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## ELEMENT 8 CHEMICAL AND BIOLOGICAL HEALTH HAZARDS AND RISK CONTROL

### Learning outcomes

On completion of this element candidates should be able to demonstrate understanding of the content through the application of knowledge to familiar and unfamiliar situations. In particular they should be able to:

- Outline the forms of, and classification of, and the health risks from exposure to, hazardous substances
- Explain the factors to be considered when undertaking an assessment of the health risks from substances encountered in construction workplaces
- Explain the use and limitations of Workplace Exposure Limits including the purpose of long term and short term exposure limits
- Outline control measures that should be used to reduce the risk of ill-health from exposure to hazardous substances
- Outline the hazards, risks and controls associated with specific agents
- Outline the basic requirements related to the safe handling and storage of waste on construction sites

### 8.1 CHEMICAL HAZARDS

#### A HAZARD IS ANYTHING WHICH HAS THE POTENTIAL FOR HARM

**Dust** - Solid particles of material, organic or inorganic, generated by physical processes. The critical size of less than 10 microns unit density sphere (this is known as inhalable dust) e.g. metal dust and silica. Inorganic dust and organic dust have different effects on the lungs.

**Respirable Dust** - This is atmospheric dust of under 7 microns in size which is able to enter the lungs during respiration and is able to reach the air exchange region.

**Fume** - Solid particles formed by condensation from the gaseous state, usually from molten metals. The pure metal can react with the atmosphere to form other compounds e.g. lead fumes in a hot rolling mill can form lead oxide.

**Gases** - Normally elements or compounds of low molecular weight which are normally air borne and will fill the space they have access to e.g. carbon monoxide.

**Vapours** - These are gaseous forms of materials which normally exist in the liquid or solid state at normal room temperature, these are formed by molecules rising from the surface of the substance. They are normally air borne liquids e.g. Petrol and white spirit.

**Mists/Aerosols** - Small liquid droplets suspended in the atmosphere.

**Liquids** - Matter in a fluid state, intermediate between a solid and a gas which maintains a fixed volume under fixed conditions.

**Solid** - Matter occupying a fixed volume, having fixed dimensions of length, breadth and height. Solids can be hazardous e.g. radioactive elements.

**Fibres** - Particles which are long and thin such as asbestos. They possess the aerodynamic properties which enable them to penetrate deep into the lungs.

**8.2 MAIN CHEMICAL CLASSIFICATIONS (In use up to the end of 2017)**

Very Toxic	A substance which if inhaled, ingested or penetrates the skin, may involve extremely serious acute or chronic risks even death.
Toxic	A substance which if inhaled, ingested or penetrates the skin, may involve serious acute or chronic risks even death. May interfere with the body in a variety of ways. E.g. Mercury
Harmful	A substance which if inhaled, ingested or penetrates the skin, may involve limited health risks.
Corrosive	A substance which may on contact with living tissue destroy them. Will attack chemically materials or people. E.g. Sulphuric acid & wet cement.
Irritant	A non corrosive substance which through immediate or prolonged contact with the skin or mucus can cause inflammation. e.g. Cleaning agents - Detergents, Organic solvents & Mineral Oils.
Highly Flammable	The temperature at which a substance gives off a flammable vapour which will sustain combustion if an ignition source is provided. Applies to liquids with a flash point of less than 32 Celsius which support combustion. e.g. Propane
Explosive	Dangerous because of their potential to release energy rapidly
Carcinogens	Prevent the correct development and growth of body cells. Cause or promote the growth of unwanted cells which can lead to cancer. E.g. asbestos, hard wood dust.
SK	Phenol, pesticides and other substances can penetrate through skin. Can be in liquid and vapour form e.g. Trichloroethylene, Cyanide, Methanol
Sen	Sensitisers: These affect the respiratory tract if inhaled and can cause asthma or allergic alveolitis. Skin sensitisers cause allergic contact dermatitis however only a proportion of those exposed will become sensitised. Examples: Grain Dust, Isocyanates (used in car spray paints) and Wood Dust.

**8.3 CHEMICAL SYMBOLS - EXISTING AND NEW**

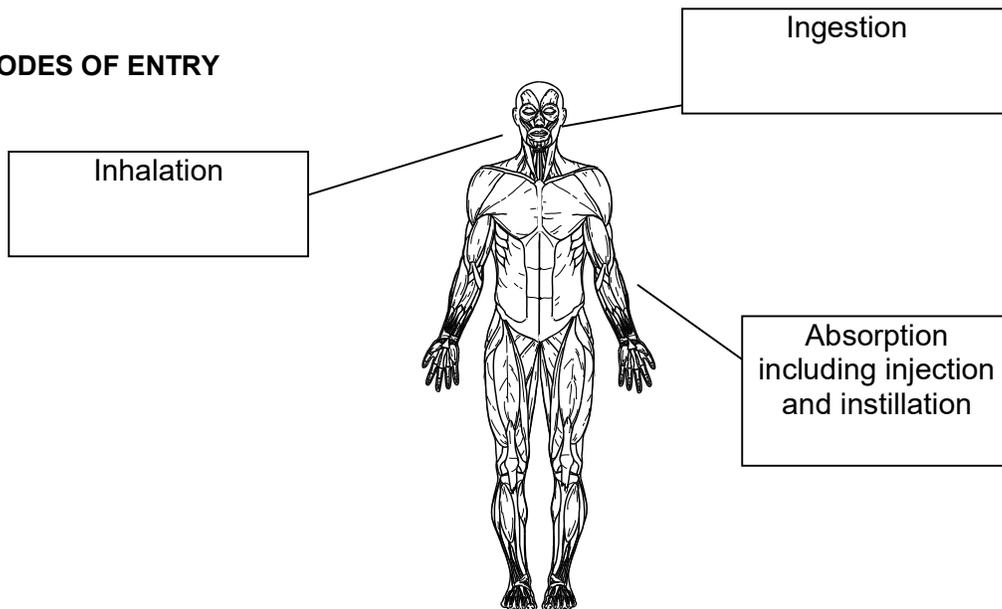
**NEW CHEMICAL HAZARDS SYMBOLS**

To be used on all new substances manufactured and imported after June 2015

GHS Pictograms and Hazard Classes		
<p><b>pic 1803</b></p>  <p>Oxidizers</p>	<p><b>pic 1802</b></p>  <p>Flammables Self Reactives Pyrophorics Self-Heating Emits Flammable Gas Organic Peroxides</p>	<p><b>pic 1801</b></p>  <p>Explosives Self Reactives Organic Peroxides</p>
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<p><b>pic 1807</b></p>  <p>Carcinogen Respiratory Sensitizer Reproductive Toxicity Target Organ Toxicity Mutagenicity Aspiration Toxicity</p>	<p><b>pic 1806</b></p>  <p>Environmental Toxicity</p>	<p><b>pic 1805</b></p>  <p>Irritant Dermal Sensitizer Acute Toxicity (harmful) Narcotic Effects Respiratory Tract Irritation</p>

## 8.4 THE EFFECT OF SUBSTANCES ON THE HUMAN BODY

### MODES OF ENTRY



### INHALATION

This is the most likely route of exposure for most substances. It involves the substance being inhaled via the nose or mouth, certain substances may damage the respiratory system itself. Others may actually enter the blood stream via the lungs and then go on to damage another organ within the body (Target Organs). For example certain solvents will enter the blood system and, via its network of arteries and veins, attack the brain and nervous system. Inhalation to the lungs provides a large surface area for absorption to take place

### ABSORPTION

This is where a substance can enter the body directly through the skin or the tear ducts. Absorption is relatively easy to control by the issue of adequate PPE. Mercury and some solvents can be absorbed directly through the skin, here they enter the bloodstream and will go on to attack a target organ within the body. Skin contact may allow liquids to be absorbed across the epidermis.

### INGESTION

Some substances depending on their form may be ingested into the body via the stomach and large intestine. Certain substances can accumulate with repeated doses and lead to problems within the digestive system itself or within a target organ. Lead, if ingested will accumulate in the liver and the kidneys. Absorption allows toxins to enter the bloodstream and transport to target organs. This is the least likely route of exposure to work based chemicals.

Biological hazards can also be transmitted via sexual contact – but this is not normally work related.

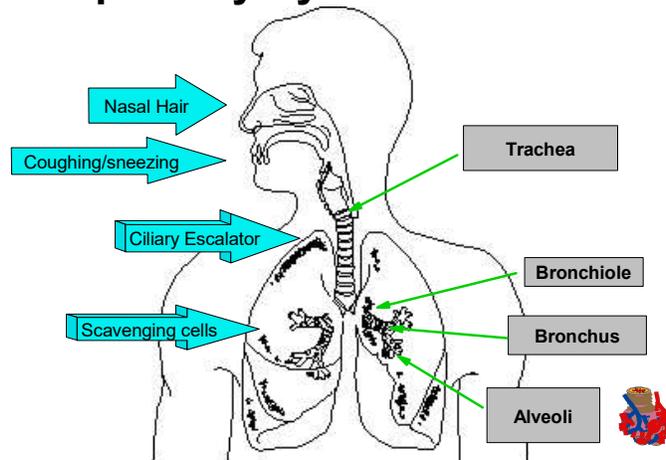
## THE BODY'S NATURAL DEFENCE MECHANISMS

Some substances will result in local effects which are confined to the specific area of the body where contact with the toxic material occurs. Systemic effects occur at organs or parts of the body distant from the site where initial contact with the toxic substance was made.

### Respiratory Defence

This relies on a variety of mechanisms including the nasal hair, sneezing and coughing which can remove dust from the respiratory tract. Particles of between 100 may be airborne but those of 10 microns or less are likely to remain airborne are likely to be inhalable, if this happens they are likely trapped by nose and sinuses. Smaller particles of between 10 and 7 microns are trapped by the ciliary escalator of the trachea (windpipe), in an escalator like movement these items are ejected from the respiratory system via the nose.

### Respiratory System & Defences



Particles of between 7 and 0.5 microns are likely to be deposited in the alveoli, those smaller than this may be exhaled. (Respirable dust) Once a particle is in the alveoli it will be attacked by phagocytes which are scavenging cells, however if they are toxic they may damage the phagocytes causing scar tissue formation.

### Eye Protection

Eyelashes on the upper and lower eyelids prevent particles from entering the eyes and also cause the lids to close rapidly if touched. The exposed surface is continuously moistened by tears secreted by a gland in the outer corner of the eye. This attempts to dilute the substance which is causing the irritation.

### Skin Protection

The skin can exhibit a hypersensitive response to certain agents and trigger the release of inflammatory substances this will normally cause irritation, redness, soreness and a rash. Certain individuals can develop an allergy to a substance and once they are sensitised the allergic reaction can be triggered by a minute amount of the substance concerned.

## 8.5 SPECIFIC CONDITIONS

### OCCUPATIONAL LUNG DISEASE

**Pneumoconiosis** : Results from the continual inhalation of mineral dusts.

Siderosis	- Iron oxide from welding
Coal workers	- Coal dust from mining
Silicosis	- Silicon from mining, quarrying and fettling
Asbestosis	- Asbestos, mining, lagging

These conditions are normally chronic.

**Allergic Alveolitis** : Results from the inhalation of organic dusts from vegetable or animal origins.

Farmers Lung	- Mouldy hay
Soft wood dust	

These are normally acute conditions with the symptoms of sneezing, coughing, runny eyes and nose, difficulty breathing and a tightness of the chest.

### DERMATITIS

This is a skin condition caused by irritants and allergens. They dry the skin out causing it to go red, the dryness causes itchiness. In severe cases this can lead to flaking and cracking of the skin which may bleed. If the sores are bad they can ulcerate and this can cause infection elsewhere in the body.

There are many substances which may cause allergic dermatitis – this is a sensitized reaction. Some substances may sensitize the skin and lungs, this includes latex, wood dust, cadmium, and nickel.

Contact dermatitis is a condition brought about by contact with substances (or conditions) called **primary cutaneous irritants**. Dermatitis occurs at the site of contact provided the irritants act for a sufficient time and in sufficient concentration. Direct attack on the outer layers of the skin causes tissue destruction and/or degreasing, allowing absorption into the "active" areas of the skin, where inflammatory conditions develop.

#### Irritants

- Greases / Mineral oils / Solvents, e.g. white spirit
- Acetone / Strong alkali and acids
- Cement
- Physical agents: heat, cold, radiation, friction

An important point to note about dermatitis is that after removal of the operative from contact with the irritant, recovery generally occurs. Further exposure to the irritant can be tolerated provided extra precautions are taken to limit contact and exposure.

Irritants associated with construction activities: bitumen, tar, stone dust, cement, lime, paints, varnishes, epoxy resins, organic solvents and white spirit. Wet cement and lime become more alkaline are harmful and potentially corrosive to the skin.

Mineral oils may inflame the skin, oil acne or even cancer.

### 8.6 WORKPLACE EXPOSURE LIMITS

This information is published annually in Guidance Note EH40, this should be used to determine the adequacy of controls which are in place to ensure employees working with specific substances are not exposed to an amount which could cause a risk to their health. This has been re-written and now contains workplace exposure limits. (WELs) These are concentrations of a hazardous substance in the air averaged over a specific time period, this is normally 8 hours or 15 mins. The short term exposure limits aim to prevent effects such as eye irritation which may occur after just a few minutes of exposure.

Substances listed include acetone, butane, carbon dioxide, wood dust, ozone and silicon.

#### Sample EH40 Table (WELs)

Substance	CAS No.	Long term exposure – 8 hour TWA		Short term exposure limit 15 minutes		Comment
Hard wood dust		-----	5 mg m <sup>3</sup>	-----	-----	Sen R45
Benzene	71-43-2	5 ppm	16 mg m <sup>3</sup>	-----	-----	R45
Formaldehyde	50-00-0	2 ppm	2.5 mg m <sup>3</sup>	2 ppm	2.5 mg m <sup>3</sup>	

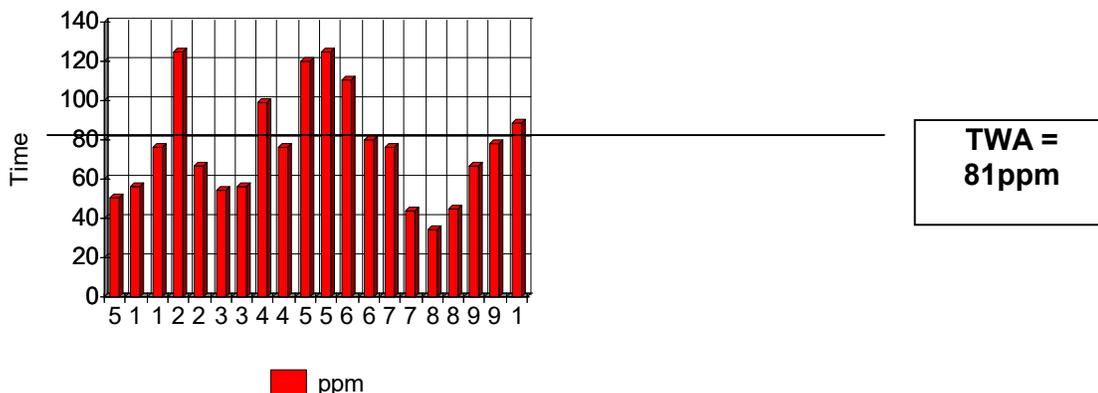
Where substances which are assigned a WEL are used in the workplace the employer must control the risks under COSHH but also utilise the principles of good practice which are listed in schedule 2A of the regulations. If these principles are applied exposure should be below the WEL. Control by PPE should only be used where other measures are not reasonably practicable.

WELs should not be exceeded but if the substances is assigned the risk phrases R45, R46 or R42 exposure must be as low as is reasonably practicable.

#### Time Weighted Average

This is the exposure of an individual to a substance averaged over an 8 hour reference period. This will show the peaks and troughs of their exposure, with the TWA being the average daily exposure.

**Exposure over 8 hours - TWA**



## 8.7 CHEMICAL CLASSIFICATIONS

Substances must be given an indication of danger which may differ from their category of danger, e.g. benzene is a carcinogen but it has a toxic symbol as an indication of the danger as there is no symbol for carcinogen.

Chemicals are classified according to their dangerous features and safety information must be provided with chemicals. The standards required were set in the Chemicals (Hazard Information & Packaging for Supply) Regulations 2009 but have now been replaced EU legislation on the labelling and classification of substances. As from June 2015 all new substances and mixtures must have the new labelling but suppliers can still sell and provide substances with the old labels on for another years so there is no need to throw out substances or not use them just because they have the old label on

GHS Pictograms and Hazard Classes		
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### General Requirements on the Manufacturer, Importer and Supplier:-

- **To identify hazards of chemicals supplied**
- **To supply information** - The supplier must inform the recipient of what they can and must do to use the chemical safely. The information must include the name of the chemical, its hazard and precautionary phrases, which must also be given on the label. This is normally in the form of a Safety Data Sheet. (See below for



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contents.) The requirement for data sheets remain but this has been transferred to a European rather than a UK requirement.

- **To Package the Chemicals Safely**
- **Classification of Chemicals**

Example hazard and precautionary phrases

- H221: Flammable gas
- H222: Extremely flammable aerosol
- H223: Flammable aerosol
- H224: Extremely flammable liquid and vapour
- H225: Highly flammable liquid and vapour
- H226: Flammable liquid and vapour
- H227: Combustible liquid

#### **Health hazards**

- H300: Fatal if swallowed
- H301: Toxic if swallowed
- H302: Harmful if swallowed
- H303: May be harmful if swallowed
- H304: May be fatal if swallowed and enters airways
- H305: May be harmful if swallowed and enters airways
- H310: Fatal in contact with skin
- H318: Causes serious eye damage
- H319: Causes serious eye irritation
- H320: Causes eye irritation

#### **Environmental hazards**

- H400: Very toxic to aquatic life
- H401: Toxic to aquatic life
- H402: Harmful to aquatic life
- H410: Very toxic to aquatic life with long lasting effects
- H411: Toxic to aquatic life with long lasting effects
- H412: Harmful to aquatic life with long lasting effects
- H413: May cause long lasting harmful effects to aquatic life

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### Precautionary statements;

Brief statement to provide measure to undertake to minimise or prevent effects from physical, health or environmental hazards. These include first aid measures and can be a pictogram (see above) or a written statement.

#### General precautionary statements

- P101: If medical advice is needed, have product container or label at hand
- P102: Keep out of reach of children
- P103: Read label before use

#### Prevention precautionary statements

- P201: Obtain special instructions before use
- P202: Do not handle until all safety precautions have been read and understood
- P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking
- P211: Do not spray on an open flame or other ignition source
- P220: Keep/Store away from clothing/.../combustible materials
- P221: Take any precaution to avoid mixing with combustibles
- P222: Do not allow contact with air
- P223: Keep away from any possible contact with water, because of violent reaction and possible flash fire

### LABELLING REQUIREMENTS

When any hazardous chemical is supplied in a package it must be labelled. The aim is to warn those handling or using the chemicals of the hazards and to give a brief account of any suitable precautions.

### CONTENTS OF THE SAFETY DATA SHEETS (SDS)

Safety Data Sheets contain information under sixteen headings, these are:

- **Identification of substance/preparation and company.**
- **Composition** - a description of the substance and identification of components where appropriate.
- **Hazards Identification** - Details of the hazards presented by the product. Hazard and precautionary phrases.
- **First Aid Measures** - First aid measures to be taken 'in case of the product being exposed to personnel.
- **Fire-Fighting Measures** - Any fire-fighting measures to be taken.
- **Accidental Release Measures** - Action to be taken in the event of a product release.

- **Handling and Storage** - The safe method of storing and handling the product.
- **Exposure Controls/Personal Protection** - Methods of reducing exposure and identifying personal protection users should take.
- **Physical and Chemical Properties** This gives specific details of the product.
- **Stability and Reactivity** - This details how stable the product is and what it reacts with.
- **Toxicological Information** - This details the toxic effects of products.
- **Ecological Information** - Any effect that the product may have on the environment.
- **Disposal Information** - Any special precautions that need to be taken with disposal of the product.
- **Transport Information** - Details requirements for the transportation of the product. This is an addition to the information supplied on the label.
- **Regulatory Information** - This includes any statutory information relating to the product.
- **Other Information** - This will include any information that is considered of use to the user.

## 8.8 CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH

The aim of these regulations is to safeguard employees who work with substances which could be hazardous to their health. This includes Chemicals, Dust and Micro-organisms.

These regulations originally came into effect 1.10.89, amended in 1999 and again in 2002. There were a few definitions amended and a new requirement to have emergency plans for dealing with chemical accidents/emergencies was introduced.

Employers must not carry on work which is liable to expose a worker to a substance hazardous to their health unless a suitable and sufficient assessment has been made of the risk and control measures to reduce the risk put in place. Assessments should be reviewed if there has been a change to the work or the employer believes they are no longer valid.

### a. COSHH Key points

- Prohibition of certain substances
- Employer to complete a suitable and sufficient assessment of the risks from hazardous substances
- Prevent or control exposure
- Ensure use of control measures
- Maintenance and testing of control measures
- Health Surveillance
- Information, Training, instruction for employees and others
- Arrangements to deal with accidents and chemical emergencies
- Principles of Good practice for substances with WELs

### **b. COMPETENT PERSON TO ASSESS THE RISK**

Essential criteria:

- Have understanding of occupational hygiene practice (Recognition, Assess, Control, Monitor)
- Be familiar with hazard control methods & COSHH's requirements
- Be able to report their findings, normally in writing
- Must be trained, given information and instruction
- Must be given authority and facilities to do the job
- May require qualifications or membership of recognised institutions

### **c. " a suitable and sufficient assessment of the risks"**

What is the potential for causing harm - Are effects acute or chronic, route of entry, chemical classification?

1. What is the chance of exposure occurring? What is the form of the substance?
2. Who could be exposed? Are there people at specific risk? Number people exposed.
3. How often is exposure liable to occur? Frequency and duration.
4. What exposure is experienced? Extra information is required if exposure is regular or the substance has a Workplace Exposure Limit (WEL).

5. Where is the substance being used – well or poorly ventilated area?
6. Is the substance used alone or as part of a mixture?
7. How much is used? How is it applied?
8. Classifications / risk phrases / safety phrases
9. Review the results of air sampling and health surveillance
10. Must be reviewed regularly and when invalid.

#### **d. CONTROLLING EXPOSURE VIA COSHH**

- Exposure of employees to substances hazardous to health to be prevented or, where not reasonably practicable, adequately controlled
- Control measures - equipment must be properly used and applied. Employees must make proper use of whatever is provided and report defects
- Ensure control measures are maintained by the employer in a good and efficient state
- Monitoring Exposure - certain substances must be monitored and records kept for 5 - 40 years (personal exposure)
- Health surveillance for listed substances, those which can cause identifiable diseases. Records must be kept for 40 years.
- Suitable and sufficient information, instruction and training for those at risk.

#### **e. SUBSTANCES WITH WELs – PRINCIPLES OF GOOD PRACTICE FOR THE CONTROL OF EXPOSURE (introduced in EH40 in 2005)**

1. Eliminate use of substance
2. Substitute
3. Completely enclose

THEN FOLLOW THE NEW PRINCIPLES :-

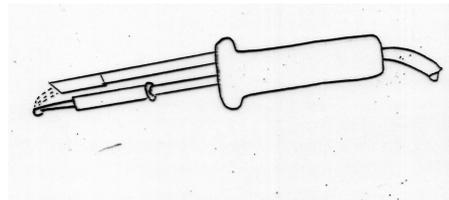
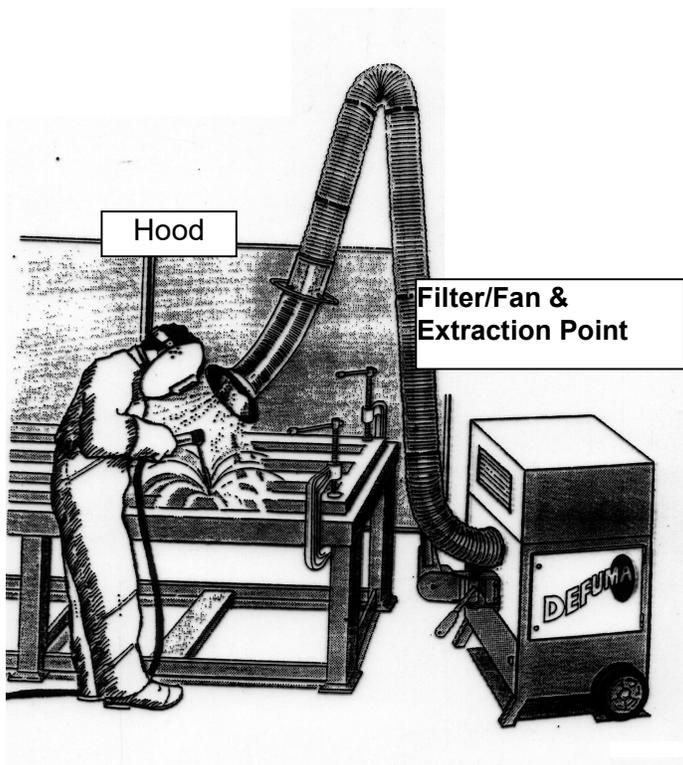
1. Design the process to reduce emissions and release
2. consider all the routes of entry when devising controls
3. control exposure by measures that are proportionate to the risk
4. choose options which is effective and reliable in minimising spread
5. where control of exposure cannot be achieved by other means use PPE
6. review elements of control strategy regularly
7. inform and train on hazards, risks and controls
8. ensure controls do not increase the overall risk to H&S

#### **f. LOCAL EXHAUST VENTILATION (LEV)**

This is used to extract fumes and dust etc. from the air and from the breathing zone of a worker. The simplest system comprises of a single hood, ductwork, filtration unit, a fan and an exhaust point. The point of extraction should be as near as possible to the source and the capture velocity enough to capture all the contaminate effectively. It is also

important to ensure that the contaminant is extracted away from the breathing zone of the worker and not through it. Capture hoods have a greater pressure to extract upwards and across, receptor hoods use the natural movement of air upwards.

Essential Components : **Hood to gather air borne hazard, ducting to take it away, filter to extract it from the air, fan to provide suction and exhaust point.**

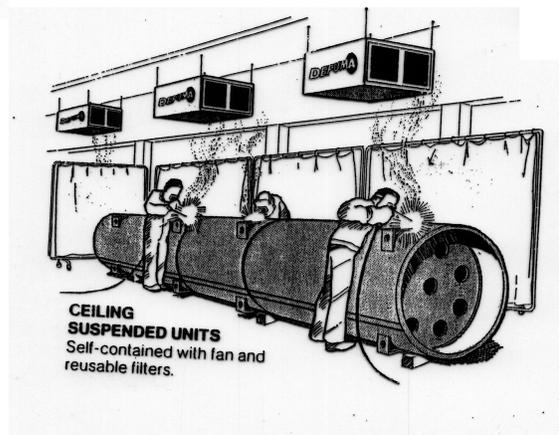


**COSHH** - Any LEV must be examined, maintained and cleaned on a regular basis. It must be tested and examined every 14 months with records kept. Filters must be changed and the air capture velocity tested on a regular basis. Maintenance is also a requirement under the general provisions of HASAWA.

**Dilution ventilation unit for fumes**

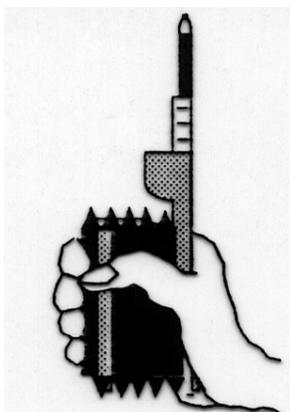


**Grinder with built in LEV**



## 8.9 ENVIRONMENTAL MONITORING

### GRAB SAMPLING :



- Draeger Tubes or chemical stain sampling tubes
- Pump set volume of air through the tube
- Only detects a family or one type of substance
- Only takes samples over a small amount of time
- They are quick to use
- One disadvantage is that tubes have a shelf life
- They will not detect other unknown substances only the one being tested for

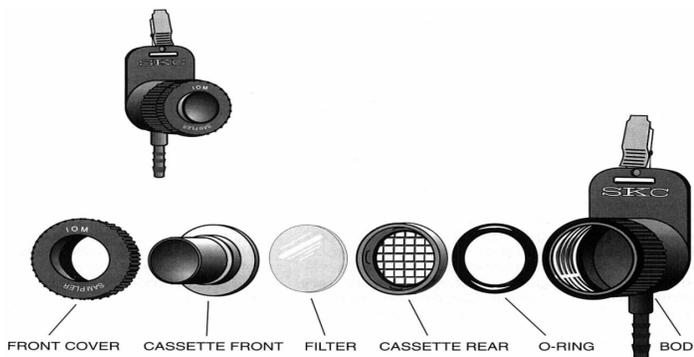


### STATIC SAMPLING

- Pump set up in one position in the workplace
- Run for a certain time at a calibrated flow rate
- Only relevant to that area not one particular employee
- Needs to be carried out by a competent person
- Accurate
- Can be used for dust or gas sampling – with appropriate equipment (e.g. cyclone dust samplers)

### PERSONAL SAMPLING

- Pump connected to the collar or near breathing zone of individual
- Preferable as it follows employee during their work representing a true picture of all exposure

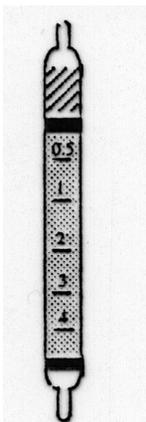


### ALARM SAMPLING

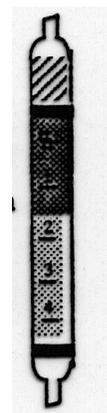
- This sampler triggers an alarm when a harmful concentration of a chemical is detected. e.g. ammonia leaks from a refrigeration unit.



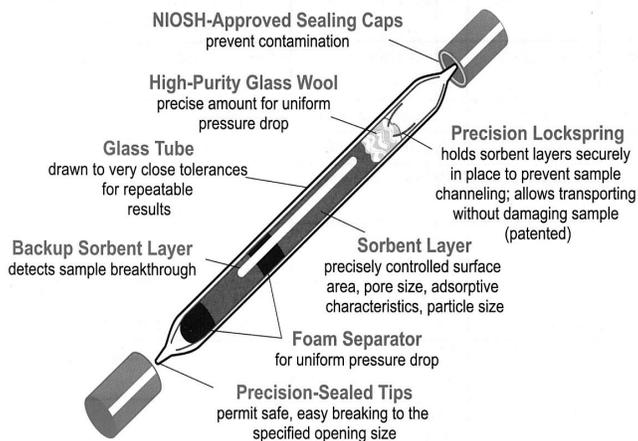
## SAMPLING TECHNIQUES



**Draeger colour detection tubes** – break end of tube, insert in hand pump, pump for a certain number of compressions, read colour change.



**Chemical Sampling Tubes** - fitted to battery operated pump, can direct reading or may need to be sent away for analysis. Not suitable for dusts.



**MINIMUM 2 MM DIAMETER HOLE WHEN TUBE END BROKEN OFF**



**Dust Grab Sampling** – The filter is weighed, a certain air flow sent through the pump, the filter is weighed again to calculate the percentage of dust in a certain volume of air.

**Dust Lamps** – These can be used to give an indication of the amount and size of particles in the air.

**Direct Reading Instruments** – These can monitor for different fumes, gases and vapours, they can monitor how much oxygen is present in the work area such as a confined space, these can give instant readings and usually sound an alarm if the concentration reached is too high or low.





## 8.10 BIOLOGICAL AGENTS AT WORK

### A. INTRODUCTION

Biological hazards arise from agents which can reproduce themselves. If you inhale anthrax spores they will germinate in your lungs and give rise to millions of bacteria. An infection is a successful invasion with the establishment and growth of pathogenic organisms in the tissues of the host. An infectious disease is one which can be transferred to another via direct or indirect contact. Biological organisms are covered by the COSHH regulations, with risks needing to be assessed and control measures taken to prevent or control exposure.

**VIRUS** - these consist of a few molecules of very complex substances, they can only reproduce when they take over a host cell. (e.g. cold, small pox & AIDS) Once attached, the virus injects its nucleic acid into the cell.

**BACTERIA** - These are single celled organisms, in various shapes, all less than microns across. They live on their own and reproduce by dividing. (e.g. sore throats, food poisoning, anthrax, brucellosis) Some diseases can be caught from animals, these are known as zoonosis.

#### Diagram : Anthrax spores

Bacteria are living cells but unlike normal cells they do not have a nucleus. Some antibiotics which treat infections work by damaging the cell wall of bacteria but not the other cells around it.



### B. COMMON BIOLOGICAL AGENTS

**Psittacosis** - often caught from inhaling the dried secretions of birds, encountered during building renovation or demolition.

**Q fever** – This is associated with the urine and faeces of animals.

**Salmonellosis** – this is carried by chickens and eggs

**Anthrax** – This can be contracted from cattle and from materials such as bamboo, goat and camel hair which was sometimes using in walls and ceilings.

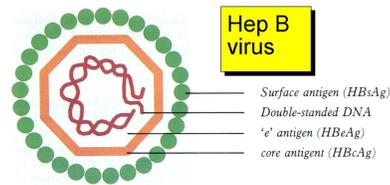
**Leptospirosis (Weils disease)** – This is associated with rat and cattle urine. It can cause flu like symptoms which if not treated can become more serious with nausea, vomiting and the loss of blood in urine, it is an infectious jaundice usually caught from work in or near contaminated water. Work outdoors when in contact with soil can lead to infection especially if the person has an open wound.

**Legionella** – This bacteria breeds in water. Its ideal home is in water cooling towers and water distribution systems, where if the water becomes aerated, it can be breathed in. This causes pneumonia/flu like symptoms and can be fatal in the young and elderly. Those carrying our maintenance of hot and cold water systems can be exposed but if the droplets get into the air they present a risk to anyone who inhales them

**Tetanus** – this can be caught if the individual is cut or grazed by contaminated soil or plants.

**Hepatitis** – This term covers a range of infections of the liver and can be caused by a virus and infection. Blood to blood contact presents the highest risk. Clearing out a building which has been used by drug users could leave employees encountering dirty needles or sharps.

**HIV & AIDS** – The HIV virus attacks the human defence system (ACQUIRED IMMUNE DEFICIENCY SYNDROME which occur as a result of the HIV) HUMAN IMMUNODEFICIENCY VIRUS. Contact with body fluids and blood in particular presents the highest risk. However the virus dies very quickly when outside the human body.



## C. LEGIONELLA BACTERIA

### *Legionella (L8 ACOP) (associated with COSHH Regs)*

The bacterium, *Legionella pneumophila*, is responsible for two important workplace conditions, Legionnaires' Disease and Pontiac Fever.



The first identified outbreak of Legionnaires' Disease occurred among people who had attended a Pennsylvanian State Convention of the American Legion in 1976. Delegates subsequently suffered respiratory illness and the bacterium *Legionella pneumophila* was isolated from lung specimens.

Pontiac Fever is a shorter, more feverish illness, without the complications of pneumonia. Legionellosis is the generic term used to cover Legionnaires' Disease and Pontiac Fever.

*L. pneumophila* is one species of a genus of bacteria grouped under the name *Legionella*. They are rod-shaped organisms, widespread in natural water sources and found in rivers, lakes, streams, mud and soil as well as man-made water systems. To date, at least 34 different species of legionella are recognised. *L. pneumophila* is the most pathogenic and is the species most commonly associated with disease outbreaks.

*Legionella* in water systems will multiply if the following conditions are met:

- Water temperatures in the range of 25-45°C favour growth. It is uncommon to find proliferation below 20°C and it does not survive above 60°C. Organisms may remain dormant in cool water, multiplying only when the temperature reaches a certain level.
- The presence of sediment, sludge, scale and organic material can act as a source of nutrients.
- Commonly encountered organisms in water systems, such as algae, amoebae and other bacteria, may serve as an additional nutrient source for *Legionella*. Algal slime may provide a stable habitat for multiplication and survival.
- Incorporation of *Legionella* in slime on surfaces in contact with water can protect the organisms from concentrations of biocides which would otherwise kill or inhibit those organisms freely suspended in water.

Legionnaires' Disease is a type of pneumonia. As well as affecting the lungs it may also have serious effects on other organs of the body. Infection is caused by inhaling airborne

droplets or particles containing viable legionella, which are small enough to pass deep into the lungs and be deposited in the alveoli.

### Who is at risk?

- Males are more likely to be affected than females by a ratio of 3 to 1.
- Most reported cases occur in the 40 to 70 year age group.
- Smokers, alcoholics and patients with cancer, chronic respiratory or kidney disease.
- Immunosuppressed patients

Initial symptoms include high fever, chills, headache and muscle pain. A dry cough soon develops and most patients suffer difficulty with breathing. About a third of patients also develop diarrhoea or vomiting and about half become confused or delirious.

Exposure to Legionella can also lead to Pontiac Fever, which is a milder condition with an incubation period between 5 hours and 3 days. The illness usually lasts between 2 and 3 days. The symptoms of Pontiac Fever are similar to those of moderate to severe influenza, with headache, tiredness, fever and in a small proportion of cases nausea, vomiting and coughing. No deaths have been reported. A high percentage of those at risk develop Pontiac Fever in comparison to the lower attack rate of Legionnaires' Disease.

In recent years up to 300 cases of Legionnaires' Disease have been reported each year in England and Wales, clusters of cases have occurred in outbreaks associated with hotels, factories and hospitals.

### Occurrence

Legionella is common in natural water sources and therefore random sampling of water systems will often yield positive results. Because the infectious dose and the variation in susceptibility are not fully understood, it is difficult to determine risk solely on the basis of water sampling results. For these reasons, random water sampling is not advocated. However, sampling can be used to monitor precautionary measures, such as water treatment, or to trace the source of infection. The Approved Code of Practice, The Prevention or Control of Legionellosis including Legionnaires' Disease, identifies the following systems as potentially at risk:

- Water systems incorporating a cooling tower.
- Water systems incorporating an evaporating condenser.
- Hot water services and hot/cold water services where occupants are susceptible, i.e. health care premises.
- Humidifiers and air washers creating a spray of water droplets above 20°C.
- Spa baths and pools.

### Assessment of Risk

The Approved Code requires employers to manage risk by:

- Identifying and assessing sources of risk.
- Preparing a scheme for preventing or controlling the risk.
- Implementing and managing precautions.
- Keeping records of the precautions.

The risk assessment should take account of:

- The potential for drop formation
- Water temperature
- The risk to those who inhale droplets
- The means of preventing and controlling risk

#### **D. LEPTOSPIRA**

Leptospirais a particular type of long, flexible, spiral bacteria termed spirochaetes, it is responsible for the condition Weil's Disease. This is an infectious jaundice fever with enlargement of the liver and blood haemorrhages.

It normally occurs where workers are brought into contact with water or mud and slime contaminated by rats. Leptospira is found in the kidneys of rats from all over the world and reaches the outside in excretions of urine; a rat does not have a bladder so urinates on a regular basis, it is normally from this source that humans are infected.

The main route of entry is thorough as open wound, but there is research to show it may also pass through intact skin. In the UK the disease has been confirmed in coal miners, canal workers, sewer workers, pig workers, butchers, workers in abattoirs, stable workers, rat catchers and agricultural workers employed in hedging and ditching. Equally an increasing number of water sports enthusiasts are becoming infected as rat populations multiply.

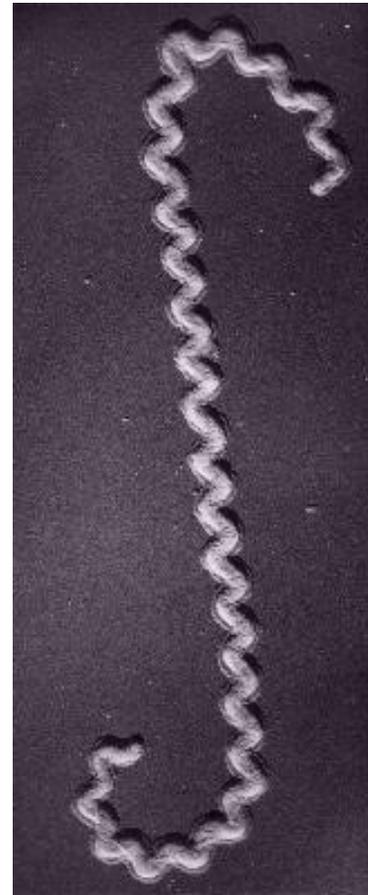
#### *Symptoms*

Flu like symptoms occur after a few days, after a weeks the fever abates and jaundice becomes more obvious, this leads to the development of antibodies in the blood and the excretion of the Leptospirosis in the urine. The urine excreted can pass on the contamination to others.

In severe cases the jaundice may be present for three or four weeks and a second fever may occur. Full recovery can take many weeks or months, with patients remaining very tired and lethargic for a considerable time.

#### *Control*

Intensive and systematic destruction of rats should be carried out in infested areas and further control can be achieved by cleaning and removing material soiled by rat urine. The disease is always associated with wet conditions. Control of the disease in sewer workers is difficult, all "at risk" workers should carry a card warning of the dangers, stressing personal cleanliness and hygiene, explaining the need for protective clothing and alerting doctors to the possibility of the disease.



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As a consequence of a successive run of mild winters, both urban and rural rat populations have increased considerably, leading to a proportional increase in disease risk.

In regard to personal exposure control, it is essential to ensure that people subject to potential risk are aware of the causes and symptoms; are given instruction in suitable first-aid precautions ( e.g. covering existing skin wounds, cleaning and disinfecting all fresh wounds); notify a GP if influenza- like symptoms occur; and notify public authorities if rat infestation is noticed in a work area.

Removal of work activities from an infested site is a wise precaution if practicable; in the case of leisure activities it may be a least-work option to transfer the activity from a freshwater to a seawater location, since rats do not prefer such an environment and dilution of any pollution will be greater.

## **E. GENERAL CONTROLS AGAINST BIOLOGICAL ORGANISMS**

- Eliminate hazard – by effective cleaning and disinfection procedures
- Containment – glove boxes, microbiological cabinets for handling organisms, ventilation systems.
- Hand washing
- Cover cuts with waterproof dressings
- Dispose of sharps safely – in sharps bins
- Wear protective clothing for direct contact with body fluids – such as gloves, aprons and goggles for where splashes may occur.
- Separate changing facilities
- Clean up spills
- Correct Disposal of waste – contaminated waste must be placed in yellow clinical waste sacks.
- Regimes for killing rodents and insects
- Sterilisation & disinfection of equipment and the work area
- Immunisation/vaccination where these are available – Hepatitis B, TB etc.
- Health surveillance – for employees
- Information – on the biological hazards, spillage procedures, equipment checks etc.
- Training – on the different biological organisms to be encountered, the precautions which need to be taken, the maintenance of control measures such as microbiological cabinets and ventilation systems.

## 8.11 CONTROL OF ASBESTOS

### Introduction

Asbestos is a generic term for a number of silicates which appear naturally in a fibrous form. It was originally mined in Crete by the ancient Greeks and, because it did not burn it became very popular. Up until the 1970's enormous amounts were imported into the UK, the fibres had an excellent heat resistance and were resistant to alkalis. Asbestos was used widely as an insulator because of its fire retardant qualities.

Cases of asbestos related injuries and deaths are not new, back as far as 1900 asbestos fibres were found present in the post mortems of workers in asbestos factories.

The main types of asbestos are crocidolite (blue), amosite/grunerite (brown) and chrysotile (white) or blue, white and brown as they are more commonly known. Any material containing asbestos (ACM) is hazardous, any material containing more than 0.1% asbestos will have to be disposed of as hazardous waste.

Asbestos comes in many forms and shape, in older buildings employers may be unaware of its danger lurking beneath the surface. Buildings built after 2000 should be asbestos free.

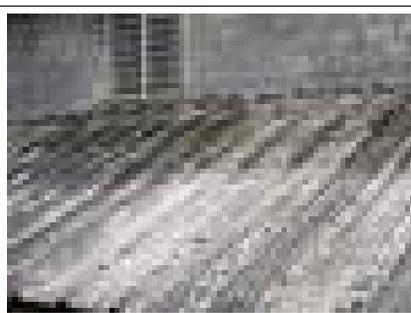
The risk of any asbestos fibres becoming airborne is the real issue, as opposed to how much is present and what type. Eating from an asbestos spoon will not be a problem but inhaling just few fibres would be.

Common areas where asbestos may be found:

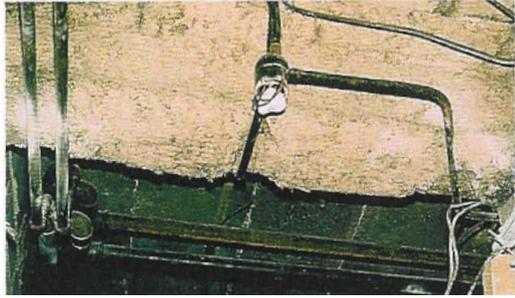
- Boilers and pipe lagging
- Vinyl floor tiles
- Aertex paint
- Cement
- Wall boarding and cladding/Ceiling tiles
- Corrugated roofing panels
- Pipe gaskets/piping/guttering
- Fire protection on steel work
- Fire protection inside fire doors
- Asbestos insulation board
- Fire breaks in ceiling voids
- Bath panels and toilet cisterns



Asbestos insulation sprayed on to structural steel



Asbestos roof sheeting

	
<p>Vinyl flooring tiles containing asbestos</p>	<p>Asbestos insulation sprayed on</p>

### III Health Effects

**Asbestosis**- This term can be used to describe a wide range of lung conditions through exposure to asbestos.

**Pleural plaques**- Scar tissue on the outer layer of the lungs, these are normally benign but they do show that asbestos is present which may lead to other ill health conditions.

**Mesothelioma** - This is a malignant tumour of the peritoneum, this can occur even after slight exposure.

**Lung Cancer** - The risk of contracting lung cancer is increased by exposure to asbestos. If the person smokes the risk is increased again.

Those who could be at risk include those involved with building demolition and renovation but also those carrying out building maintenance.



### LEGAL BASIS

#### CONTROL OF ASBESTOS AT WORK REGULATIONS 2012

These regulations are the current version of asbestos controlling legislation, they aim to prevent and reduce the risk to those working in buildings where asbestos is present, those who may encounter asbestos when working and those who work in the asbestos removal industry. The regulations are supported by an approved code of practice (L127) and a number of guidance notes. HSG264 covered asbestos surveys and Asbestos Essentials covers a range of practical guidelines on carrying out low risk work which may involve asbestos containing materials.

Duties are imposed on the employer to take steps as far as is reasonably practicable to protect those who may be affected by work with asbestos. It sets up a regime for work with asbestos which includes three different levels, licensed, non-licensed notifiable work and exempt work based on the risk level. The main duties are to:-

manage asbestos, every building containing asbestos must have a duty holder, this may include the employer, occupier or landlord. The duty holder must also:-

- Take reasonable steps to find materials likely to contain asbestos and check their condition
- Presume they contain asbestos unless strong evidence to show they do not
- Make written records of location and condition of any asbestos containing materials
- Assess likelihood of anyone being exposed
- Prepare a plan to manage the situation – including any issues which may affect the emergency services.
- The assessment must be reviewed if there has been significant changes or it is out of date.
- Ensure that the control measures highlighted in the plan and assessment are carried out.

The employer must not carry out work which is liable to expose employees to asbestos unless the type of asbestos has been identified. This will also include finding out what the material is that contains asbestos, what condition it is in. If the detail is unknown it should be presumed that it is not white asbestos i.e. the least harmful.

This information must be available and easy to understand, it should also identify if any parts of the building have not been checked.

### **Assessment of work which exposes employees to asbestos**

The employer should assess the risks to employees before the work is undertaken. This assessment should be written if there are over five employees and it should include

- The hazardous properties /type of asbestos
- Degree of exposure
- Information from medical surveillance
- Duration and type of exposure
- Current prevention measures
- Results from monitoring

The assessment must be reviewed if there are any significant changes, after monitoring and after medical surveillance shows it to be necessary.

### **Control limit for Exposure**

“concentration of asbestos in the atmosphere measured in accordance with the WHO method of 0.1 fibres per cubic centimetre of air averaged over a continuous period of four hours”

### **Training**

The training should cover those likely to be exposed and those managing asbestos related work. The training will cover issues such as:

- Properties of asbestos
- Ill health effects
- Synergistic effects (i.e. smoking)
- Type of materials likely to contain asbestos
- Types of work which could expose employees
- Preventing exposure & Safe work methods



- 
- Equipment needed
  - Emergency procedures
  - Hygiene facilities
  - Decontamination procedures
  - What to do if you come across a material you suspect contains asbestos

The higher the risks then the more in-depth the training should be.

**Other requirements cover:-**

- Those who sample and test asbestos must show they confirm to UKAS accreditation scheme and ISO 17025.
- Notification of work with asbestos – 14 days
- Information, training and instruction on the risks involved
- Prevention and reduction of exposure
- Use of control measures
- Provision and cleaning of PPE
- Arrangements to deal with accidents and emergencies
- Duty to prevent the spread of asbestos
- Cleanliness of plant and premises
- Designated areas – controlling entry and exposure

**ASBESTOS SURVEYS HSG 264**

Asbestos comes in many forms and shape, in older buildings employers may be unaware of its danger lurking beneath the surface. Buildings built after 2000 should be asbestos free.

There are now two different types of survey: management and refurbishment and demolition.

The type of survey will vary during the lifespan of the premises and several may be needed over time. A management survey will be required during the normal occupation and use of the building to ensure continued management of the ACMs in situ. A refurbishment or demolition survey will be necessary when the building (or part of it) is to be upgraded, refurbished or demolished.

**Management Surveys**

A management survey is the standard survey. Its purpose is to locate, as far as reasonably practicable, the presence and extent of any suspect ACMs in the building which could be damaged or disturbed during normal occupancy, including foreseeable maintenance and installation, and to assess their condition.

Management surveys will often involve minor intrusive work and some disturbance. The extent of intrusion will vary between premises and depend on what is reasonably practicable for individual properties, i.e. it will depend on factors such as the type of building, the nature of construction, accessibility etc. A management survey should include an assessment of the condition of the various ACMs and their ability to release fibres into the air if they are disturbed in some way. This 'material assessment' will give a good initial guide to the priority for managing ACMs as it will identify the materials which will most readily release airborne fibres if they are disturbed.

The survey will usually involve sampling and analysis to confirm the presence or absence of ACMs. However a management survey can also involve presuming the presence or

absence of asbestos. A management survey can be completed using a combination of sampling ACMs and presuming ACMs or, indeed, just presuming. Any materials presumed to contain asbestos must also have their condition assessed.

### Demolition and refurbishment surveys

A refurbishment and demolition survey is needed before any refurbishment or demolition work is carried out. This type of survey is used to locate and describe, as far as reasonably practicable, all ACMs in the area where the refurbishment work will take place or in the whole building if demolition is planned. The survey will be fully intrusive and involve destructive inspection, as necessary, to gain access to all areas, including those that may be difficult to reach. A refurbishment and demolition survey may also be required in other circumstances, e.g. when more intrusive maintenance and repair work will be carried out or for plant removal or dismantling.

Refurbishment and demolition surveys are intended to locate all the asbestos in the building (or the relevant part), as far as reasonably practicable. It is a disruptive and fully intrusive survey which may need to penetrate all parts of the building structure. Aggressive inspection techniques will be needed to lift carpets and tiles, break through walls, ceilings, cladding and partitions, and open up floors. In these situations, controls should be put in place to prevent the spread of debris, which may include asbestos.

Typical Information to be collected by the surveyor

- Description and use of property (i.e. industrial, office, retail, domestic, education, health care etc.).
- Number of buildings: age, type and construction details.
- Number of rooms.
- Any unusual features, underground sections.
- Details about whether the buildings have been extended, adapted or refurbished, and if they have, when the work was done.
- Any plant or equipment installed.
- Whether a listed building, conservation area etc.
- Extent or scope of survey required (possibly mark details on a site plan or architects' drawings).
- Whether the surrounding ground and associated buildings or structures are to be included in the scope of the survey.
- Current plans or drawings of the site.
- Previous plans, including architects' original drawings and specifications and subsequent plans for major changes and refurbishment.
- Whether the premises are vacant or occupied.
- Any restrictions on access.
- Special requirements or instructions
- Responsibility and arrangements for access.
- Whether survey damage is to be made good (refurbishment/demolition surveys).
- Details of any previous asbestos surveys (Type 1/2/3 Surveys), current asbestos registers and all records of asbestos removal or repairs.
- Information on possible repairs to ACMs, e.g. pipe/thermal insulation.
- History of the site: any buildings previously demolished; presence of underground ducts or shafts etc.



## After the Survey

### When asbestos is found - the assessment

Asbestos of greater risk if it:-

- Has already deteriorated or been damaged.
- Is likely to be disturbed in the course of planned work.
- Is very accessible and likely to be disturbed or damaged in normal use.
- May be damaged by vandalism.

### Repair or remove the asbestos?

This is sometimes a difficult decision, if there is a lot of asbestos present in a building. If the asbestos is not removed, it will have to be managed as it may deteriorate through wear and tear, maintenance activities and or fire or water damage. It will have to be removed sometime, either when it does decay, or when there is extensive refurbishment or demolition of the building. And there is always the worry factor of asbestos being present in a building and the lower value of those premises. The option to remove all the asbestos in premises should always be the first one to be considered seriously, it may be the best long-term option, although if there is damaged asbestos in a building, it should certainly be removed first.

### Managing any asbestos left in place

Arrangements will need to be made so that information about the location and condition of any asbestos containing materials is given to anyone who may disturb them - either accidentally or deliberately.

The arrangements should be written down or recorded in some retrievable way and easy to understand way. They should take account of the possibility that the main contact or nominated person may not be there all the time. One way of doing this is to clearly label (the asbestos) where reasonably practicable.

Only those licensed to work on asbestos should disturb the asbestos.

Review the condition of the asbestos-containing materials, as required and at least once every six to 12 months.

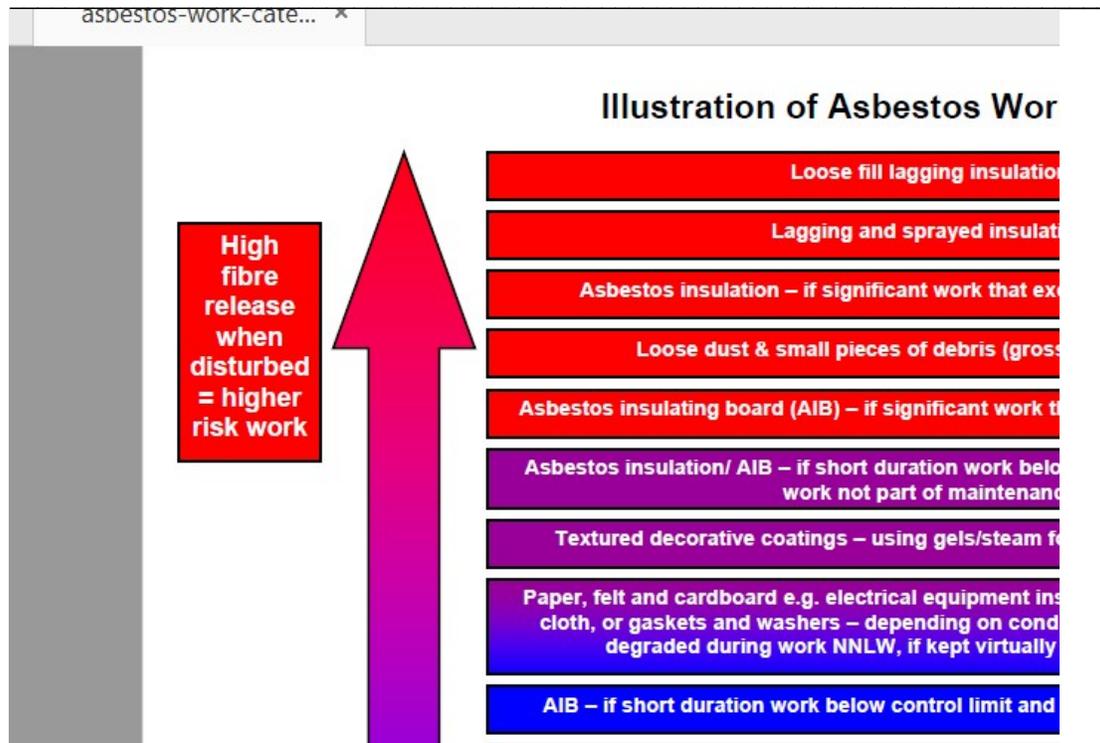
Tell employees what the arrangements are. And provide copies for employee representatives and trades union safety representatives.

### WORK WITH ASBESTOS

For a number of years there has been some high risk work with asbestos which can only be undertaken by licensed contractors, those licensed by the HSE. In 2012 this was changed and we now have three levels of asbestos work.

- Licensed
- Non-licensed notifiable
- Non-licensed exempt

Most asbestos work must be undertaken by a licensed contractor but any decision on whether particular work is licensable is based on the risk.



#### Licensed work

- Exposure is not sporadic and of low intensity
- RA shows control limit may be exceeded ( $0.1 \text{ f/cm}^3$ );
- Work with coating; insulation, insulating board over at the work will last more than two hours in a week,
- One person works for more than one hour in that two hour period

#### Non-Licensed

Non-licensed work is now further sub divided, the very low risk tasks are exempt but other work can be completed by non-licensed workers but the HSE must be notified online about the work to be completed.

To be exempt from needing a license the work must be:

- Sporadic and low intensity - to be considered sporadic and low intensity the concentration of asbestos in the air should not exceed  $0.6 \text{ f/cm}^3$  measured over 10 minutes; and
- Carried out in such a way that the exposure of workers to asbestos will not exceed the legal control limit of  $0.1 \text{ asbestos fibres per cubic centimetre of air (} 0.1 \text{ f/cm}^3\text{)}$ ; and
- Meet at least one of four other conditions:
  - It is a short non-continuous maintenance task, with only non-friable materials (friability describes how likely an ACM is to release asbestos fibres when worked on, so non-friable materials will only release a small number of fibres during work); or
  - It is a removal task, where the ACMs are in reasonable condition and are not being deliberately broken up, and the asbestos fibres are firmly contained within a matrix, e.g. the asbestos is coated, covered or contained within another material, such as cement, paint or plastic; or

- It is a task where the ACMs are in good condition and are being sealed or encapsulated to ensure they are not easily damaged in the future; or
- It is an air monitoring and control task to check fibre concentrations in the air, or it's the collection and analysis of asbestos samples to confirm the presence of asbestos in a material.

### Notifiable non-licensed work

All non-licensed work needs to be carried out with the appropriate controls in place. But for notifiable non-licensed work (NNLW), employers also have additional requirements to:

- notify work with asbestos to the relevant enforcing authority;
- ensure medical examinations are carried out; and
- maintain registers of work (health records).

If the work is exempt from the need for a license, you then need to determine if it is notifiable non-licensed work or non-notifiable work. The key factors to consider are:

#### The type of work you are planning to do:

- **Maintenance**, e.g. drilling holes to attach fittings or pass cables through, painting, cleaning etc. Maintenance includes some removal where it is incidental to the main task, e.g. removing an asbestos ceiling tile to allow inspection; or
- **Removal**, e.g. as part of a refurbishment or redesign project; or
- **Encapsulation**, e.g. work to enclose or seal asbestos materials in good condition; or
- **Air monitoring and control, and the collection and analysis of samples.**

#### The asbestos type:

- Is it **friable?** - the more friable a material is, the more likely it will release asbestos fibres when worked on and the greater the risk of exposure. Work which disturbs more friable materials e.g. asbestos insulation will tend to be NNLW and work which disturbs the least friable materials e.g. asbestos cement can normally be treated as non-licensed work; and
- **How firmly is the asbestos bonded in a matrix?** (For removal work only) – Asbestos containing materials (ACMs) where the asbestos is coated, covered or contained within another material, such as cement, paint or plastic are considered to be firmly bonded in a matrix, ACMs of this type in good condition can usually be treated as non-licensed work but where they are significantly damaged, and so more likely to release fibres, they will need to be treated as NNLW.

#### The material's condition:

- **Has the material been damaged or is it in poor condition?** – removal of ACMs in poor condition e.g. due to flood or fire damage, will normally need to be treated as NNLW; and
- **Will the materials' matrix be destroyed when worked on?** – e.g. deteriorating textured decorative coatings e.g. 'Artex' with gel or steam to remove it, will normally need to be treated as NNLW.

Examples of NNLW include, (assuming in all cases exposure is sporadic and of low intensity and will not exceed the control limit):

- minor, short duration, maintenance work involving asbestos insulation, e.g. repairing minor damage to a small section of pipe insulation where the exterior coating has been broken or damaged;
- minor removal work involving AIB, when short duration and as part of a refurbishment project, e.g. removing AIB panels fixed with screws following water damage;
- entry into the roof space above an AIB tiled ceiling, when no decontamination or cleaning has taken place;
- removal work involving textured decorative coatings where the method of removal requires deterioration of the material, e.g. where the material is treated by steam, hydrating gel etc. and scraped off the underlying surface, or where it is very badly flood-damaged;
- removal of asbestos paper and cardboard products if not firmly bonded in a matrix;
- removal of asbestos cement (AC) which is substantially degraded e.g. badly fire-damaged or de-laminated material, or where substantial breakage is unavoidable to achieve removal.

When notifiable non-licensed work is completed, the HSE online form needs to be completed.

### Medical Surveillance

By 30 April 2015, all workers carrying out notifiable non-licensed (NNLW) work will need to have had a medical examination. Examinations will then need to be repeated **at least every 3 years**, as long as the worker continues to do this type of work. These records must be kept for 40 years.

### Record Keeping

Employers need to keep a register (health record) of NNLW with asbestos for each employee exposed to asbestos which includes:

- the nature and duration of work with asbestos and estimated exposure for each individual worker; and
- dates of the worker's medical examinations;

### Exempt work

The lowest category of work is known as Non-Licensed Non Notifiable or exempt includes:-

- short, non-continuous maintenance work involving AIB which is in good condition, e.g. drilling holes in AIB to attach a fitting or pass through a cable or pipe, cleaning light fittings attached to AIB, removing a door with AIB fire-proofing, or lifting ceiling tiles for inspection where there is no full-body entry into the roof space;
- short, non-continuous maintenance work on asbestos cement (AC), e.g. work on weathered AC roof tiles;

- removal of AC, which is kept virtually intact;
- short, non-continuous maintenance work on textured decorative coatings, e.g. drilling holes, inserting screws or painting;
- small-scale maintenance work with textured decorative coatings when this can be achieved without deterioration of the material, e.g. by careful cutting around backing sheets to achieve removal intact;
- removal, for example, of gaskets or asbestos rope cords from heating appliances, which can be left in situ for disposal or can be lifted out virtually intact, without substantial breakage;
- air monitoring and control, and the collection and analysis of samples.

The document published by the HSE known as Asbestos Essentials provides details on safe working methods when undertaking certain low risk tasks. This is available to purchases in hard copy or individual work sheets can be downloaded from the HSE web site.

## CONTROLLING THE RISKS

**Designated Areas** – When licensed work is undertaken a specific area must be designated, these will normally also be designated as respirator zones. Only those involved with the removal of asbestos should be allowed into these areas.

### Air sampling

Air sampling may be needed before work starts to identify background levels, static work sampling may be needed in the work area and personal sampling to check how much asbestos individual workers are being exposed to. During work sampling will need to be completed to be sure that asbestos containing materials are not shedding fibres, the air in that part of the premises could be tested. Measurements of more than 0.01 fibres per millilitre of air should be investigated to find out the cause.

Bear in mind that the visual inspection is as important as any air tests since there may be deposits of material on any nearby surface.

### Medical Surveillance

Workers who may be exposed to levels of asbestos over the control limit must have regular medical surveillance by an HSE appointed doctor. Medical examinations should be held every two years for those completing licensed work and every three years for those completing non-notifiable licensed work. Records must be held for 40 years after the last entry.

**Asbestos waste** – this will be designated as hazardous waste, double bagged and disposed of via a permitted waste carrier.

**Every building with asbestos in it must have a nominated person** – to support and guide the organisation and ensure their asbestos management plan is completed and actioned.

**Discrete labelling** - to highlight the hazards but not create panic



**Arrange for Removal of asbestos containing materials** – only used licensed contractors

**Check condition** - Ensure asbestos not being removed is checked regularly to ensure it is not damaged

**Use wet methods for removal** – damp down the area first

**Vacuum at source** - no sweeping to reduce air borne dust

**Respiratory protective equipment (RPE)** – usually at least a half mask respirator but it needs to be fitted properly.

**Washing and changing facilities**

**Disposal coveralls and over shoes**

**Training** – this may involve awareness training, training for those working with asbestos but doing non-licensed work and training for those who complete licenced work. Refresher training should not repeat the initial training and be completed annually for workers completing licenced work.



**Further information**

**ACAD** – Asbestos control and Abatement Division

**ARCA** – Asbestos Removal Contractors Association

**ATAC** – Asbestos Testing and Consulting

**BOHS** - British Occupational Hygiene Society – consultancy standards for sampling and surveys

**HSE** – Asbestos essentials



## 8.12 PERSONAL PROTECTIVE EQUIPMENT AT WORK

**“all equipment designed to be worn or held by a person at work to protect against one or more risks in addition to any ordinary uniform or clothing”**

As regulated by the PPE regulations 1992, some minor amendments were made in 2002 (These are shown *in italics*).

Limitation of any PPE: It does not reduce the risk at source

The effectiveness of PPE will depend on:-

- Nature of hazard
- Performance data of the PPE
- Exposure levels
- Period of use
- Ability to adjust PPE and its size.
- Comfort and ergonomics
- Training required to ensure it is worn correctly
- Does the PPE interfere with task?
- Management commitment

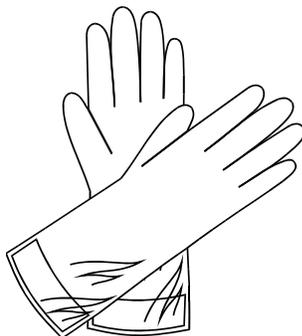
The regulations do not cover PPE that is already covered by existing regulations e.g. ear defenders are still covered by the Control of Noise at Work Regulations.

### REQUIREMENTS OF THE REGULATIONS

- i) Provision of Personal Protective Equipment
  - suitable
  - last resort
  - appropriate
  - ergonomically sound
  - to correct standards e.g. CE marking
- ii) Compatibility of Personal Protective Equipment - If more than one item of PPE is supplied they must be compatible with each other and the risks for which they are provided to protect against.
- iii) Maintenance And Replacement - All equipment must be in good working order and in a hygienic condition *“Where it is essential that PPE is hygienic and free from risk to health, the employer and self employed must ensure it is provided for individual use”*
- iv) Accommodation - for PPE when not in use
- v) Information, Instruction, *Demonstrations* and Training - for employees and others on the risks. This must include the purpose & manner of use plus the action necessary to keep it in an efficient state of repair and hygienic condition
- vi) Use of PPE - The employer must ensure it is properly used and the employee must use it.
- vii) Reporting Loss or Defect - The employee is responsible for reporting any loss or faults in the PPE

viii) Duty to Charge - No levy should be made for the provision of PPE

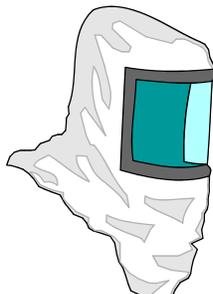
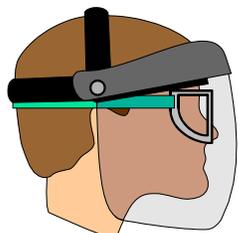
**TYPES OF PPE**



Glasses

Goggles

Safety Boots shields



Face Shield

Face Shield

Respirator

**Examples of PPE**

<b>Hazard</b>	<b>PPE type</b>
Concrete, brickwork and solvents	Neoprene, nitrile, PVC or rubber gloves
Abrasion hazards i.e. brick handling	Rubber, nitrile, leather with a reinforced palm.
Protruding nails in wood	Reinforced soles
Falling objects	Hard hat/ safety foot wear
Dust	Respirator
Transport	High visibility vests

## 8.13 RESPIRATORY PROTECTIVE EQUIPMENT

### a. RESPIRATORS

These purify the air by drawing it through a filter which should remove most of the contaminant. Filters are available against fibres and vapours.

**Filtering Face Pieces** - single use disposable masks

**Half Mask** - Rubber or plastic face piece which covers nose and mouth, with replaceable filters

**Full Face Piece** - Cover eyes, nose and mouth. Replaceable canisters fit onto face piece or can be worn on a belt.

**Powered Air Purifying Respirators** - Air is drawn in via battery powered fan as shown here.



**Powered Visor** - Self contained helmet, power pack and filter system. Forces air through filters across the breathing zone.

### b. BREATHING APPARATUS

**Fresh Air Hose** - Draws air from uncontaminated air, either by breathing or bellows

**Compressed Airline** - Cleaned filtered air, through compressed air line.

**Self Contained Breathing Apparatus**

**(scuba)** - Oxygen from a cylinder which can be worn by the wearer. Provides air from an uncontaminated source, overcomes the weakness of respirators which cannot be used in environments where there is little oxygen.



<i>Breathing Apparatus</i>	<i>Respirator</i>
<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Provides an uncontaminated source of air</li> <li>• Suitable for most hazards</li> <li>• Can be used where there is insufficient oxygen</li> <li>• Positive pressure</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• Heavy</li> <li>• Bulky - can restrict movement</li> <li>• Only last for short period of time</li> <li>• Maintenance is very important</li> <li>• Specific training required</li> </ul>	<p><b>Advantages</b></p> <ul style="list-style-type: none"> <li>• Light</li> <li>• Relatively cheap</li> <li>• Suitable for many different hazards</li> <li>• Limited training needed</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>• You need to know what the hazards is t choose the right filter</li> <li>• Not suitable where there is insufficient oxygen</li> <li>• Only a filter</li> <li>• May not seal if person has a beard</li> </ul>

### 8.14 SUMMARY TABLE ON SPECIFIC AGENTS

Cement dust	Inhalation of dust. Can irritate skin on contact Dries out natural oils of the skin Cement burns	Irritant
Wet Cement	Splashes on skin May burn through the skin May damage nerve endings	Irritant Corrosive
Organic solvents e.g. white spirit, xylene, methanol etc. Engineering, cleaning of metal components, degreasers. Often in paints, varnishes and cleaning products.	Light headedness, Dermatitis, Headaches, Nausea, Loss of consciousness, impaired co-ordination. Long term mental health problems.	Irritant & Harmful
Isocyanates (Paint spraying/foam insulation)	Respiratory sensitiser, dermatitis, lung aging, asthma, eye irritation – used in production of foam and in paints.	Toxic Irritant
Carbon dioxide  Produced by MIG welding can old be used as a dry ice to freeze pipes.	Heavier than air. Loss of consciousness, light headed, difficult to concentrate.  Dry Ice – when it converts to a gas  Vaporizes at normal temperatures without forming a liquid. Vapour can cause rapid suffocation, increase respiration and heart rate, nervous system damage and dizziness and drowsiness.	Toxic, Asphyxiant
Nitrogen  Pipe freezing .	Nitrogen is a colourless, odourless, tasteless, diatomic and generally inert gas at standard temperature and pressure. The gas rapidly expands when released and can knock out the oxygen in the surrounding area. Symptoms include loss of mobility, loss of consciousness. Hazard in confined spaces  Nitrogen is non-toxic under normal conditions. Direct skin contact with liquid nitrogen causes severe frostbite. Decompression in divers or astronauts can cause the 'bends' - a potentially fatal condition when nitrogen bubbles form in the bloodstream.	Asphyxiant in high concentrations

<p>Carbon monoxide</p> <p>Produced by incomplete combustion from engines and MIG welding.</p>	<p>Combines with haemoglobin preventing oxygen being transported by the blood. It can cause a reduction in the oxygen carrying capacity of the blood that can be fatal. In lower concentrations it causes headache and dizziness, nausea and weakness.</p> <ul style="list-style-type: none"> <li>• toxic gas - produced by natural sources and human activities</li> <li>• Non-irritating, colourless, odourless &amp; tasteless</li> <li>• Accounts for many occupational &amp; non-occupational deaths (about half of all gas poisonings)</li> <li>• “Some 2,000 persons a year are killed out right by CO gas exposure”</li> <li>• “At least 10,000 more workers suffer from exposure to debilitating levels of CO”</li> <li>• “One of the most dangerous industrial hazards”</li> <li>• “One of the most widespread”</li> </ul> <p>III Health effects</p> <ul style="list-style-type: none"> <li>• Acute effects <ul style="list-style-type: none"> <li>• Headache (frontal at first)</li> <li>• Roaring in ears</li> <li>• Weakness &amp; dizziness</li> <li>• Darkened vision &amp; sleepiness</li> <li>• Muscular weakness &amp; loss of coordination</li> <li>• Involuntary evacuation &amp; collapse</li> <li>• Coma</li> <li>• Death</li> <li>• Effect on the unborn foetus</li> </ul> </li> <li>• But high concentrations may cause immediate collapse with few other symptoms</li> <li>• Chronic effects <ul style="list-style-type: none"> <li>• Headache</li> <li>• irritability</li> <li>• Insomnia</li> <li>• Personality disturbances</li> <li>• Cardiac disturbances</li> <li>• Reduction in ability to concentrate</li> </ul> </li> </ul>	<p>Asphyxiant, Toxic</p>
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<p>Lead</p> <p>Lead smelting Metal working with metal alloys i.e. soldering Painting of buildings Hot cutting Recovering lead from buildings Lead paints Welding galvanised metal</p>	<p>Targets the nervous system, blood, muscles and blue gums, headaches &amp; anaemia. Acute (short-term) poisoning, from a large dose, causes severe intestinal symptoms with abdominal pain, vomiting and diarrhoea. Later, there are signs of damage to the nervous system, including convulsions, muscle weakness and coma. In severe cases, acute lead poisoning can be fatal.</p> <p>Chronic (long-term) lead poisoning can cause gradual damage to brain function, with headache, loss of physical co-ordination, loss of intellectual ability and memory, and abnormal behaviour.</p> <p>There are several different types of lead compounds including <b>inorganic</b> lead, e.g. <b>lead oxide</b> in lead/acid batteries, <b>lead chromate</b> (chrome yellow), <b>red lead</b> used for pigments and <b>organic lead</b>, e.g. petrol.</p> <p>In its solid metal state lead does not normally present a risk as it cannot gain entry into the body. However in the workplace lead may be in the form of a fume or dust where it can be readily absorbed into the body.</p> <p>Inorganic lead compounds are normally found in the form of dust which can be inhaled, organic lead can also be inhaled but is also a risk through skin contact.</p> <p>Tetra-ethyl organic lead presents a high risk which if not controlled can have fatal consequences. Once absorbed into the body it attacks the central nervous system causing a range of extreme behaviours such as twitching, excitement, restlessness and delusions. The body temperature falls as the blood pressure falls. The body becomes weaker and unable to protect itself.</p> <p>Those working in the following industries could be at risk from lead:</p> <p style="padding-left: 40px;">Metal work Ship yards Plumbing Painting Welding</p>	<p>Toxic</p>
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<p>Silica and mineral dusts</p> <ul style="list-style-type: none"> <li>• Silica</li> <li>• Stone</li> <li>• Quartz</li> </ul>	<ul style="list-style-type: none"> <li>• Pulmonary disease attributed to silica reported since the 16th century</li> <li>• At risk are: <ul style="list-style-type: none"> <li>• Tunnelling, Masons</li> <li>• Drillers, Foundry workers</li> </ul> </li> <li>• shortness of breath</li> <li>• cough and progressive shortness of breath</li> <li>• Extreme vulnerability to tuberculosis</li> <li>• Autoimmune effects leading to arthritis</li> <li>• Probable carcinogen</li> <li>• Silicosis</li> <li>• WEL <ul style="list-style-type: none"> <li>• LTEL of 0.3 mgm-3</li> </ul> </li> </ul>	
Wood dust	<p>Irritant – soft wood dusts can cause skin and eye irritation, conjunctivitis, asthma, dermatitis, coughing.</p> <p>Septic wounds can be caused by red cedar wood.</p> <p>Hard wood dust (i.e. mahogany) may cause nasal cancer.</p> <p>Size of particles may determine where the dust reaches in the respiratory system.</p>	Irritant
Organic Dust	<ul style="list-style-type: none"> <li>• Allergic alveolitis &amp; Occupational Asthma</li> <li>• Sneezing, sore throat &amp; coughing</li> <li>• Bronchitis</li> <li>• Emphysema</li> <li>• Byssinosis - cotton dust</li> <li>• Bird fanciers lung - bird droppings/feather/skin particles</li> <li>• Mushroom workers lung - compost</li> <li>• Farmers lung - mouldy hay</li> <li>• Acute</li> <li>• May also lead to pneumoconiosis</li> </ul>	
Hydrogen Sulphide	<p>A colourless, very toxic, flammable gas with the characteristic foul odor of rotten eggs. It often results from the bacterial breakdown of organic matter in the absence of oxygen, such as in swamps and sewers (anaerobic digestion). It also occurs in volcanic gases, natural gas, and some well waters. Often known as sewer gas. Low concentrations can be detected by the odour higher more fatal doses cannot be detected by the sense of smell alone.</p>	Highly Toxic Explosive/Flammable
Legionella Contact with bacteria in water systems	<p>Bio Hazard</p> <p>Legionnaires disease. Inhalation risk. Early symptoms include a flu-like illness with muscle aches, tiredness, headaches, dry cough and fever. Sometimes diarrhoea occurs and confusion may develop. These symptoms frequently lead on to pneumonia.</p>	

<p>Leptospira</p> <p>Leptospirosis Weils Disease</p> <p>Contact with rats urine usually in those who work outside near water or sewers.</p>	<p>Bio Hazard</p> <p>The organism enters the body through breaks in the skin such as cuts, blisters and abrasions, or via the lining of the nose, throat or alimentary tract. The incubation period is 7-13 days and the disease starts with a fever, muscular aches and pains, loss of appetite and vomiting with prostration. Subsequent bruising of the skin, sore eyes, nose bleeds and jaundice may occur. The fever lasts about five days and may be followed by significant deterioration.</p> <p>Controls</p> <ul style="list-style-type: none"> <li>• Control of rat populations</li> <li>• Immunisation</li> <li>• Carry a warning card</li> <li>• Promote personal hygiene</li> <li>• Protective clothing</li> <li>• Cover all wounds, cuts &amp; abrasions</li> <li>• Education of exposed persons</li> </ul>
<p>Hepatitis</p> <p>Contact with infected blood and body fluids. There are a number of different types. (Virus)</p>	<p>Bio hazard</p> <p>Symptoms include nausea, poor appetite, changes in taste perception, pressure or pain below the right ribs caused by an enlarged liver aching muscles and joints, headache, skin rash.</p> <p>The jaundice phase: yellowing of the eyes, skin and mucous membranes, dark urine, light-coloured stools and severe tiredness.</p>
<p>Tetanus – outdoor work in contact with plants and the soil.</p>	<p>Bio Hazard</p> <p>This is a spores forming bacteria been found in earth contaminated with the excrement of animals such as horses, cattle etc. Its spores are highly resistant and therefore it remains active for many years once having left the animal.</p> <ul style="list-style-type: none"> <li>• Symptoms             <ul style="list-style-type: none"> <li>• Lesions</li> <li>• Blocks neurons</li> <li>• Muscle damage &amp; contractions</li> <li>• Spreads along nerves to spinal column</li> <li>• Lockjaw</li> </ul> </li> </ul> 

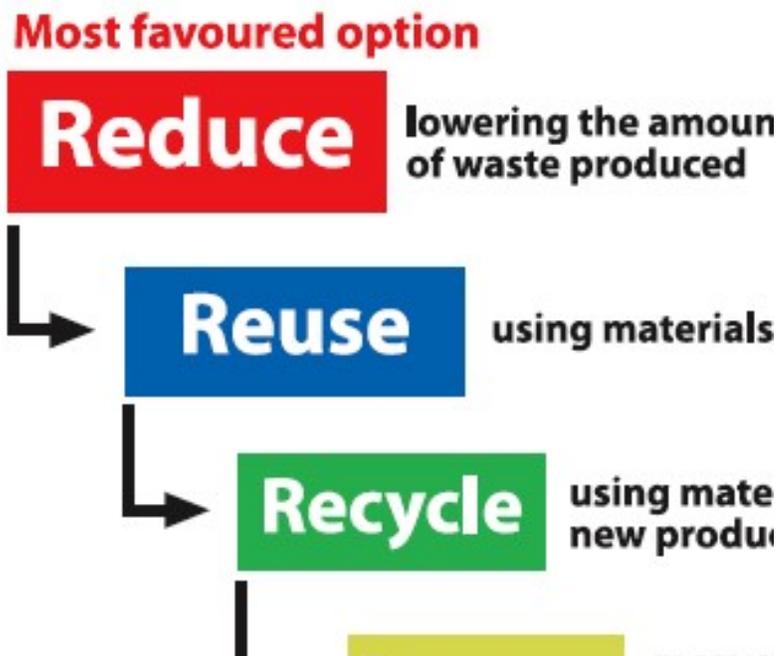


## 8.15. WASTE

Just what is waste?

“substance which constitutes a scrap metal, effluent or other unwanted surplus substance”

Landfill is the predominant disposal route for waste in the UK. Landfill sites are running out of space quickly and alternative strategies are required. Landfill also creates hazards to the environment as they can contaminate water systems, generate methane gas (a greenhouse gas) and once they are full, keeping them safe so they do not contaminate further can be problem. 400 million tonnes materials used in construction in England and Wales each year. At least 109 million tonnes of waste produced. Which has led to UK Government and industry targets to reduce for construction waste.



### 8.15.1 Waste Management Duty of Care

Section 34 of the Environmental Protection Act 1990 introduced a Duty of Care on anyone who is the holder of controlled waste.

A holder is any person who:

“produces, imports, keeps, treats, carries, or disposes of controlled waste.”

Householders are exempt for their own household waste.

The duty represents good business practice and places a duty on anyone, who in any way has a responsibility for controlled waste, to ensure that it is managed properly and that it is recovered or disposed of safely.

The duty is set out in a schedule which is regularly updated. It recommends a series of steps which should normally be enough to meet the duty of care. The legal obligation is to comply with the duty itself rather than with the code, it is however admissible as evidence

in any legal proceedings. The current code of practice was issued in March 1996. It outlines the requirements of the duty are for holders of waste to:

- contain it securely to avoid escape
- transfer it only to someone with authority to take it (e.g. registered carrier/ licensed waste), or be allowed to actually take the waste if receiving it
- keep appropriate records using transfer notes and making sure the documentation is properly completed

Also, all waste holders should be alert to non-compliance of others. A breach of the duty of care is an offence with a penalty of an unlimited fine if convicted on indictment.

There are more detailed requirements for the disposal of special waste which includes items dangerous to life which includes explosive, oxidising, corrosive, carcinogenic and flammable substances.

General approach to waste – avoid, reduce, reuse recover (recycle) then disposal.

## **DOCUMENTATION**

The 2011 Waste (England and Wales) Regulations set out documentary requirements associated with the Duty of Care.

Transfers of waste must be accompanied by a transfer note containing certain information. There is no compulsory form for keeping waste transfer records, however, an example is given in the Code of Practice. The transfer note must be kept for at least two years.

Where there are a series of transfers of the same waste between the same parties within a 12 month period, one transfer note can cover that series of transfers. This is referred to as a 'Season ticket'.

<http://www.environment-agency.gov.uk>

### **8.15.2 Hazardous Waste Regulations 2005**

These regulations do not apply to the disposal of mixed municipal waste from domestic properties. However, asbestos produced at or removed from domestic properties is subject to the regulations. Also where other hazardous waste from a domestic property is moved separately to a central collection point, such as a household waste recycling centre, the regulations apply from the central collection point.

#### **Requirements:-**

- define hazardous waste;
- describe the form (consignment note) you must use before you can get rid of hazardous waste;
- set out procedures for multiple collections of hazardous waste;
- describe the form (consignee return) that people receiving waste must complete and send to the Environment Agency;
- describe the return the consignee has to make to the producer;
- describe the records that must be kept;
- set fees for premises notification and consignments;
- restrict mixing of wastes;
- set out the penalties for not complying with requirements

**What is waste?**

“Waste” is “...any substance or object...which the holder discards or intends or is required to discard.”

**What are hazardous wastes?**

These are the most dangerous wastes. They can cause the greatest environmental damage or are dangerous to human health. This may include:-

- Acids
- Alkaline solutions
- Batteries
- Oil fly ash
- Industrial solvents
- Oily sludges
- Pesticides
- Pharmaceutical compounds
- Photographic chemicals
- Waste oils
- Wood preservatives
- TVs
- Computer monitors

Categories of chemicals covered include harmful, irritant, corrosive, highly flammable, carcinogenic, mutagenic, ecotoxic, oxidising, infectious etc.