

# UNIT 1 – Health and Safety in the Engineering Workplace

## Answers to odd-numbered Activities

- 1.1a) The HSE and HSC are the two departments for the work and pensions (DWP) agencies, responsible for health and safety in Great Britain.

The non-executive Commission works to ensure that relevant legislation is appropriate and understood by conducting and sponsoring research; providing training; providing an information and advisory service and submitting proposals for new or revised regulations and approved codes of practice. It also has specific duty to maintain the Employment Medical Advisory Service (EMAS).

The Executive is the operating arm of the Commission. It advises and assists the Commission in its functions and has specific responsibility, shared with local authorities for enforcing the law.

- 1.1b) **Guidance** is provided by the HSE to help people to understand the law including certain EC directives, it may be general or specific to certain industries. So for example, it may provide specific technical advice on engineering matters. **Approved codes of practice** (ACOP), offer practical examples of good practice (i.e. what is reasonably practical), in how to comply with the law. For example if regulations use words like 'suitable and sufficient', an ACOP can illustrate what is required in particular circumstances. Approved Codes of Practices have a special legal status. If employers are prosecuted for a breach of health and safety law and it is proved that they *have not followed* the relevant provisions of the ACOP, a court can find them at fault unless they can show they have complied with the law in some other way. **Regulations** are law, approved by Parliament and normally made under The Health and Safety at Work Act, following proposals from the HSC and as such must be obeyed by employers and all others in positions of responsibility for H&S at work.

- 1.1c) Descriptions of any of the following activities that may cause pollution of our land or water or air:

- Disposal of waste
- Collection of waste
- Treatment of waste
- Emissions from coal powered fire stations
- Chemical waste disposal
- Car exhaust emissions
- Recycling
- Disposal of asbestos

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- 1.3a) The statistics speak for themselves, with around 350 deaths, over 6000 injuries and about 30 million working days lost due to health and safety issues at work, there is an obvious need for the management of health and safety in the workplace. Accidents and ill health are costly to workers and their families. They can also hurt companies because in addition to the costs of personal injuries, they may incur far greater costs from damage to property or equipment, lost production and loss of reputation. Nearly all workers, with very few exceptions have to have liability insurance, but even with this there are hidden costs of accidents and incidents that are not covered by such insurance. These include: sick-pay, cover for absence,

repairs to plant and equipment, overtime work and temporary labour, fines and investigation time, to name but a few. It can be seen from what has been said that the effective and comprehensive management of health and safety in the workplace is of the utmost importance to the health, safety and welfare not only of employees but to the company at large.

- 1.3b) A comprehensive explanation of the ‘five recommended steps’ may be found in the free to download version of *HSE leaflet L21 Management of health and safety at work*, approved code of practice and guide. Only the identification of these steps with a few words of explanation is given here.

Step 1 *Set a policy* – This policy should influence all workplace activities, including the selection of people, equipment and materials, the way work is done and how the company designs and provides goods and services. There should be a written statement of this policy and the organisational arrangements for implementing it and monitoring it.

Step 2 *Organising staff* – To ensure the health and safety policy is effective managers and other responsible people should ensure that all company staff are involved and committed to the policy by ensuring their *competence* to do the job, *controlling* their responsibilities and commitments, *cooperating* with individuals and groups of staff and *communicating* with them on a regular basis.

Step 3 *Planning and setting standards* – Planning for health and safety involves setting objectives, identifying hazards, assessing risks, implementing standards of performance and developing a positive culture, these plans are best recorded in writing.

Step 4 *Measure performance* – In order to gauge the effectiveness of health and safety policy and plans a monitoring system needs to be put in place. Active monitoring before things go wrong, involves regular inspection and checking to ensure that company standards are being met and management controls are working. Reactive monitoring needs to occur after things go wrong, where people learn from their mistakes, whether or not, they have resulted in injury and illness, property damage or near misses.

Step 5 *Audit and review* – Monitoring provides the information to let management review activities and decide how to improve performance. Audits by company staff or outsiders, complement monitoring activities by looking to see if management policy, organisation and systems are actually achieving the right results. Combining the results from measuring performance with information from audits improves the approach taken towards reviewing, company health and safety systems.

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- 1.5a) In brief the regulations mention the following concerning the safe movement of people and vehicles in and around the workshop, workstation seating and workshop cleanliness:

- i) There should be sufficient traffic routes, for vehicles, pedestrians or both to allow people and vehicles to circulate safely with ease  
Horizontal swing barriers used as gates at car park or similar entrances should be locked open or locked shut so that they do not swing open and constitute a risk to oncoming vehicles  
Appropriate speed limits should be set and other traffic rules obeyed  
Provide route markings and signs so that drivers and pedestrians know where to go and what rules to apply to their route  
Loading bays should have at least one exit point from the lower level

Floors and traffic routes should be strong enough for the loads they are expected to take

Open sided staircases should be fenced with an upper rail at 0.9m or higher, and a lower rail

A handrail should be provided on at least one side of every staircase  
Access between floors should not be by ladders or steep stairs.

- ii) At workstations if work can or must be done sitting, seats that are suitable for the people using them and for the work they do, should be provided. Seating should give adequate support for the lower back, and footrests should be provided for workers who cannot place their feet flat on the floor.
- iii) Every workplace and the furniture and fittings should be kept clean and it should be possible to keep the surfaces of floors, walls and ceilings clean. Cleaning and the removal of waste should be carried out as necessary by an effective method. Waste should be stored in suitable receptacles.

- 1.5b) No hard and fast rules can be set concerning workplace temperature because it is difficult to set temperatures that satisfy everyone. Nevertheless in a workplace where the activities are mainly sedentary the temperature should normally be at least 16°C. If the work involves physical effort it should be at least 13°C (unless other laws require lower temperatures).

Lighting should be sufficient to enable people to work and move about safely, if necessary local lighting should be provided at individual workstations and at places of particular risk such as crossing points or traffic routes. Lighting and light fittings should not create any hazard and automatic emergency lighting, powered by an independent source, where sudden loss of light would create risk.

- 1.5c) Suitable and sufficient sanitary conveniences and washing facilities should be provided at readily accessible places. They and the rooms containing them should be kept clean and be adequately ventilated and lit. Washing facilities should have running hot and cold or warm water, soap and clean towels or other means of cleaning or drying. If required by the type of work, showers should also be provided. Men and women should have separate facilities unless each facility is in a separate room with a lockable door and is for use by only one person at a time.

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- 1.7a) Noise is measured in decibels (dB). An 'A-weighting' sometimes written as 'dB(A)', is used to measure *average noise levels*, and a 'C-weighting' or 'dB(C)', to measure *peak, impact or explosive noises*.

- 1.7b) The Noise Regulations require employers to take specific action at certain *action values*, that relate to the levels of exposure to noise of their employees averaged over a working day or week; and the maximum noise (peak sound pressure) to which their employees are exposed in a working day. The values for these two types of noise exposure are:

- Lower exposure action values; daily or weekly exposure of 80 'dB' and peak sound pressure of 135 'dB'
- Upper exposure action values; daily or weekly exposure of 85 'dB' and peak sound pressure of 137 'dB'.

There are also levels of noise exposure that must not be exceeded, known as *exposure limit values*, these are:

- Daily or weekly exposure of 87 'dB'

- Peak sound pressure of 140 ‘dB’

1.7c) Machinery or equipment may include: power presses, grinding equipment, electrically powered guillotines, running engines and other machinery, riveting, hammering and other noisy metal working and fabrication processes.

1.7d) Employers should:

- Make sure that protectors given enough protection
- Target the use of protectors to the noisy tasks and jobs in a working day
- Select protectors that are suitable for the working environment, considering both comfort and hygiene
- Think about how they will be worn and fit-in with other protective equipment
- Provide a range of protectors, so that employees can choose one to suit.

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1.9) To ensure that employers/companies comply with COSHH legislation, they are advised to follow the practice suggested in the following eight steps:

- Design and operate processes and activities to minimise emission, release and spread of substances hazardous to health
- Take into account all relevant routes of exposure – inhalation, skin absorption and ingestion – when developing control measures
- Control exposure by measures that are proportionate to the health risk
- Choose the most effective and reliable control options which minimise the escape and spread of substances hazardous to health
- Where adequate control and exposure cannot be achieved by other means, provide, in combination with other control measures, suitable personal protective equipment
- Check and review regularly all elements of control measures for their continuing effectiveness
- Inform and train all employees on the hazards and risks from substances they work with and the use of control measures developed to minimise the risks
- Insure that the introduction of control measures does not increase the overall risk to health and safety

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1.11a) Asbestos is the name given to a group of fibrous minerals that occur naturally in the earth. These are grouped into two mineral types known as serpentine and amphibole. The most common types of asbestos fibre used are chrysotile (white) asbestos which is a serpentine mineral, while amosite (brown) and crocidolite (blue) asbestos are amphibole minerals.

1.11b) Asbestos was widely used in buildings, vehicles and domestic and industrial items because of its chemical and physical properties of high tensile strength, flexibility, chemical and heat resistance and excellent thermal and electrical insulation properties. It has been found that exposure to asbestos fibres and particularly asbestos dust can lead to many serious diseases, including lung

cancer. Its common use and the *long latency period* (time between exposure and onset of disease) has, made it a particularly dangerous substance to work with or come into contact with.

- 1.11c) As, asbestos fibres and dust accumulate in the lungs, several types of disease may occur, after long latency periods, these include:
- *Asbestosis* – scarring of the lung tissue caused by breathing in asbestos fibre over a period of many years, leading to a progressive loss of elasticity and lung function. It is a slowly developing disease with a latency period of 15 to 20 years.
  - *Mesothelioma* – is a cancer of the lining of the lungs (pleura) or more rarely of the lining of the abdominal cavity (peritoneum). Mesothelioma has a long latency period, averaging 35 to 40 years and is almost always associated with asbestos exposure.
  - *Lung cancer* – is a malignant tumour of the bronchi of the lungs, the tumour grows through the surrounding tissue, invading and often obstructing passages.
  - *Diffuse pleural thickening* – is a non-malignant disease in which the lining of the lungs become scarred. This condition does not normally cause impairment of lung function or associated disability.

- 1.11d) Any tradesmen, fitters or engineers who have reason to work on any building built or refurbished before 2000, may come into contact with asbestos, these include:
- Heating and ventilating engineers
  - Demolition workers
  - Carpenters and joiners
  - Plumbers
  - Roofing contractors
  - Plasterers
  - Painters and decorators
  - Construction workers
  - General maintenance workers
  - Telecommunication engineers
  - Building surveyors

- 1.11e) All, work with asbestos and the precautions needed are covered by the *Control of Asbestos at Work Regulations 2002*.  
*The Asbestos (Licensing) Regulation 1983*, as amended in 1998, prohibit contractors working on asbestos insulation, asbestos board or asbestos coating, unless they have a license issued by HSE.  
*The Control of Asbestos Regulations 2006*, prohibit the importation, supply and use of all forms of asbestos. They continue the ban introduced for blue and brown asbestos in 1985 and white asbestos in 1999.

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- 1.13.1a) The acronym VICES stands for; *ventilation, ignition, containment, exchange and separation*. In more detail we have:
- *Ventilation* – Is there plenty of fresh air where flammable liquids or gases are stored? This is needed to readily disperse any vapours that

may be given off, as a result of a spill, leak, or release from any process.

- *Ignition* – Have all the obvious ignition sources been removed from the storage and handling areas? These ignition sources may include, sparks from electrical equipment or from welding and cutting tools, hot surfaces, smoking materials or from open flames from heating equipment.
- *Containment* – Are flammable substances kept in suitable containers? Such as spill-proof containers, lidded containers or spillage catchment trays.
- *Exchange* – Can a flammable substance be exchanged for a less flammable one or eliminate flammable substances from the process altogether? Other alternatives may be appropriate to do the job.
- *Separation* – Are flammable substances stored and used well away from other processes and general storage areas? Separation by a physical barrier, wall or partition, will contribute to a safer workplace.

1.13.1b)

*Flammable liquids:*

- Store flammable liquids in separate storage are, or in a purpose made bin or cupboard
- Dispense and use them in a safe place where there is good ventilation and no source of ignition
- Keep containers closed when not in use and if possible use safety type containers with self-closing lids
- Dispense liquids over a drip tray and keep some non-flammable absorbent material handy, to mop up spills
- Dispose of contaminated materials safely or call in disposal experts.

*Flammable solids:*

- Do not store these materials close to heaters or electrical equipment that could run hot and act as a source of ignition
- Make sure that gangways and exits from storage an working areas are kept clear of packaging materials or finishing products that contain flammable solids

*Flammable gases:*

- Stored cylinders need to be suitably restrained and their valves protected from impact damage
- Gas cylinders may need special valves, fittings and hoses, ensure these are fitted in accordance with manufacturers/suppliers instructions
- Protect hoses from potential causes of damage that could cut, scuff or weaken them.

1.13.2a)

*Water type extinguishers are coloured red* and may be used to put out solid materials, normally organic such as wood and paper, as well as liquids that are miscible (mix) with water such as methanol or acetone.

1.13.2b)

*Vapourising liquid* fire extinguishers such as bromochlorodifluoromethane (BCF), *coloured green* are most suitable for extinguishing electrical fires. *Carbon dioxide* fire extinguishers coloured *black* may also be used to extinguish electrical fires.

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- 1.15 Comprehensive answers to the questions asked in this activity, can be found in the book, under the section headed 'What is RIDDOR', however, for the sake of completeness, abbreviated answers are given below.
- 1.15a) RIDDOR is the *Reporting of Injuries, Diseases, and Dangerous Occurrences Regulations 1995*.
- 1.15b) Employers, the self-employed and other people in control of premises should report the specified incidents/accidents under RIDDOR.
- 1.15c) The short answer is, deaths, major injuries, dangerous occurrence, over 3-day injuries, certain diseases and gas incidents.
- 1.15d) It is advisable to report all incidents that come under the Regulations, as soon as possible. However in the case of death, major injury, or dangerous occurrences, the enforcing authority must be notified without delay. Cases of individuals being either absent from work or unable to complete their work satisfactorily, for more than 3 days, as a result of an incident/accident, must be notified to the enforcing authority within 10 days of the incident occurring. Cases of diseases should be reported as soon as confirmation is received from a doctor, that the employee is suffering from a reportable work-related disease.
- 1.15e) See full list under the HSE reference for the activity, however reportable injuries include:
- Fractures other than to fingers, thumbs and toes
  - Amputation
  - Loss of sight (temporary or permanent)
  - Chemical or hot metal burn to eye or any penetrating injury to the eye
  - Unconsciousness caused by asphyxia or exposure to harmful substance or biological agent
  - Acute illness requiring medical treatment.
- Reportable dangerous occurrences under RIDDOR include:*
- Collapse, overturning or failure of load-bearing parts of lifts and lifting machinery
  - Explosion, collapse or bursting of any closed vessel or associated pipe work
  - Failure of any freight container in any of its load bearing parts
  - Plant or equipment coming into contact with overhead power lines
  - Electrical short circuit or overload causing fire or explosion
  - Accidental release of a biological agent
  - Malfunction of breathing apparatus while in use or during testing immediately before use
  - Dangerous occurrence at a pipeline
  - A dangerous substance being conveyed by road is involved in a fire or is released.
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- 1.17a) Hazards from welding and brazing will depend on the type of welding/flame cutting being carried out, but general hazards include:
- Gas explosion
  - Inhalation of harmful welding fumes
  - Electric shock from arc welding equipment
  - Fires and injury from sparks, hot material and welding flames

- Pressurised gas bottles and valves
- Noise from plasma cutting
- Laser radiation
- Entrapment between electrodes
- Vibration due to grinding
- Handling of work pieces
- Ultraviolet radiation and arc eye

The above hazards apply to all those directly involved with welding, brazing and soldering operations and all those people transiting or working in the vicinity of these operations. These people may be harmed by inhalation of toxic fumes, burn injuries, pressure injuries, hearing problems, arc eye, electric shock trauma, muscular pain and injuries/illness from radiation.

1.17b) Control measures might include:

- Use of extraction equipment
- Welding booths or other means of isolating processes
- Provision and use of PPE including overalls, protective apron, glove/gauntlets, safety boots/footwear, respiratory protection, welding helmets, visor protection, welding screens
- Provision of electrical and other power isolation switches
- Use of step-down transformers for welding sets
- Insulated electrode holder, welding leads etc
- Regular care and maintenance of all welding/brazing equipment
- Fire extinguishing and first-aid equipment near to hand
- Use of residual current devices
- Training and tests for competence on all welding and extraction equipment
- Training and tests for competence on welding/brazing/soldering procedures, including gas bottle change and operation
- Warning signs posted
- Walkways positioned and marked to avoid hazards
- Welding bottles positioned in purpose built portable trolleys
- Fire curtains positioned and used at welding booths
- Avoid use of toxic filler materials
- Carryout pre-use checks on welding/brazing equipment
- Use anti-scatter guards, interlocking enclosure doors and specialist laser eye protection, when using laser welding and cutting equipment

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1.19 Hazards directly related to motor vehicle bodywork repair, painting and spraying activities, include:

- Electric shock and/or burns from welding, brazing and soldering equipment/tools
- Heat generated by welding/brazing/soldering
- Fire by ignition of flammable materials near or in cars (including upholstery, petrol tanks, fuel lines etc)
- Harmful fumes and gases from welding, brazing, soldering, paints, painting and spraying operations
- Percussion noise from body repair shop
- Dust from body repair work

- Vibration from body repair tools and equipment
  - Irritant hazard from working with bodywork fillers, paints and solvents
  - Inflammable and toxic vapours from paints and solvents
  - Paint spraying mists
  - Fire risk from paints, solvents, heaters and curing ovens
  - Explosion from fuel and fuel vapours
  - Asthma and dermatitis
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- 1.21a) This category of injury *does not* need to be reported under RIDDOR, since only fractures *other than* to fingers, thumbs or toes are reportable. However, the company accident book (BI 510) should be completed in order to comply with Social Security regulations. An additional advantage of completing the accident book diligently is that it provides hard evidence of accident types and trends, that will aid employers, when evaluating risks and implementing control measures.
- 1.21b) This incident must be reported under RIDDOR because it comes under the reportable occurrence that states ‘collapse, overturning or failure of load-bearing parts of lifts and *lifting machinery*’.
- 1.21c) This incident *does not* need to be reported under RIDDOR, because the regulation concerning the uncontrolled release of a substance in a building, gives a reportable lower-limit for inflammable gases, of 10kg. However an in-house investigation should take place and control measures put in place to try and prevent such an incident ever taking place again.
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