

Local Exhaust Ventilation

Practical Applications
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LEV Issues

- n Size of the Problem.
- n Engineering Controls.
- n The standards that apply.
- n Important Design Features.
- n Case Studies.
- n Legal Requirements.

A Salesman Approaches!



One size fits all or does it?

Source: shponline.com

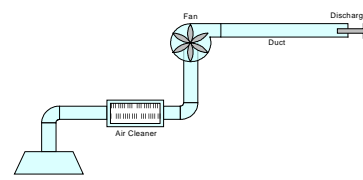
Why is LEV important?

- n It removes harmful, dusts, fumes vapours, and gases from the breathing zone of the operator.
- n It is a legal requirement under the COSHH Regulations.
- n The equipment is often not properly understood by employers.

What is it supposed to do?

- n Collect or contain the airborne contaminant.
- n Carry it away from workers for treatment or discharge to a safe place.
- n Ensure adequate control of exposure and, below relevant Workplace Exposure Limits (WEL).
- n Note that loss of LEV control can lead to ill health.

What comprises an LEV system?

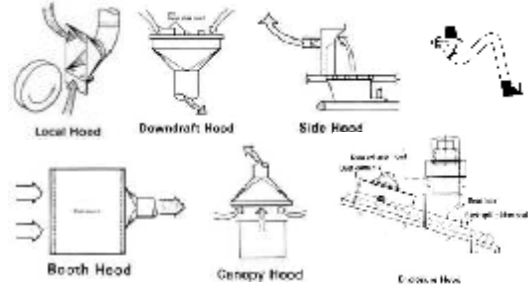


Source: Adrian Hirst

Which contaminants is LEV suitable for?

- n Dusts and Fumes
- n Mists and Fogs
- n Vapours and Gases
- n Aerosols and Smoke.
- n These might be classified as harmful, irritants, or corrosive.
- n LEV is not suitable for highly toxic materials as it is not 100% efficient.

What are the types of hood?

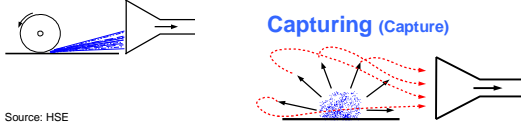


The three basic types of LEV hood

Enclosing (Contain and separate)

Receiving (Receive, contain & empty)

Capturing (Capture)



Source: HSE

LEV hood classification expanded

Enclosures

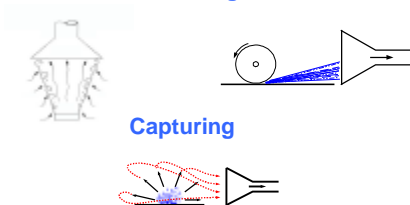


Full Partial, large Partial, small Room

LEV hood classification expanded

Receiving

Capturing

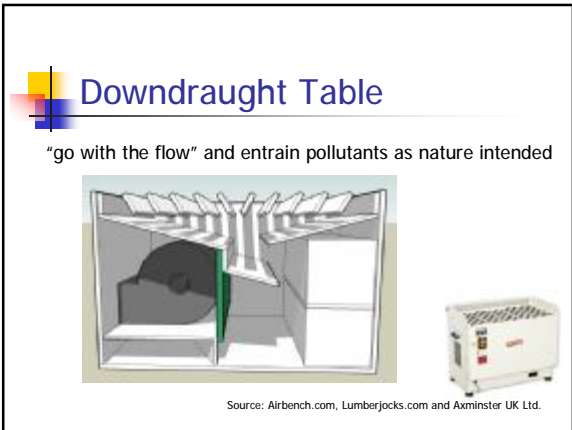
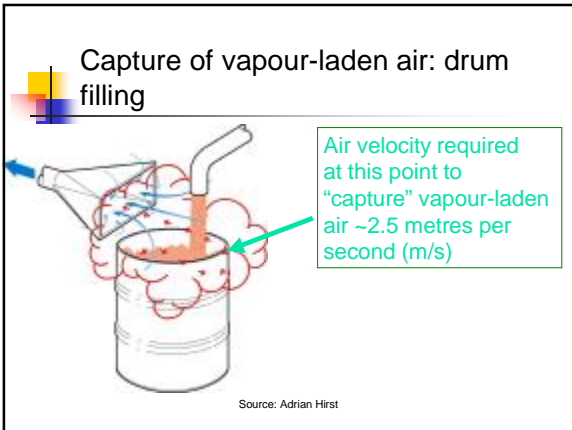
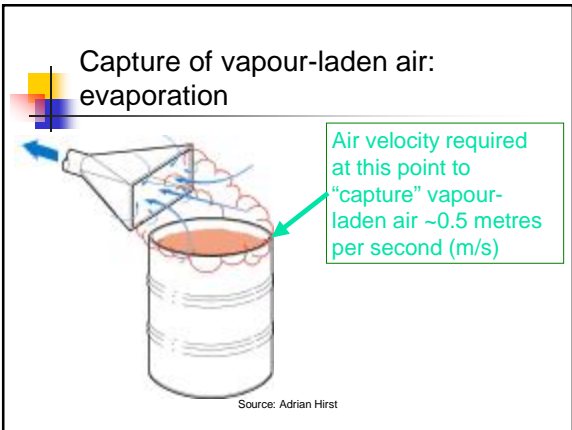
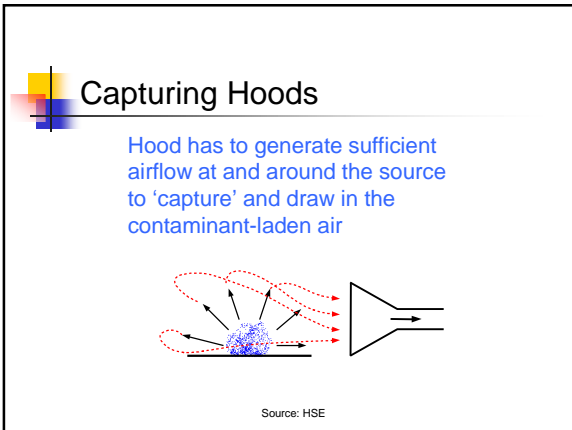
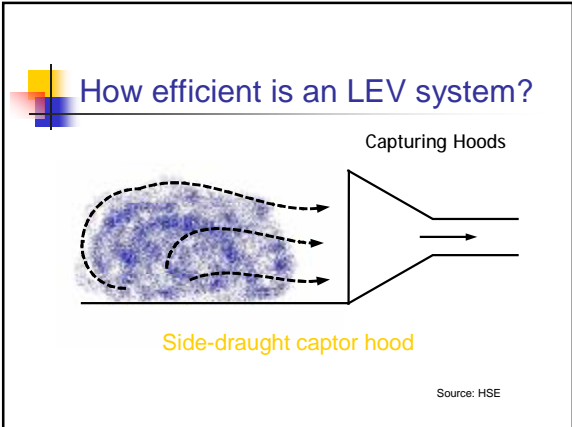
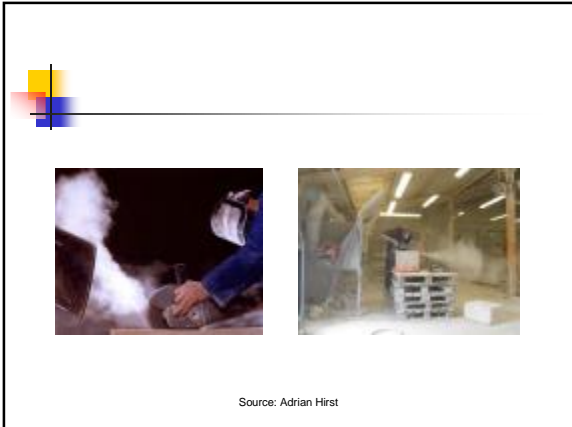


Source: HSE

LEV system design, the most critical element is the hood

Main reasons why systems fail to protect:

- Incorrect type of hood is chosen (and could never provide sufficient protection)
- The airborne contaminant isn't contained or captured.
- LEV hood design doesn't match the process and source(s)
- Insufficient airflow (various reasons).

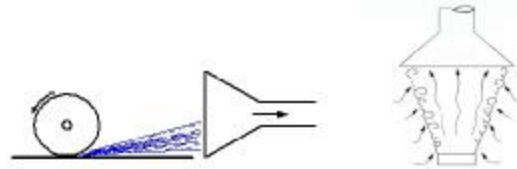


Downdraught applications



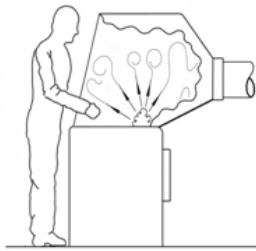
Use of Angle Grinders in Workshops

Receptor Hoods



Source: HSE

Enclosing Hood



Source: HSE

Types of LEV used for various processes

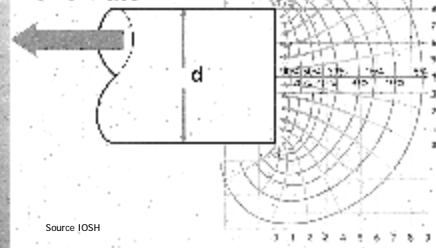
| Industrial process | Nature of hazardous substance | Types of LEV |
|--------------------------|---|---|
| Welding | Welding fume: fine particulate with some natural buoyancy | Capture hood positioned close to the welding activity; or Tip extraction fitted to the end of the welding gun |
| Paint spraying | Mist and solvent vapours released in controlled direction with velocity | Walk in paint spray booth Down flow booth |
| Polishing | Metal and polishing dust released in controlled direction with high velocity | Receptor hood and enclosure around the polishing wheel |
| Shot blasting | Steel shot and metal dust from components released at high velocity in variable direction | Fully enclosed glove box type cabinet with airflow managed to compensate for compressed air input and shot recycling system |
| Hand held orbital Sander | Wood dust released in variable directions | Extraction integrated into the sander disc |
| Paint curing Ovens | Hot air and curing vapours with strong thermal buoyancy | Extract/vent from top of oven combined with a receptor hood over the doorway |
| Laboratory analysis | Acid and solvent vapours released with low velocity and little direction | Partial enclosure and extraction within a fume cupboard |

What is the capture area of a hood?

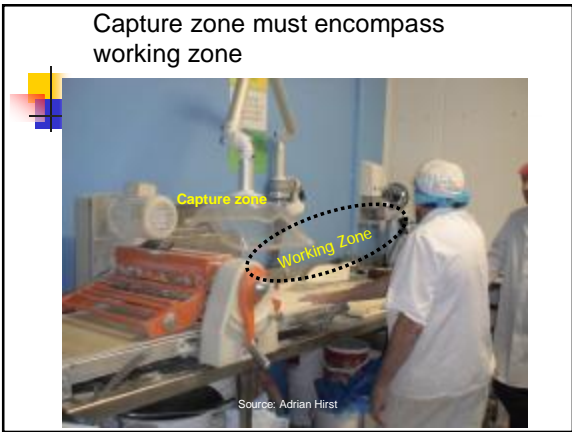
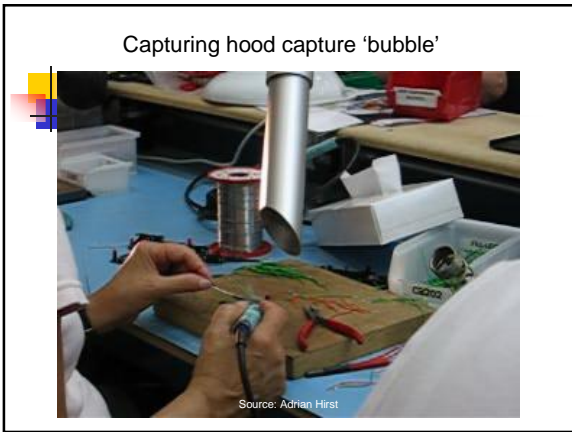
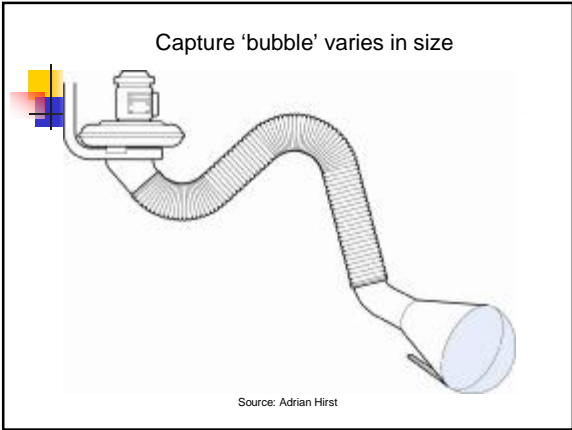
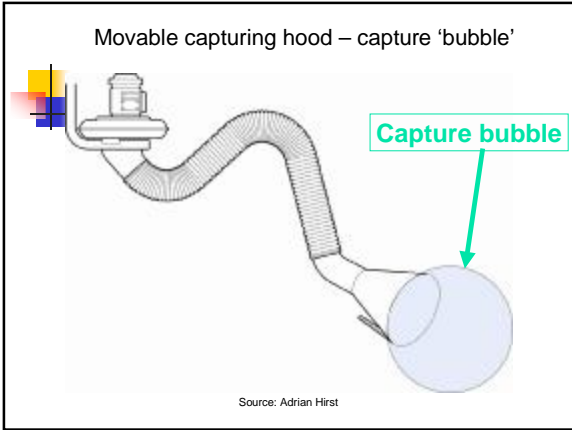
- The face velocity one diameter from the the face of the hood is less than 10%.

Capturing hood: Velocity contours and airflow lines

Rule of thumb
 $\sim 10\%$ face velocity
 $1d$ from face



Source: IOSH



Ductwork

- n Velocity Important
- n Should be sufficiently strong
- n Well supported and capable of withstanding normal wear and tear
- n The number of changes of directions should be kept to a minimum
- n Should be made smoothly
- n Access to ducting may be required

Duct Velocity

| Type of contaminant | Duct velocity (m sec-1) |
|---|-------------------------|
| Gases (non-condensing) | No minimum limit |
| Vapours, smoke, fume | 10 |
| Light/medium density dust (e.g. sawdust, plastic dust) | 15 |
| Average industrial dusts (e.g. grinding dust, wood shavings, asbestos, silica) | 20 |
| Heavy dusts, (e.g. lead, metal turnings and dusts which are damp or that tend to agglomerate) | 25 |

How must it be maintained?

- The system must perform to its design specification.
- The LEV user manual should set out the frequency of checks.
- If you have no user manual then you must hire a competent person, to prepare a suitable document.

Checks and Maintenance Cover Four Types of Parts:

- Moving parts that wear e.g. fan bearings, filter shakers.
- Hoods, duct work and seals that can get damaged.
- Parts that deteriorate with use e.g. filters, flexible ducting.
- Items needing regular attention e.g. filter bins, sludge collectors.

Maintenance other factors

- COSHH Assessments for cleaning and maintenance must be carried out;
- Everyone must know who is responsible for what checks.
- Permit to Work procedures may be needed to carry out this work.

Thorough Examination and Test:

- Most LEV needs a statutory test at least once every fourteen months.
- The test must be done by a competent person, tested against minimum legal standards.

Future Actions

- Implement the report recommendations.
- Keep records of all examinations for at least five years.
- A long list of actions arising from this test shows that your maintenance is not thorough enough.

What training does the operator need?

- Training should cover how the LEV system works.
- How to use the LEV to get the best out of it.
- How to check that the LEV is working.
- What to do if something goes wrong.
- Note – you must keep training records.
- Changes to the work process and LEV means that staff may need re-training.

Buying New LEV Systems

- n Use a reputable LEV supplier with experience of the controls you need.
- n Ask LEV suppliers how they will prove that their system will control exposure adequately.
- n LEV is rarely straightforward and mistakes are costly.

You must specify your LEV.

- n You must describe the process, the contaminant, its hazards and the sources to be controlled, and how stringent the control needs to be.
- n You must require indicators to be fitted to show that the system is working properly.
- n You must require the LEV to be easy to use, check, maintain and clean.
- n You must specify that the supplier provides training in how to use, check and maintain the LEV system.

You must specify your LEV.

- n You must 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.
- n You must require the supplier to provide a logbook for the system to record the results of checks and maintenance.
- n See HSE Guidance Leaflet: indg408.

What guidance is available from the HSE?

- n Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV) HSG258 HSE Books 2008 ISBN 978 0 7176 6298 2
- n Time to clear the air! A workers' pocket guide to local exhaust ventilation (LEV) Pocket card INDG409 HSE Books 2008 (Single copy free or priced packs of 25 ISBN 978 0 7176 6300 2)

Case Studies

- n Grinding in a Forge
- n Food factory
- n Powder Coating
- n Gluing Process
- n Die head ventilation
- n Ceramics

Practical LEV

- n Our Thanks to Dr Adrian Hirst for his permission to use his diagrams and illustrations in this talk.
- n Thanks to you for listening.
- n Are there any Questions?