Control of lead exposure using Local Exhaust Ventilation

Introduction

vent-tech
industrial environment control

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Director and Trustee of **The LEV Association**

Control of Lead at Work Regulations 2002

STATUTORY INSTRUMENTS

2002 No. 2676

HEALTH AND SAFETY

The Control of Lead at Work Regulations 2002

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ARRANGEMENT OF REGULATIONS

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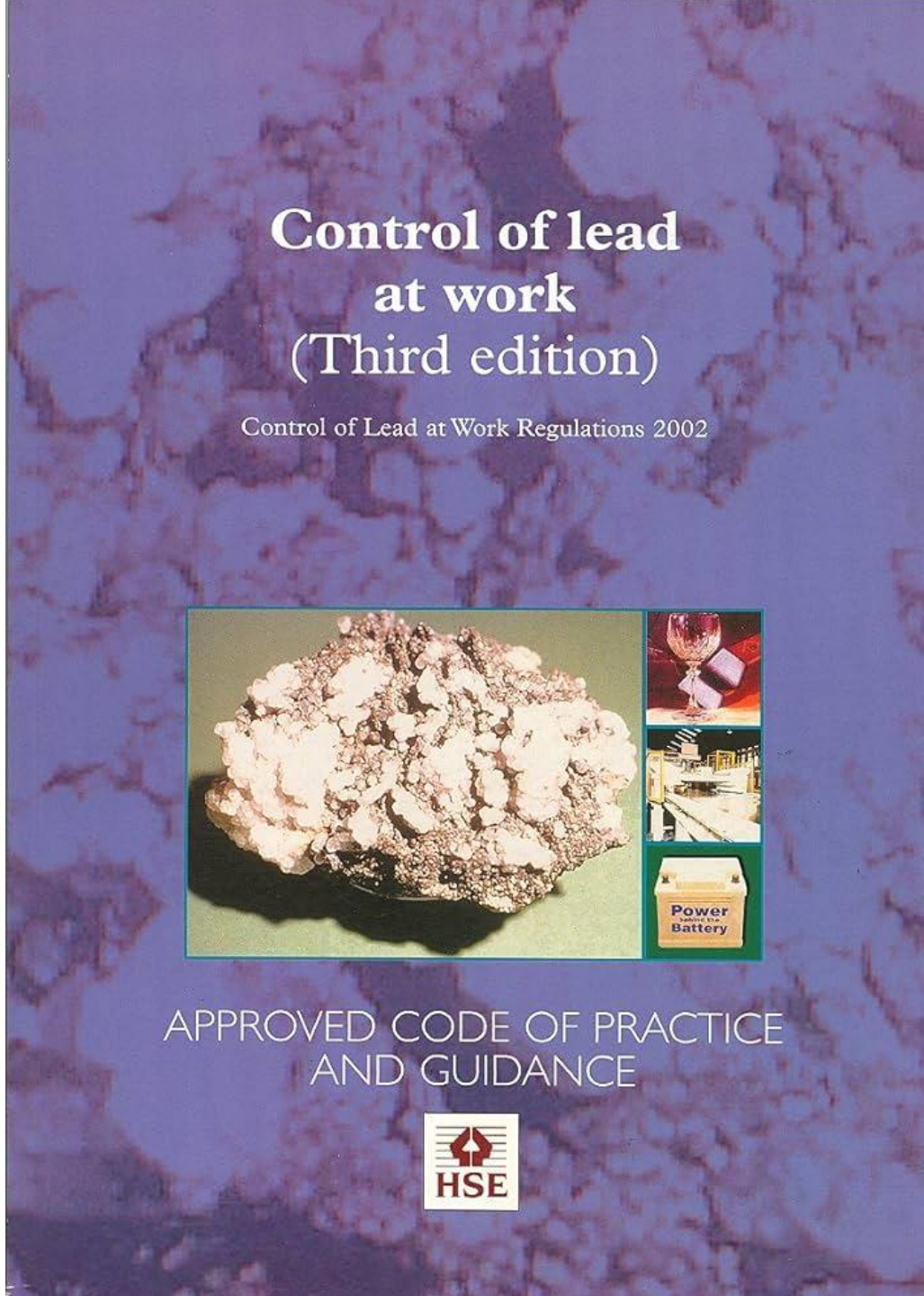
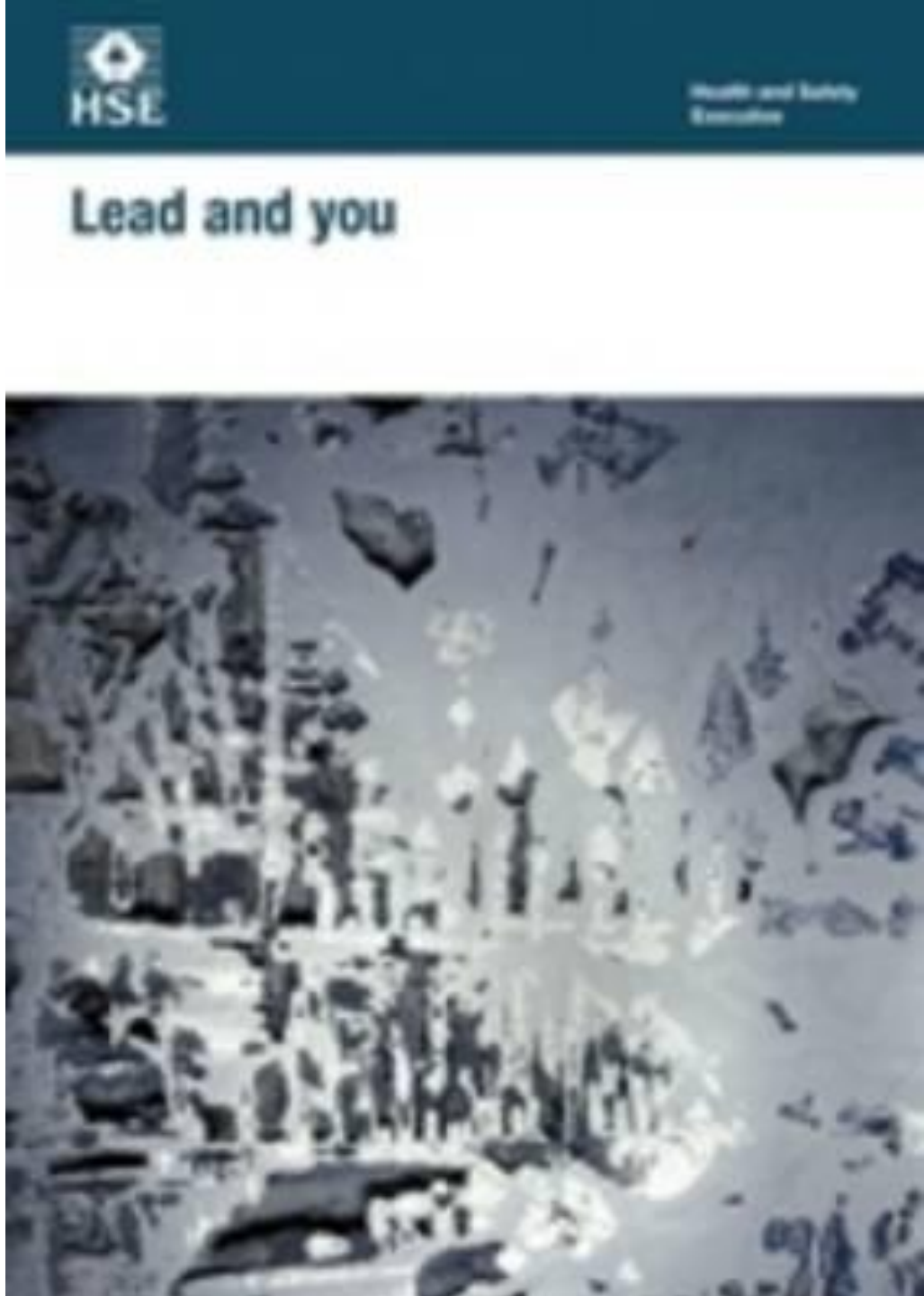
Approved Code of Practice and guidance



HSE Lead & You



CLAW – Reg 6

Prevention or control of exposure to lead

6.—(1) Every employer shall ensure that the exposure of his employees to lead is either prevented or, where this is not reasonably practicable, adequately controlled.

(2) In complying with his duty of prevention under paragraph (1), substitution shall by preference be undertaken, whereby the employer shall avoid, so far as is reasonably practicable, the use of lead at the workplace by replacing it with a substance or process which, under the conditions of its use, either eliminates or reduces the risk to the health of his employees.

(3) Where it is not reasonably practicable to prevent exposure to lead, the employer shall comply with his duty of control under paragraph (1) by applying protection measures appropriate to the activity and consistent with the risk assessment, including, in order of priority—

(a) the design and use of appropriate work processes, systems and engineering controls and the provision and use of suitable work equipment and materials;

(b) the control of exposure at source, including adequate ventilation systems and appropriate organizational measures; and

(c) where adequate control of exposure cannot be achieved by other means, the provision of suitable personal protective equipment in addition to the measures required by sub-paragraphs (a) and (b).

(4) The measures referred to in paragraph (3) shall include—

(a) arrangements for the safe handling, storage and transport of lead, and of waste containing lead, at the workplace;

(b) the adoption of suitable maintenance procedures;

(c) reducing, to the minimum required for the work concerned—

(i) the number of employees subject to exposure,

(ii) the level and duration of exposure, and

(iii) the quantity of lead present at the workplace;

(d) the control of the working environment, including appropriate general ventilation; and

(e) appropriate hygiene measures including adequate washing facilities.

(5) Where, notwithstanding the control measures taken in accordance with paragraph (3), the exposure of an employee to lead is, or is liable to be, significant, the employer shall provide that employee with suitable and sufficient protective clothing.

(6) Without prejudice to the generality of paragraph (1), where there is exposure to lead, control of that exposure shall, so far as the inhalation of lead is concerned, only be treated as being adequate if—

(a) the occupational exposure limit for lead is not exceeded; or

(b) where that occupational exposure limit is exceeded, the employer identifies the reasons for the limit being exceeded and takes immediate steps to remedy the situation.

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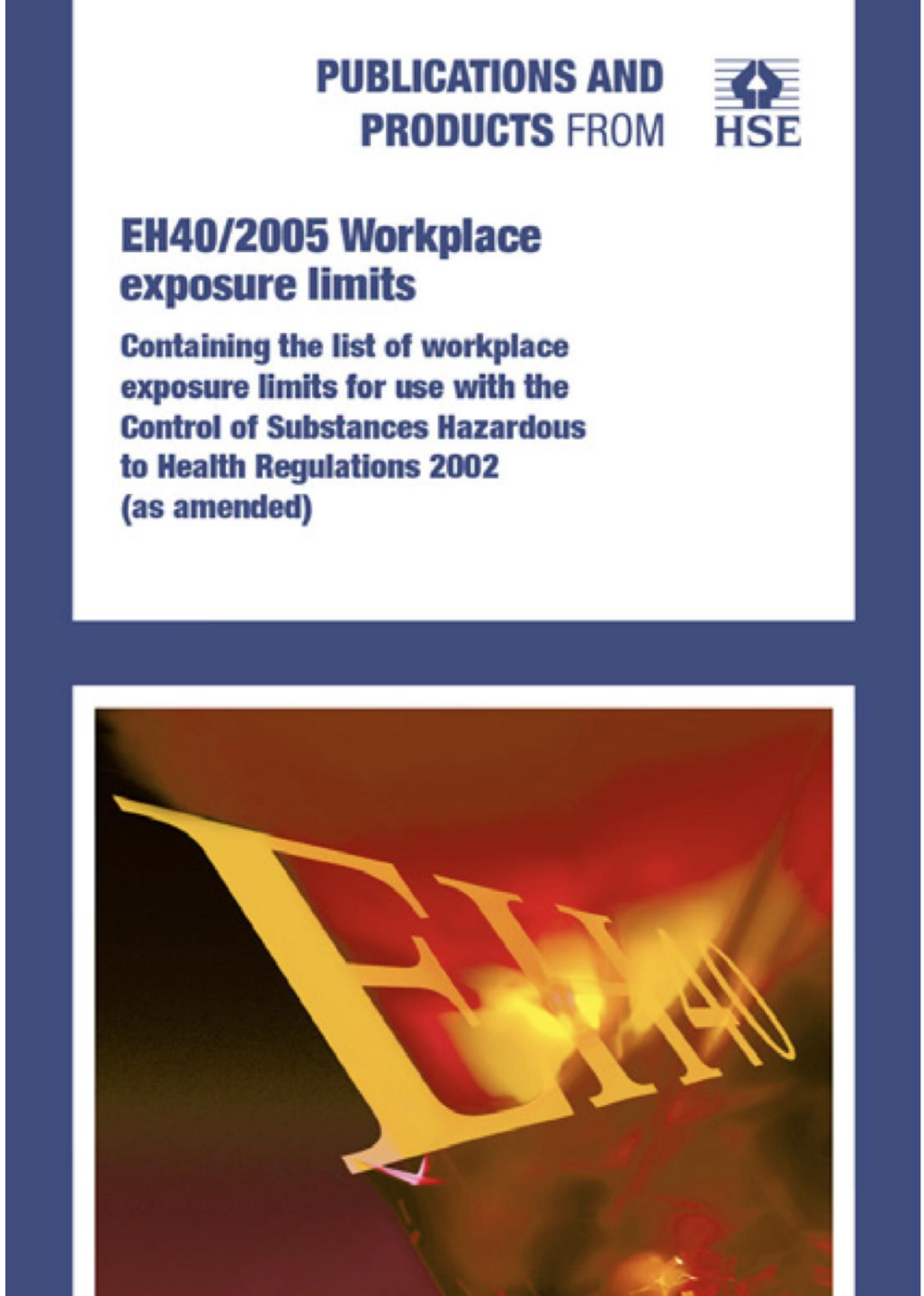
EH40 Workplace exposure limits

Asbestos and Lead

52 Asbestos and lead are regulated separately; you can find more information on these substances on the HSE website www.hse.gov.uk.



Control of Lead at Work Regulations 2002

Interpretation

2.—(1) In these Regulations:

"action level" means a blood-lead concentration of—

(a) in respect of a woman of reproductive capacity, 25 µg/dl;

(b) in respect of a young person, 40 µg/dl; or

(c) in respect of any other employee, 50 µg/dl;

"appointed doctor" means a registered medical practitioner appointed for the time being in writing by the Executive for the purpose of these Regulations;

"approved" means approved for the time being in writing;

"biological monitoring" includes the measuring of a person's blood-lead concentration or urinary lead concentration by atomic absorption spectroscopy;

"control measure" means a measure taken to reduce exposure to lead (including the provision of systems of work and supervision, the cleaning of workplaces, premises, plant and equipment, the provision and use of engineering controls and personal protective equipment);

"employment medical adviser" means an employment medical adviser appointed under section 56 of the Health and Safety at Work etc. Act 1974;

"glaze" does not include engobe or slip;

"hazard" means the intrinsic property of lead which has the potential to cause harm to the health of a person, and "hazardous" shall be construed accordingly;

"lead" means lead (including lead alkyls, lead alloys, any compounds of lead and lead as a constituent of any substance or material) which is liable to be inhaled, ingested or otherwise absorbed by persons except where it is given off from the exhaust system of a vehicle on a road within the meaning of section 192 of the Road Traffic Act 1988(**b**);

"lead alkyls" means tetraethyl lead or tetramethyl lead;

"leadless glaze" means a glaze which contains less than 0.5 per cent lead by weight of the element lead calculated with reference to the total weight of the preparation;

"low solubility glaze" means a glaze which does not yield to dilute hydrochloric acid more than 5 per cent of its dry weight of a soluble lead compound when determined in accordance with a method approved by the Health and Safety Commission;

"medical surveillance" means assessment of the state of health of an employee, as related to exposure to lead, and includes clinical assessment and biological monitoring;

"occupational exposure limit for lead" means in relation to—

(a) lead other than lead alkyls, a concentration of lead in the atmosphere to which any employee is exposed of 0.15 mg/m^3; and

(b) lead alkyls, a concentration of lead contained in lead alkyls in the atmosphere to which any employee is exposed of 0.10 mg/m^3,

assessed—

(i) by reference to the content of the element lead in the concentration, and

(ii) in relation to an 8-hour time-weighted average reference period when calculated by a method approved by the Health and Safety Commission;

(**a**) 1974 c. 37; sections 11(2), 15(4) and 50(3) were amended by the Employment Protection Act 1975 (c. 71), Schedule 15, paragraphs 4, 6 and 16(3) respectively.

(**b**) 1988 c. 52.

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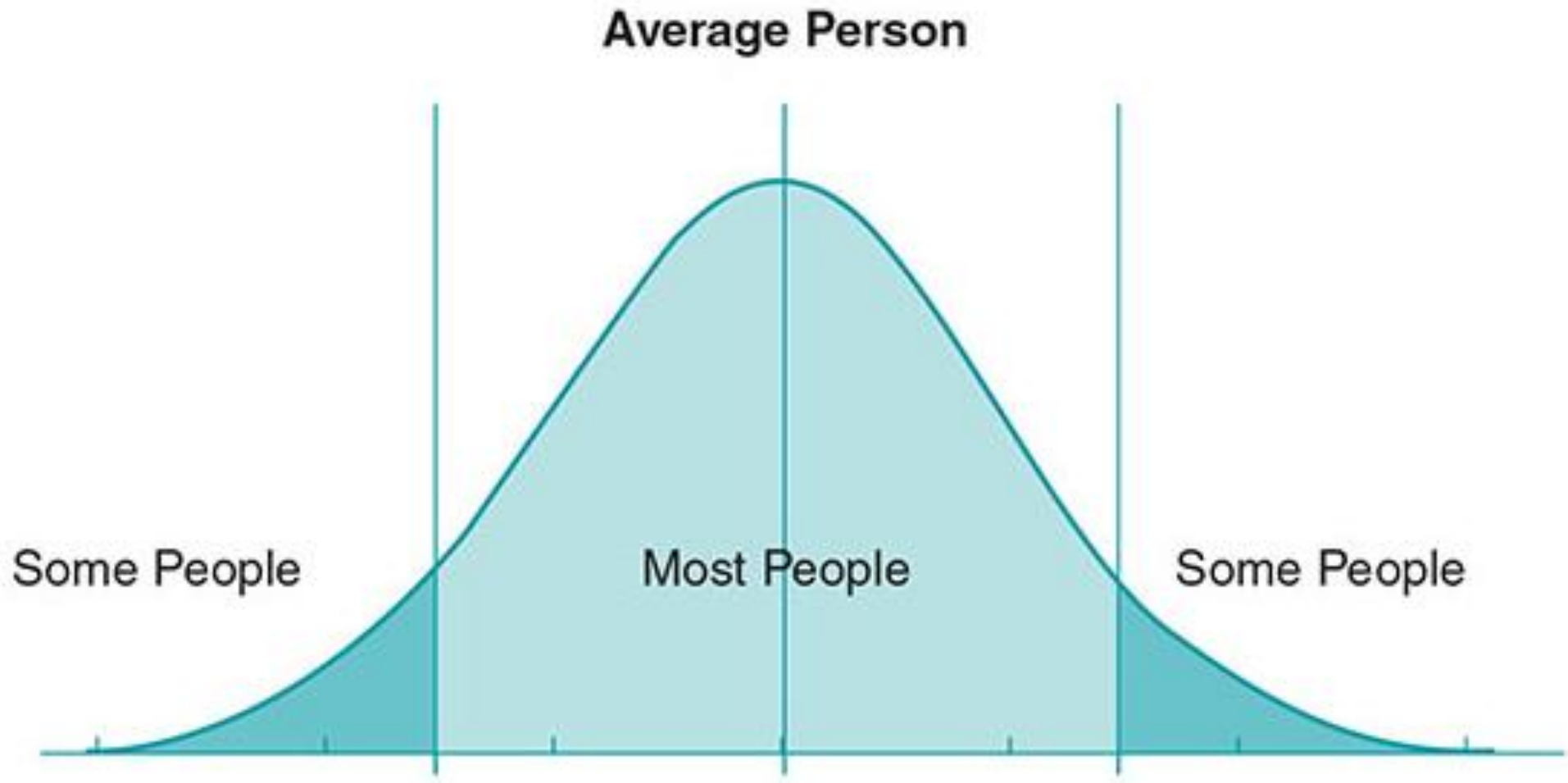
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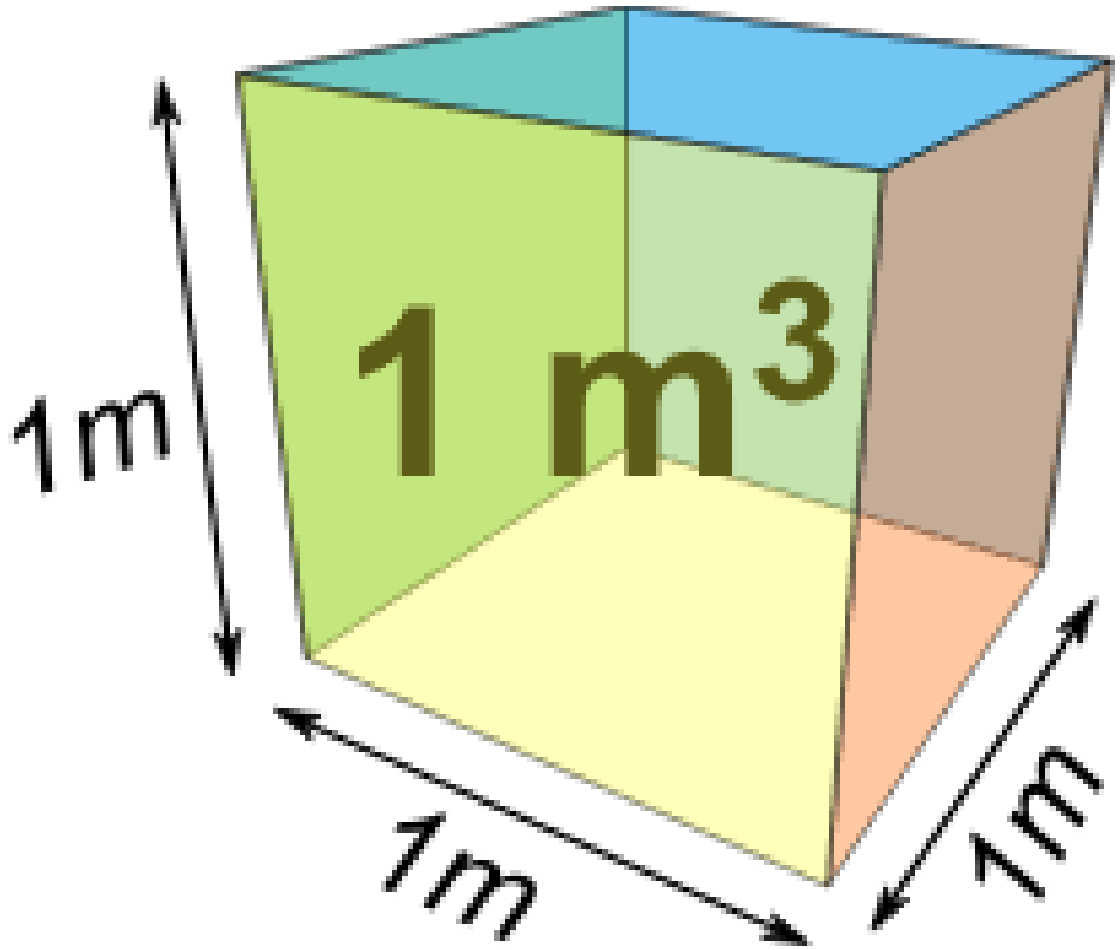
Some People
Most People
Some People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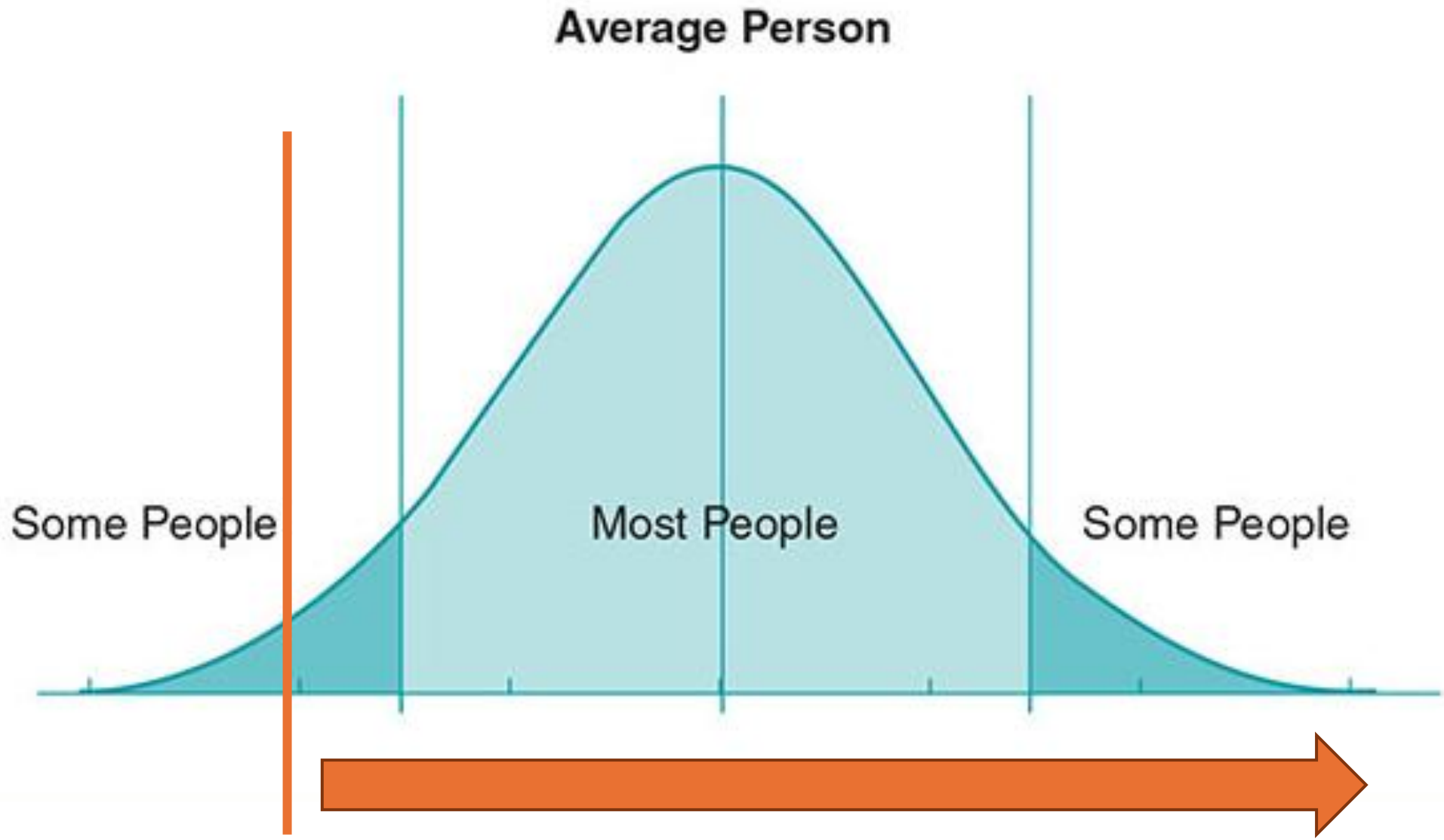
Average Person
Some People
Most People
Some People

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Maintenance, examination and testing of control measures

8. (1) Every employer who provides any control measure to meet the requirements of regulation 6 shall ensure that, where relevant, it is maintained in an efficient state, in efficient working order, in good repair and in a clean condition.

(2) Where engineering controls are provided to meet the requirements of regulation 6, the employer shall ensure that thorough examination and testing of those controls is carried out—

(a) in the case of local exhaust ventilation plant, at least once every 14 months; and

(b) in any other case, at suitable intervals.

(3) Where respiratory protective equipment (other than disposable respiratory protective equipment) is provided to meet the requirements of regulation 6, the employer shall ensure that thorough examination and, where appropriate, testing of that equipment is carried out at suitable intervals.

(4) Every employer shall keep a suitable record of the examinations and tests carried out in accordance with paragraphs (2) and (3) and of repairs carried out as a result of those examinations and tests, and that record or a suitable summary thereof shall be kept available for at least 5 years from the date on which it was made.

(5) Every employer shall ensure that personal protective equipment, including protective clothing, is—

(a) properly stored in a well-defined place;

(b) checked at suitable intervals; and

(c) when discovered to be defective, repaired or replaced before further use.

(6) Personal protective equipment which may be contaminated by lead shall be removed on leaving the working area and kept apart from uncontaminated clothing and equipment.

(a) S.I. 2002/1144.

(7) The employer shall ensure that the equipment referred to in paragraph (6) is subsequently decontaminated and cleaned or, if necessary, destroyed.

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Regulation	Regulation 6 Prevention or control of exposure to lead
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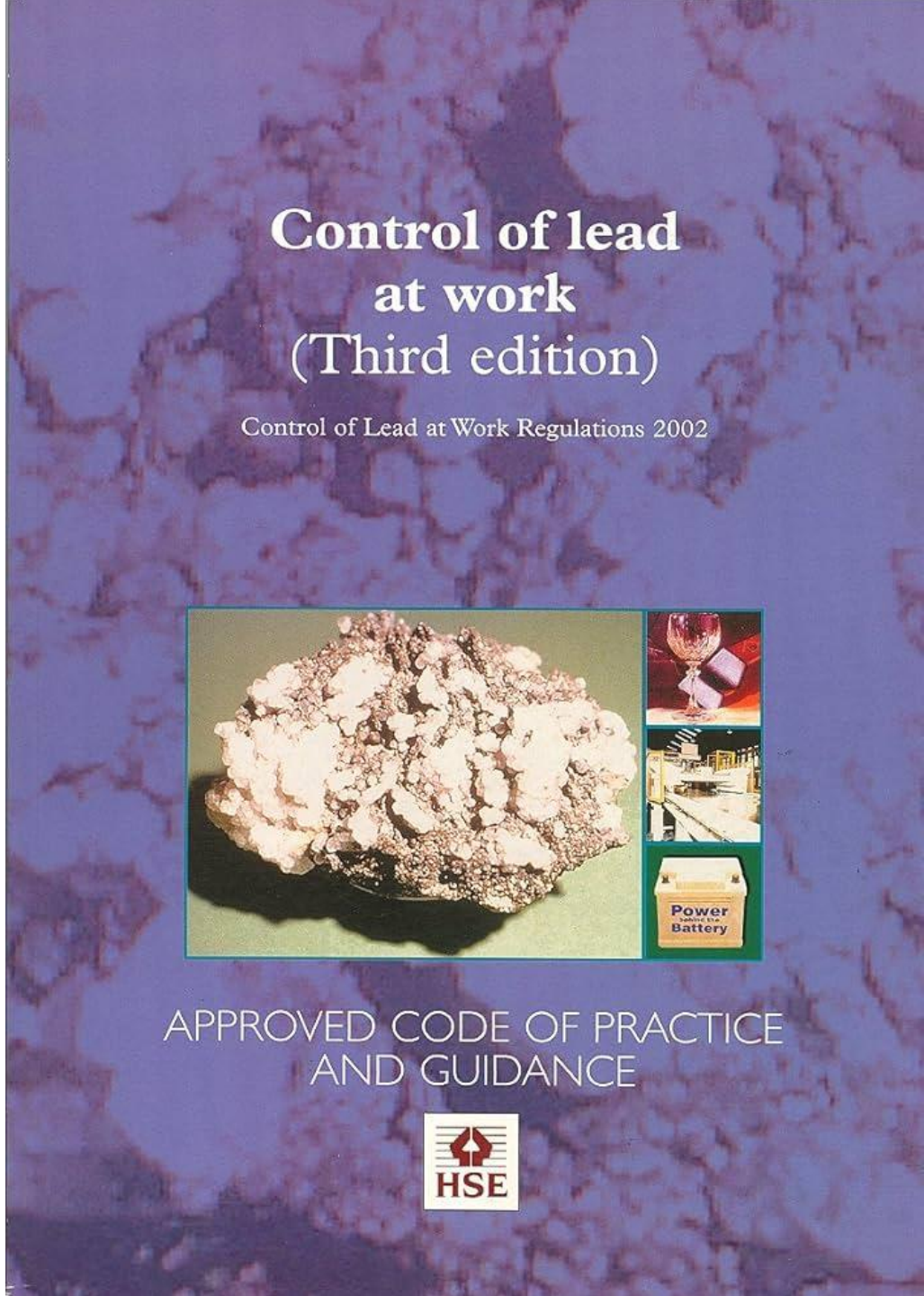

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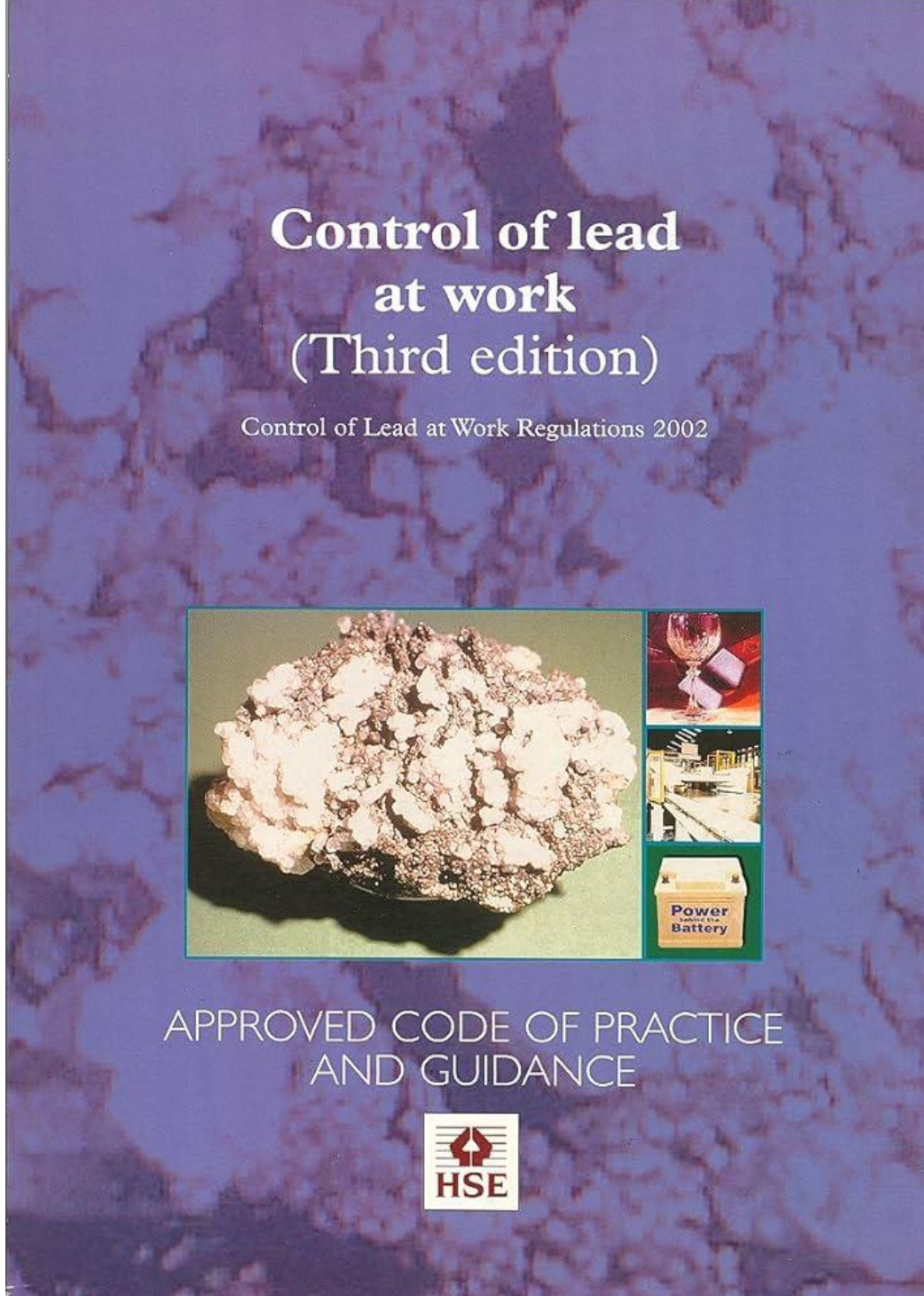
Preventing and adequately controlling exposure to lead

93 Regulation 6(1) sets out the general duty: the employer must ensure that the exposure of employees to lead by any route (eg inhalation, ingestion, absorption through the skin or contact with the skin) is either prevented or, where this is not reasonably practicable, adequately controlled. In meeting these requirements, the employer should consider and adopt the best practical measures for achieving the overall protection of employees' health.



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(c) ventilation:

(i) partial enclosure, with local exhaust ventilation;

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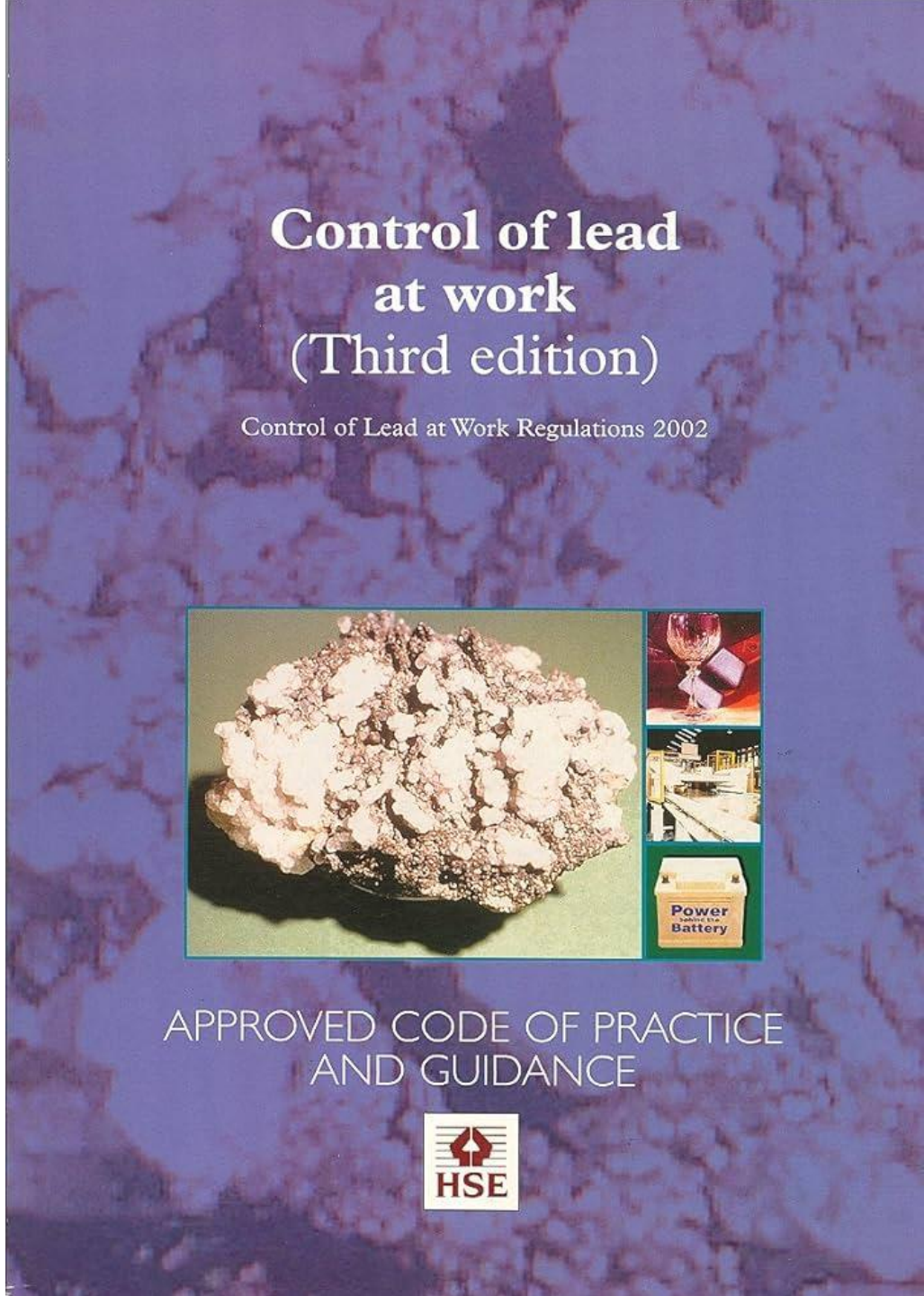
(ii) local exhaust ventilation;
(iii) sufficient general ventilation;



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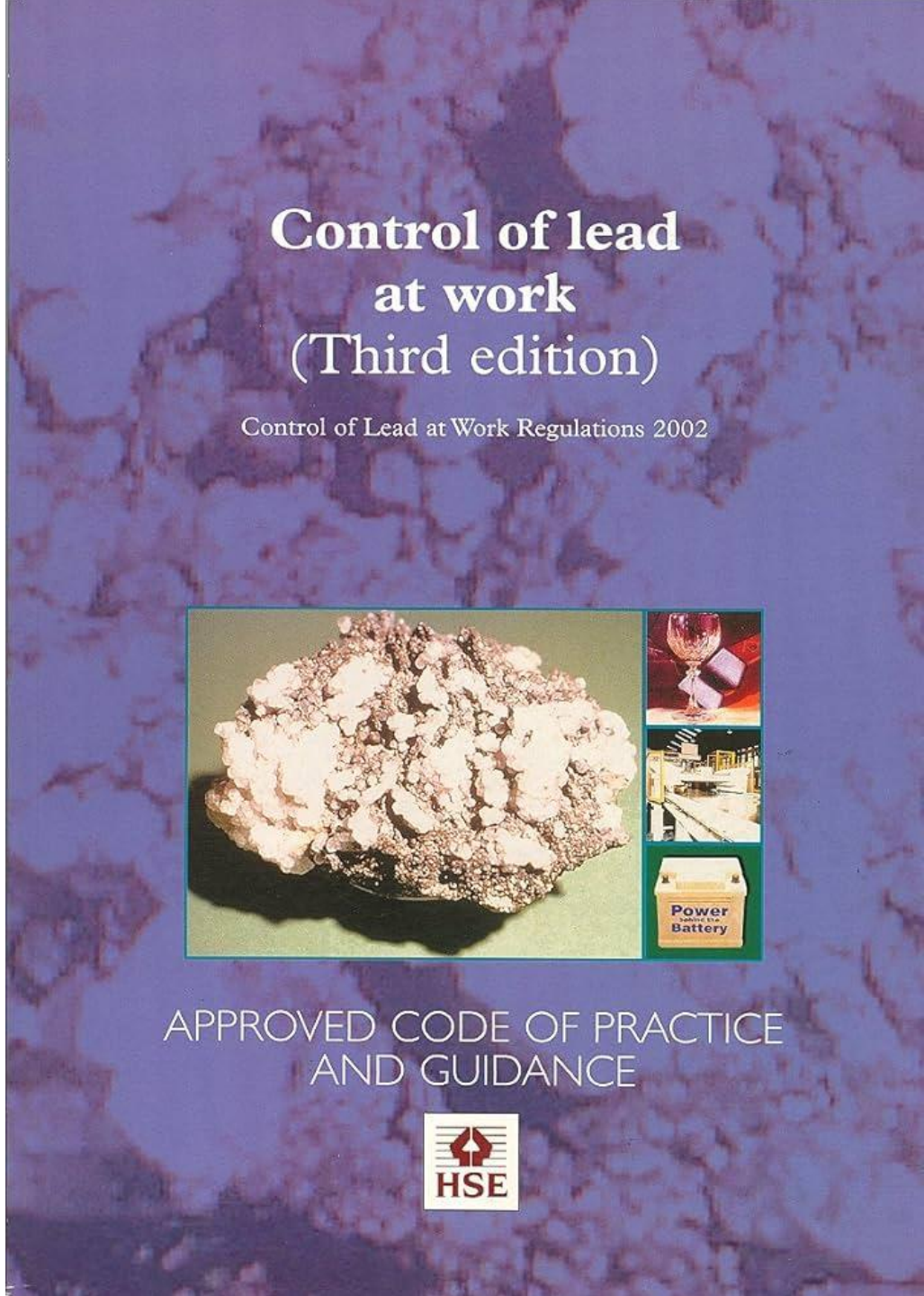
(d) if total enclosure is not reasonably practicable, using an effective exhaust ventilation system which should normally consist of:

(i) partial enclosures such as booths which enclose the lead at source and prevent its escape outside the enclosure by using an exhaust draught;

(ii) various types of hoods which are used when it is not reasonably practicable to enclose the source of pollution. The air movement in the hoods should direct the lead dust, fume or vapour and carry it into the exhaust system. To be effective these hoods should be placed as near as practicable to the point of origin of the lead dust, fume or vapour and draw it away from the employee's breathing zone;

(iii) ductwork with an airflow that is adequate to carry away the dust, fume or vapour;

(iv) a dust and/or fume collection unit with any necessary filtration equipment. Preferably, filtered air from the exhaust system should not be returned to the workplace. If it is, the employer's assessment must demonstrate that there is no significant additional risk to employees'



THE RELATIVE SIZE OF PARTICLES

From the COVID-19 pandemic to the U.S. West Coast wildfires, some of the biggest threats now are also the most microscopic.

A particle needs to be 10 microns (µm) or less before it can be inhaled into your respiratory tract. But just how small are these specks?

Here's a look at the relative sizes of some familiar particles ↘

SOURCES Clearstream, Donal Loverbey, EPA, Financial Times, News Medical, Science Direct, SCMP, Susan Sokolowski, Petroclear, U.S. Dept. of Energy
COLLABORATORS RESEARCH + WRITING Carmen Ang, Iman Ghosh | DESIGN + ART DIRECTION Hanson Scholl

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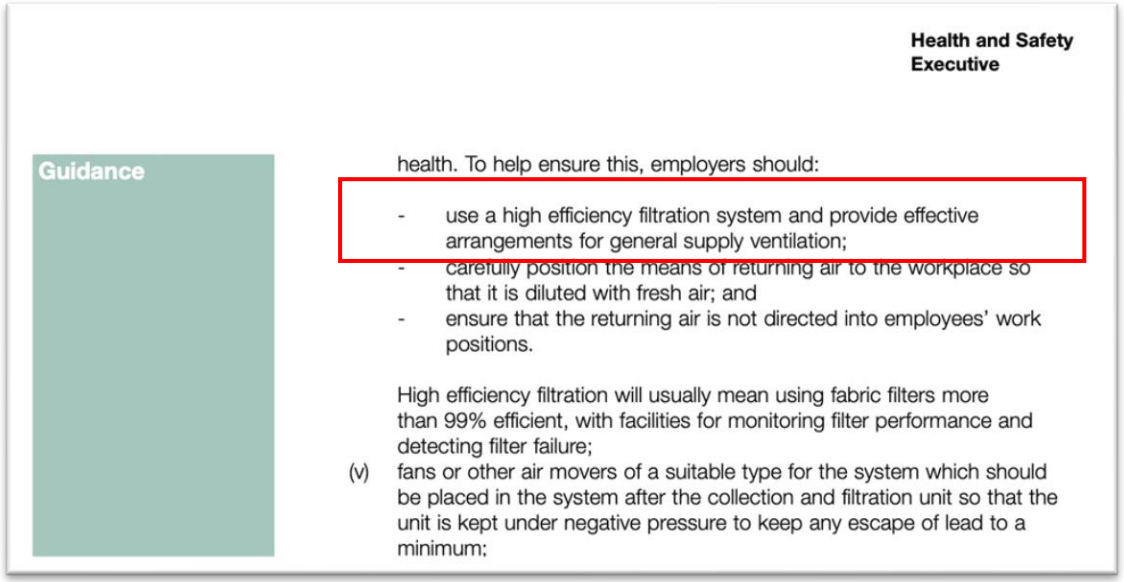

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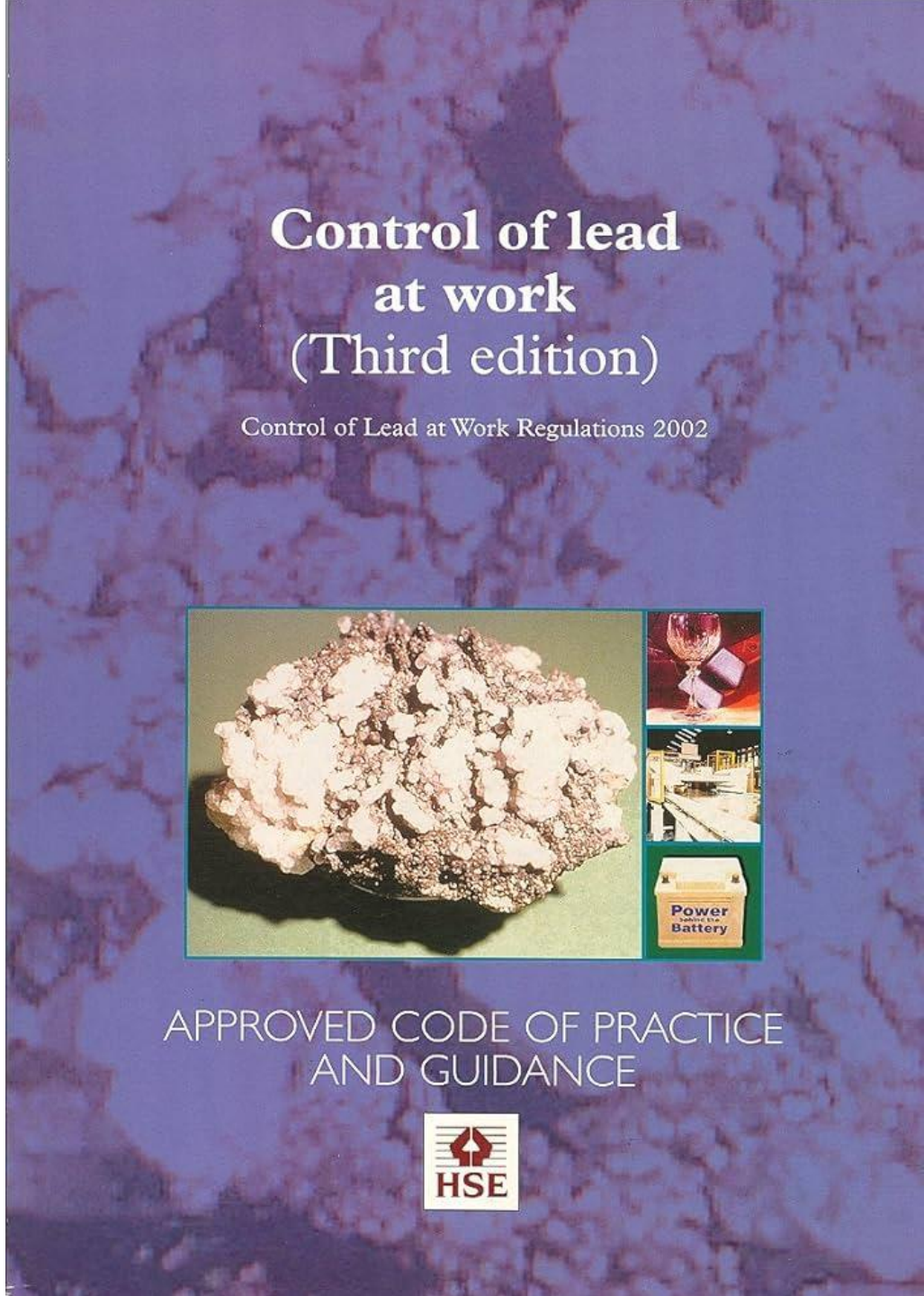
health. To help ensure this, employers should:

- use a high efficiency filtration system and provide effective arrangements for general supply ventilation;
- carefully position the means of returning air to the workplace so that it is diluted with fresh air; and
- ensure that the returning air is not directed into employees' work positions.

High efficiency filtration will usually mean using fabric filters more than 99% efficient, with facilities for monitoring filter performance and detecting filter failure;

(v) fans or other air movers of a suitable type for the system which should be placed in the system after the collection and filtration unit so that the unit is kept under negative pressure to keep any escape of lead to a minimum;

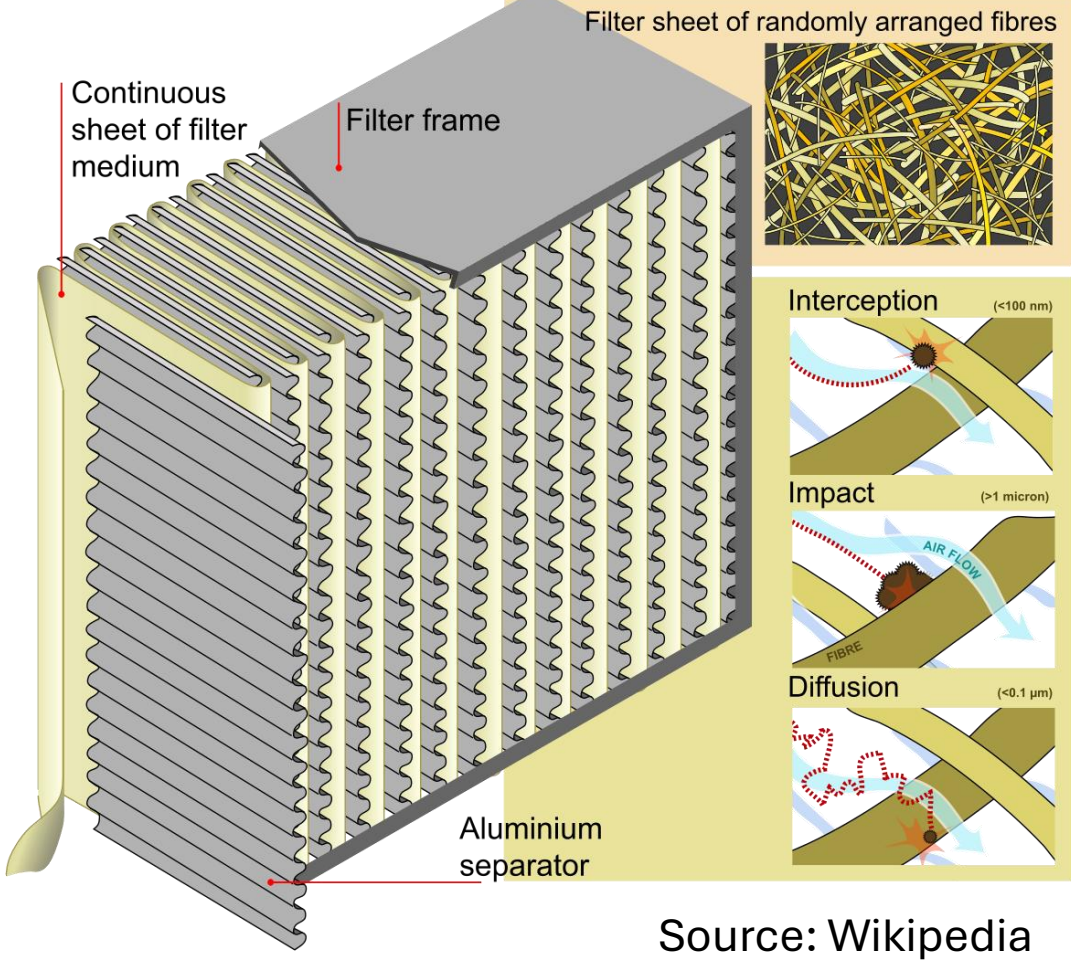


HEPA Filters

A HEPA (High-Efficiency Particulate Air) filter is a type of air filter designed to trap **extremely small particles**, including dust, pollen, mold, bacteria, and viruses, from the air.

These filters are known for their high efficiency, typically removing at least 99.97% of airborne particles that are 0.3 microns or larger.

Classes of HEPA filter:



Source: Wikipedia

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Classes of HEPA filter:

- H13 (MERV17) 99.95% efficient to remove 0.3 micron
- H14 (MERV18) 99.995% efficient to remove 0.3 micron

MERV Rating	Air filter will trap particles sized .3 to 1.0 microns	Air filter will trap particles sized 1.0 to 3.0 microns	Air filter will trap particles sized 3.0 to 10 microns	Filter Type & Particles Removed
MERV 1	<20%	<20%	<20%	Fiberglass and Aluminum Mesh pollen, dust mites, spray paint, carpet fibers, pet dander
MERV 2	<20%	<20%	<20%	
MERV 3	<20%	<20%	<20%	
MERV 4	<20%	<20%	<20%	
MERV 5	<20%	<20%	20% - 34%	Disposable Filters mold spores, kitchen aerosols, hair spray, furniture polish, household cleaning sprays
MERV 6	<20%	<20%	35% - 49%	
MERV 7	<20%	<20%	50% - 69%	
MERV 8	<20%	<20%	70% - 85%	Home Box Filters lead dust, flour, auto fumes, welding fumes
MERV 9	<20%	>50%	85% or better	
MERV 10	<20%	50% - 64%	85% or better	
MERV 11	<20%	65% - 79%	85% or better	Commercial Filters bacteria, wildfire smoke, respiratory droplets
MERV 12	<20%	80% - 90%	90% or better	
MERV 13	>75%	90% or better	90% or better	
MERV 14	75% - 84%	90% or better	90% or better	
MERV 15	85% - 94%	95% or better	90% or better	
MERV 16	95% or better	95% or better	90% or better	
MERV 17	99.97%	99% or better	99% or better	HEPA and ULPA viruses, carbon dust
MERV 18	99.997%	99% or better	99% or better	
MERV 19	99.9997%	99% or better	99% or better	
MERV 20	99.99997%	99% or better	99% or better	

ISO-Aire

Source: ISO-AIRE

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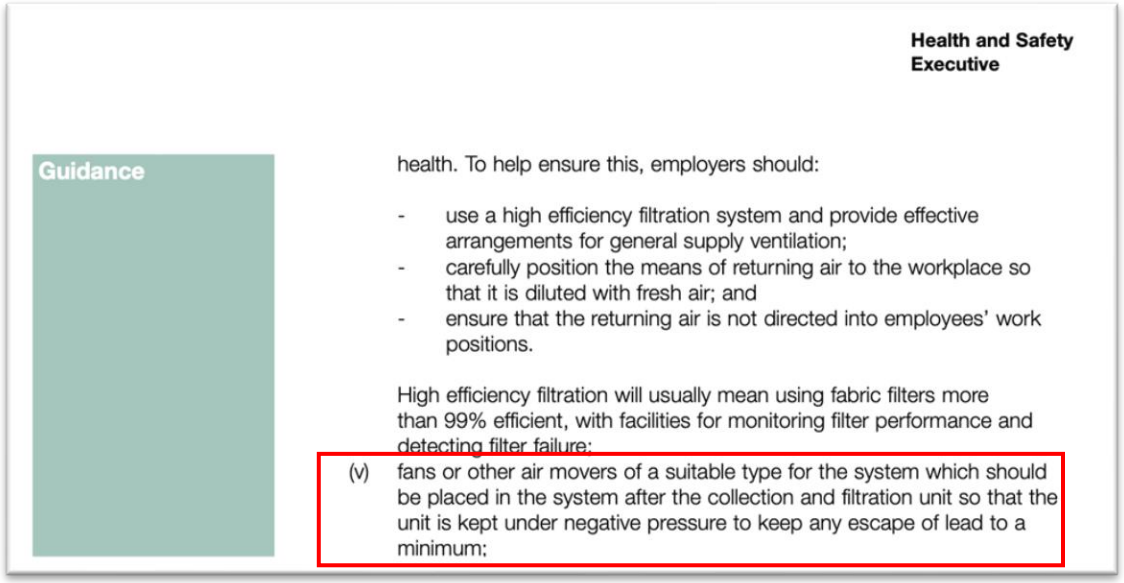

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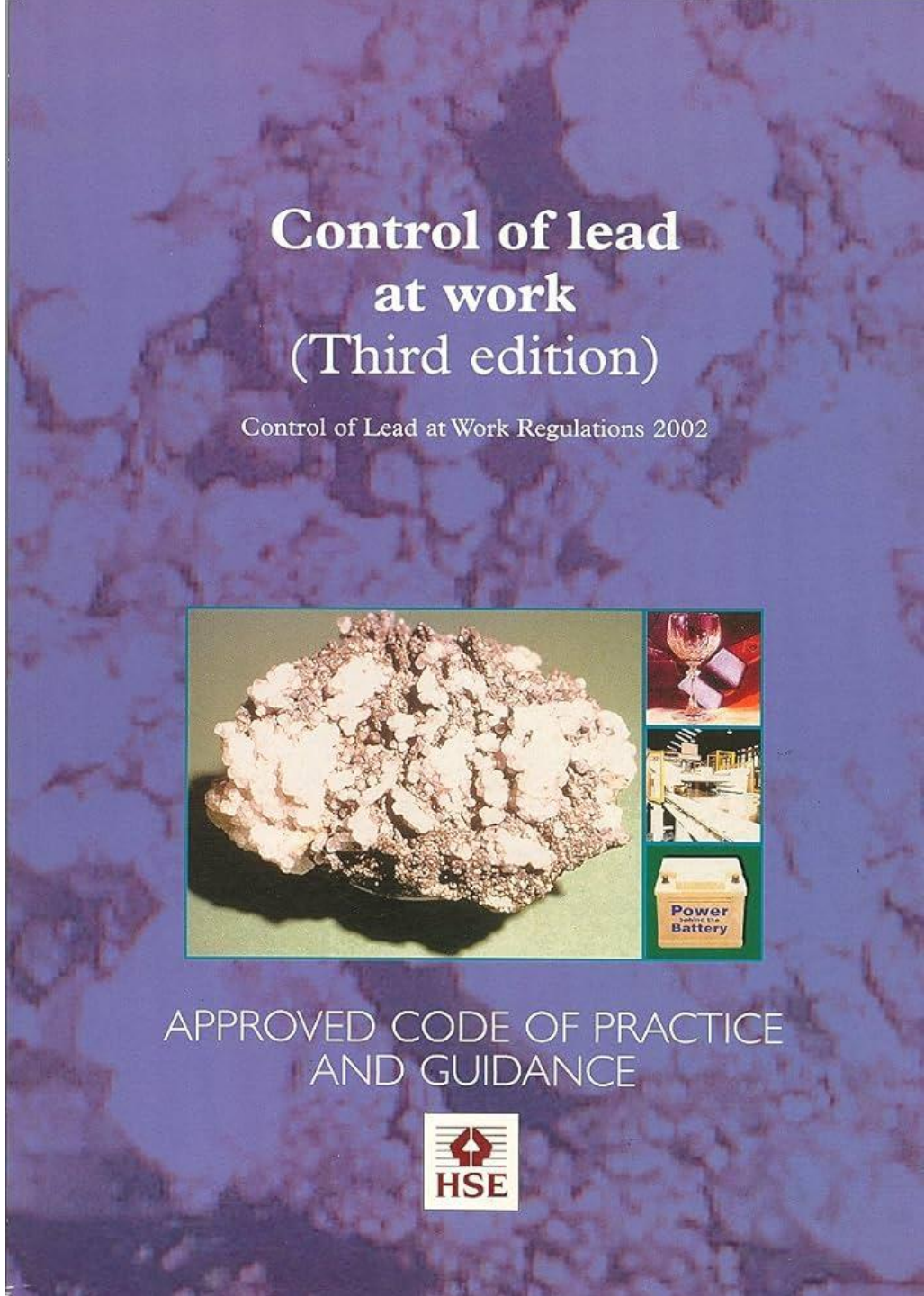
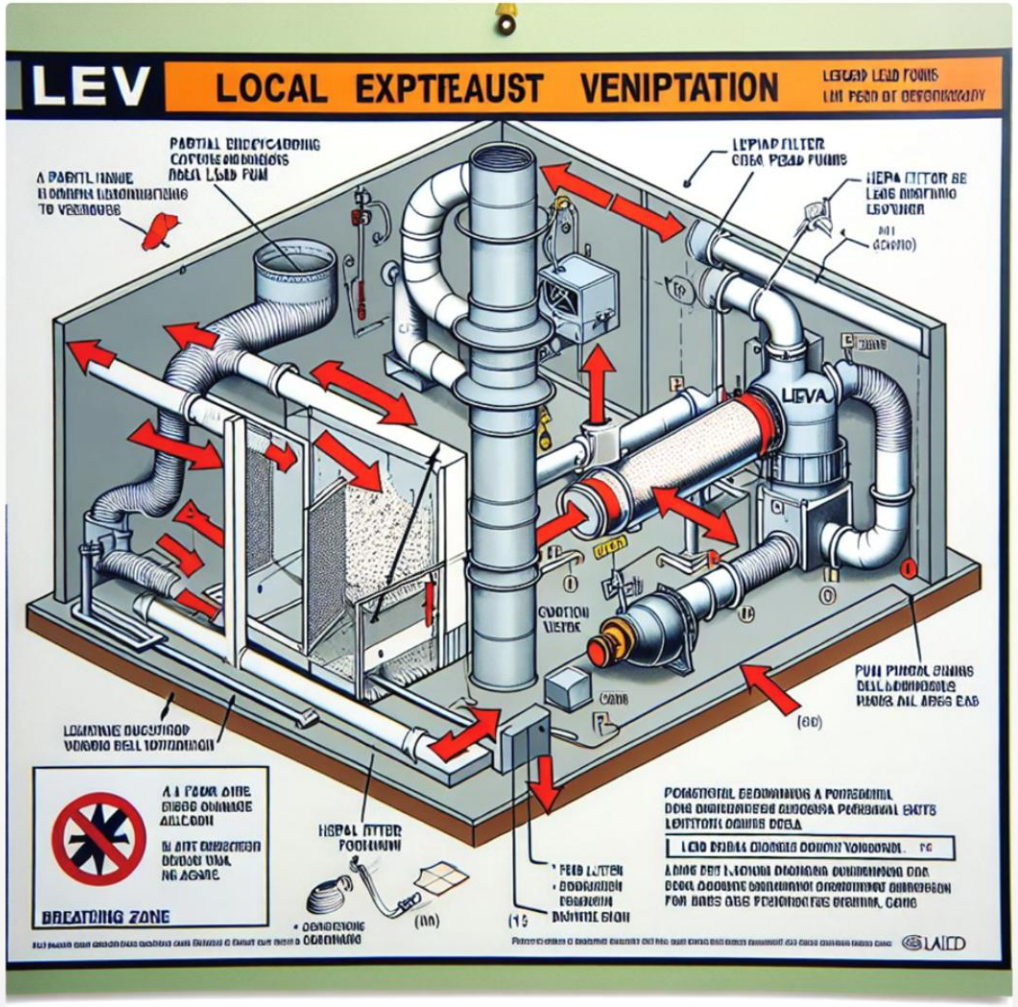


LEV Design



A detailed diagram of a Local Exhaust Ventilation (LEV) system used to control lead fumes. Include components such as a partial enclosure, HEPA filter (H13), fan, ducting, and discharge to a safe place. Show airflow direction with arrows and label the breathing zone.

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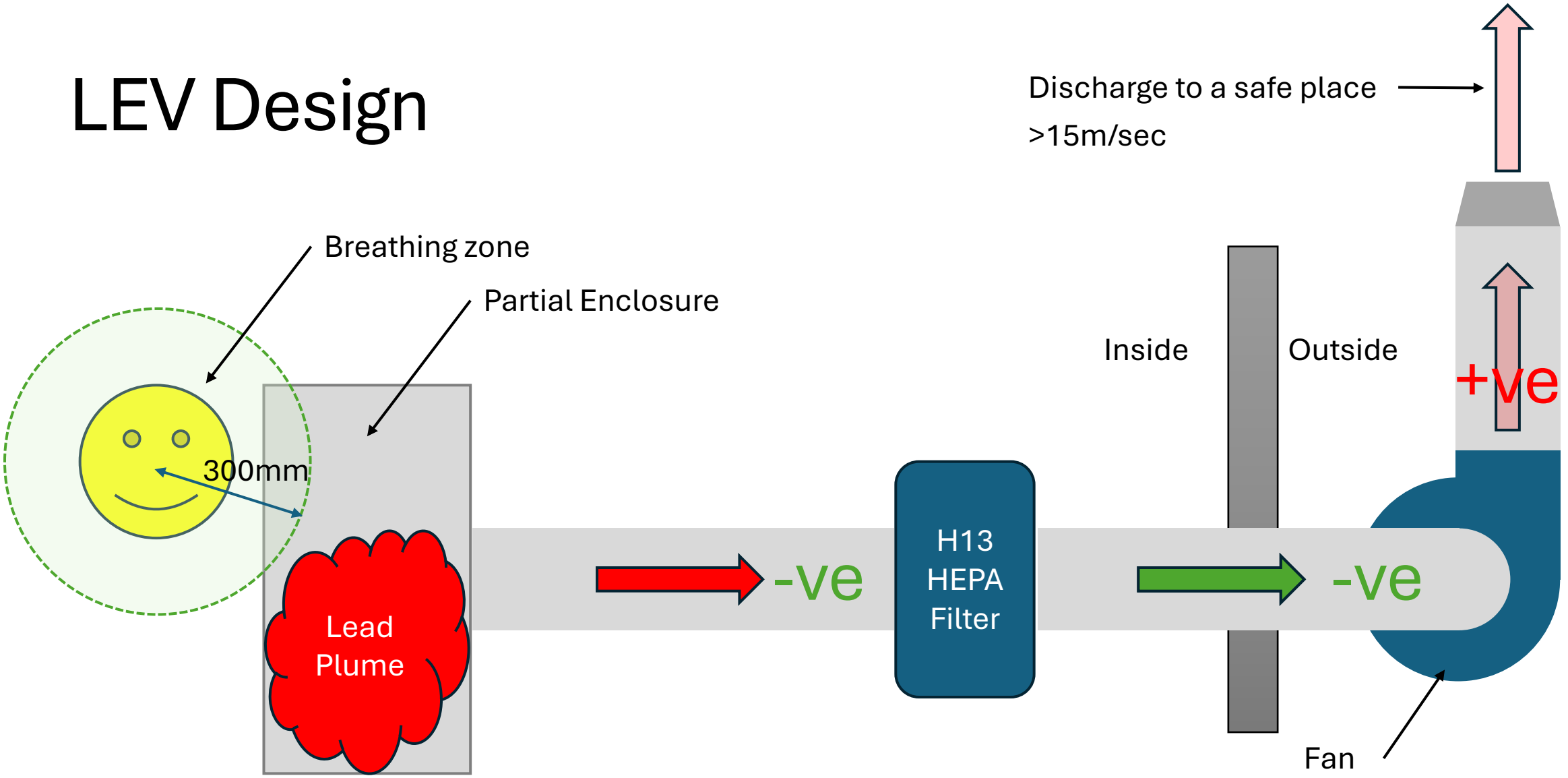
LEV Design


Discharge to a safe place
>15m/sec
Breathing zone
Partial Enclosure
300mm
Lead
Plume
-ve
H13
HEPA
Filter
Inside
Outside
-ve
+ve
Fan

HSE G258 – Controlling airborne contaminants at work (Third edition)

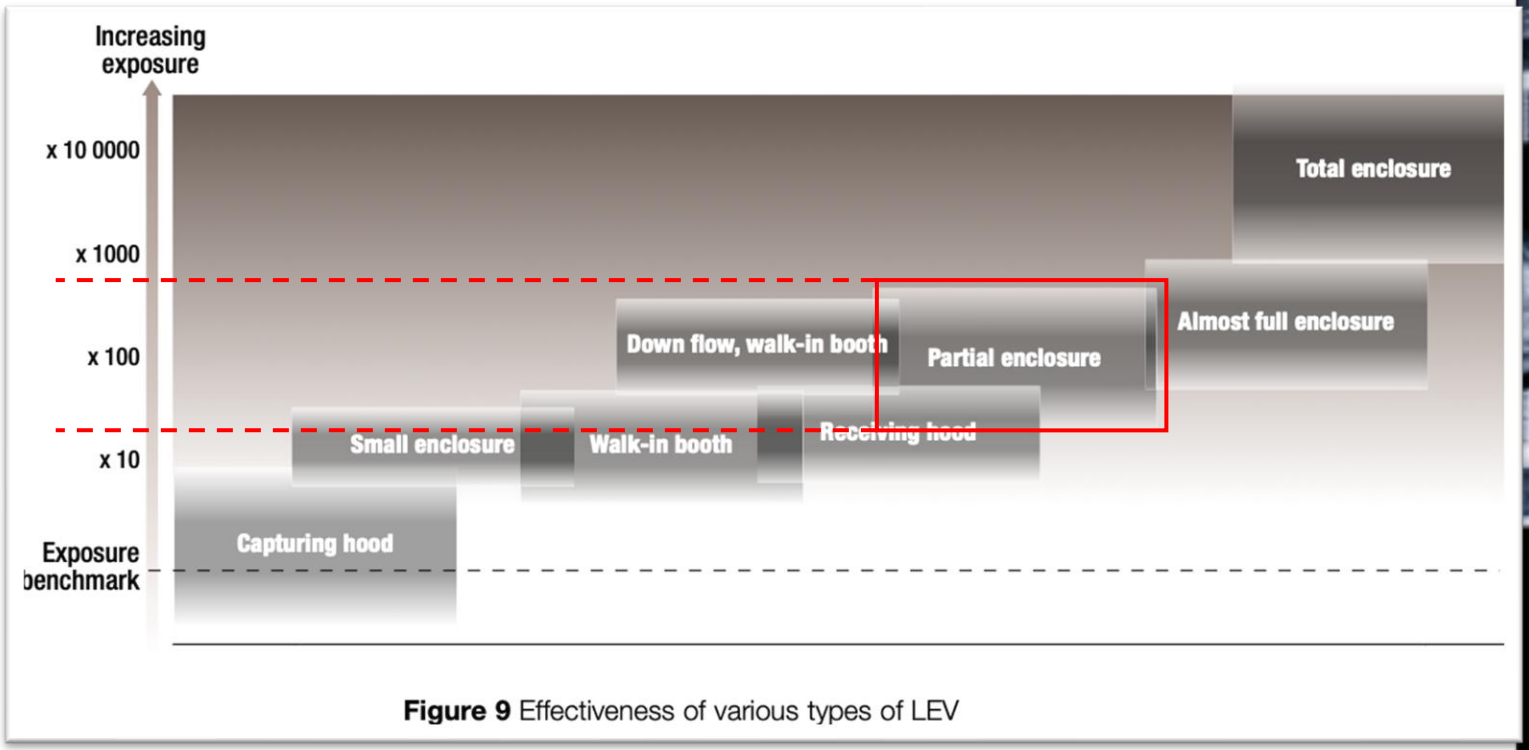


Figure 9 Effectiveness of various types of LEV

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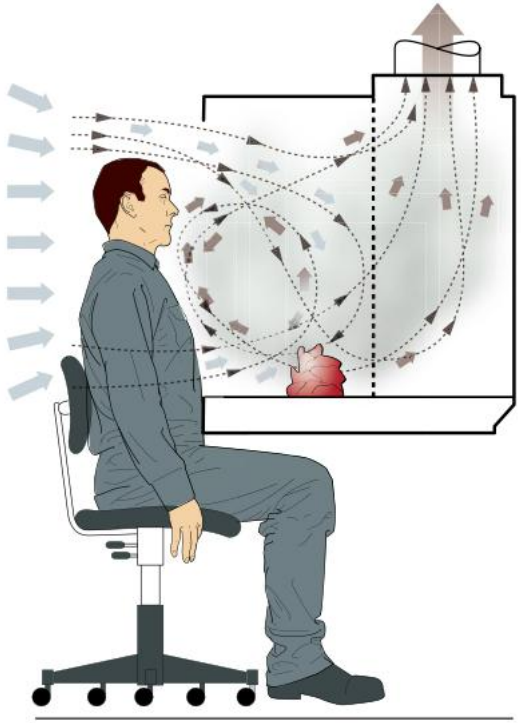

If the booth is too shallow, hot contaminant clouds can escape due to eddies and wake effects

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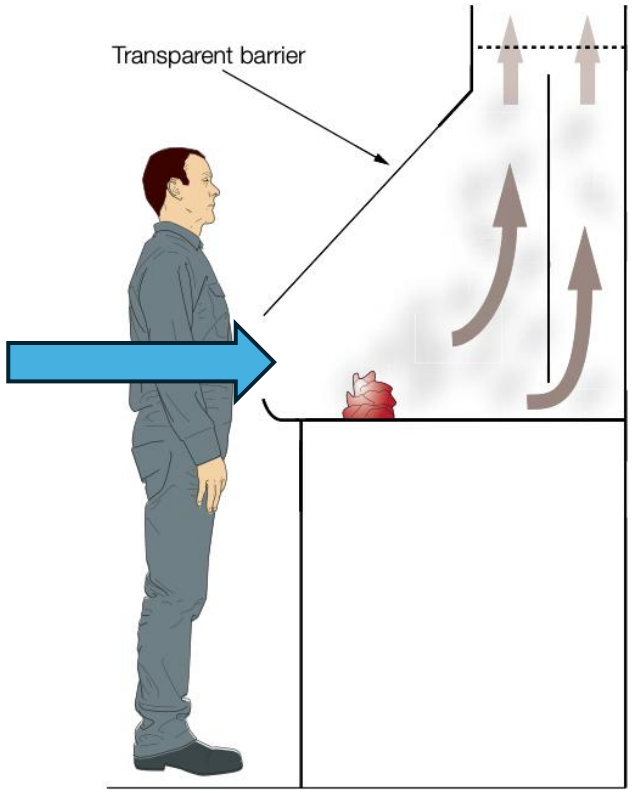
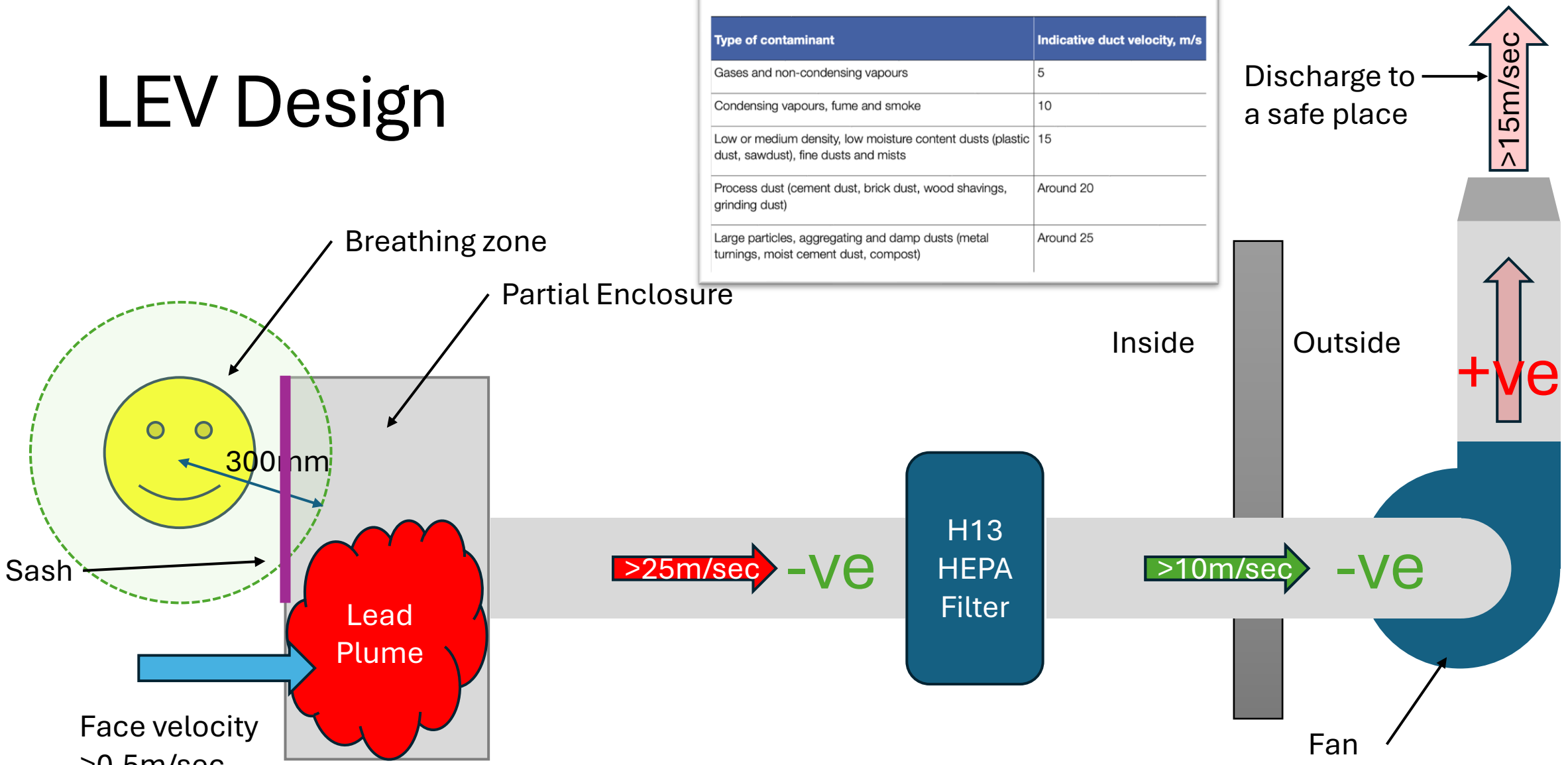


LEV Design

Table 12 Recommended minimum duct velocities

Type of contaminant	Indicative duct velocity, m/s
Gases and non-condensing vapours	5
Condensing vapours, fume and smoke	10
Low or medium density, low moisture content dusts (plastic dust, sawdust), fine dusts and mists	15
Process dust (cement dust, brick dust, wood shavings, grinding dust)	Around 20
Large particles, aggregating and damp dusts (metal turnings, moist cement dust, compost)	Around 25



$$Q = V \times A$$

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