

ELEMENT 7 – CHEMICAL AND BIOLOGICAL HEALTH HAZARDS AND RISK CONTROL

1. Outline the forms of, the classification of, and the health risks from the exposure to, hazardous substances.
2. Explain the factors to be considered when undertaking an assessment of the health risks from substances commonly encountered in the workplace.
3. Explain the use and limitations of occupational exposure limits, including the purpose of long term and short term exposure limits.
4. Outline control measures that should be used to reduce the risk of ill-health from exposure to hazardous substances.
5. Outline the hazards, risks and controls associated with specific agents.
6. Outline the basic requirements related to the safe handling and storage of waste.

7.1 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 methylated 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.








7.2 MAIN CHEMICAL CLASSIFICATIONS

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 destroy living tissue on contact. Will chemically attack 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. Trichlorethylene, 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.

7.3 CHEMICAL SYMBOLS

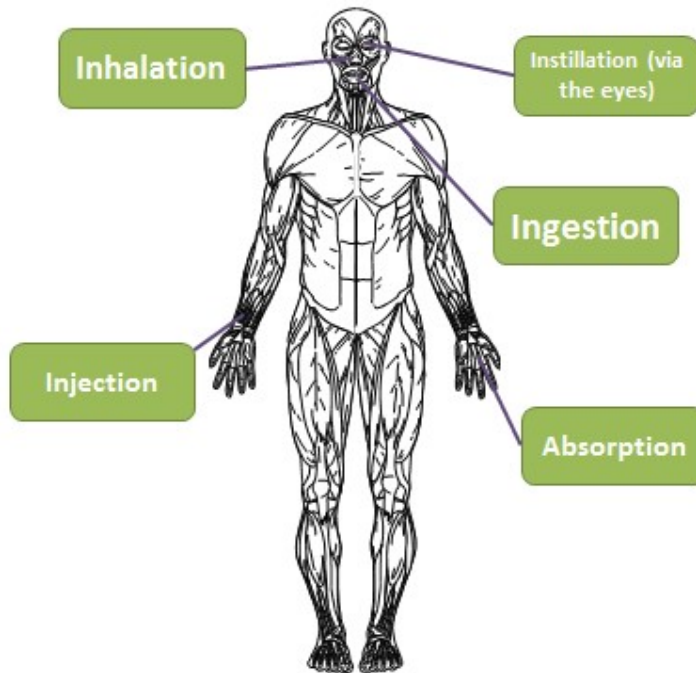


CHEMICAL HAZARDS SYMBOLS

GHS Pictograms and Hazard Classes		
<p>pic 1803</p>  <p>Oxidizers</p>	<p>pic 1802</p>  <p>Flammables Self Reactives Pyrophorics Self-Heating Emits Flammable Gas Organic Peroxides</p>	<p>pic 1801</p>  <p>Explosives Self Reactives Organic Peroxides</p>
<p>pic 1809</p>  <p>Acute Toxicity (severe)</p>	<p>pic 1808</p>  <p>Corrosives</p>	<p>pic 1804</p>  <p>Gases Under Pressure</p>
<p>pic 1807</p>  <p>Carcinogen Respiratory Sensitizer Reproductive Toxicity Target Organ Toxicity Mutagenicity Aspiration Toxicity</p>	<p>pic 1806</p>  <p>Environmental Toxicity</p>	<p>pic 1805</p>  <p>Irritant Dermal Sensitizer Acute Toxicity (harmful) Narcotic Effects Respiratory Tract Irritation</p>

7.4 THE EFFECT OF SUBSTANCES ON THE HUMAN BODY

a. 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 where they enter the bloodstream and go on to attack a target organ within the body. Skin contact may allow liquids to be absorbed across the epidermis directly into the blood stream. If there is a cut, substances and biological organisms can also enter more readily.

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

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accumulate in the liver and the kidneys. Once in the body, absorption allows toxins to enter the bloodstream and then go on to target organs. This is the least likely route of exposure to work-based chemicals.

Injection

This is a form of absorption through the skin via a needle or other sharp surface.

b. ILL-HEALTH EFFECTS

Acute - This is an effect which becomes apparent immediately after just one exposure to a particular hazard, usually the body has the ability to recover e.g. chemical splash on the skin.

Chronic - This is an effect which may become apparent after repeated exposure to a hazard. The ill-health effects may also take a long time to become apparent, these may be permanent and irreversible e.g. asbestosis from asbestos.

Target organ/system – This term is used to describe the organ of the body where a hazardous substance exerts influence or causes harm after entering the blood stream e.g. mercury targets the nervous system and the brain.

Local Agent – this term is used to describe a substance which injures the body at its point of contact e.g. cement on skin may burn or irritate.

c. 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. Substances which cause irritant dermatitis include solvents, detergents, white spirit, mild acids and cement.






There are many substances which may cause allergic dermatitis – this is a sensitized reaction. Some substances may sensitize the skin and lungs. Leather, rubber, formaldehyde, organic dyes and natural materials such as wood dust can cause allergic reactions.



7.5 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 by EU legislation on the labelling and classification of substances. As from June 2015 all new substances and mixtures had to have the new labelling.

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 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

Precautionary statements;

Brief statement to provide measures 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 MANUFACTURER'S SAFETY DATA SHEETS (MSDS)

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.

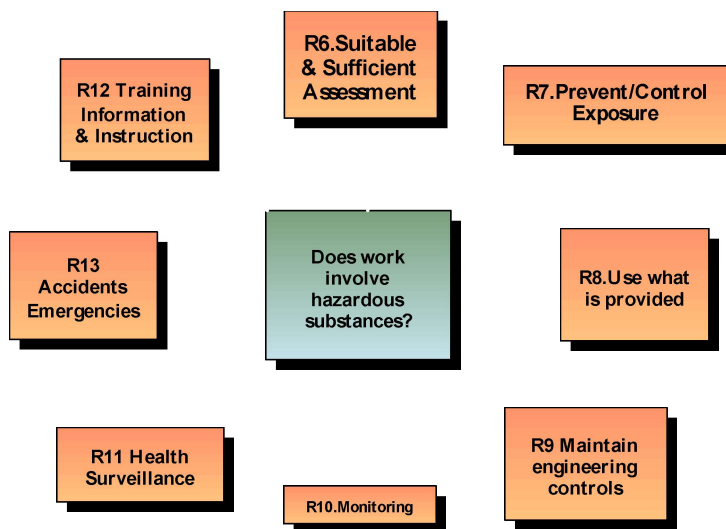
- **Handling and Storage** - The safe method of storing and handling the product.
- **Exposure Controls/Personal Protection** - Methods of reducing exposure and identifying personal protection users should take.
- **Physical and Chemical Properties** This gives specific details of the product.
- **Stability 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 in 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.

7.6 CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS (COSHH) 2002 as amended

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.

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 risks. Control measures to reduce the risk must then be put in place. Assessments should be reviewed if there has been a change to the work or if the employer believes they are no longer valid.

COSHH 2002



a. COSHH KEY POINTS

- Prohibition of certain high risk substances
- Employer to complete a suitable and sufficient assessment of the risks from hazardous substances
- Steps must be taken to prevent or control exposure
- Employers must ensure control measures are used e.g. LEV is used or PPE worn when required
- Maintenance and testing of control measures e.g. ventilation systems
- Health surveillance for those at high risk
- Information, training, instruction for employees and others
- Arrangements to deal with accidents and chemical emergencies
- Principles of good practice to be followed 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 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 institution depending on the nature of the substances being assessed.

c. “A SUITABLE AND SUFFICIENT ASSESSMENT OF THE RISKS”

Sources of information to assist with the identification of hazardous substances and their associated risks include substance labels, EH40, HSE guidance and manufacturer’s safety data sheets.

1. What is the potential for causing harm - are effects acute or chronic?
2. What is the route of entry?
3. What are the chemical classifications?
4. What is the chance of exposure occurring?
5. Who could be exposed? Are there people at specific risk?
6. How often is exposure liable to occur?
7. What exposure is experienced? Extra information is required if exposure is regular or the substance has a Workplace Exposure Limit (WEL).
8. Where is the substance being used? In a well- or poorly-ventilated area?
9. Is the substance used alone or as part of a mixture?
10. How much is used? How often?
11. Who is exposed? Number of people? Any vulnerable people?
12. Synergistic effects?
13. Review the results of air sampling and health surveillance to identify any potential problems.
14. Any existing controls. How effective are they?
15. Implement control measures
16. Record assessment
17. Must be reviewed regularly and when invalid.

d. HIERARCHY OF CONTROL

- 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.
- Monitoring Exposure - certain substances must be monitored and records kept for 5 - 40 years (personal exposure).
- Health surveillance for listed substances, which can cause identifiable diseases. Records must be kept for 40 years.



e. 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. 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, gluteraldehyde, wood dust, ozone, silicon and plaster of Paris.

Sample EH40 Table (WELs)

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

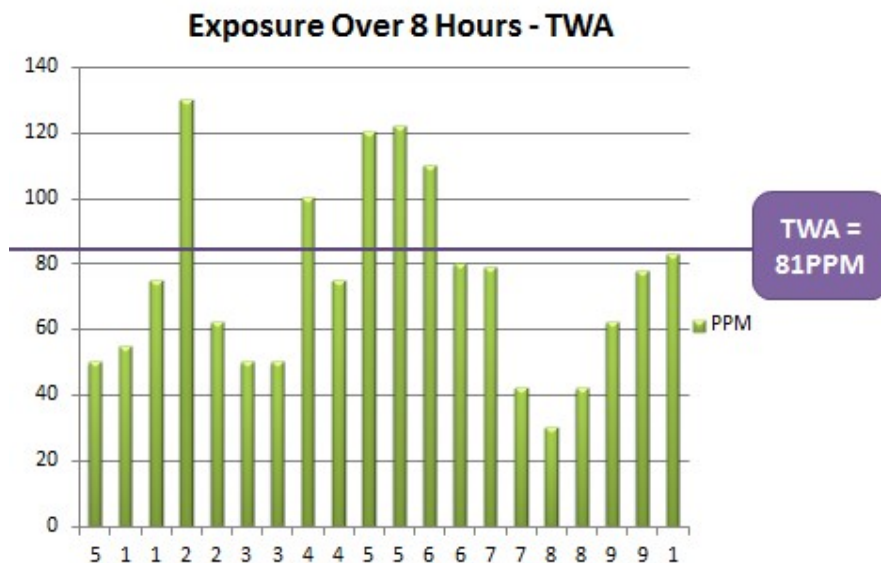
Where substances assigned a WEL are used in the workplace, the employer must control the risks under COSHH but also utilise the principles of good practice which are listed in schedule 2A of the regulations. If these principles are applied, exposure should be below the WEL. Control by PPE should only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

WELS should not be exceeded but if the substance is assigned, the risk phrases R45, R46 or R42 exposure must be as low as is reasonably practicable e.g. substances causing allergic reactions, cancer or genetic defects.

WELs only apply in the UK and EU but there are a variety of international exposure limits but the limits they set may be different from those acceptable in the UK.

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. It is not the highest concentration of the substance, nor the lowest but the daily average. It is this figure which is needed to compare against the levels in EH40.



f. SUBSTANCES WITH WELs – PRINCIPLES OF GOOD PRACTICE FOR THE CONTROL OF EXPOSURE (introduced by EH40 in 2005)

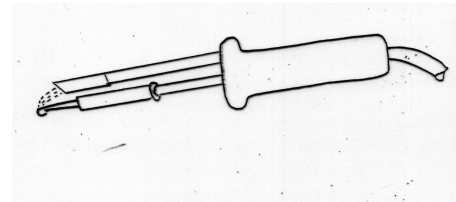
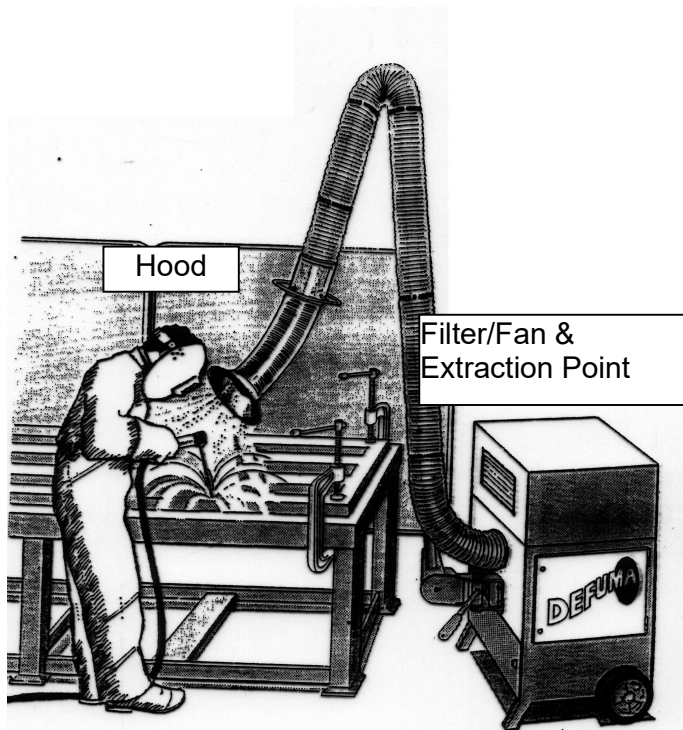
Substances which have a WEL listed in EH40 must be controlled using the usual hierarchy of control but in addition the following principles must be applied.

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 are 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

g. LOCAL EXHAUST VENTILATION (LEV)

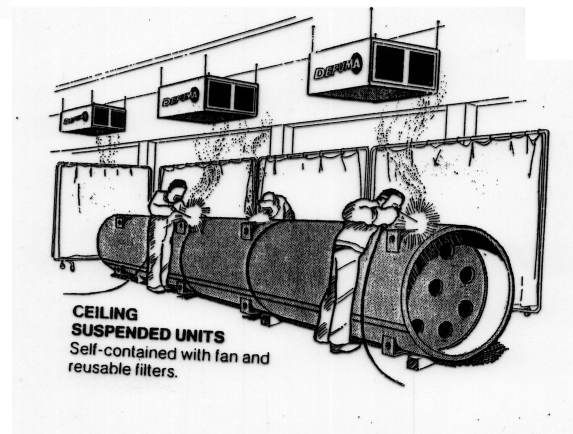
This is used to extract fumes and dust etc. from the air and from the breathing zone of a worker. The simplest system comprises of a single hood, ductwork, filtration unit, a fan and an exhaust point. The point of extraction should be as near as possible to the source and the capture velocity enough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

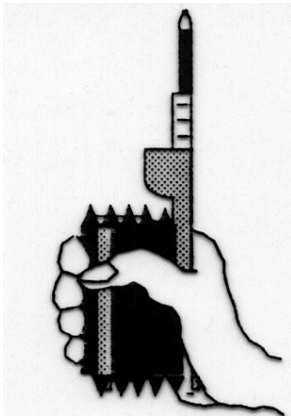
Dilution ventilation unit for fumes



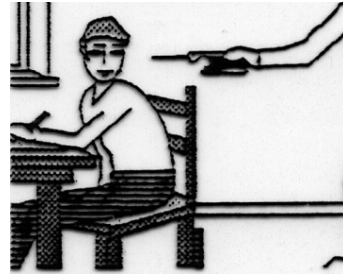
(Picture above) **Receptor Hood**

7.7 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

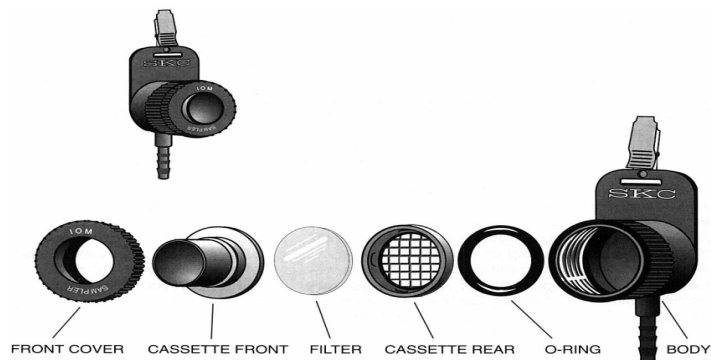


STATIC SAMPLING

- 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)

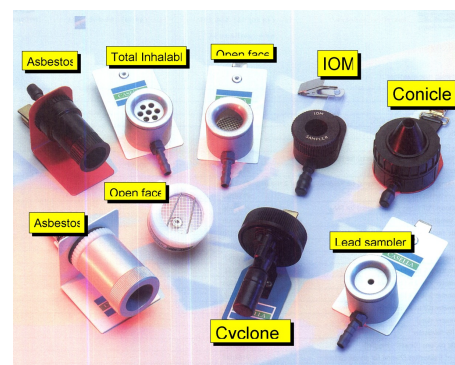
PERSONAL SAMPLING

- 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

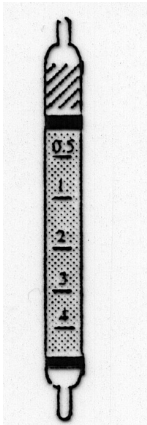


ALARM SAMPLING

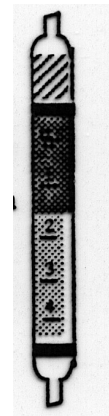
- This sampler triggers an alarm when a harmful concentration of a chemical is detected. e.g. ammonia leaks from a refrigeration unit.



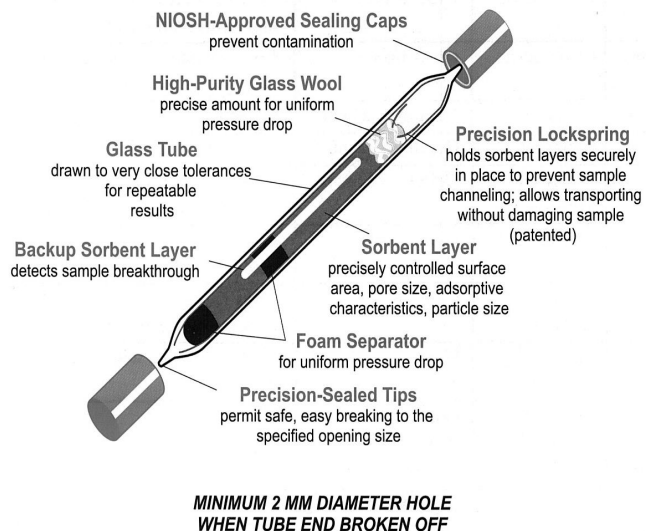
SAMPLING TECHNIQUES



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 be directly read or may need to be sent away for analysis. Not suitable for dusts.



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 and can give instant readings.



7.8 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 person via direct or indirect contact. Biological organisms are covered by the COSHH regulations, with risks assessed and control measures taken to prevent or control exposure.

Types of Biological Agents

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, smallpox, HIV & AIDS). Once attached, the virus injects its nucleic acid into the host 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.

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.

FUNGI – These produce spores which disperse easily in the area, enabling a quick spread of the hazard which can also easily be inhaled.

Fungi often affect the lungs from inhalation. A hypersensitive reaction at the alveolar level often results producing coughs, wheezing, and a lack of breath leading to a chronic respiratory disease over a period of time.

Diagram: Anthrax spores



b. COMMON BIOLOGICAL AGENTS

Psittacosis - often caught from inhaling the dried secretions of birds.

Salmonellosis – this is carried by chickens and eggs

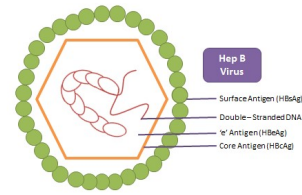
Anthrax – This can be contracted from cattle

Leptospirosis (also known as 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.

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.

Hepatitis –inflammation of the liver, can be caused by a virus and infection. Blood to blood contact presents the highest risk.
HIV & AIDS – The HIV virus attacks the human defence system (Acquired Immune Deficiency Syndrome which occur as a result of the Human Immunodeficiency Virus (HIV)).



c. CONTROLS AGAINST BIOLOGICAL ORGANISMS

- Eliminate hazard – by effective cleaning and disinfection procedures
- Containment – glove boxes, microbiological cabinets for handling organisms or 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 possible – 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.
- Glove boxes – see picture below

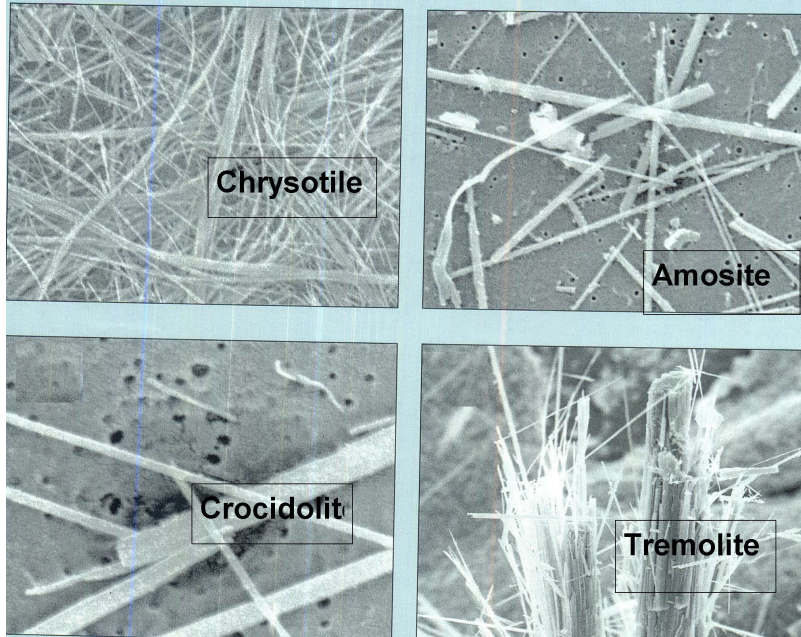


7.9 CONTROL OF ASBESTOS

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 1970s enormous amounts were imported into the UK, the fibres had an excellent heat resistance and were resistant to alkalis.

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), grunerite (amosite (brown)) and chrysotile (white) or blue, white and brown as they are more commonly known.



Common areas where asbestos may be found:

- Boilers and pipe lagging
- Pottery – as filler
- Wall boarding and cladding/ceiling tiles
- Corrugated cement
- Pipe gaskets



Asbestos was used widely as an insulator because of its fire retardant qualities.

a. ILL-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.

Skin warts – asbestos fibres can become imbedded in the skin. The warts are non-cancerous.

b. WHO IS AT RISK?

This could include builders and engineers as well as the asbestos removal industry.

c. LEGAL BASIS

CONTROL OF ASBESTOS AT WORK REGULATIONS 2012

These regulations impose duties on employers and the self-employed where they may expose employees to asbestos during the course of their work. The regulations and ACOP aim to protect those workers who may come across asbestos-containing materials during the day to day maintenance of buildings. Regulation 4 deals with a duty to manage the risks of asbestos in non-domestic premises.

Where significant risks are identified, the risk must be determined, a written plan recorded and measures taken to manage the risks involved. 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 exists 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 effect the emergency services.
- The assessment must be reviewed if there have been significant changes or it is out of date.
- Ensure that the control measures highlighted in the plan and assessment are carried out.

HSE Asbestos Home page for lots of downloadable documents

<http://www.hse.gov.uk/asbestos/index.htm>

d. CONTROLLING THE RISKS

Nominated Person – every organisation with asbestos must have a nominated person to manage asbestos

Inspection of Asbestos material to identify location, type and use. There are two main types of asbestos surveys; one for those who have a building which contains asbestos and they are managing the risks, the other is where building or demolition work it to be undertaken

Discrete labelling to highlight the hazards but not create panic

Removal – only use licensed contractors. Asbestos waste is classed as hazardous waste

Nebosh Certificate © Jackie Cambridge, CSLLP Version 2 2019



Disposal – via licensed waste site only

Incident reporting when cracks and damage are identified

Containment Enclosure to limit access and control exposure, with good lighting and viewing panels

Ensure waste is double wrapped, labelled and disposed of accordingly

“Cut and wrap” - the removal and disposal of work piece is undertaken with minimal disturbance to other areas

Wet methods – damp down the area first

Vacuum at source - no sweeping

Ventilation - of areas where asbestos is being removed

Sampling and monitoring for asbestos fibres

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

7.10 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*).

The limitation of any PPE is that 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

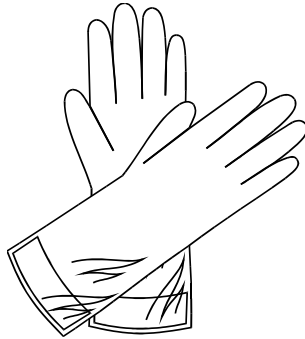
The regulations do not cover PPE that is already covered by existing regulations e.g. ear defenders are still covered by the Control of Noise at Work Regulations.

REQUIREMENTS OF THE REGULATIONS

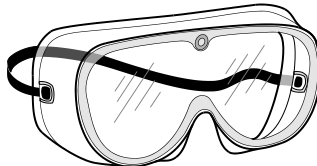
- i) Provision of Personal Protective Equipment that is:
 - suitable
 - last resort
 - appropriate
 - ergonomically sound
 - to correct standards e.g. CE marking
- ii) Compatibility of Personal Protective Equipment - if more than one item of PPE is supplied they must be compatible with each other and 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



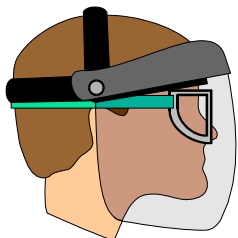
Glasses



Goggles



Safety Boots shields



Face Shield



Face Shield



Respirator

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

7.12 SUMMARY TABLE ON SPECIFIC AGENTS

Organic solvents Engineering, cleaning of metal components, degreasers.	Light headedness, Dermatitis, headaches, nausea, loss of consciousness, cancer, long term mental health problems.	Irritant & harmful carcinogenic
Cement dust	<ul style="list-style-type: none"> • Inhalation of dust. • Can irritate skin on contact • Dries out natural oils of the skin • Cement burns 	Irritant
Wet Cement	<ul style="list-style-type: none"> • Splashes on skin • May burn through the skin • May damage nerve endings 	Irritant corrosive
Silica and mineral dusts <ul style="list-style-type: none"> • Silica • Stone • Quartz 	<ul style="list-style-type: none"> • Pulmonary disease attributed to silica reported since the 16th century • At risk are: <ol style="list-style-type: none"> 1) Tunnelling, masons 2) Drillers, foundry workers • shortness of breath • cough and progressive shortness of breath • Extreme vulnerability to tuberculosis • Auto-immune effects leading to arthritis • Probable carcinogen • Silicosis • WEL • LTEL of 0.3 mgm-3 	Carcinogen
Carbon monoxide Produced by incomplete combustion from engines and MIG welding/boilers.	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.	Asphyxiate, toxic
Wood dust	<ul style="list-style-type: none"> • Irritant – soft wood dusts can cause skin and eye irritation, conjunctivitis, asthma, dermatitis, coughing. • Septic wounds can be caused by red cedar wood. • Hard wood dust (i.e. mahogany) may cause nasal cancer. • Size of particles may determine where the dust reaches in the respiratory system. 	Irritant, can cause cancer
Legionella Contact with bacteria in water cooling systems	Bio Hazard 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>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>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>

7.13 WASTE MANAGEMENT

What is waste?

“A 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.



a. 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.

General duties on the duty holders of controlled waste are 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.

b. Documentation

Transfers of waste must be accompanied by a transfer note containing certain information. There is no compulsory form for keeping waste transfer records. 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'.

c. Hazardous Waste Regulations 2005

The current regulations:-

- define hazardous waste;
- describe how to notify premises producing hazardous waste to the Environment Agency;
- 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 Hazardous Waste?

These are the most dangerous wastes. They can cause the greatest environmental damage or are dangerous to human health.

- | | |
|--|--|
| <ul style="list-style-type: none"> • Acids • Alkaline solutions • Batteries • Oil fly ash • Industrial solvents • Oily sludge • Pesticides • Pharmaceutical compounds • Chemical classifications covered include all those covered by the global harmonisation system i.e. toxic, corrosive, harmful to the environment, infectious, carcinogenic, mutagenic etc. | <ul style="list-style-type: none"> • Photographic chemicals • Waste oils • Wood preservatives • TVs • Computer monitors • Paint • Fluorescent tubes • Clinical waste |
|--|--|

The Regulator for England and Wales is the Environment Agency.

Before any hazardous waste leaves the premises, a consignment notice must be completed. Part A of the note requires a consignment code. The producer will generally allocate these codes (although the consignor may do so in some cases). The codes must

be unique for each movement of hazardous waste and be devised on the basis of a formula issued by the Environment Agency.

Carriers must check the consignment notice before they move the waste from the premises. Copies of the consignment notice must be retained by the producer with copies to the carrier.

Receivers of hazardous waste must make quarterly returns to the Environment Agency.

Mixing hazardous waste can be harmful to the environment and discourages the recycling of some materials. The Regulations prohibit the mixing of different categories of hazardous waste or the mixing of hazardous waste with non-hazardous waste or other substances and materials by anyone (including the producer), unless the mixing is authorised by a permit or exemption.

Penalties

- Magistrates court fine of up to £5,000/ 2 years' prison sentence
- The Environment Agency are also able to issue fixed penalty notices for £300 for some more minor offences.
- Crown Court – unlimited fine/ 2 years' prison sentence