



**MEASURING AND ASSESSING
WORKPLACE HAZARDS**

AN INTRODUCTORY GUIDE TO OCCUPATIONAL HYGIENE

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INTRODUCTION

The evaluation and assessment of workplace hazards fall under the discipline known as Occupational Hygiene. As professionals in this industry, our Occupational Hygienists are committed to protecting worker health in all industries and organisations.

WHAT DOES OCCUPATIONAL HYGIENE COVER?

Occupational Hygienists are involved at the interface of people and their workplaces. They use science and engineering to protect against ill health at work and specialise in identifying, evaluating, and controlling the risks.

These risks can be found in any workplace and fall into three main areas:

CHEMICAL HAZARDS	PHYSICAL HAZARDS	BIOLOGICAL HAZARDS
Liquids	Noise	Legionella
Dusts	Vibration	Bioaerosols
Fumes	Ergonomics	Bacteria
Gases	Thermal environment	Mould
Mists	Radiation	Fungi
Vapours	Lighting	Viruses

Good occupational hygiene practice means that some health risks can be eliminated, while others can only be controlled, so workplaces will continue to have the potential to expose workers to health hazards. Any risks will always need to be properly understood, assessed, and managed.

HOW WILL THIS BENEFIT MY BUSINESS?

Professionally addressing occupational hygiene issues enables businesses to comply with a broad raft of workplace legislation and regulatory requirements. Indeed, the cost of non-compliance is potentially ruinous.

Whether you are a manufacturer, services company, or office-based organization, sound occupational hygiene practices deliver tangible bottom-line benefits to businesses across all sectors and of all sizes.

A professional approach to occupational hygiene practice will:

- Boost productivity
- Reduce risks of litigation and legal costs
- Raise staff morale
- Improve employee retention rates
- Minimise waste
- Reduce absenteeism and sickness
- Enhance your reputation

This e-book aims to provide a single reference guide that will enable you to grasp what the law requires of you, recognise areas of your activity where gaps might exist, and show you how to identify potential occupational hygiene risks in your workplace.



HAZARDOUS SUBSTANCES (COSH H)

WHAT HEALTH HAZARDS DO WORKERS FACE DUE TO EXPOSURE TO SUBSTANCES?

Diseases caused by hazardous substances in the workplace exact a high – and sometimes devastating – price on workers, businesses, and society.

Poor or inadequate management of hazardous substances results in thousands of workers suffering from lung diseases such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer, as well as skin conditions including non-melanoma skin cancers and dermatitis.

- Approximately 12,000 people die each year as a result of occupational respiratory diseases. Around two-thirds are due to asbestos-related conditions or COPD (HSE).
- 17,000 new cases of breathing or lung problems are caused or made worse by work each year averaged over the last three years (ONS Labour Force Survey)
- In 2018 there were 1018 individuals with new cases of work-related skin disease, of these diagnoses, 875 (86%) were contact dermatitis, 22 (2%) were other non-cancerous dermatoses, and the remaining 121 (12%) were skin cancers (HSE).

Whatever your line of business, it is essential for legal, commercial, and reputation related reasons, for all employers – and employees – to be aware of what constitutes a harmful substance.

WHAT DOES THE LEGISLATION COVER, AND WHAT ARE EMPLOYERS' LEGAL RESPONSIBILITIES?

Employers are responsible for protecting the health of their workforce by effectively assessing and controlling any exposure to hazardous substances. To do this, they must comply with the Control of Substances Hazardous to Health (COSHH) Regulations.

Undertaking a COSHH Assessment is the first step to recognizing whether or not your company has hazardous substances and the risks they potentially pose.

An employer cannot carry out work liable to expose employees to a hazardous substance without a full assessment of the risks and a thorough evaluation of the steps needed to control any exposure. (Regulation 6).



WHAT FALLS UNDER COSHH?

SUBSTANCES COVERED BY COSHH

- Chemicals
- Products containing chemicals
- Substances given off from processes/activities
- Micro-organisms

SUBSTANCES COVERED BY OTHER SPECIFIC LEGISLATION

- Asbestos (see Chapter 2)
- Lead
- Radioactive substances

ALL OTHER LEGAL REQUIREMENTS FLOW FROM THE ASSESSMENT OUTCOMES

- | | |
|-----------------|---|
| · Regulation 7 | Control of exposure |
| · Regulation 8 | Use of control measures |
| · Regulation 9 | Maintenance, examination, and testing of control measures |
| · Regulation 10 | Monitoring of exposure |
| · Regulation 11 | Health surveillance |
| · Regulation 12 | Information, instruction, and training |
| · Regulation 13 | Arrangements to deal with accidents, incidents, and emergencies |

HOW DO EMPLOYERS ASSESS THE RISKS?

In evaluating their employees' exposure to COSHH risks, employers should ask several questions to satisfy the assessment requirements.

- Does any product you use have a danger label?
- Does your process produce gas, fumes, dust, mist, or vapour?
- Is the substance harmful to breathe in?
- Can the substance harm your skin?
- Could harm arise because of the way you use or produce it?
- What are you going to do about it? (for example, use something else? use it in another, safer way?)

In addition, employers should:

- Gather information about the substances, the task, and the working practices (or find out what the problems are)
- Evaluate the risks to health (or look at any problems that are found)
- Decide on the necessary measures to comply with regulations
- Decide if workplace air monitoring or biological monitoring is required
- Record the assessment
- Find out when the assessment needs to be reviewed

COSHH assessment also looks at the types of substances in use (which can be by-products, such as welding fumes), and their toxicity.

HOW CAN ELEMENT HELP YOU BE COMPLIANT?

For complex chemical processes, qualified occupational hygienists or persons with suitable training and qualifications should advise.

Element can fully assess the interaction of the substances with the working environment, provide advice on any appropriate controls to protect workers, and ensure compliance with the COSHH and other substance regulations.



WORKPLACE AIR MONITORING (WAM)

WHAT DOES WORKPLACE AIR MONITORING INVOLVE?

Workplace Air Monitoring is a scientific procedure used to assess an employee's exposure to airborne contaminants.

Air monitoring methodologies are as wide-ranging as the contaminants they aim to quantify. Still, they generally involve the pumping of contaminant-laden air through a filtering or absorbent medium located within a subject's breathing zone and the subsequent laboratory analysis of that medium. Once a concentration is established, it can be compared with statutory occupational exposure limits; in the UK, these are known as Workplace Exposure Limits (WELs) and are time-weighted over an 8-hour, Long Term Exposure Limit (LTEL) or 15-minute, Short Term Exposure Limit (STEL). These limits are defined in the HSE document EH40: Workplace Exposure Limits. It is important to note that not all substances have WELs, but this does not necessarily mean they are safe.

A Workplace Air Monitoring Assessment is not only about determining concentrations. It also involves detailed observation of the activities and processes at a workplace, enabling conclusions about which activities and processes may lead to exposure, recommendations for reducing exposure, and assessment against good practice and other legislative requirements. A comprehensive report should be issued following a Workplace Air Monitoring campaign that meets the requirements laid out in the COSHH Approved Code of Practice with ACOP and, preferably, to the standard defined in the British Occupational Hygiene Society's Clear and concise report writing: guidance for occupational hygienists.

WHAT DOES THE LEGISLATION COVER AND WHAT ARE EMPLOYERS LEGAL DUTIES?

Air Monitoring is a requirement under the COSHH 2002, covered specifically in Regulation 10: Exposure Monitoring.

Air monitoring is required for several reasons. These reasons could include: where your risk assessment requires further information to determine risk; where health risks are present if your control measures fail/deteriorate; where WELs for a substance you use exist; a change in a process/environment has occurred and when checking the effectiveness of control measures.

COMMON WORKPLACE AIR MONITORING SCENARIOS AND SUBSTANCES

FLOUR DUST

Flour dust is a respiratory sensitiser, meaning it can cause occupational asthma. As such, it is often a requirement to conduct Workplace Air Monitoring where it is present in your workplace. It is commonly found in bakeries and other food manufacturing plants.

Sampling for flour dust is carried out to MDHS 14/4: General methods for sampling and gravimetric analysis of respirable, thoracic and inhalable aerosols, whereby a sampling pump is affixed to an operative, and a known volume of air is drawn through a pre-weighed glass fibre filter, positioned in the operative's breathing zone. This filter is subsequently weighed with a precise laboratory balance and a concentration determined.

Flour dust has a WEL of 10 mg.m^{-3} and a STEL of 30 mg.m^{-3} . It also has a further obligation under COSHH, due to its status as a respiratory sensitiser, in that exposure should be reduced to levels as low as reasonably practicable (ALARP), meaning that, where controls can be reasonably implemented to reduce exposure, they should be.

ISOCYANATES

Isocyanates are a group of compounds used in polyurethane product manufacturing. Typical industries and processes include paint manufacturing, paint spraying and foam production. They are also potent respiratory and skin sensitisers, irritants and, in the case of toluene diisocyanates, possible carcinogens.

Sampling for isocyanates is achieved through a multi-phase method prescribed in MDHS 25/4. This involves air being drawn through a spiked filter and, where applicable, an impinger of absorbing solution, before analysis by High Performance Liquid Chromatography.

Isocyanates have a LTEL of 0.02 mg.m^{-3} and a STEL of 0.07 mg.m^{-3} , along with a requirement for exposure to be ALARP.



WELDING FUME

The main health hazard with welding is the fume. Welding fume includes very fine particles of metal oxides and is internationally classified as possibly carcinogenic to humans. The fume can cause respiratory irritation and metal fume fever. Welding fume can also contain irritating gases such as oxides of nitrogen and ozone. Inert shielding gas used in welding can also present a serious risk of asphyxiation in a confined space.

Sampling for welding fume and its metal oxides is achieved through the method prescribed in British Standard EN ISO 10882-1: Health & Safety in Welding and Allied Processes - Sampling of airborne particles and gases in the operator's breathing zone, whereby a sampling pump is affixed to an operative, and a known volume of air is drawn through a pre-weighed mixed cellulose ester filter, positioned in the operative's breathing zone. This filter is subsequently weighed with a precise laboratory balance and a concentration determined, subsequent analysis of individual metal oxides is undertaken by inductively couple plasma. Sampling for hexavalent chromium (specific to stainless steel and welding) is conducted by drawing air through a PVC filter and analysis via Visible Absorption Spectrophotometry in accordance with NIOSH method 7600.

There is no single WEL for welding fume, with individual limits for the different constituents in the fume such as: iron oxide, hexavalent chromium, nickel and manganese, along with a requirement for exposure to the constituents of the fume to be ALARP.

SOLVENTS – VOLATILE ORGANIC COMPOUNDS (VOCs)

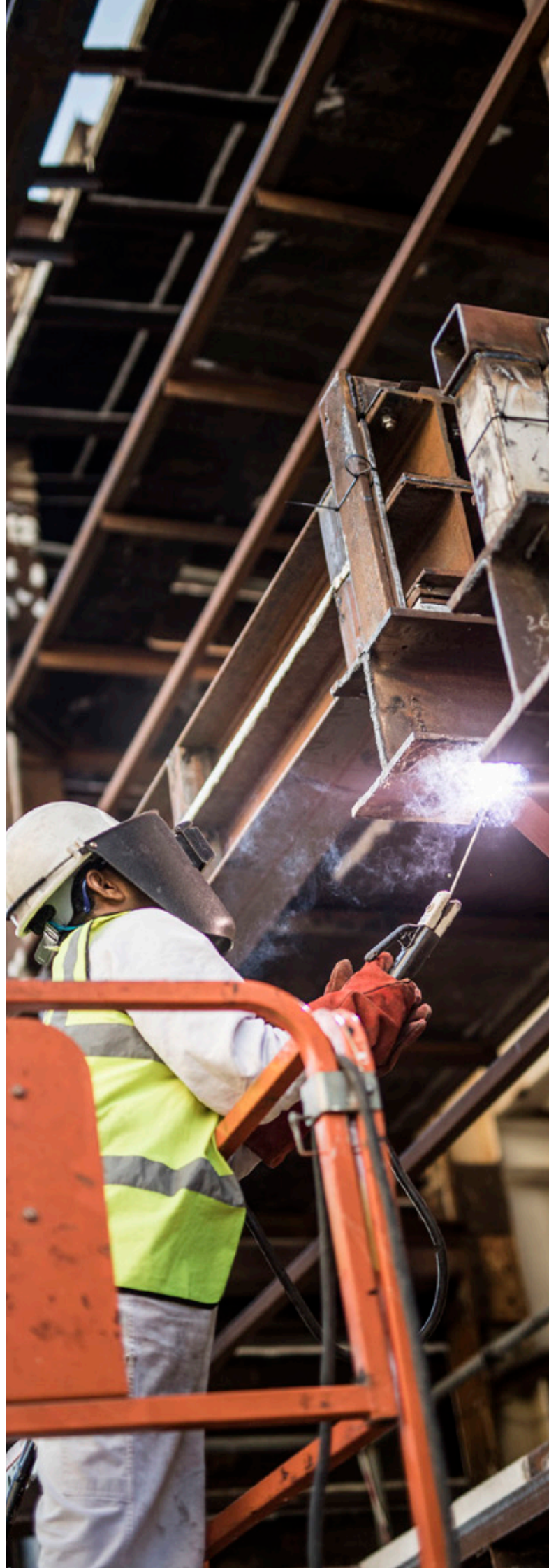
A wide range of solvents are used in industrial processes, laboratories and manufacturing. They have generic health effects such as narcosis, skin defatting and irritation to the respiratory tract. Some VOCs have carcinogenic potential, are reprotoxins or cause peripheral nerve damage. Therefore, this class of compound is often subject to a Workplace Air Monitoring Assessment.

Air sampling is conducted by drawing air over a tube containing a suitably adsorbent material. This is then analysed via Gas Chromatography-Flame Ionisation Detection.

WELs for VOCs vary dependent upon their individual toxicities.

HOW CAN ELEMENT HELP YOU BE COMPLIANT?

Our qualified, experienced team can undertake monitoring campaigns, following the latest sampling strategies, to provide fully interpretive reports, with reference to applicable Occupational Exposure Limits.



LOCAL EXHAUST VENTILATION (LEV)

WHAT IS LOCAL EXHAUST VENTILATION (LEV) AND HOW DOES IT HELP PROTECT WORKER'S HEALTH?

Local Exhaust Ventilation is an engineering system used to control worker exposure to airborne contaminants. It achieves this by extracting contaminant laden air generated by a work process at its source.

LEV is typically comprised of a discharge point, air mover (e.g. fan) a filter system, ducting and an extraction hood. Common examples include fume cupboards, welding hood extraction and spray booths.

WHAT DOES THE LEGISLATION COVER AND WHAT ARE THE EMPLOYERS LEGAL DUTIES?

Legislation in respect to LEV is encompassed within the Control of Substances Hazardous to Health Regulations (2002), specifically in respect to Regulation 7 – Control of exposure; Regulation 8 – Use of control measures and Regulation 9 – Maintenance, examination and testing of control measures.

Under these regulations an employer has a number of legal duties to fulfil, including; a requirement to:

- Employers must assess the degree of exposure and the risks to their employees, devise and implement adequate control measures, and check and maintain them.
- Employers must ensure that the equipment necessary for control is maintained ‘in an efficient state, in efficient working order, in good repair and in a clean condition’

- Employers must ensure that thorough examination and testing of their ‘protective’* LEV is carried out at least every 14 months (unless otherwise stipulated), other engineering controls at ‘suitable intervals’ and must ‘review and revise’ ways of working so that controls are being used effectively.

HSE within their guidance document, HSG258 Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV) provides information about the roles and legal responsibilities of employers and suppliers; competence; principles of good design practice for effective LEV hoods and their classification; ducts; air movers; air cleaners; and system documentation - with checking and maintenance schedules and the marking of defective equipment.

HOW CAN ELEMENT HELP YOU BE COMPLIANT?

In accordance with HSG258: Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV), Element offer a service to conduct your Routine Thorough Examination and Test, as well as provide Initial Examination and Tests required for new systems. These include a full report detailing the performance of your system and its effectiveness at controlling contaminants, along with detailed recommendations to improve your system and achieve compliance with the regulations.



NOISE AT WORK

WHAT HEALTH HAZARDS DO WORKERS FACE DUE TO EXPOSURE TO NOISE?

Approximately 17,000 working people in the UK reported work-related hearing problems over a three year period (2017/18 to 2019/20), according to the Labour Force Survey. RNIB reported 95 new cases Industrial Injuries Disablement Benefit awards for occupational deafness in 2019.

It is difficult to overstate the effects of hearing damage caused by exposure to noise at work, which can be permanent and incurable. Noise-induced deafness has life-changing impacts on individuals, families, and society.

Damage usually occurs gradually over several years due to prolonged exposure to noise. The signs may go unrecognised until the noise-induced deafness, combined with age-related hearing loss or non-occupational noise sources (such as loud music, motor racing, power tool use), becomes quite severe.

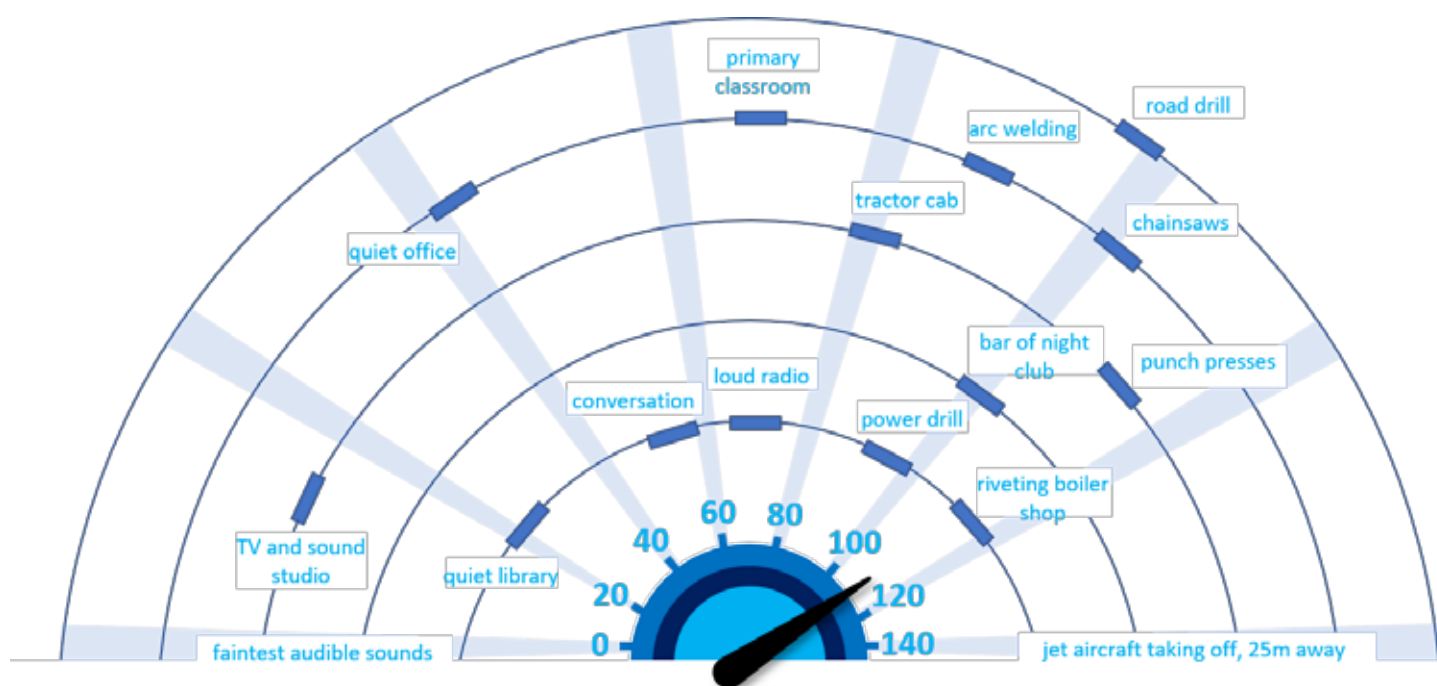
HOW IS EXPOSURE CALCULATED?

Daily personal noise exposure (LEP,d) is the daily total of personal exposure to noise at work, taking into account the average levels of noise in working areas and the time spent in them.

The values are based on a standard 8-hour shift to allow for 16 hours' recovery away from the noisy environment. If people work longer shifts (more than 8 hours), the LEP,d has to be corrected as their exposure is increased and recovery time is decreased.

If one of the noise exposure action values is likely to be exceeded, an employer must carry out a risk assessment to assess whether any employees are likely to be exposed to harmful noise levels.

TYPICAL NOISE LEVELS



WHAT DOES THE LEGISLATION COVER, AND WHAT ARE THE LEGAL RESPONSIBILITIES?

The Control of Noise at Work Regulations 2005 means employers must ensure their employees' exposures to noise are either eliminated at the source or reduced to the lowest reasonably practical level.

Regulations say noise-induced hearing loss is entirely preventable if:

- Employers take action to reduce exposure to noise
- Manufacturers design tools and machinery to operate more quietly
- Employees use personal hearing protection and other control measures supplied by the employer

Regulations set the action and limit values for daily noise exposures and peak sound levels. These are detailed in units called decibels, which is the measurement of sound pressure.

UK LEGAL NOISE LIMITS	DAILY NOISE EXPOSURE (LEP,D)	PEAK SOUND PRESSURE LEVEL
Lower exposure action value (LEAV)	80 dB(A)	135 dB(C)
Upper exposure action value (UEAV)	85 dB(A)	137 dB(C)
Exposure limit value (ELV)*	87 dB(A)	140 dB(C)

*ELV takes into account hearing protection

HOW DO I ASSESS IF I HAVE A NOISE PROBLEM?

- Do you work in a noisy workplace? (for example, manufacturing, construction/demolition, road work, power generation, entertainment, and leisure).
- Is noisy equipment or machinery used for more than 30 minutes in a day?
- Are impact noises heard, such as impact tools, explosive sources, regular banging?

You can use the following guidelines to establish if your activities are likely to exceed the legal action/limit values where people are working.

RULE OF THUMB	TIME IN THE NOISY AREAS IN A DAY	PROBABLE NOISE LEVEL
Need to shout to be heard at one meter	>30 minutes	≥90 dB
Need to shout to be heard at two meters	>2 hours	≥85 dB
Can talk at two metres but noise is an issue	>6 hours	≥80 dB

Usually, a noise assessment will involve a series of measurements using specialist, calibrated equipment. This includes a hand-held sound level meter and, where appropriate, small personal 'dosimeters' that continuously record sound levels on individuals as they work.

Personnel undertaking the assessments should be fully trained on an industry-recognized course. This usually covers the theory of sound, how to take measurements, and how to understand and report results.

If the LEAV (80 dB(A) or 135 dB(C)) is likely to be exceeded, employers must:

- Carry out a noise risk assessment (reviewed at least every two years)
- Provide suitable hearing protection on request
- Provide personnel with information, instruction, and training relating to noise and its risks

If the UEAV (85 dB(A) or 137dB(C)) is likely to be exceeded, additional measures required include:

- Produce a noise control action plan to reduce exposure to as low a level as is reasonably practicable
- Provide suitable hearing protection, and ensure it is worn
- Designate and demarcate hearing protection zones
- Carry out appropriate health surveillance by qualified health professionals



VIBRATION AT WORK

WHAT HEALTH HAZARDS DO WORKERS FACE DUE TO VIBRATION EXPOSURE?

Occupational exposure to vibratory tools and equipment can cause permanent and debilitating ill-health affecting individuals' dexterity and circulation.

HAND-ARM VIBRATION (HAV)

HAV is mechanical vibration that is transmitted into the hands and arms during working activities. Exposure can cause hand-arm vibration syndrome (HAVS) or carpal tunnel syndrome (CTS). HAVS can lead to finger blanching (known as vibration white finger), pins and needles, chilblains, tingling or numbness in fingers, along with loss of sensation and dexterity.

CTS can result in tingling in fingers and hands, as well as numbness, pain, and weakness in the wrists. Typical hand-held tools generating high hand-arm vibration include chainsaws, grinders, drills, sanders, and other hand-held mechanical equipment.

WHOLE-BODY VIBRATION (WBV)

WBV is the shaking or jolting of the human body through a supporting surface such as a seat or the floor. The primary health risk of exposure to WBV is that it can cause or aggravate back pain. Other reported effects include digestive and circulatory disruption.

Typical mobile equipment that could present a vibration problem in the workplace includes pedestrian ride-on trucks, forklift trucks, ride-on mowers, and vibrating surfaces on which employees are required to work.

WHAT DOES THE LEGISLATION COVER, AND WHAT ARE EMPLOYERS' LEGAL RESPONSIBILITIES?

It is important for employers to understand how they are affected by the Control of Vibration at Work Regulations 2005, which cover both hand-arm and whole-body vibration issues at work.

If there is likely to be a risk from exposure to vibration, the regulations require employers to:

- Reduce exposure to a minimum
- Assess risks
- Carry out a program of measures to reduce risks
- Keep exposure below the exposure limit value
- Provide information and training on the risks and controlling risks
- Provide appropriate health surveillance when exposure reaches the exposure action value

The employer must ensure risk from the exposure of employees to vibration is either eliminated at source or, where this is not reasonably practicable, reduced to as low a level as possible.

WHICH VIBRATION DATA TO USE? MANUFACTURER'S DATA OR ACTUAL MEASUREMENTS

The manufacturer's data is a useful starting point and will indicate new tools/vehicles giving high vibration levels. However, the manufacturers' data may not reflect your working environment. Why?

- Data is based on specific test codes – i.e., laboratory conditions, not 'real-life' situations
- Data is based on the use of new tools/vehicles using new consumables/smooth surfaces
- Tools/vehicles may be used on multiple materials or varying surfaces
- Data cannot give accurate levels on old, used or poorly maintained equipment, consumables or surfaces

For complex issues with large numbers of tools or vehicles and varying ages and states of maintenance, employers are advised to seek specialist occupational hygiene advice and obtain detailed vibration assessments.

Once the vibration values are assessed, these can be compared directly with the legal vibration limits.

HOW DO EMPLOYERS ASSESS THE RISKS CREATED BY THESE ACTIVITIES?

An employer who carries out work that is liable to expose any employees to risk from vibration has to make a suitable assessment of the risk created to the health and safety of those employees.

What information will you need?

- Observations of working practices
- Detailed information on exposure time relating to tool/vehicle 'contact' – i.e., exactly how long they are in use (employees will only be affected when in direct contact with the vibrating source)
- Vibration level data using the manufacturers' tool or equipment data; or vibration measurements on the tool or vehicle

UK LEGAL VIBRATION LIMITS	EXPOSURE ACTION VALUE (EAV)	EXPOSURE LIMIT VALUE (ELV)
Hand arm vibration	2.5 ms ⁻² A(8)	5.0 ms ⁻² A(8)
Whole body vibration	0.5 ms ⁻² A(8)	1.15 ms ⁻² A(8)

The risk assessment must identify the measures needed to meet regulatory requirements.

HOW ELEMENT CAN HELP YOU BE COMPLIANT

Excessive exposure to vibration can result in severe and long term ill-health issues among your workforce. Element can provide high precision measurements to enable employers to manage exposures, by taking simple, cost-effective precautions.

ELECTROMAGNETIC FIELDS (EMF)

WHAT ARE ELECTROMAGNETIC FIELDS AND WHAT HEALTH HAZARDS DO WORKERS FACE FROM EXPOSURE?

Electromagnetic fields (EMF) are constantly present around us in our homes, public places, and occupational settings. Many sources generate them, including; electrical currents, radio-wave transmissions, radioactive materials and magnets – even visible light from the sun is an electromagnetic wave!

Electromagnetic fields can be split into two distinct categories; ionising radiation and non – ionising radiation. Ionising radiation has enough energy to strip away electrons from an atom, potentially causing damage if this occurs within our cells. Non – ionising radiation does not have this property; however, it can still cause undesirable health and sensory effects, such as; whole body or localised heat burns, potentially dangerous rises in body temperature, tingling or pain sensations, disturbed heart rhythm, heat damage to the eyes, vertigo and microwave hearing effect.

EMF's can cause indirect effects to those with implanted medical devices such as pacemakers or metallic implants, along with providing an unwanted source of ignition through sparks and cause electric shock risk by inducing electrical currents in conductive objects.

The risks from non – ionising radiation are the chief concern with our electromagnetic field measurement and assessment service.

WHAT DOES THE LEGISLATION COVER AND WHAT ARE THE EMPLOYERS LEGAL DUTIES?

The Control of Electromagnetic Fields At Work Regulations 2016 provides defined Action Levels and Limit Values for EMF exposure and a range of responsibilities for the employer.

An employer is required to:

- assess the levels of EMFs to which your employees may be exposed;
- ensure that exposure is below exposure limit values (ELVs);
- take action if employees are exposed to EMFs in excess of the ELVs;
- when appropriate, devise and implement an action plan to ensure compliance with the exposure limits;
- when appropriate, assess the risks of employee exposure and eliminate or minimise those risks. Ensure you take employees at particular risk, such as expectant mothers and employees with active or passive implanted or body-worn medical devices, into account.
- provide information and training on the particular risks (if any) posed to employees by EMFs in the workplace and details of any action you are taking to remove or control them. This information should also be made available to their safety representatives as appropriate; and
- provide health surveillance or medical examination as appropriate.



HOW SHOULD EMPLOYERS ASSESS THE RISK?

There is a three-stage approach to conducting an EMF exposure assessment:

Stage 1: Employers should check whether plant and equipment at their site have the potential to expose workers above the limit values by comparison with lists compiled within the guidance*. Where this is the case OR the site has Workers At Particular Risk (e.g., those with implanted or body-worn medical devices or expectant mothers), the employer must carry out a Stage 2 Exposure Assessment.

Stage 2: Assessment of equipment against the Action Levels must be made to determine exposure risk to employees. This may be achieved by use of information supplied by manufacturers or other credible sources; however, this is often not readily available and field measurements will be required to prove compliance. Where Action Levels are exceeded or the safety of Workers At Particular Risk cannot be proven, a Stage 3 Assessment is required.

Stage 3: This involves sophisticated numerical modelling techniques to enable assessment against the Exposure Limit Values. – this is rarely a requirement, as it is more cost – effective to introduce controls to comply with the Action Levels.

HOW CAN EMPLOYERS TAKE ACTION TO CONTROL THE RISK?

Where Action Levels or potential for harm to Workers At Particular Risk exists, Element will provide a range of general and bespoke recommendations to control and reduce this risk. These controls can include, where practicable;

- Elimination or Substitution to equipment producing weaker EMF;
- Engineering controls such as shielding and guarding;
- Organisational measures such as no access zones, suitable signage or written procedures;
- Suitable instruction, training and supervision

* HSG 281 Electromagnetic Fields at Work - A guide to the Control of Electromagnetic Fields at Work Regulations 2016 and Non – binding guide to good practice for implementing Directive 2013/35/EU – Electromagnetic Fields – Volume 1: Practical Guide

HOW CAN ELEMENT HELP YOU BE COMPLIANT

Element's EMF assessment and measurement service can provide comprehensive assistance throughout Stage 1 and Stage 2 Assessments, ensuring your organisation's compliance with the CEMFAW regulations.

Element can also conduct a general assessment where workers with Implanted or Body Worn Medical Devices (Pacemakers, insulin pumps, hearing aids metallic implants etc.) or expectant mothers are present in the workplace.



WORKPLACE ENVIRONMENT

WHAT HEALTH HAZARDS DO WORKERS FACE DUE TO THE GENERAL WORKPLACE ENVIRONMENT?

This chapter examines and explains the action employers should take to tackle other workplace issues that can have significant impacts on workers' health.

These include:

- Indoor air quality
- Lighting
- Thermal comfort
- Workplace design

Much will be covered by the The Health and Safety at Work etc. Act, 1974.

The Management of Health and Safety at Work Regulations 1999 stipulate that employers must make a suitable assessment of the risks to the health and safety of their employees and take action where necessary.

INDOOR AIR QUALITY

A wide range of parameters affect comfort and well-being in the working environment, and airborne contaminants, in particular, can have an adverse effect or perceived effect on employees' health.

Indoor air quality and exposure to airborne contaminants are also covered by the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended).

KEY PARAMETERS	POTENTIAL HEALTH EFFECTS
Relative Humidity	If the level is too low (less than 40%) symptoms such as sore and irritated eyes, dry throat and skin can be experienced. If the level is too high, workers will experience physical discomfort and work performance can be impaired.
Air Movement	A certain amount of air movement is necessary for physical comfort, but too great a movement causes discomfort.
Ambient Airborne Particulates	These will be produced from both internal and external sources. They can aggravate allergic symptoms, chronic obstructive pulmonary disease, airborne respiratory infections, and cardiovascular disease.
Volatile Organic Compounds	Exposure to high concentrations of vapours may cause symptoms such as eye and throat irritation.
Formaldehyde	Vapours can be given off by items used in building construction as well as from furnishings and fittings, such as chipboard resins and cleaning materials. Exposure may cause symptoms including eye and throat irritation.
Carbon Dioxide	If the air change rate is inadequate carbon dioxide concentrations from exhaled breath can build up. This can lead to headache and tiredness.
Carbon Monoxide	If insufficient oxygen is available to allow complete combustion of fuel, carbon monoxide is likely to be produced, potentially leading to unconsciousness and ultimately, fatality.
Bacteria and Fungi	These can arise from sources such as humidifiers and contaminated ventilation. Building dampness and mould has been associated with an increase of approximately 30% to 50% in a variety of respiratory and asthma-related health outcomes

LIGHTING

Lighting should enable people to work and move about safely. In some cases, employees need local light at individual workstations and places of particular risk, for example, crossing points on traffic routes.

Guidelines on the recommended minimum lighting levels are published by the Health and Safety Executive in 'HSG38: Lighting at Work' and by The Chartered Institution of Building Services Engineers (CIBSE) in 'Lighting Guide 1: The Industrial Environment'.

Recommended minimum lighting levels for various types of work

ACTIVITY	TYPICAL LOCATIONS/TYPES OF WORK	MINIMUM MEASURED LUMINANCE (LUX)	AVERAGE LUMINANCE (LUX)
Movement of people, machines, vehicles	Lorry park, corridors, circulation routes	5	20
Movement of people, machines and vehicles in hazardous areas; rough work not requiring any perception of detail	Construction site clearance, excavation & soil work, loading bays, bottling & canning plant	20	50
Work requiring limited perception of detail	Kitchens, factories assembling large components, potteries	50	100
Work requiring perception of detail	Offices, sheet metal work, bookbinding	100	200
Work requiring perception of fine detail	Drawing offices, factories assembling electronic components, textile production	200	500

WORKPLACE DESIGN

WHY THE DESIGN OF THE WORKPLACE IS ESSENTIAL

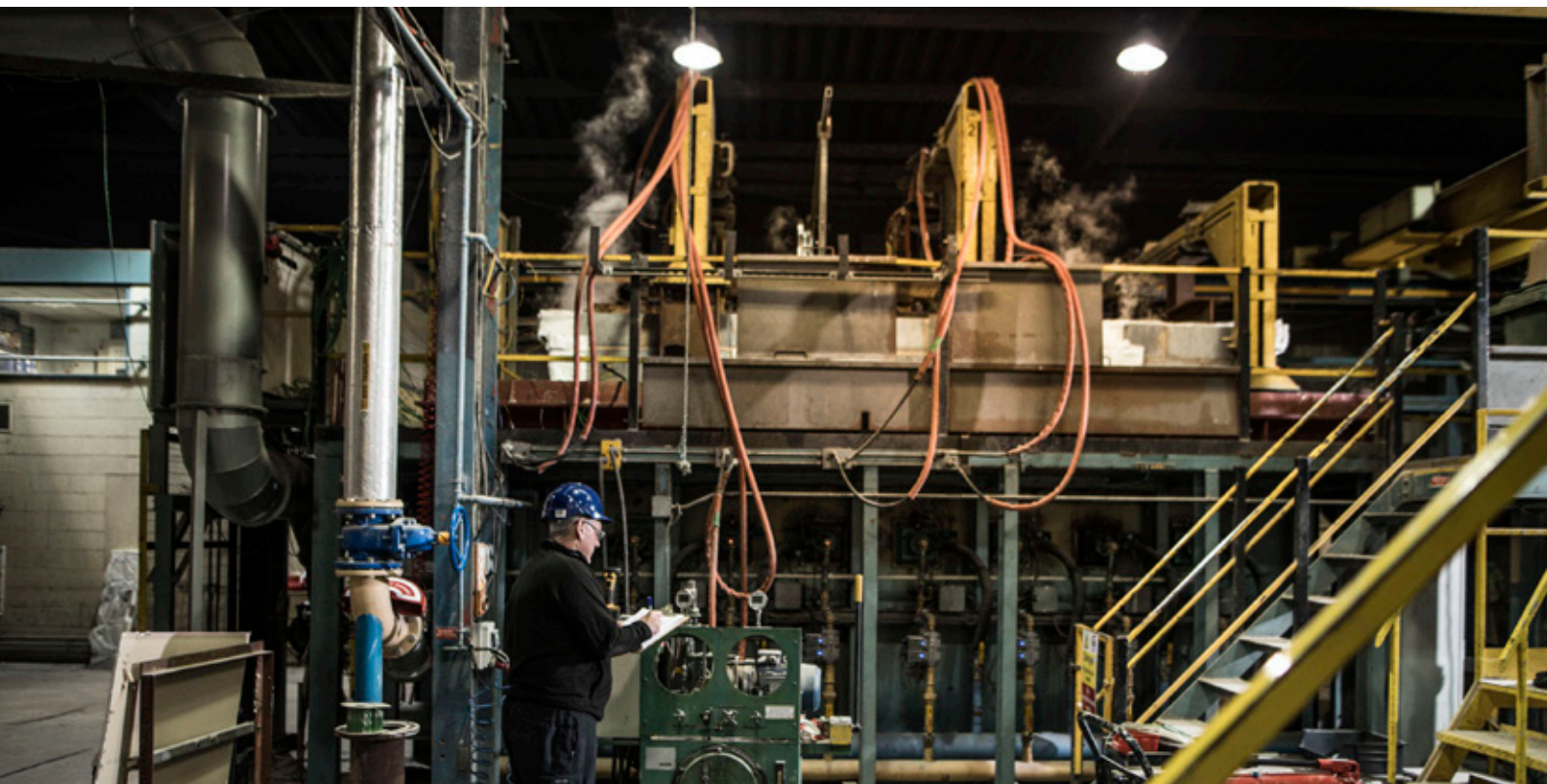
Productivity and employee motivation are significantly influenced by the design of rooms, plants, and equipment. Mistakes, mishaps, and poor health among workers can be reduced by designing activities, equipment, and work locations to maximize workers' performance. Conversely, an organization's output may suffer if ergonomic design is ignored.

Experience suggests that involving professional ergonomics specialists and workers in the design of workplace systems delivers the most productive outcomes.

ERGONOMICS IS KEY TO DISPLAY SCREENS DESIGN

A broad raft of health problems, including neck, shoulder, back, and arm pain, can be attributed to poorly-designed digital workstations.

Research suggests that many display screen equipment (DSE) workers suffer various aches and pains that include medical issues such as repetitive strain injury (RSI). The Health and Safety (Display Screen Equipment) Regulations 1992 are designed to safeguard the well being of staff operating DSE.



THERMAL ENVIRONMENTS

HOT ENVIRONMENTS

In hot working environments, such as foundries, glass making, or hot weather, there can be a risk of workers developing conditions such as heat stress or heat stroke.

Other conditions include dehydration and heat exhaustion, prickly heat, heat fatigue, and burns from direct contact or radiant heat.

There can also be risks if workers must wear personal protective equipment for prolonged periods in hot environments, such as in chemical manufacturing or asbestos removal.

COLD ENVIRONMENTS

Cold working environments – including cold storage, or outdoors in the winter – can cause significant health problems if workers are exposed for lengthy periods, or do not wear adequate clothing. In extreme cases, this can lead to severe frostbite or even hypothermia.

WHAT DOES THE LEGISLATION COVER, AND WHAT ARE THE LEGAL RESPONSIBILITIES?

The Workplace (Health, Safety, and Welfare) Regulations 1992 stipulate that employers are obliged to provide a ‘reasonable’ temperature in the workplace, but are more applicable to non-industrial situations.

STAGES	HOT ENVIRONMENTS: SIGNS TO WATCH FOR HEAT STRESS ILLNESS	COLD ENVIRONMENTS: SIGNS TO WATCH FOR COLD STRESS ILLNESS
Mild symptoms	<ul style="list-style-type: none"> · Excess sweating · Tiredness and weakness · Heat rash 	<ul style="list-style-type: none"> · Constant shivering · Tiredness · Low energy · Cold or pale skin · Fast breathing (hyperventilation)
Moderate symptoms	<p>Heat exhaustion</p> <ul style="list-style-type: none"> · Tiredness and weakness · Feeling faint and dizzy · Decrease in blood pressure · Headache · Muscle cramps · Feeling or being sick · Heavy sweating · Intense thirst · Fast pulse · Urinating less often and having much darker urine than usual 	<p>Onset hypothermia</p> <ul style="list-style-type: none"> · Being unable to think or pay attention · Confusion · Loss of judgment and reasoning (someone with hypothermia may decide to remove clothing despite being very cold) · Difficulty moving around · Loss of coordination · Drowsiness · Slurred speech · Slow, shallow breathing (hypo-ventilation)
Severe symptoms	<p>Heat stroke</p> <ul style="list-style-type: none"> · Hot dry skin · Confusion · Disorientation · Seizures (fits) · Loss of consciousness 	<p>Hypothermia</p> <ul style="list-style-type: none"> · Unconsciousness · Shallow or no breathing · Weak, irregular pulse, or no pulse · Dilated pupils

LOW WORKPLACE TEMPERATURES

According to the Approved Code of Practice, the lowest workplace temperature is a minimum of 16°C. Where workplace operations require high levels of physical activity, the temperature should be at least 13°C. Importantly, these temperatures are not specified by law and are not always possible in some work situations. The employer must decide what temperature will deliver ‘reasonable comfort.’

HIGH WORKPLACE TEMPERATURES

There is no upper limit temperature because it is possible to work safely in very hot environments such as foundries – provided there are strict controls. As temperatures get hotter, issues beyond air temperature (for example, radiant temperature, humidity, and air velocity) adopt greater significance, and the interaction between them is less straightforward.

HOW DO EMPLOYERS ASSESS THE RISKS CREATED BY THESE EXTREME TEMPERATURES?

An individual’s capability and health must be screened before putting them into the working environment and factored into any risk assessment.

Key personal factors include physical fitness, body size, pre-existing conditions, prescribed medication, illness, and acclimatization.

Assessing the risk involved in extreme temperature conditions usually requires the measurement of key parameters. These include:

- Air temperature
- Mean radiant temperature
- Humidity
- Air movement
- Metabolic work rate
- Clothing

The readings are taken and put into appropriate assessment tools (thermal indexes) that look at the allowable working times in given conditions and the need to introduce controls to protect workers.

COLD ENVIRONMENT TOOLS

- Wind chill index
- Equivalent chilling temperature
- IREQ
- ACGIH TLV standards

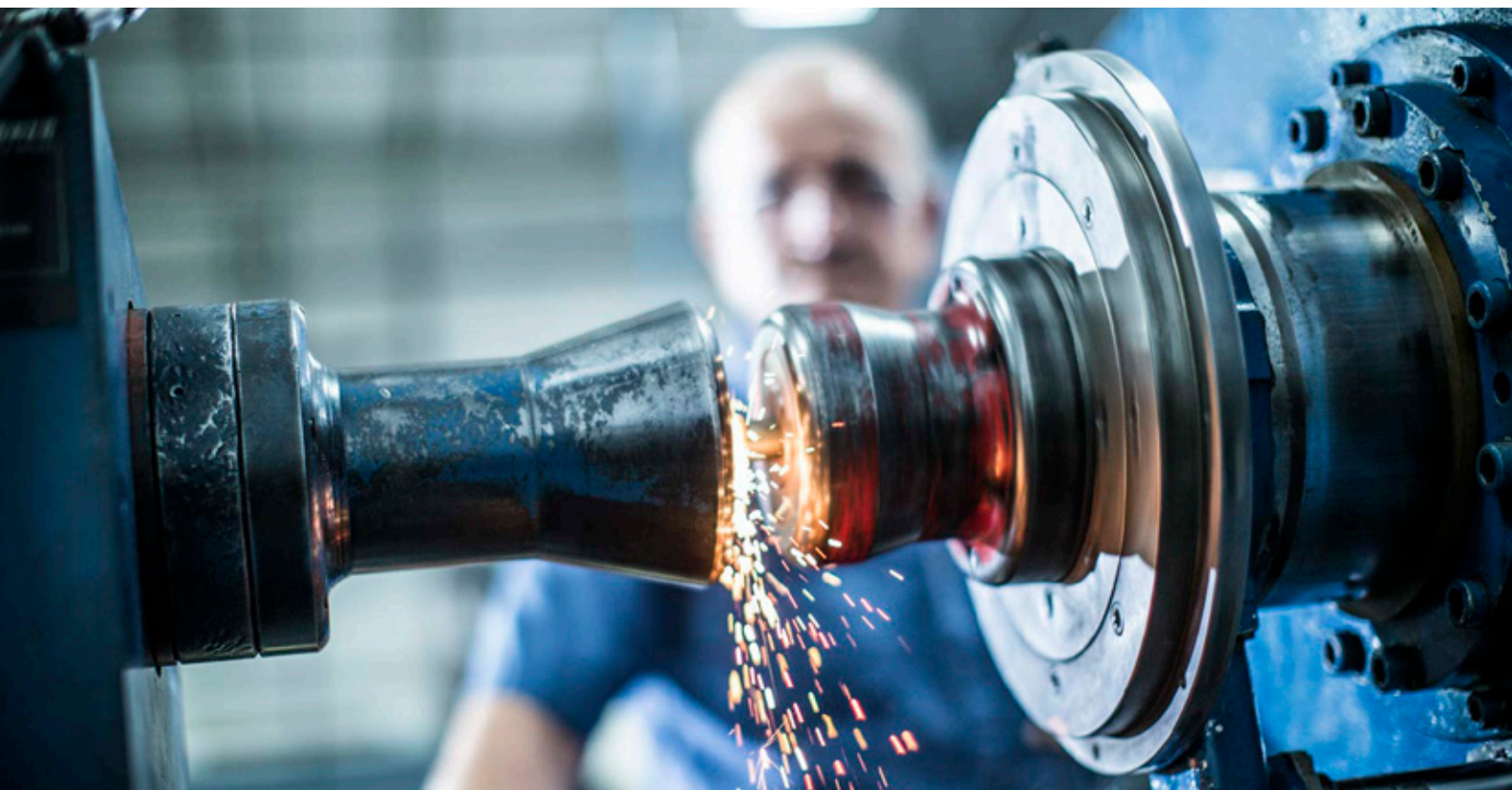
HOT ENVIRONMENT TOOLS

- Corrected effective temperature (CET)
- Predicted 4-hour sweat rate (P4SR)
- Wet bulb globe temperature (WBGT)
- Heat stress index (HSI)

THE NEED TO TAKE EXPERT ADVICE

Employers whose workers are exposed to extreme hot or cold conditions should seek the advice of professionally qualified specialists such as occupational hygienists.

Appropriate controls will depend on assessment outcomes but usually involve limiting time in extreme environments and, if this is not a safe or practical option, additional controls to extend safe working times.



LEGIONELLA

WHAT IS LEGIONELLA BACTERIA, AND WHAT HEALTH HAZARDS DO WORKERS FACE FROM EXPOSURE?

Legionella bacteria are widespread in natural water sources and can enter human-made water systems or water services, where they can multiply under certain conditions.

Legionnaires' disease is a type of pneumonia caused by the inhalation of aerosols containing legionella bacteria and can have devastating and sometimes fatal consequences for employees and the general public.

People who are elderly, unwell, suffering from immunosuppression, and who smoke are especially vulnerable to Legionnaires' disease.

Legionella bacteria can also cause less severe illnesses that are not fatal or permanently debilitating among the general population.

WHAT DOES THE LEGISLATION STIPULATE REGARDING LEGIONELLA EXPOSURE?

The prevention of legionnaires' disease is the legal responsibility of 'duty-holders,' which means employers, individuals in control of premises, and those with health and safety duties.

Businesses and individuals flouting the regulations can be held legally accountable if they fail to implement appropriate prevention measures.

Legislation and guidance covering employers' responsibilities concerning legionella include:

- The Health and Safety at Work etc. Act, 1974
- Management of Health and Safety at Work Regulations 1999
- The Control of Substances Hazardous to Health Regulation, 2002 (as amended)
- Approved Code of Practice (ACoP) L8 "Legionnaires' disease. The Control of Legionella bacteria in water systems."
- HSG 274 Legionnaires' disease: Technical guidance. Parts 1-3

The Approved Code of Practice (ACoP) sets out an employer's duties concerning the risk of infection by legionella, under the Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended).

The Approved Code of Practice means state employers must carry out a risk assessment and take any necessary action. This might include:

- Preparing a scheme for preventing or controlling the risk identified – the written scheme
- Implementing, managing, and monitoring the precautions and controls identified in the written scheme

- Keeping records of the risk assessment, precautionary measures, and monitoring
- Appointing a 'responsible person' and 'deputy responsible person' to be managerially responsible for the relevant plant, systems, and implementation of the written scheme

In addition, the ACoP places duties on manufacturers, importers, installers, and service providers concerning water systems. The technical guidance documents provide practical advice on the legal requirements.

HOW DO EMPLOYERS ASSESS THE RISKS CREATED BY THESE SUBSTANCES?

The risk assessment should only be undertaken by a qualified person who has completed a recognized training course and is experienced as a legionella risk assessor.

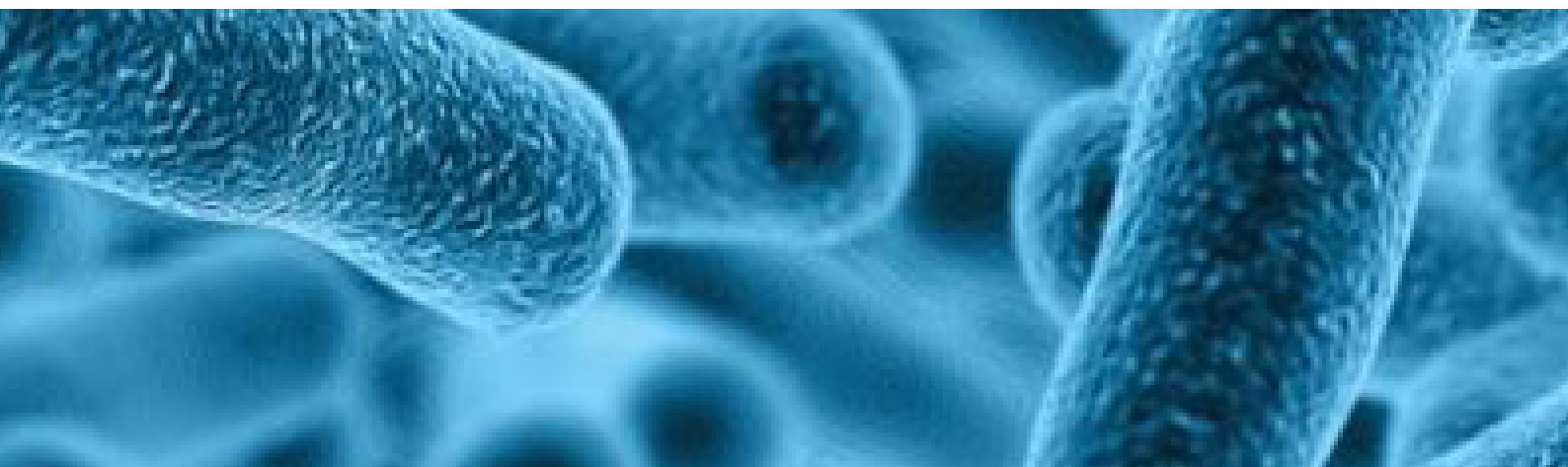
WHERE COULD YOU FIND LEGIONELLA BACTERIA ON YOUR PREMISES?

- Water systems incorporating a cooling tower
- Water systems incorporating an evaporative condenser
- Hot and cold water systems
- Other plant and systems containing water that is likely to exceed 20°C
- Systems that may release a spray or aerosol (such as a cloud of droplets and/or droplet nuclei) during operation or maintenance

THE ASSESSMENT SHOULD ADDRESS:

- The presence of legionella bacteria
- Water temperature range – i.e., conditions suitable for legionella growth (20°C to 45°C)
- Potential nutrient sources such as sludge, rust, scale, algae and organic matter
- The potential for droplet formation
- Likely risk to those who may inhale water droplets
- Means of preventing or controlling the risk

Legionella risk assessments should be reviewed at least every two years, and whenever there is a reason to believe that the original assessment may no longer be valid.



ASBESTOS

WHAT HEALTH HAZARDS DO WORKERS FACE DUE TO ASBESTOS EXPOSURE?

Asbestos is widely recognized by the World Health Organization as a dangerous cancer-causing substance. However, many people are not aware of what it is or what the real risks are.

Asbestos is a naturally occurring mineral that comes in a variety of types. All are naturally occurring fibrous minerals mined in places such as Canada, Brazil, India, and South Africa. It was first imported into the UK during the industrial revolution when it was used in a number of products. A cheap and versatile material, asbestos has many useful properties such as fire and chemical resistance, tensile strength, and acoustic and thermal insulation. As a result, it was mixed and used widely in building materials up until 1999 when importation, supply, use and re-use of the material was banned completely (with a few exemptions for specialist applications). Thus asbestos containing materials (ACMs) can be found in any building constructed before the year 2000, buildings constructed after this year should not contain asbestos. Old stock may have been used up after the ban in 1999, hence the use of the year 2000 as a cut-off point.

Asbestos is hazardous to workers when ACMs are damaged and the asbestos fibres are released and become airborne where they can be breathed in. Occupational ill-health associated with asbestos exposure includes:

- Asbestosis
- Mesothelioma
- Asbestos Related Lung cancer
- Pleural plaques

Asbestos diseases can take anywhere between 15 and 60 years to develop, so the effects of exposure will continue to appear long into the future. Asbestosis, mesothelioma and asbestos related lung cancer are incurable, so exposure prevention is critical.

WHAT DOES THE LEGISLATION COVER, AND WHAT ARE EMPLOYERS' LEGAL RESPONSIBILITIES?

In UK legislation, asbestos falls under the Control of Asbestos Regulations (CAR) 2012 supported by an approved code of practice and guidance.

The regulations place legal duties on employers responsible for employees working with asbestos and also place a specific duty to manage asbestos in premises on the owners, or those with a maintenance responsibility.

DUTY TO MANAGE

If you are responsible for the maintenance of non-domestic premises, you have a 'duty to manage' the asbestos in them, to know where any asbestos-containing materials (ACMs) are located, and prevent the exposure of those using or working in the premises.

If existing ACMs are in good condition and are not likely to be damaged, they may be left in place, but must be monitored and managed to ensure they are not disturbed.

If damaged ACMs are discovered, access must be immediately restricted to the area and an asbestos expert should be consulted on next steps which is likely to involve remediation of the damaged materials by competent individuals.

LICENSED WORK

In most cases, working with asbestos needs to be done by a licensed contractor. With some exceptions, this generally includes all work with sprayed coatings and lagging, asbestos insulation and asbestos insulating board (AIB).

NON LICENSED WORK

Some work on less friable and therefore lower risk ACMs such as asbestos cement and asbestos containing floor tiles can be carried out by competent Non Licensed trained contractors. Any work on or with ACMs falls into one of these categories

TRAINING

Training is mandatory for anyone liable to be exposed to asbestos fibres at work. This applies to maintenance or engineering staff working on plants or on building fabric.

HOW DO EMPLOYERS ASSESS THE RISKS CREATED BY ACMs?

The current HSE guidance requires all ACMs to be treated in the same way.

Risk assessment of ACMs is based on how easily the materials release the asbestos fibres from the product, which is described as friability.

RISK AND FRIABILITY	MATERIAL
High risk/friability	sprayed coatings insulation
Medium risk/friability	asbestos insulating board
Low risk/friability	asbestos cement
Very low risk/friability	floor tiles, 'Artex,' toilet cisterns

HOW TO FIND ASBESTOS AND DETERMINE ITS CONDITION

In order to manage the risks from asbestos on your premises you need to identify where it is. A qualified asbestos surveyor from a UKAS accredited company can conduct a survey to determine the location of asbestos. The two survey types described by the HSE are as follows:

- Management surveys are conducted to locate the presence and extent of any asbestos in a building, which could be damaged or disturbed during normal occupancy and routine maintenance, and to assess its condition. This information can then be used to develop an asbestos management plan, which should detail how the Duty Holder will manage asbestos on site and prevent exposure.
- Refurbishment/demolition surveys are needed prior to any building work and involve specific intrusive investigations to identify all asbestos, within the fabric of the building that could be disturbed by the planned works. This would include asbestos located behind walls or under floors for example.

Re-inspection surveys of asbestos-containing materials (ACMs) are required regularly to check on condition. It is considered best practice to conduct such surveys annually, although buildings with higher risk items may require more frequent inspection.

PUTTING THE RISK INTO PERSPECTIVE

It is essential to understand that for someone to be potentially harmed from an asbestos-containing material, it would need to be disturbed to produce airborne inhalable fibres, which someone would need to breathe in.

If you have been working in an environment with asbestos materials that are in good condition (such as in offices, service, or production areas), the health risk is likely to be very low. Similarly a one-off exposure is unlikely to result in adverse health effects. Therefore, identifying what you have and managing the risk to prevent exposure is key.



CONCLUSION

Occupational hygiene regulations are in place to protect the health of your employees, which in turn ensures your workplace is a safe and productive environment.

A firm grasp of all legal requirements is essential to fulfilling your regulatory obligations – and also translates into highly motivated and efficient commercial activities. Conversely, a failure to take occupational hygiene commitments seriously can significantly damage your business.

At Element, we work closely with our clients to make sure we have a comprehensive understanding of their operational and commercial needs. We then produce a solution tailored to their exact requirements.

Our multi-disciplinary occupational hygiene team provides all services covered by the e-book. We are accredited, and the British Occupational Hygiene Society recognizes our occupational hygienists as highly qualified professionals.

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