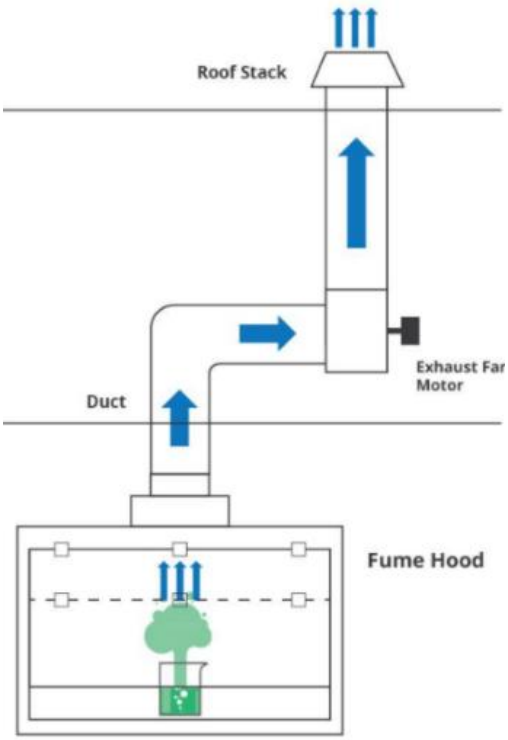
UNIVERSITY OF SUSSEX

Health and Safety

Ducted LEV Procedure



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1 Introduction

In general, the University uses two different types of fume hood.

A. **Ducted fume hoods**, where a motor and fan draw hazardous substances from the hood along a duct and discharge them into the air (usually above roof level) where they are rapidly diluted and dispersed.

B. **Recirculating fume hoods (Ductless)**, which draw air from the cabinet through a filter to remove any contamination and then recirculate the clean air back into the work space.
Refer to Recirculating Fume Hoods (Ductless) LEV Procedure (HS G060).

Both are effective in different ways and each type has advantages and disadvantages.

1.1 Definition

The definition of a LEV is; an engineering control system to reduce exposures to airborne contaminants such as dust, mist, fume, vapour or gas in the workplace. Simply put it is something that sucks an airborne contaminant out of the workplace. If you are unfamiliar with LEV, start by viewing the video that describes what LEV is, its key components and how the system works to protect health.

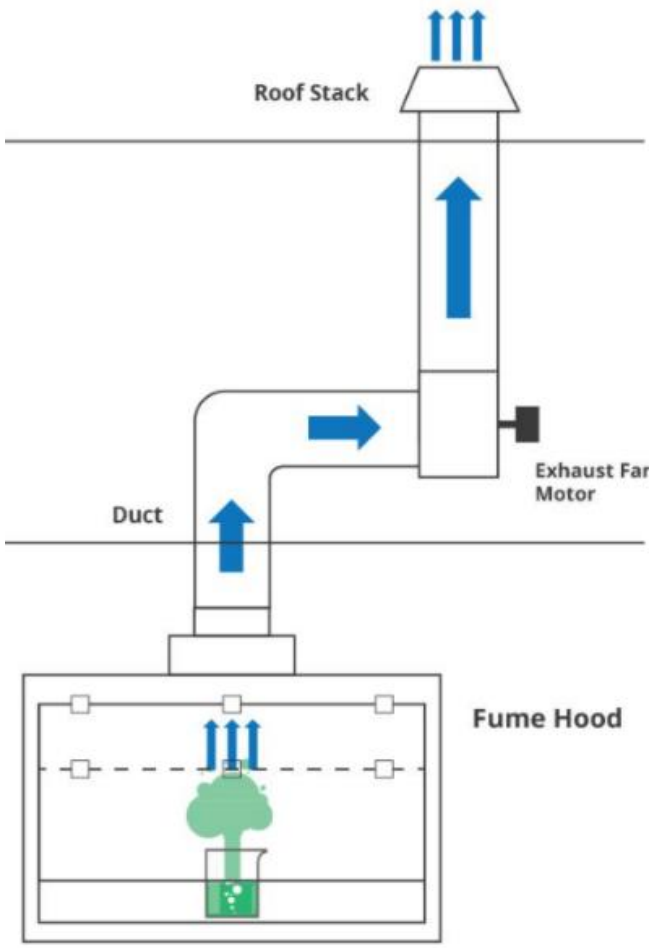
2 Background

This procedure outlines the University approach to the safe management and use of ducted local exhaust ventilation systems (LEV) including but not limited to:

- Fume cupboards. Primarily used in laboratories for using hazardous chemicals via the respiratory route.
- Ducted trunking with a capture hood. Used in engineering machinery, e.g. welding.
- Ducted cabinets. Used around devices like laser cutters.
- Ducted biological safety cabinets (BSC). Used for handling higher hazard microorganisms. There are specific guides on the safe use and examination of these types of containment systems.

Most systems consist of the following elements:

- Hood – where the contaminant enters the LEV
- Ducting - to transport the contaminant and air
- Fan – To power the system
- Discharge – To release extracted air to a safe place
- Air cleaner or arrestor – to filter or clean the extracted air (not all systems have this type)



Ducted LEV is one of the controls (an engineering control) referred to by the Control of Substances Hazardous to Health Regulations 2002 (COSHH) and there are explicit requirements with regards to its use including periodic examination and testing.

3 Purpose

To provide the critical information to the stakeholders engaged in the use, maintenance and testing of ducted LEV. It covers:

- Where supplementary school processes and procedures are required e.g. Containment level 3 facilities where a number of tasks need to be scheduled at the same time and require specific decontamination.
- Statutory testing (at least once every 14 months).
- Process if test is a pass.
- Process if test is a fail, which includes the process to ensure repairs are completed and function is verified before reuse.
- Safe use by users.
- Issues and reporting –a decision if issue needs equipment to be taken from use.
- Local user or school checks.
- Planned preventative maintenance (PPM). Usually on system elements e.g. motor belts.
- Record keeping
    - Up to date list of ducted LEV
    - Records held for 5 years for each piece of LEV including any repairs made.
- Competence and training.
- Roles and responsibilities.

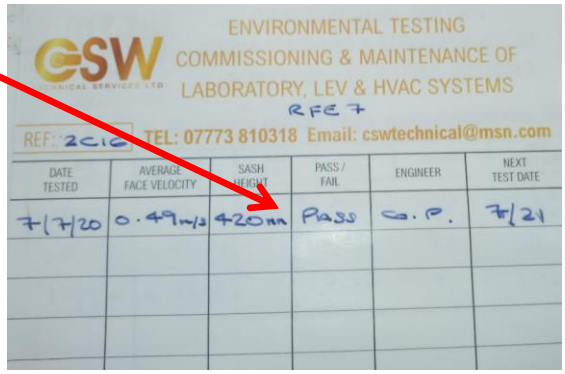
This procedure excludes:

- Recirculating fume hoods (Non-ducted systems), which draw air from the cabinet through a filter to remove any contamination and then recirculate the clean air back into the work space. These include non-ducted BSCs, non-ducted fume cupboards, etc. which are always managed by their owners, and not centrally.
  Refer to Recirculating Fume Hoods (Ductless) LEV Procedure (HS G060).
- Contractor control
- Permit to work system
- COSHH Programmes
- New LEV e.g. design and specification. No new ducted LEV systems should be installed outside of the formal University Project management Process which will deal with matters of design, engagement with all stakeholders, commissioning, handover etc.
- Make-up air supplied to the room that replaces the air extracted from the room.
- General ventilation.

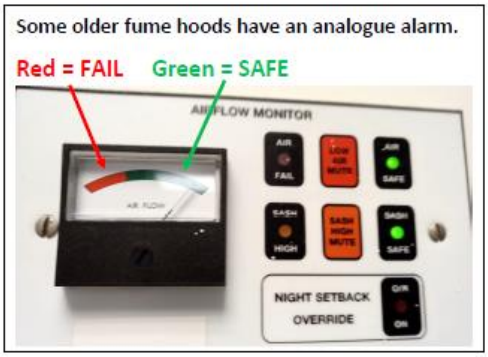
4 Appendix 1 Guidance for the Safe Use of Fume Hoods

A fume hood (sometimes called a fume *cupboard*) is a primary means of protection of workers from the inhalation of hazardous chemicals in the form of fumes and vapours. It consists of an enclosed working chamber with a clear window (sash) at the front. The hood is extracted via a fan (on the roof) and ductwork so that toxic fumes and vapours are drawn away from the user into the cabinet and exhausted to atmosphere at the top of the building.

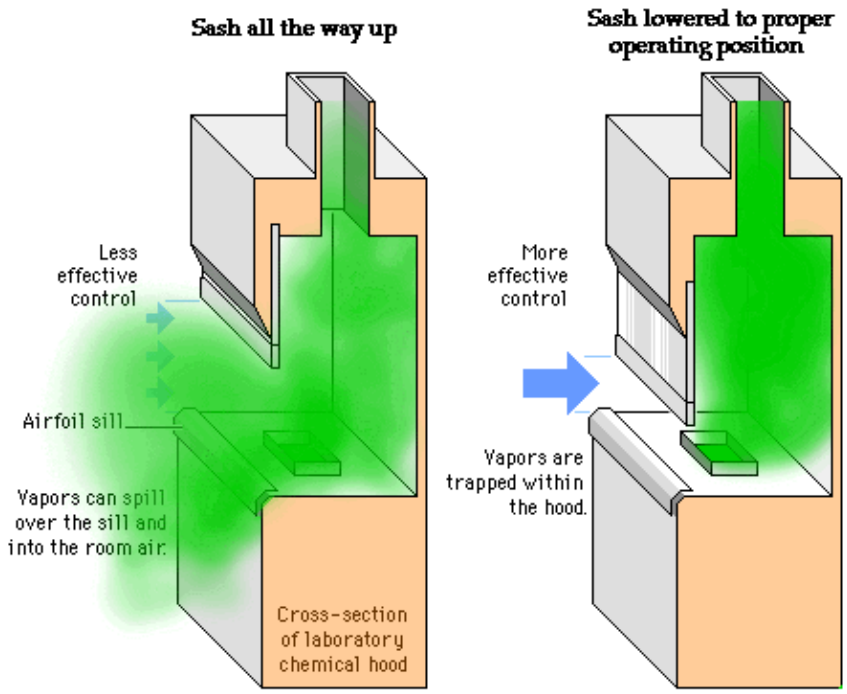
Before conducting work in a fume hood ensure that the hood is displaying a current test certificate (pass). (Failed fume hoods should not be used).



Every hood has a flow rate monitor/alarm. This lets you know that the flow rate is safe. Before working check the meter is on and is showing 0.4 to 0.8m/s. Unsafe flow rates or high sash will be shown with lights and an audible alarm. If there are a bank of fume hoods with a shared duct, the system must be able to operate all fume hoods safely and simultaneously.



Safe working



- The type of LEV should be assessed as suitable for the activity in the activity risk assessment (typically COSHH Assessment). Factors affecting suitability may be the type and volume of corrosive fumes or liquids generated during the activity.
- Care must be taken to select a fume hood that is made of suitable materials resistant to the substances being used.

  Note: not all substances can be used, e.g. anhydrous perchloric acid (>85%) should always be done in a dedicated perchloric acid fume hood. Dedicated perchloric acid fume hood and ducts are made of stainless steel.
- Turn on hood (if it has on/off controls) and wait for flow to stabilise.
- Raise the sash to its **safe certified height** (indicated by sticker on side of opening). (When not working in the hood, the sash should be lowered).
- Fume hood should be not overloaded in order that the airflows are unobstructed. Equipment should be more than 15cm from the front of the hood. Large items should be raised on blocks (5-10cm) so that air can flow underneath.
- Do not override or disable hood face velocity monitors/alarms. If the alarm sounds contact your supervisor or local senior technician.
- Avoid putting your head in the fume hood.
- Exercise extreme caution when using ignition sources and when flammables are being used.
- Keep storage to a minimum. Overloaded hoods will have disrupted airflows.
- Do not use the fume hood as a waste disposal route (e.g. evaporation of chemicals) use the approved disposal route.
- Do not disrupt airflows – keep movements slow and deliberate to avoid disrupting airflows. Avoid side-draughts by keeping nearby windows closed.
- All work being conducted in the fume hood should be covered by an active COSHH risk assessment.

EMERGENCY PROCEDURES:

- If alarms sound or you feel the hood is not operating safely then make safe your work, close sash and alert other workers. Evacuate lab if necessary. Contact your supervisor or local senior technician.
- SPILLAGES: Follow procedure in COSHH assessment.

5 Appendix 2 Document management

- School to hold a full list of ducted LEV items and systems with clear indication as to who is responsible for completion of the statutory tests and examinations, where responsibilities are shared e.g. the cabinet compared with motors and ducts running through plant rooms, planned preventative maintenance frequencies, names of technical leads in schools. This will be made available via a shared Box folder with the UoS Health and Safety Team and owned by the School to maintain their own LEV register.
- For each ducted LEV item and system there are 5 year records held which include:

    - The statutory tests undertaken by a competent person.
    - Maintenance and repairs undertaken on the items or system.
    - Where available, the original commissioning data.
    - Any system changes or updates rebalancing system data and information.
    - For complex systems e.g. multiple LEV elements served by one duct and exhaust, a drawing or system description to ensure there is clear understanding of the interconnecting system.
    - Records of periodic checks e.g. monthly checks on fume cupboards

- For each item element of LEV e.g. each fume cupboard should have its function checked with these local test or inspection records being held by the school but available for the person completing the test and examination.
- Documents and record availability:

    - The current statutory inspection should be available for LEV users. This can be via a copy of the most recent record being positioned on the equipment; or copies held in a locally accessible file (can be electronic or hard copy). Examples of how this can be achieved include holding a copy of the test certificate on the actual equipment, an accessible file held by the technical services lead.
    - The main five-year records can be held as hard copies or electronic copies (e.g. on facilities electronic record system (CAFM)) by the organisation who arranges these visits. This is specified in the list of ducted LEV. These must be held in a coherent way that allows easy access or copies when requested, with clear record keeping indicating gaps.
    - The current statutory record and any repairs undertaken since the last inspection should be available for the competent inspector on their visits.

- Each item of LEV to have a small sticker or similar indicating last statutory test and its status at that time e.g. Pass or Fail.

- Each piece of LEV has a unique identification number. These are not always in a logical order, but to change these should be subject to a full change control assessment to ensure historic documents and new documents can be collated and cross referenced without the risk of causing confusion. This number should be marked on each piece of equipment.
- All required repairs must be logged via the Service Centre to ensure an electronic record of requests and status is maintained.

6 Appendix 3 Statutory test and examination

The standard frequency of these statutory tests and examinations must not exceed 14 months, and must be completed by a competent contractor. There are applications where this may be required more frequently, these include, but are not limited to LEV used for safeguarding the handling of hazard group 3 microorganisms.
The requirements for statutory test and examinations are:

- Competent contractor to complete work.
- Maintained in accordance with BS EN 14175:2003 (for fume cupboards and appropriate standards for other types of LEV).
- Include any related checks e.g. make up air, proximity to windows or drafts.
- To include any include connected vented storage cupboards.
- To work to a schedule agreed between the teams responsible for the operation of the building e.g. technical teams; users e.g. researchers; and teams responsible for engaging and coordinating the scheduling of the competent contractor to undertaken the statutory test and examination.
- Schedules will be communicated to local areas.
- A clear and agreed communication and coordination of the activities undertaken by the contractor completing the test and examination. These include but are not limited to:

    - Parties responsible for the building activities are aware and have agreed access and equipment isolation.
    - Expected condition of equipment. For example some fume cupboards contain large experiential rigs which would not be easy to remove.
    - Agreed notice of works. Some equipment available at short notice but some equipment will require many weeks' notice e.g. containment level 3.
    - Agreed communication routes e.g. mobile phone numbers provided to the contractor.
    - The contractor to be aware of what they have been provided safe access to, and anything not explicitly stated, should not be worked upon without explicit permission e.g. isolation of other systems, roof access, etc.
    - Confirmation with the equipment users to ensure they are not using the systems and to ensure they are in a safe condition to be examined and tested.
    - Who and how to return the equipment to use from the contractor to the users for the equipment, likely to involve the team responsible for the building operations.
    - Some contractors ask for a user signature or similar. Where this is requested the purposes of this handover signature should be clear. This individual is unlikely to be competent to review or interpret the readings.
    - Process for equipment fail and how to ensure not taken back into use until safe to do so. See separate "Fail" process.

- These steps will form part of an overall safe system of work to ensure safe completion of test and examination, including hand back of equipment.

- The test certificates will be forwarded to a pre-agreed recipient who has engaged the contractor. These will then be forwarded to those responsible for the building operations and users (will be specified in the ducted LEV spread sheet for all equipment). The recipient of the certificate should:

  - Review the results to ensure no obvious errors have been made e.g. an out of scope air flow but still showing as a pass.
  - Update the five year document file.
  - Organise and complete any remedial works. Any remedial works that cannot be completed must be advised both to the School and Estates & Facilities Management (EFM). These records form part of the five year record for the equipment.
  - Diarise the next scheduled test and examination date, likely to be part of the PPM scheduling system.

7 Appendix 4 Routine checks and testing

It is important that performance of systems is monitored between the formal tests and examinations which are undertaken within 14 months for most pieces of equipment.
Routine checks and testing encompasses a broad range of equipment from fume cupboards (most commonly used equipment, through to ducted engineering extract systems and specialised biological safety cabinets. The routine checks and testing guidance is broad to cover the breadth of equipment used. These tests can include, but are not limited to:

- A user checking the equipment appears to be operating in a satisfactory condition. Depending on the equipment this may include visual observation that fumes or generated dust is visibly extracted; any indicators are showing in range; no unexpected odours, no obvious damage or kinks in flexible ducts. This can be supplemented by a daily inspection check record.
- There should be clear criteria on what is acceptable, and what requires the equipment to be taken out of use. This will form part of the local procedure for the school's equipment.
- Some local procedures will specify air flow checks. The method, acceptable range and resulting actions for out of scope readings should form part of the school procedure. In addition they may include:

    - Routine face velocity, airflow alarm and visual checks on fume hoods and identify any deterioration.
    - Use of smoke pencils or other similar devices.

- If an unacceptable test result is obtained it should lead to the equipment being taken out of use and users instructed to stop work. Where equipment is taken out of use there should be a clear process to indicate the equipment is out of use e.g. signage and a process to escalate via the local technical lead. The issue must be logged with the Service Centre.
- Any repair records and associated revalidation of the equipment should form part of the five year equipment records.
- Local procedures for checks should be documented, including any test standards and criteria building used for checks.

8 Appendix 5 Roles and Responsibilities

The table in the key responsibilities linked to the safe use, testing and management of ducted local exhaust ventilation systems. This appendix gives a high level overview of who is responsible for the various tasks. Because different schools have different titles for the roles, general role description have been used.

To ensure that roles are absolutely clear the Health and Safety Team will work with the Schools to update a master spread sheet, available via Box, to all ducted LEV stakeholders. In addition the master spread sheet will include clear demarcations on responsibilities where it is split. For schools who organise their own statutory testing, it will clearly state where the boundary exists e.g. the filter on a BSC; so that SEF have the responsibility for the fans and associated duct work.

Each school will have someone assigned under the broad heading of “building responsible person”. This in many cases will be technical services staff who will coordinate between the contractor completing statutory testing and the researchers and staff using the equipment. Where required this will include the coordination of any preparation of the equipment prior to the visit. They will act as the school point of contact during and after testing as equipment is handed back.

For each area an individual or group will be assigned as having “responsibility for engaging the specialist contractor”. For most schools this will be SEF. However it is acknowledged that some schools organise their own statutory testing, and where this is the case the person who organises this will be specified in the master spread sheet.

Activity	Tasks	Responsibility
Update of the ducted LEV Procedure	• Redrafting, updating and publishing the procedure. • Checking function of current procedure (via inspection, reactive reports or audit). • Formal procedure Governance.	• H&S • H&S; EFM and Users • Hazardous Agents Safety Sub-Committee[1] and the SSHEMG[2]
Maintenance of five year LEV Records	• These documents must be held in either an accessible format; or in a format to allow records to be provided if required within a few days in an easy to interpret format. BSMS & GDSC use their own LEV contractor therefore store own records	• SEF • BSMS & GDSC
Maintenance of LEV register	• Maintain a full list of ducted LEV items such as, • Responsibility for completion of statutory tests, • Lifecyle of LEV asset from commissioning to decommissioning, • Make available via shared folder with the UoS Health and Safety Team, • Owned by the School to maintain their own LEV register.	• Building responsible person
Engage the competent specialist contractor.	• Assess and appoint competent contractor. • Coordinate site attendance with building users and equipment users. • Produce schedule of tests to be completed in the coming year.	The group with responsibility for engaging the specialist contractor to complete statutory test and examination.
Complete statutory test and examination	• Prepare equipment for safe test and examination. • Meet contractor on site and ensure scope of work understood. • Coordinate with building responsible person and equipment users. • Complete the test and examination; this includes reporting back to person responsible for the area or building (named). • Allows equipment use to restart or taken out of use. Involves coordination with equipment users. • Equipment accepted back by user school.	• Equipment user. • Team who engaged contractor. • Team who engaged contractor. • Contractor or other competent person. • Person responsible for building.
Routine checks of equipment	• Create local procedure (including frequencies), commensurate for the type of equipment, including reporting and record keeping. • Undertake checks or tests. • Maintain anemometer service and in-calibration	• Building responsible person (BRP). • BRP or user • BRP or user

[1] Formally reports to the University Health and Safety Committee.
[2] Statutory Safety Health and Environment Management Group.

Ensure BRP or users are competent	• Awareness and understanding of H&S legal requirements for LEV. • Where identified by training needs analysis, specific LEV technical / safety training (internal and/or external)	• H&S • H&S or external British Occupational Hygiene Society (BOHS)/ Institute of Local Exhaust Ventilation Engineers (ILEVE)
System PPMs	• Any elements of the systems that need periodic PPMs e.g. motors, fan belts, etc. • Add to five year records for the system. • Work to be coordinated in the same way as statutory test and examination. PPM frequencies shown on master LEV spread sheet. • The building responsible person must be advised prior to PPMs and any anticipated adverse impacts on the system.	SEF
Taking equipment out of use	• If a significant fault found. • Must be reported to the technical services lead for the building. • Escalates issue and coordinates repairs. • Equipment needs repair and revalidation before going back into use.	• Whoever finds the fault. • Whoever finds the fault. • Building technical lead.
Repair of equipment and equipment reinstatement.	• Reporting the issues. • Follow up of issues from statutory test and examination. The building responsible person must be advised prior to work and any anticipated adverse impacts on the system. • Complete repairs • Accepting documentation to evidence equipment is safe to reinstate, formally advise technical lead, and add records to five-year record file for equipment.	• Whoever finds the fault. • Responsible person for engaging contractor. • Contractor • Responsible person for engaging contractor.
User requirements	• Experience or knowledge of using a fume cupboard. • Understands limitations. • Understands how to identify and report an issue. • Able to complete simple user checks e.g. how to read the airflow monitor. Issues result in work stopping and being reported.	User and supervisor
Ensure users are competent	• Check competency and provide instruction, information and training as required.	• Person leading area activities.
Safe use of fume cupboard	• Sash used at specified maximum height; and down when not in use. • Working airflow indicator in safe range. • Avoid over loading fume cupboard, particularly towards the front where air flow disruption is foreseeable. • Fume cupboards to be operated to agreed local housekeeping standards. • If a fault develops, stop work and report the issue.	• User

Local instructions, programmes and competence programmes	• Local procedures. • Record accessible locally. • Competence programmes, with records if required. • Local inspections to ensure processes working.	Detailed in school procedure.

Reference sites

British Occupational Hygiene Society (BOHS) https://www.bohs.org/

Institute of Local Exhaust Ventilation Engineers https://www.cibse.org/institute-of-local-exhaust-ventilation-engineers/about-ileve

9 Appendix 6 Process to remove unsafe equipment from use

Significant faults could be detected by:

- The user, either during use or during routine checks.
- The person responsible for carrying out routine checks for the school.
- The contractor conducting the statutory test and examination.

Immediate action

- Stop using equipment.
- Make safe e.g. remove any unsafe hazardous materials and stop any hazardous experiments.
- Contact school technical lead. (Place sign on equipment to indicate out of use if unable to contact the school technical lead).

Action to take out equipment out of use, make repairs and reinstate equipment

- Technical lead to ensure equipment taken safely out of use and has appropriate signage in place.
- Report to Service Centre.
- SEF to coordinate repairs in conjunction with Estates ad Facilities, depending on who is funding repairs. Timescales to be communicated to the technical services lead.
- Once repairs are complete and system safely reinstated and checked, documents issued to technical lead.
- Technical lead will coordinate reinstatement use of equipment.
- Records of repairs files in five year equipment records.

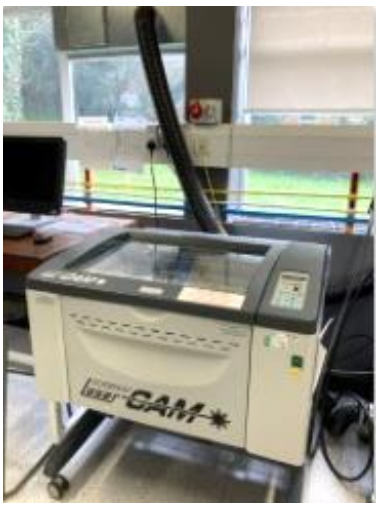
10 Appendix 7 Examples of different University ducted LEV

Pevensey 1 Workshop



Mobile extractor hoods


Welding booth (extractor hood ducted)

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11 Appendix 8 Respiratory Protective Equipment (RPE)

The Health and Safety Executive issued a safety alert regarding changes to enforcement expectations for mild steel welding fume. The following key issues apply:

- There is new scientific evidence that exposure to all welding fume, including mild steel welding fume, can cause lung cancer.
- There is also limited evidence linked to kidney cancer.
- There is a change in HSE enforcement expectations in relation to the control of exposure of welding fume, including that from mild steel welding.
- All businesses undertaking welding activities should ensure effective engineering controls are provided and correctly used to control fume arising from those welding activities.
- Where engineering controls are not adequate to control all fume exposure, adequate and suitable respiratory protective equipment (RPE) is also required to control risk from the residual fume.

12 References

- Controlling airborne contaminants at work A guide to local exhaust ventilation (LEV) HSG 258 https://www.hse.gov.uk/pubns/priced/hsg258.pdf
- BS EN 14175-2:2003 Fume cupboards. Safety and performance requirements
- A visual inspection of the fume cupboards should be carried out as detailed in BS EN 14175-4:2004
- The Control of Substances Hazardous to Health Regulations 2002 Approved Code of Practice and guidance
- Video: What is Local Exhaust Ventilation (LEV)? https://www.hse.gov.uk/lev/what-is-ileve.htm