Filter material replacement.

**Methods to assess performance**
13. There are a variety of methods to assess the performance of LEV and the most appropriate method will be described in the user manual. Below is an outline of some of the most common methods.

- **Full enclosures** - Measure the static pressure between the interior of the enclosure and the workroom. The pressure in the interior must be lower than the workroom.
- **Partial enclosures – Booths/fume cupboards** - Measure the face velocity. Readings should not vary excessively. Fume cupboards and safety cabinets should also be further tested according to appropriate BS or EN Standards.
- **Receiving hoods including canopies and capturing hoods** - Measure the face velocity. For larger hoods, measure at several points over the face. Readings should not vary excessively.
- **Capturing hoods – Slots** - Measure the air velocities at equidistant points along the entire length and average the readings. Readings should not vary excessively.
• **Hood static pressure** - Measure the hood static pressure. If an airflow monitor is fitted, check the reading is correct.

• **Plenums** - Measure the static pressure of the plenum (the enclosure behind certain types of hood) as well as the hood duct measurement.

• **Ducts** - Measure the air velocity in the duct serving each hood, where this is possible. Measure in a straight section of duct – the measuring point should be well downstream of bends and other turbulence sources.

• **Fan/air mover** - Measure the static pressure at the fan inlet and the volume flow rate. Measure the volume flow rate either on the fan inlet or outlet, wherever there is a reasonably straight section of duct – the measuring point should be well downstream of bends and other turbulence. For a belt-driven fan, measure the rate of revolution of the fan shaft with a tachometer. See manufacturer’s instructions.

• **Filters** - Measure the static pressure across the filter. Where a fabric filter has a shakedown cleaning device, operate the shake-down before taking measurements. If the air volume passing through the filter is the same as that through the fan, the filter flow rate need not be measured.

• **Fitted pressure gauges** - Check the functioning and accuracy of any fitted pressure gauges.

• **Special filter** - Filtration of ‘toxic’ particles requires a high performance filter, for example high efficiency particle arrestors (‘HEPA’ or ‘absolute’ filters). Follow an appropriate British, European or ISO standard to test such filters in situ.

• **Wet scrubber** - Measure the static pressure at the inlet and outlet, and the water pH if relevant to the scrubbing performance.

**Maintenance**

14. Maintenance tasks will vary and will be detailed in the user manual. Maintenance will be designed to ensure, as far as is reasonably practicable, that the equipment remains in an efficient state, in efficient working order and good repair. As with inspection, maintenance regimes will have been determined by the designer of the LEV, an LEV engineer or Occupational Which specialising in LEV and should be complied with.

15. The UAL H&S Standard ‘The inspection and maintenance of work equipment’ has more detail about designing maintenance schedules and record keeping.
Appendix 1
Frequencies of thorough examination and testing of LEV

<table>
<thead>
<tr>
<th>Process</th>
<th>Minimum frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processes in which blasting is carried out in, or incidental to, the cleaning of metal castings, in connection with their manufacture</td>
<td>1 month</td>
</tr>
<tr>
<td>Processes other than wet processes, in which metal articles, other than gold, platinum or iridium) are ground, abraded or polished using mechanical power, in any room for more than 12 hours a week</td>
<td>6 months</td>
</tr>
<tr>
<td>Processes giving off dust or fume in which non-ferrous metal castings are produced.</td>
<td>6 months</td>
</tr>
<tr>
<td>Other processes</td>
<td>14 months</td>
</tr>
</tbody>
</table>