Section 1 – J/602/2479

Understand and carry out safe working practices in building services engineering
J/602/2479 - Understand and carry out safe working practices in building services engineering

The combination unit provides learning in the essential health & safety job knowledge required to work safely in the Building Services Engineering Industries. The essential job knowledge covered relates to work on new-build construction sites (dwellings and industrial/commercial buildings) and refurbishment work in occupied and unoccupied properties (dwellings and industrial / commercial buildings). Upon completion of the unit the learners will:

- **LO1.** Know the health and safety legislation that applies to the building services industry
- **LO2.** Know how to recognise and respond to hazardous situations while working in the building services industry
- **LO3.** Know the safe personal protection measures while working in the building services industry
- **LO4.** Be able to apply manual handling techniques
- **LO5.** Know how to respond to accidents that occur while working in the building services industry
- **LO6.** Know the procedures for electrical safety when working in the building services industry
- **LO7.** Be able to apply basic electrical safety measures in the building services industry
- **LO8.** Know the methods of working safely with heat producing equipment in the building services industry
- **LO9.** Be able to safely work with gas heating equipment in the building services industry
- **LO10.** Know the methods of safely using access equipment in the building services industry
- **LO11.** Be able to safely use access equipment in the building services industry
- **LO12.** Know the methods of working safely in excavations and confined spaces in the building services industry

**Learning Outcomes highlighted in Red indicates that these are covered by practical tasks from the learner practical portfolio and will not appear in this book.**

**Introduction**

In 2014 - 2015, a total of 611,000 accidents occurred at work in the UK with 27.3 million working days lost. The loss to the UK economy totalled £14.3 billion that can be directly attributed to injuries and ill health from current working conditions and practices in the UK. Despite the requirement that all UK construction operatives carry a Construction Safety (CSCS) card, the construction industry alone reported 1.7 million working days lost due to work-related injury or illness costing £900 million in lost production and added employer costs, and preventable accidents continue to happen with mounting regularity.

It is a fact that construction sites are dangerous environments, with an infinite amount of hazards and dangers that can cause injury, illness and even death to any site worker. With an increasing level of health, safety and welfare legislation over the last twenty years, an enormous amount of stress has been placed on employers, site managers and supervisors to ensure that construction sites are as safe as they can possibly...
be for the site worker, but this can only be successful with our help.

It is EVERYONE’S RESPONSIBILITY to ensure that correct health and safety practices are carried out on site. Only by working safely and working together can we reduce the accident rate in our industry further.

In this first module, HS-1, we will investigate generic construction health and safety requirements, along with those aspects of construction safety that are aimed more specifically at the Building Services Sector.
Learning Outcome 1

Know the health and safety legislation that applies to the building services industry

Within this Learning Outcome, there are five assessment criteria:
AC1. State the aims of Health and Safety legislation in protecting the workforce and members of the public.

AC2. Identify the responsibilities of members of the construction team under health & safety legislation.

AC3. State the legal status of health and safety guidance materials.

AC4. State the role of enforcing authorities under health & safety legislation.

AC5. Identify the powers of inspectors under health & safety legislation.

AC1.1 State the aims of Health and Safety legislation in protecting the workforce and members of the public.

Before we look at the Health and Safety legislation in the Building Services sector, it is important that we understand what the word ‘legislation’ actually means.

Legislation is the law of the land that has been written and passed by the UK Government. The term may refer to a single law or a collection of laws that form an Act of Parliament. Once an Act of Parliament has been passed, it becomes a legal requirement to comply with that Law. Failure to comply could result in a fine and, in severe cases, imprisonment.

Health and Safety legislation takes three distinctive forms:

1. **General Legislation:**
   - Health And Safety At Work etc Act 1974
   - Provision and Use of Work Equipment Regulations (PUWER) 1998
   - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013
   - Control of Substances Hazardous to Health Regulation (COSHH) 2002
   - Electricity at Work Regulations 1989
   - Working at Height Regulations 2005
   - Safety Signs and Signals Regulations 1996
   - Personal Protection Equipment at Work Regulations 1992
   - Control of Asbestos at Work Regulations 2012
   - Control of Lead at Work Regulations 2002

2. **Construction Specific Legislation:**
   - Construction Design and Management Regulations (CDM) 2015

3. **Building Services Specific Legislation:**
   - Water Supply (Water fittings) Regulations 1999
   - 18th Edition of the IET Regulations (BS 7671:2008 incorporating amendment number 1:201

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1. General Legislation

Health and Safety at Work etc Act (HASAWA) 1974

The Health and Safety at Work Act is the principal piece of occupational health, safety and welfare legislation in the United Kingdom that is enforced by the Health and Safety Executive. It is the foundation from which all other health and safety regulations are written.

The aim of the Act is to ensure that employers, employees and the self-employed understand and implement a safe attitude towards health and safety at work. In particular, the requirement for employers to complete a written health and safety policy ensures that all employees know how health and safety is managed and implemented within the company.

In general terms, the HASAWA imposes a duty of care on employers to maintain the health, safety and welfare of their employees whilst at work. It also imposes a set of parallel duties on employees and the self-employed that are aimed at helping the employer maintain and implement their duty of care responsibilities.

Employers, employees, the self-employed, manufacturer’s and suppliers must all comply with the duties set out in the Act, the main sections of which are summarised below:

- **Section 2** places a duty on employers to ensure, as far as is reasonably practicable, the health, safety and welfare of their employees. Employers must also consult with trade union safety representatives on matters affecting health and safety in the workplace. Where an employer employs more than five people he/she must prepare a written health and safety policy and bring it to the attention of their employees.

- **Section 3** requires employers to ensure that non-employees (including the general public and site visitors etc) who may be affected by work activities are not exposed to risks to their health and safety. Where young people or vulnerable persons may be affected, the duty of care is much greater.

- **Section 4** places a duty on anyone responsible for the workplace to ensure that the premises, plant and machinery do not endanger the people using them.

- **Section 5** requires employers to prevent and control harmful, noxious or offensive emissions into the atmosphere.

- **Section 7** states that it is the duty of every employee whilst at work to take reasonable care of themselves and of any other person who may be affected by their acts or omissions. This section also requires employees to work together with their employer in relation to health and safety matters.

- **Section 8** requires employees not to interfere with or misuse equipment provided in the interest of health and safety.
A free copy of HASAWA can be downloaded from: http://www.legislation.gov.uk/ukpga/1974/37

Provision and Use of Work Equipment Regulations (PUWER) 1998

The Provision and Use of Work Equipment Regulations 2009, also known as the PUWER Regulations set out the minimum standards for the use of all work related equipment. They are usually used in conjunction with other, more specific, Regulations, such as the Electricity at Work Regulations. The requirements of the Regulations are specifically aimed at employers. They must:

- Take account of working conditions and hazards when selecting equipment
- Provide work equipment which conforms to relevant safety standards
- Ensure that the work equipment is suitable for its intended purpose and used only for that purpose
- Maintain the equipment in good working order
- Ensure that appropriate safety devices are available, if required
- Issue staff with appropriate instructions, training and supervision to enable them to use the work equipment safely
- Make sure that equipment is inspected after installation or after assembly at a new location.

A free copy of PUWER Regs can be downloaded from: http://www.hse.gov.uk/pubns/priced/l22.pdf

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013

Under these regulations, often referred to as RIDDOR, certain work-related accidents must be reported by law to the Health and Safety Executive or the local authority.

Specific reportable incidents include:

- The death of any person
- A 'major injury' to any person at work
- Hospital treatment of any person who is not at work
- An accident, which results in a person at work being off work for more than seven consecutive days. This excludes the day of the accident but includes weekends and rest days. The report of the injury must be made within 15 days of the accident occurring
- Specified dangerous occurrences, e.g. building collapse
- Specified work-related diseases, e.g. mesothelioma and hepatitis

Construction sites and other workplaces should have clear guidelines on incident reporting, which should be conveyed to all staff on the first day of their employment.

For more information about the reporting and investigation of accidents, including how to report, see the section on accident reporting.
A free copy of RIDDOR can be downloaded from: http://www.hse.gov.uk/riddor/

Control of Substances Hazardous to Health Regulations (COSHH) 2002

The Control of Substances Hazardous to Health Regulations (COSHH) require all employers to assess, adequately control and, where possible, prevent the risks to health from the use of any hazardous substances that are used in the workplace. Manufacturer’s are required to produce safety data sheets (SDS) giving vital information, which will allow employers to complete risk assessments and produce recommendations as required by COSHH.

A hazardous substance is one, which has, by law, to be labelled as 'very toxic', 'toxic', 'harmful', 'irritant' or 'corrosive'. Employers must:

- Assess the risks
- Decide what precautions are needed
- Take steps to reduce or adequately control exposure to hazardous substances
- Ensure that control measures are utilised and maintained
- Monitor exposure
- Carry out health surveillance of employees who have been or are likely to be exposed
- Have in place emergency procedures to deal with accidents/incidents
- Ensure that employees are properly informed, trained and supervised

To comply with COSHH eight steps should be followed:

1. **Assess the risks**
   Assess the risks to health from hazardous substances used in or created by your workplace activities.

2. **Decide what precautions are needed**
   Your employer must not carry out work, which could expose you to hazardous substances without first considering the risks and the necessary precautions.

3. **Prevent or adequately control exposure**
   Your employer must prevent you being exposed to hazardous substances. Where preventing exposure is not reasonably practicable, then your employer must adequately control it.

4. **Ensure that control measures are used and maintained**
   Your employer must ensure that control measures are used and maintained properly and that safety procedures are followed.

5. **Monitor the exposure**
   Your employer should monitor the exposure of employees to hazardous substances, if necessary.

6. **Carry out health surveillance**
   Your employer must carry out appropriate health surveillance where the risk assessment has shown this is necessary or where COSHH sets specific requirements.
7. Prepare plans and procedures to deal with accidents, incidents and emergencies
Your employer must prepare plans and procedures to deal with incidents and emergencies involving hazardous substances, where necessary.

8. Ensure employees are properly informed, trained and supervised
Your employer should provide you with suitable and sufficient information, instruction and training.

Advice is given on controlling hazardous substances on the HSE website at: www.HSE.gov.uk

Electricity at Work Regulations 1989
The Electricity at Work Regulations place duties on all employers to ensure that all risks involving electricity are properly assessed. Employers are required to ensure that safe systems of working are implemented and that all electrical equipment is well maintained and regularly tested. Any repairs must be carried out by suitably qualified staff or those that are deemed to have sufficient and suitable technical knowledge. For more information on Portable Appliance Testing (PAT), see the section on electrical safety.

A free copy of EAW Regulations can be downloaded from:


Working at Height Regulations 2005
Working at height continues to be the principal cause of death in the workplace. The overriding aim of the Working at Height Regulations is to avoid working at height wherever possible. Where this is unavoidable, employers and duty holders must do all that is reasonably practicable to prevent anyone from falling:

- Work at height must be properly planned and suitable equipment used
- Fall prevention equipment should be adopted before personal protective equipment (PPE)
- Work at height should be properly supervised and carried out in a safe manner
- The worker must be provided with appropriate training and instructions

These four points form the basis for a hierarchy of control measures designed to effectively manage working at height and aid the selection of appropriate equipment.

A free copy of WAH Regulations can be downloaded from:

http://www.hse.gov.uk/work-at-height/index.htm
Manual Handling Operations Regulations 1992

Around 30% of all work related injuries are caused by incorrect lifting techniques many of which could be avoided by the use of lifting and moving equipment. It is the responsibility of the employer to ensure that all manual handling operations are carried out safely to minimise the risk to health. Employers are required to:

- Avoid the need to lift, carry, push, pull, lower or support loads wherever possible
- Use mechanical lifting equipment where manual handling tasks cannot be avoided by the use of trolleys, barrows, lifts or hoists
- Carry out risk assessments that take into account the activity, the individual’s carrying capacity, the working environment and other related factors
- Undertake training, instruction and information

A free copy of MHO Regulations can be downloaded from:


Safety Signs and Signals Regulations 1996

These Regulations brought into force the European Safety Signs Directive 92/58/EEC on the use and provision of safety signs in the workplace. The Directive recognised the need for a standard set of safety signs and signals to be implemented across the European Union so that signs and symbols relating to health and safety had the same meaning across all member states. This Directive was implemented in the UK under the Safety Signs and Signals Regulations 1996 and applies to all places of work covered by the Health and Safety at Work Act 1974.

The Regulations require all employers to provide specific safety signs in any situations that have not been covered by other means, e.g. fire alarms. These are in addition to the traditional signage such as prohibition signs and warning signs.

Employers are required to display specific safety signs whenever or wherever there is a risk to safety that has not been controlled by other means, such as safe working systems and risk assessments.

They are also required to explain those signs that may be unfamiliar to the workforce. The Regulations apply to all places of work.

A free copy of Safety Signs and Signals Regulations can be downloaded from:


Personal Protection Equipment at Work Regulations 1992

These Regulations were written as a requirement of the Health and Safety at Work etc Act 1974 and place a duty of care on all employers to ensure that suitable Personal Protective Equipment is provided to all
employees who may be exposed to health and safety risks whilst they are at work.

The PPE Regulations impose certain requirements:

- PPE must be compatible where more than one item of PPE is required
- Risk assessments must be written, reviewed and/or altered in relation to the choice of PPE by individual employees
- PPE must be maintained, cleaned or replaced as necessary
- Instruction and training on the use of PPE must be given
- Employers must ensure that any PPE issued is used

A free copy of Personal Protection Equipment at Work Regulations can be downloaded from: http://www.legislation.gov.uk/uksi/1992/2966/made

Control of Asbestos at Work Regulations 2012

The Control of Asbestos Regulations place a set of specific duties on employers, building owners and those in control of buildings to ensure that the risks posed by asbestos and asbestos fibres that may be released during building maintenance or building work are properly managed.

The Regulations require that the following steps must be taken to manage the risk effectively:

- Find out if there is asbestos on the premises, the amount and its condition
- Presume that materials contain asbestos, unless there is evidence to prove otherwise
- Make and keep up to date a record of the location and condition of the materials containing asbestos or which are presumed to contain asbestos
- Carry out a risk assessment on materials containing asbestos
- Prepare and implement a plan that sets out in detail how the risk from this material is going to be managed
- Review and monitor the plan and the arrangements
- Provide information on the location and condition of the material to anyone who is liable to work on or disturb it (including staff)

Specialist help is required to determine the presence of asbestos and to supervise its removal. Asbestos, because of its highly toxic nature, is not covered by the COSHH Regulations.

A free copy of the Control of Asbestos Regulations can be downloaded from:


Control of Lead at Work Regulations 2002

Commonly referred to as the CLAW Regulations, the aim of these Regulations is to protect the health of people at work by controlling their exposure to lead. This is achieved by imposing specific duties on
employers to carry out risk assessments, prevent and control the exposure to lead and to monitor their exposure by specialist medical screening of all employees who may encounter lead on a regular basis.

These Regulations came into force on 21 November 2002 and apply to England, Scotland and Wales. Lead, because of its highly toxic nature, is not covered by the COSHH Regulations.

A free copy of the Control of Lead at Work Regulations can be downloaded from:


2. Construction Specific Legislation

The Building Regulations 2010

These are the minimum standards for the design, construction and maintenance of building in the UK. They are developed, written and implemented by the UK Government. The Building Regulations are set out in a number of Approved Documents, which give detailed and practical guidance on how to comply with the Regulations.

- Part A - Structure
- Part B - Fire Safety
- Part C - Site preparation and resistance to contaminates and moisture
- Part D - Toxic Substances
- Part E - Resistance to the passage of sound
- Part F - Ventilation
- Part G - Sanitation, hot water safety and water efficiency
- Part H - Drainage and Waste Disposal
- Part J - Combustion appliances and fuel storage systems
- Part K - Protection from falling, collision and impact
- Part L - Conservation of fuel and power
- Part M - Access to and use of buildings
- Part N - Glazing Safety (Withdrawn)
- Part P - Electrical Safety
- Part Q - Security
- Part R - Physical infrastructure for high speed electronic communications networks.
- Regulation 7 - Materials and workmanship

Construction Design and Management Regulations (CDM) 2015

The aim of the CDM Regulations is to incorporate construction Health and Safety into the management of construction projects. It encourages everyone to:

- Improve the planning and management of projects from the very start
• Identify hazards early on, so they can be eliminated or at least reduced at the design or planning stage and the remaining risks can be properly managed
• Target effort where it can do the most good in terms of health and safety
• Discourage unnecessary red tape

The Regulations focus the attention on planning and management over the whole life of the construction project from conception to completion and beyond. The overriding aim is to treat health and safety as an essential, integral part of the project management rather than an afterthought as has happened in the past.

In order to pursue these aims, CDM places legal obligations on specific members of the construction team. Under the Regulations, these members are known as ‘Duty Holders’ and include:

• Clients including Domestic Clients
• Designers
• Principal Designers
• Contractors
• Main Contractors
• Workers / Employees

The HSE produce a guidance document (L153) for CDM 2015, which provides easy to understand information and guidance for those who have legal obligations under the Regulations.

When do the Regulations Apply?

The CDM Regulations apply to all construction work as defined within the Regulations. According to the Regulations, construction work means:

‘…..the carrying out of any building, civil engineering or construction work.’

This, obviously, includes a huge range of activities ranging from minor repairs and maintenance to major construction and renovation projects.

These include:

• The preparation for an intended structure, including site clearance
• All decommissioning and demolition of structures including the removal of any product or waste resulting from such projects
• The installation, maintenance, repair or removal of any services such as electrical, gas, compressed air, hydraulic, telecommunications, computer or similar installations

In all cases, Clients should assume activities are in scope unless the project is not covered by the comprehensive list of activities given within the Regulations.
Assembling the Project Team

It is the responsibility of the Client to ensure that the Duty Holders, mentioned earlier, have the necessary skills, knowledge, experience and organisational ability to manage the risks posed by health and safety. The extent of the background checks that a Client has to make into the capability of the appointed duty holder will depend on the complexity of the project and the range and nature of the health and safety involved. This requirement applies to:

Single Contractor projects where the Client appoints a Designer or Contractor directly, and projects involving more than one Contractor where the Client must appoint a Principal.

Designer and Principal Contractor. These appointments must be made in writing as soon as is practicable and before the construction phase begins. Where a Client fails to appoint in either of these key roles, the Client themselves becomes responsible to fulfil the duties required of both positions.

Notification of a Project (to the HSE)

The Health and Safety Executive must be formally notified in advance when certain types of project (essentially larger more complex ones) are to be undertaken.

The criterion used to determine whether a project is notifiable is illustrated below.
## CDM duty holders: Who are they?

<table>
<thead>
<tr>
<th>Role/Title</th>
<th>Summary of role/main duties</th>
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</thead>
<tbody>
<tr>
<td><strong>Clients (customers)</strong></td>
<td>Make suitable arrangements for managing a project. This includes making sure:</td>
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<td>- Other Duty Holders are appointed;</td>
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<td></td>
<td>- Sufficient time and resources are allocated.</td>
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<td></td>
<td>- Relevant information is prepared and provided to other Duty Holders;</td>
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<td></td>
<td>- The Principal Designer and Principal Contractor carry out their duties.</td>
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<td></td>
<td>- Welfare facilities are provided</td>
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<td></td>
<td>Domestics Clients (customers) are people who have construction work carried out on their own home, or the home of a family member that is not done as part of a business, whether for profit or not.</td>
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<td></td>
<td>Domestic Clients are in scope of CDM 2015, but their duties as a Client are normally transferred to:</td>
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<td></td>
<td>- The Contractor, on a single contractor project</td>
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<td></td>
<td>- The Principal Contractor on a project involving more than one contractor</td>
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<td></td>
<td>However, the domestic client can choose to have a written agreement with the Principal Designer to carry out the Client duties</td>
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<tr>
<td><strong>Designers</strong></td>
<td>When preparing or modifying designs, to eliminate, reduce or control foreseeable risks that may arise during:</td>
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<td>- Construction</td>
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<td></td>
<td>- The maintenance and use of a building once it is built</td>
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<td></td>
<td>- Provide information to other members of the project team to help them fulfil their duties</td>
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<tr>
<td><strong>Principal Designers</strong></td>
<td>Plan, manage, monitor and coordinate health and safety in the pre-construction phase of a project. This includes:</td>
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<td></td>
<td>- Identifying, eliminating or controlling foreseeable risks</td>
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<td></td>
<td>- Ensuring designers carry out their duties</td>
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<td></td>
<td>- Prepare and provide relevant information to other duty holders</td>
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<td></td>
<td>- Provide relevant information to the Principal Contractor to help them plan, manage, monitor and coordinate health and safety in the construction phase</td>
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<tr>
<td><strong>Main Contractors</strong></td>
<td>Plan, manage, monitor and coordinate health and safety in the construction phase of a project. This includes:</td>
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<td>- Liaising with the Client and Principal Designer</td>
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<td>- Preparing the construction phase plan</td>
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<td></td>
<td>- Organising cooperation between contractors and coordinating their work</td>
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<td></td>
<td>- Ensuring: Suitable site inductions are provided; reasonable steps are taken to prevent unauthorised access; workers are consulted and engaged in securing their health and safety; welfare facilities are provided</td>
</tr>
<tr>
<td><strong>Contractors/Sub-Contractors</strong></td>
<td>Plan, manage and monitor construction work under their control so that it is carried out without risks to health and safety. For projects involving more than one Contractor, coordinate their activities with others in the project team – in particular, comply with directions given to them by the Principal Designer or Principal Contractor. For single-contractor projects, prepare a construction phase plan.</td>
</tr>
<tr>
<td><strong>Workers/Employees</strong></td>
<td>They must:</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Work for, or are under the control of, contractors on a construction site.</th>
<th>Be consulted about matters which affect their health, safety and welfare</th>
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<tbody>
<tr>
<td>Take care of their own health and safety and others who may be affected by their actions</td>
<td></td>
</tr>
<tr>
<td>Report anything they see which is likely to endanger either their own or others’ health and safety</td>
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</tr>
<tr>
<td>Cooperate with their employer, fellow workers, contractors and other duty holders</td>
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</tbody>
</table>

**Pre-Construction Information**

This provides health and safety information required by Designers and Contractors who are bidding for a project or have already been appointed to construct the project. It is used when planning, managing, monitoring and co-ordinating the work. PCI provides the basis for the preparation of the construction phase plan and may also be relevant to the preparation of the Health and Safety File.

The information must:

- Be relevant to the project
- Have an appropriate level of detail
- Be proportionate given the health or safety risks involved

Some examples of PCI include the existing health and safety hazards present on the site, asbestos surveys and utilities information. If there is an existing Health and Safety File, then this information will also need to be considered.

**Construction Phase Plan**

The CPP is produced by the Principal Contractor and must set out all of the arrangements for securing health and safety for the construction phase. For projects that involve more than one contractor, the Principal Contractor must ensure that CPP is written and implemented. Where there is only one contractor, then the responsibility for CPP falls on that contractor. In either case, CPP must be done during the pre-construction phase before the site is set up.

The CPP must take into account the information the Principal Contractor holds, such as PCI and any information given by the designers.

During the construction phase, the Principal Contractor must ensure that the plan is reviewed and amended as required so it retains its effectiveness.

**Health and Safety File**

The Health and Safety File is only required on those projects where there is more than one contractor and must contain relevant health and safety information that should be taken into account when any construction work is carried out after the initial project has been completed.
The responsibility for producing the file falls to the Principal Designer, who should review, update and revise the file as the project progresses. If the Principal Designer’s appointment finishes BEFORE the end of the project, then the responsibility for completing, reviewing and updating the file falls to the Principal Contractor. The file must be passed to the Client upon completion of the project.

**General Requirements for all Construction Sites**

In Part 4 of the CDM Regulations, Regulations 16 to 35 set out a number of provisions that only relate to works carried out on the construction site itself. Any contractor carrying out construction work of any kind MUST comply with the detailed requirements of Part 4, which calls for on-site hazards to be identified and the risks eliminated or adequately controlled. The work includes:

- Demolition or dismantling
- Excavations
- Prevention of drowning
- Stability of structures
- Explosives
- Traffic routes

A free copy of the CDM can be downloaded from here: [http://www.hse.gov.uk/pubns/books/l153.htm](http://www.hse.gov.uk/pubns/books/l153.htm)

### 3. Building Services Specific Legislation


The Water Supply (Water Fittings) Regulations 1999 play an important role in maintaining and protecting public health by safeguarding the water supplies of the United Kingdom and promoting efficient use of this most precious of resources within customers’ homes and properties across the UK.

The Regulations set out the requirements for the design and installation, operation and maintenance of plumbing systems, water fittings and associated water-consuming appliances.

They have five specific purposes:

1. To prevent contamination of water
2. To prevent misuse of water
3. To prevent wastage of water
4. To prevent undue consumption of water
5. To prevent erroneous metering of water

By far the most important of these requirements is the prevention of contamination of the public drinking...
Where do they apply?

These Regulations and Byelaws apply in all types of premises supplied, or to be supplied with water from a water undertaker (the legal term for a specific type of water supplier).

They apply from the point where the water undertaker’s responsibility ends, usually at the external stop tap at the property boundary, to where the water is used in plumbing systems and water consuming appliances.

They DO NOT apply where water is supplied via an external supply, nor under the control of a water undertaker, such as a borehole or well. In these cases, the Private Water Supply Regulations 2009 apply.


The IET Wiring Regulations are the UK’s national standard to which all domestic, commercial and industrial electrical installations must conform.

They are divided into 7 sections:

1. Scope, object and fundamental principles
2. Definitions
3. Assessment of general characteristics
4. Protection for safety
5. Selection and erection of equipment
6. Special installations or locations
7. Inspection and testing

The Regulations are co-published by the Institution of Engineering and Technology and the British Standards Institution (BSI). The IET Regulations were updated in 2015. Information regarding the IET Regulations can be found here: http://electrical.theiet.org/wiring-regulations/

Gas Safety (Installation and Use) Regulations 1998 Approved Code of Practice and Guidance

Known as GSIUR, these Regulations cover all aspects of the supply and use of gas, and the qualifications and duties of those who are qualified to work on gas installations and appliances.

The GSIUR are divided into 7 parts:
• Part A General
• Part B Gas Fittings – General Provisions
• Part C Meters and Regulators
• Part D Installation Pipework
• Part E Gas Appliances
• Part F Maintenance
• Part G Miscellaneous

The Regulations require that all persons working on any aspect of gas installation and maintenance be suitably qualified and registered on the Gas Safe Register. It also requires that Landlord’s ensure that all gas appliances and gas installations in rented properties are properly inspected and tested every 12 months and that a Landlords Gas Safety Record is obtained and a copy of the record given to the tenant.


AC1.2 Identify the responsibilities of members of the construction team under health & safety legislation.

Within this Assessment Criteria, the range will cover:

• Clients (customers)
• Designers
• Main contractors
• Sub-contractors
• Employees
• Self-employed (labour only)
• Employers (including employer representatives)

Under health and safety legislation, members of the construction team have individual responsibilities towards the overall health, safety and welfare of the construction project. In this section, we will take another look at the construction team members and identify their roles and responsibilities under the Construction (Design and Management) Regulations

Clients (Customers)

The Commercial Client

A Commercial Client is anyone who has construction work carried out for them in connection with a business, irrespective of whether the business makes a profit or not. It can be an individual, partnership or
organisation. He/she has contractual control over the project, appoints designers and contractors, and has control over finances, time and any other available resources. CDM 2015 makes the Commercial Client accountable for the impact their decisions have on Health, Safety and Welfare of the project.

The Commercial Client’s duties begin at the very start of the project and continue until the very end. They will also be responsible for any health and safety issues that arise from building maintenance and use long after the construction work has finished. Their responsibility for health and safety only ceases when they no longer own the building.

The Domestic Client

A Domestic Client is anyone who has construction work carried that is not associated with a business. In most cases, this means a domestic property. Many Domestic Clients will have little or no skills when it comes to managing a construction project, which is why CDM 2015 passes their duties on to other, more experienced members of the construction team. However, a Domestic Client still has a role to play in the overall project by ensuring that the people they hire are capable of working in a way that avoids harm to anyone. They can do this by asking simple questions about their record of accomplishment in managing health and safety risks and allowing sufficient time and money in the agreed contract for the work to be carried out safely.

The Domestic Client’s duties will automatically pass to the Contractor, where only one contractor is used, or the Principal Contractor where more than one contractor exists. As an alternative, the Domestic Client may wish to have a written agreement with the Principal Designer to carry out the Client’s duties on their behalf.

Principal Designers

The Principal Designer is the designer with control over the pre-construction phase of the project and has the relevant experience, skills, knowledge and organisational expertise to carry out all of the functions required by the role. They will take the lead in planning, managing, monitoring and co-ordinating health and safety during the pre-construction phase, which is likely to involve more than one contractor. They do not have to carry out the actual design work and so, as such, may be an organisation or an individual.

The Principal Designer has an important role to play in influencing how health and safety risks are managed and incorporated into the whole project. Decisions taken at pre-construction stage will have an important effect on whether the project is delivered in a way that reinforces and secures health and safety. Their role increasingly involves close liaison with the Client and Principal Contractor by co-ordinating the work of other duty holders to ensure that all significant and foreseeable risks are managed throughout the design process.

The Principal Designer must be appointed in writing by the Client as early as possible in the project and preferably at the concept stage.

The Principal Designer should be in place as long as there is a need for their role. If their appointment ends before the end of the project, then they should brief the Principal Contractor on any problems arising from the designs relevant to the construction work and pass on the Health and Safety File to them.
Designers

The Designer’s role involves preparation and, if needed, modification of the design. Designers can be Architects, consulting engineers and quantity surveyors or anyone who specifies or alters designs as part of their work. They can be an individual or an organisation.

A designer will have a strong influence, especially at the early planning stages of the project. Their decisions will influence health and safety of not only the constructors, contractors and workers, but also those who will eventually use, maintain, clean, alter and eventually, demolish the building.

Decisions made with regard to the materials and components that the building will be constructed from can significantly reduce, control and even eliminate the risks involved in its construction, maintenance and use.

Designer duties apply on all projects, including:

- Major construction projects
- Minor building works
- Small projects involving refurbishment and repair work
- Domestic projects

The Designer’s duties begin as soon as they are appointed to the project. Most design work is carried out at the pre-construction stage but it is not unusual for design work to be ongoing into the construction stage. The Designer should agree with whoever has appointed them on the duration of their appointment.

Main Contractors

Where more than one Contractor exists, the Main Contractor has control over the whole of the construction phase of the project. They are appointed in writing by the Client to plan, manage, monitor and co-ordinate health and safety. They, along with the Client and the Principal Designer, have an important role to play in influencing how the risks to health and safety are managed during the construction work. This role includes ensuring that standards are understood and followed.

The Main Contractor should be appointed by the Client as early in the project as possible and before the construction phase begins, so that they can:

- Allow time to plan the work of the construction phase and, in liaison with the Principal Designer and others involved in the project, identify any risks to health and safety and the control measures which need to be put in place
- Record details of any planning in a construction phase plan
- Work with the Client for the duration of their appointment
- Liaise with the Principal Designer for the remainder of their appointment for the purposes of planning, managing, monitoring and coordinating the pre-construction phase
Contractors/Sub-Contractors

A Contractor is an organisation or individual who directly employs construction workers (sub-contractors), or manages or controls construction work. They include the self-employed and sole traders. A contractor can be either self-employed, a worker or an employee.

It is the Contractors, and the Sub-Contractors they employ, who are most at risk during the construction phase. Because of this, Contractors have an important role in planning, monitoring and managing the work. They must liaise with the Main Contractor to ensure those risks are properly controlled.

The Contractor duties apply as soon as they are appointed to carry out the construction work. They should be appointed early enough so that sufficient time is allowed to plan the work and identify the risks to health and safety.

Employees / Self-Employed (Labour Only)

An Employee works under the control of a Contractor or Sub-Contractor on a construction site and are those most at risk of injury and ill health. Because they are in a good position to recognise the risks involved during the construction phase, they can help those who are trying to establish safe working methods that reduces or eliminates the risk to health. Workers must report anything they see that is likely to cause a danger to either themselves or others.

Employees must be consulted by their employers about matters which affect their health, safety and welfare. Employees’ duties start as soon as they are appointed to start work on site, and continue until the period that their work finishes.

Self-Employed workers do not have the same employment rights and responsibilities as those of employees.

Employers

Employers can be a person, a company, or organisation that pays someone to work for them as a member of their staff. Employers must consult their employees about matters, which affect their health, safety and welfare.

AC1.3 State the legal status of health and safety guidance materials.

Within this Assessment Criteria, the range will cover:

- Acts of Parliament
- Regulations
- Approved codes of practice
- HSE Guidance Notes

Health and Safety publications are divided into two groups:
1. Those publications that are mandatory (the Law), usually published by the UK Government, and
2. Those publications that give guidance and advice (advisory documents), usually published by the Health and Safety Executive.

Mandatory Documents (The Law)

These are sub-divided into two distinct types of publication:

Acts of Parliament
An Act of Parliament can either create new laws or change existing ones. They are the responsibility of specific departments within the UK Government. In the case of health and safety legislation, the Main Act of Parliament is the Health and Safety At Work etc Act 1974.

The Health and Safety Executive is responsible for enforcing the Act.

Regulations
These are rules and procedures designed to control the conduct of those to whom they apply and are set by authorities or governmental agencies. They are legally enforceable in a court of law and must be followed if prosecution is to be avoided.

Guidance Documents (Advice and Guidance)
Again, these are sub-divided into two distinct types of publication:

Approved Codes of Practice (ACoP)
These give practical advice on how to comply with the Regulations. ACoPs are not law and not complying with them is not a criminal offence but, in a court of law, proof that their advice has been ignored, could be seen as evidence of guilt if the person is facing prosecution under Health and Safety law. Following the guidance given in an ACoP is good practice.

Guidance Notes
These are produced by the Health and Safety Executive to assist businesses and individuals in interpreting and understanding their obligations under the law. They offer guidance and, where necessary, technical advice. The course of actions set out in the guidance notes are not compulsory, but if followed, it is enough to comply with the Regulations.

AC1.4 State the role of enforcing authorities under health & safety legislation

Within this Assessment Criteria, the range will cover:

• Health & Safety Executive (HSE)
• Local Authority (LA)

The Health and Safety Executive and Local Authority working in partnership under the Health and Safety Executive/Local Authorities Enforcement Liaison Committee (HELA) enforce Health and Safety Law. Both employ Health and Safety Inspectors whose job it is to ensure that organisations, companies and individuals comply with the law.

The Health and Safety (Enforcing Authority) Regulations 1998 allocate the enforcement of Health and Safety Legislation at different premises between the LAs and the HSE. This is based solely on the main activity at the premises. In general terms, the LA would be responsible for enforcement at locations such as retail, wholesale distribution, warehousing, hotels and catering premises, offices and leisure centres.

In some areas of work, the main activity is less clear-cut and the LA and the HSE would agree and assign the appropriate enforcement responsibility.

Both the HSE and Local Authorities use a number of intervention approaches to regulate and influence businesses and employers in the management of health and safety:

• Provision of advice and guidance to individual businesses or groups
• Proactive interventions including inspection
• Reactive interventions e.g. to investigate an accident or complaint.

For the construction sector, allocation is straightforward with regard to site health and safety inspections. In most cases, these are undertaken by the HSE.

The table shows which enforcing body is responsible for the Construction industry:

<table>
<thead>
<tr>
<th>'Construction work' and 'Contractor' have the meaning assigned to them by the Construction (Design and Management) Regulations 2015 (CDM Regs) Reg 2 (1).</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSE</td>
</tr>
<tr>
<td>A building or construction site, i.e. premises where the only activities being undertaken are construction work and activities for the purposes of, or in connection with, such work. Health and Safety (Enforcing Authority) Regulations Reg.3(5)(c).</td>
</tr>
<tr>
<td>The following activities carried on in any premises by persons who do not normally work in the premises, Health and Safety (Enforcing Authority) Regulations Sch 2 para 4(a)(i-iii), as follows: (i) - All notifiable construction projects. CDM Regs 2015 defines a project as being notifiable if the construction phase is likely to involve more than 30 days, or more than 500 person days, of construction work, or; (ii) - Where the whole or part of the work to be undertaken by the contractor at the premises is to the external fabric or other external part of a building or structure. Note: Fabric is the basic structure, the walls, roof and floor. ‘Other external part’ refers to something other than the fabric. An external door, for example, is a fixture believed to fall within this description. A door also forms part of the structure, and its construction or repair etc falls within the definition of ‘construction work’. (iii) - Where the construction work is carried out in a physically segregated area of the premises, the activities normally carried out in that area have been suspended for the purpose of enabling the construction work to be</td>
</tr>
</tbody>
</table>
carried out, the contractor has authority to exclude from that area persons who are not attending in connection with the carrying out of the work and the work is not the maintenance of insulation on pipes, boilers or other parts of heating or water systems or its removal from them.

The erection and dismantling of temporary stages, grandstands and other temporary structures used at entertainment, sports and other public events is construction work as defined.

<table>
<thead>
<tr>
<th>LA</th>
<th>Non-notifiable construction work which is entirely internal to the building and which is not separated off from the normal operations of the premises where the LA is the enforcing authority for that class of premises.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Where the only work carried out in a segregated area of LA - enforced premises is the removal or maintenance of insulation on heating or water systems.</td>
</tr>
</tbody>
</table>

AC1.5 Identify the powers of inspectors under health & safety legislation

Health and Safety Inspectors have a legal right to enter any work place without giving notice. However, notice can be given where an inspector judges it appropriate. During a normal inspection visit, the inspector would look at the place of work and the work activities. They would check to ensure that the employer is complying with health and safety law with regard to the management of health and safety.

Where it is necessary, the inspector would give guidance and advice and talk to employees. They may take photographs and samples and, in cases where a risk to health and safety is noted, may serve improvement notices or take more serious action. If a breach of health and safety law is discovered, then the inspector will decide what action is appropriate. The inspector should provide all employees and their representatives with information relating to the breach and any action to be taken.

There are four courses of action that an inspector could take and this would depend upon the severity of the breach. They may:

1. **Have a role in providing advice and guidance** – where the breach of the law is small, the inspector will advise the duty holder on what action to take to ensure that the law is conformed to. This advice can be given in writing if requested.

2. **Issue an improvement notice** – Severe breaches will receive a direct order to take specific action to comply with the law. The inspector will discuss at length the improvement notice with the duty holder to resolve any points of conflict before serving it. The notice will say what has to be done, why and by what date. Corrective action must usually be taken within a minimum of 21 days, to allow the duty holder time to appeal to an Industrial Tribunal.

3. **Issue a prohibition notice** – where a work activity carries the risk of serious personal injury, the inspector may consider it appropriate to serve a prohibition notice. At this point, the activity must cease until the inspector is satisfied corrective action has been taken.
4. **Prosecution** - In some cases, the inspector may decide prosecution is necessary. Failure to comply with an improvement or prohibition notice, or a court remedy order, can result in a fine of up to £20,000, or six months imprisonment, and sometimes both. Unlimited fines, and even imprisonment, can be ruled by a higher court.
Learning Outcome 2

Know how to recognise and respond to hazardous situations while working in the building services industry
Within this Learning Outcome, there are nine assessment criteria:

**AC2.1.** Identify the types of general site hazards that may be encountered while at work.

**AC2.2.** State the potential dangers to the workforce and members of the public when work is carried out.

**AC2.3.** Identify the methods that can be used to prevent accidents or dangerous situations occurring during work activities.

**AC2.4.** Identify how hazardous substance legislation classifies substances and the direct precautions to be taken while working with those substances.

**AC2.5.** Identify the general precautions necessary for working with commonly encountered substances.

**AC2.6.** State the range of common building materials and services components that may contain asbestos.

**AC2.7.** Identify the types of asbestos that may be encountered in the workplace:

**AC2.8.** State the procedures that must be used to safely work with asbestos cement based materials.

**AC2.9.** Identify the actions

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**AC2.1 Identify the types of general site hazards that may be encountered while at work.**

Within this Assessment Criteria, the range will cover:

- Construction sites (all property types)
- In industrial commercial premises (occupied and unoccupied refurbishment)
- In dwellings (occupied and unoccupied refurbishment)
- Vehicle use

Hazards on construction sites fall into three basic categories:

1. **General site/work area cleanliness** – this can lead into 3 distinct areas of concern:

   - **Slips** – slipping hazards, these include spills, water on the floor from leaks, condensation, rain and ice.
     Poor weather conditions. Other less obvious slipping hazards such as mud, loose soil, dead leaves etc

   - **Trips** – tripping hazards such as trailing cables, discarded packaging, incorrectly stored/stacked materials, rubbish, uneven surfaces, dust sheets, poor lighting and missingsigns

   - **Falls** – any of the hazards mentioned above can cause a fall

2. **Equipment and Personal Protective Equipment:**
• **Faulty equipment** such as missing guards, electrical faults, and damaged mechanisms such as drill chucks, broken or cracked casings, damaged cables, damaged or altered safety devices such as safety cut-outs etc.

• **PPE** – no PPE provided, mis-matched PPE such as the wrong type of safety glasses, incorrect level of protection for the task, faulty or damaged PPE giving reduced or no protection

3. **Personal conduct:**

• Incorrect and unsafe methods of manual handling
• Incorrect methods of working at heights, in trenches, and in excavations
• Lack of care and attention in dangerous environments
• Using equipment or carrying out activities without the correct training
• Taking risks - excessive haste or taking shortcuts in order to get the job done, lack of preparation and failure to comply with instructions and rules of safety
• Immature behaviour
• Lack of concentration due to distractions in the work place or lack of interest in the job
• Tiredness
• Inadequate training and supervision, failure to use guards provided etc.

Accidents are preventable by initiating an ethos of safe working practice, which should include the use of properly written risk assessments, method statements and permits to work.

**The General Public and Construction Work**

It is not only construction workers that can suffer accidents because of construction work. The general public too are vulnerable, especially when construction work takes place in the centre of towns and cities. Accidents occur when people are walking close to where construction work (i.e. construction, refurbishments and demolition) is being carried out.

It must be remembered that any construction work that takes place near to where the general public have access needs to be planned correctly and that those people with disabilities, people with children, and the elderly are especially vulnerable.

The safest way of protecting the public from construction site dangers is to restrict access:

• Erect a 2m high perimeter fence. If parts of it need to be taken down for access, make sure it is put back at the end of the day
• Lock the site gates and any windows and doors at night
• If work is being done in an occupied property, clear responsibilities need to be established with the occupier for maintaining the fencing
• If the work is near a school or residential area, enlist the help of the head teacher or the residents’ association to discourage children and young people from entering the site
• Young children should be protected from the dangers of building sites. Steps taken should include:
  o Cover trenches, excavations and scaffolds, removing all ladders
  o Store materials so there is no risk of them toppling over
  o Lock away hazardous substances
  o Initiate other security methods such as security guards
• Protect passers-by from falling objects from scaffolds by the use of toe boards, brick guards and netting
• Use plastic sheeting to retain dust, drips and splashes
• Tie down or remove loose materials from scaffolds
• Ensure that warning and danger signs are posted on and around the scaffold

Vehicle Use

According to the HSE, within the construction industry approximately ten people die as a result of being struck by moving plant. There are specific duties placed on all of those involved within the construction process. Regulation 36 of CDM requires that: Every construction site shall be organised in such a way that, so far is reasonably practicable, pedestrians and vehicles can move safely.

To ensure that any pedestrians and vehicles are separated on-site the main contractor should:

• Provide pedestrian only areas
• Provide designated pedestrian walk ways
• Provide vehicle only areas with safe routes around site

<table>
<thead>
<tr>
<th>Identification</th>
<th>Routes for Vehicles</th>
<th>Routes for Pedestrians</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site and exit</td>
<td>Adequate lines, signs, maps, security and management procedures for vehicles</td>
<td>Signs and instructions with separate entrance</td>
</tr>
<tr>
<td>Parking areas</td>
<td>Designated vehicle, delivery and contractor /worker parking areas</td>
<td>Pedestrian routes from all areas with clear signs and instructions</td>
</tr>
<tr>
<td>Primary traffic routes</td>
<td>Possible use of one-way systems with all traffic routes allowing safe passage of site and delivery vehicles</td>
<td>Where there is a possibility that pedestrians may be at risk of being struck by vehicles or their loads, provide pedestrian crossing points</td>
</tr>
<tr>
<td>Offices and welfare facilities</td>
<td>Make sure all offices and welfare facilities are situated away from the main site routes and traffic</td>
<td>Provide clear signs and instructions with safe pedestrian routes to and from place of work</td>
</tr>
<tr>
<td>Vehicle facilities</td>
<td>Provide vehicle washing areas, weighbridges away from the main traffic routes</td>
<td>Safe pedestrian access routes to areas of work</td>
</tr>
</tbody>
</table>

Any driver or pedestrians who enter a site should be informed of all site traffic hazards and site rules.
AC2.2 State the potential dangers to the workforce and members of the public when work is carried out.

So far, we have looked at the potential hazards that may be encountered on any construction site in the UK, but the wider picture shows that there are other hazards that we have not yet mentioned and that these hazards may only occur on certain types of construction project.

Some of the work, especially in the Building Services Sector, is undertaken not just on new buildings but on refurbishments and extensions also. Some of this type of work is likely to be occupied by the customer. Faced with this situation, not only do we have to consider our own and our work colleagues’ health and safety, but also that of the general public. Where a property is occupied, the customers’ health, safety and welfare is a priority.

Below is a table that lists the hazards that could be encountered on the various types of construction project.

<table>
<thead>
<tr>
<th>Generic Construction Site Hazards (all construction sites)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slips, trips and falls</td>
</tr>
<tr>
<td>Falls from height</td>
</tr>
<tr>
<td>Falling objects</td>
</tr>
<tr>
<td>Moving plant</td>
</tr>
<tr>
<td>Site traffic</td>
</tr>
<tr>
<td>Electrocution</td>
</tr>
<tr>
<td>Entrapment and entanglement</td>
</tr>
<tr>
<td>Dust</td>
</tr>
<tr>
<td>Noise</td>
</tr>
<tr>
<td>Vibration</td>
</tr>
<tr>
<td>Burns (including chemical burns)</td>
</tr>
<tr>
<td>Scaffold collapse</td>
</tr>
<tr>
<td>Trench collapse</td>
</tr>
<tr>
<td>Trespassers</td>
</tr>
<tr>
<td>Flying debris</td>
</tr>
<tr>
<td>Explosion</td>
</tr>
<tr>
<td>Lone working</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industrial/Commercial (occupied and unoccupied refurbishment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the hazards previously mentioned</td>
</tr>
<tr>
<td><strong>Additional hazards:</strong></td>
</tr>
<tr>
<td>Specific dangers associated with industrial or commercial activities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dwellings (occupied and unoccupied refurbishment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All of the hazards previously mentioned</td>
</tr>
<tr>
<td><strong>Additional hazards:</strong></td>
</tr>
<tr>
<td>Children</td>
</tr>
<tr>
<td>Vulnerable people</td>
</tr>
</tbody>
</table>
AC2.3 Identify the methods that can be used to prevent accidents or dangerous situations occurring during work activities.

Within this Assessment Criteria, the range will cover:

- Method statements
- Permit to work systems
- Risk assessments
- Safety notices
- CSCS card

Accidents, in many cases, can be prevented by initiating safe working practices. These include the use of:

- Risk assessments
- Method statements
- Permits to work and safety notices

Risk Assessments

A risk assessment is a systematic process of evaluating the potential risks that may be involved with a particular activity. It is a way of assessing whether enough steps have been taken to prevent harm. You, other workers and the public have a right under health and safety law to be protected from any consequences that may be caused by the failure to take all reasonable steps to prevent harm.

Employers are legally required to assess the risks in the workplace and to take all relevant measures to control those risks as far as is reasonably practicable.

A hazard is anything that may cause harm, such as electricity, gas, chemicals, working from ladders, etc.

The risk is the chance, no matter how high or low, that somebody could be harmed by the hazards, together with an indication of how serious the harm could be.

According to the HSE, there are five areas to a risk assessment:

Assess how people could be harmed by:

1. **Identify the Hazards**
   - Checking manufacturer’s and COSHH data sheets
   - Looking back at your accident and ill-health records
   - Taking account of non-routine operations
   - Remembering to think about long-term hazards to health
   - Visiting the HSE website (www.hse.gov.uk)
2. **Who might be harmed**
   - Identify the groups of people at risk

3. **Evaluate the risks**
   - Can I get rid of the hazard altogether?
   - If not, how can I control the risks so that harm is unlikely?

4. **Record your significant findings**
   - A proper check was made
   - You asked who might be affected
   - You dealt with all the significant hazards, taking into account the number of people who could be involved
   - The precautions are reasonable, and the remaining risk is low, and
   - You involved your staff or their representatives in the process

5. **Review your assessment**
   - Review the risk assessments every year
   - Have more employees joined the company?
   - Has new machinery and equipment been installed?
   - Have any fellow workers spotted any problems?
   - Has anything been learned from accidents or near misses?

### Method Statements

A method statement, often called a ‘safe system of work’, is a written document that identifies the possible hazards that may arise during the work to be completed. They should contain a detailed step-by-step guide as to how the work to be done can be completed safely. The method statement must also contain any measures that have been implemented to ensure the safety of the workforce and members of the public who may be affected by the work processes.

There is no set format for the contents of a method statement and, since every job is different, they should be job and site specific. However, the document should follow a basic pattern and include the following headings as a minimum requirement:

1. Basic Contract/Job Information
2. Contract/Job Details
3. Method of Work
4. Risk and COSHH Assessments
5. Plant/Equipment
6. Operative Competence
7. Drawings/Sketches
8. Monitoring and Review

A competent person who is familiar with health and safety guidelines, the work processes and the site or job location and layout should complete the method statement.

The HSE suggests that those writing method statements should consider the following:

- Is there a safer way of doing the job?
- Will the workers implement the planned controls?
- Do the controls make the job more difficult than it otherwise would be?
- Are there small changes that will improve the intended method?
- How will the controls implemented work in adverse conditions, e.g. the weather?
- Will the workers require any additional briefings or instructions?

Permits to Work

Strict health and safety controls are required where jobs are identified as high risk. High risk work must only be carried out against an agreed ‘Permit to Work’. A Permit to Work allows high-risk work to be undertaken provided the appropriate health and safety measures are put in place. It is written by those authorising the work and those who will complete it.

It stipulates the name of the person(s) completing the work, the area where the work will be undertaken, the date, the time that the work will be started, and a specific period for it to be completed. It also lists the precautions that are necessary for the work to be completed safely and how the work will be carried out.

When the work has been completed, the permit will require a written signature from the permit originator that normal working conditions and practices can be resumed, before any machinery and/or equipment is restarted.

Safety Notices

On construction sites, safety signs and symbols are used where the risks to health and safety cannot be avoided by other means. Site workers need to be trained in safety sign and symbol recognition so that their meaning can be properly understood. It is the Employer’s responsibility to ensure that safety signs are provided and maintained.

To ensure that the correct number and type of safety signs have been positioned correctly, the Employer should:

- Conduct a risk assessment
- Make sure fire equipment and emergency exits are indicated
- Use signs to prohibit entry into dangerous areas
- Make sure that mandatory requirements, such as wearing PPE, are shown

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The signs used must conform to EC Safety Signs Directive (92/58/EEC), which encourages standardisation of sign types across the EU.

Safety signs are categorised into 6 groups:

**Prohibition Signs** – A red circular band with a diagonal cross bar on a white background; the symbol within the circle to be black.

- **Purpose:** To indicate that certain behaviour is prohibited.
- **Meaning:** Stop | Do not | You must not

- [No Smoking](#)
- [Digging Prohibited](#)
- [Authorised Personnel Only](#)
- [Alcohol Not Permitted on This Site](#)

**Hazard Signs** – A yellow triangle with a black border and black symbol.

- **Purpose:** To warn of any type of hazard.
- **Meaning:** Danger | Hazard | Caution | Beware | Careful

- [Electric Shock](#)
- [Radiation](#)
- [Flammable](#)

**Mandatory Signs** – A blue circle with a white symbol.

- **Purpose:** Indicates that a specific course of action must be taken.
- **Meaning:** Obey | You must | Carry out instructions shown | Do

- [Headphones](#)
- [Gloves](#)
- [Protective Goggles](#)
- [Hard Hat](#)
Fire Equipment Signs – A red rectangle or square with a white symbol.

Purpose: To describe the location of firefighting equipment.
Meaning: Location of firefighting equipment

Safe Condition Signs – A green rectangle or square with a white symbol or text.

Purpose: To provide information about safe conditions.
Meaning: The safe way | Where to go in emergencies | First aid

Warning Signs – An orange rectangle or square with black edges and a black symbol.

Purpose: To make aware of possible danger.
Meaning: Take notice | Be aware of | watch out for

CSCS Card

CSCS is the leading skills certification scheme within the UK construction industry. CSCS cards provide proof that individuals working on construction sites have the required training and qualifications for the type of work they carry out.

The scheme keeps a database of people working in construction who have achieved, or are committed to achieving, a recognised construction related qualification. Most principal contractors and major house builders require construction workers on their sites to hold a valid CSCS card.
AC2.4 Identify how hazardous substance legislation classifies substances and the direct precautions to be taken while working with those substances.

Within this Assessment Criteria, the range will cover:

1. Toxic
2. Harmful
3. Corrosive
4. Irritant
5. Oxidising
6. Extremely flammable

All of the above, under the COSHH Regulations, are classified as hazardous substances. In Section 7 of the Health and Safety at Work Act, it states that:

‘Every Employer must ensure that the exposure of his/her employees to substances hazardous to health is either prevented or adequately controlled.’

The table below shows the effects of the six classes of hazardous substances:

<table>
<thead>
<tr>
<th>Class</th>
<th>Typical Substances</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic</td>
<td>Asbestos, lead, poisons such as cyanide</td>
<td>Poisons and dangerous substances that have the ability to cause death if ingested inhaled or absorbed into the body.</td>
</tr>
<tr>
<td>Harmful</td>
<td>Fluxes, solvents, cleaning fluids, chemicals, dust</td>
<td>Harmful substances could be a liquid, solid (dust) or gas.</td>
</tr>
<tr>
<td>Corrosive</td>
<td>Acids and caustic soda</td>
<td>Can cause severe burns to exposed parts of the body.</td>
</tr>
<tr>
<td>Irritant</td>
<td>Fibre glass roof insulation, some paints, solvents and sealants</td>
<td>Causes irritation of the skin, eyes, nose and throat.</td>
</tr>
<tr>
<td>Oxidising</td>
<td>Oxygen from welding bottles</td>
<td>Induces materials to burn fiercely by adding oxygen to a fire.</td>
</tr>
<tr>
<td>Extremely Flammable</td>
<td>Petrol, Liquid Petroleum Gas, acetylene, solvent weld adhesives, solvent cleaning fluids</td>
<td>Has the potential to burn fiercely if the substance is either exposed to a source of ignition or subjected to temperatures close to its flash point so that it spontaneously combusts. In most cases, these substances are highly flammable.</td>
</tr>
</tbody>
</table>
AC2.5 Identify the general precautions necessary for working with commonly encountered substances.

Within this Assessment Criteria, the range will cover:

- Lead - solid and fume
- Solvents and lubricants
- Fluxes
- Jointing compounds
- Sealants
- Gases – LPG, oxy-acetylene and carbon dioxide
- Petroleum
- Diesel fuels
- Cleaning agents

Chemicals and Materials

There are many different chemicals and materials to be found on construction sites, whether the site is a new build, a refurbishment or a demolition site. By far the most dangerous site is demolition, simply because demolition sites carry unseen chemical and material hazards that were almost certainly used during the building’s original construction. A Victorian building, for example, may carry unseen asbestos in the plaster, on the roof and even the flue pipes. It may also have been painted with lead-based paint, which was commonly used in buildings of all kinds up to the 1960s.

Some of the more common chemicals used on construction sites are:

1. Fluxes
2. Hydrochloric Acid (commonly known as brick acid, used for cleaning brickwork)
3. Cadmium found in many plastics
4. Aerosol paints
5. Cutting oil mists (cutting and threading mild steel tubes)
6. Solvents
7. Jointing compounds
8. Sealants (bath sealant, window sealant etc)
9. Adhesives
10. Acetates
11. Cleaning agents

As well as these, other hazardous materials may also exist:

1. Asbestos
2. **Lead**

3. Carbon monoxide (from use of blowtorches, welding, generators, gas heaters etc)

4. Welding fumes and Flux fumes

5. Wood dust

6. Concrete and mortar

7. Petroleum and diesel fuels (generators, used in ventilated areas only (outside))

The effects on your health from exposure to chemicals and materials can range from the very mild to the very severe. In some cases, it could be many years before the effects are felt, as with asbestos for example.

**Working with Lead**

Working as a plumber, you may have to work with lead in some form. This may be replacing old lead piping in a dwelling or covering a roof in lead sheet. If this is the case then you must be made aware of the dangers of working with lead.

Lead is a highly toxic metal that can enter the body through:

- **Absorption:** handling lead without the use of barrier cream or gloves
- **Ingestion:** by not washing your hands before eating and drinking after handling lead, or
- **Inhalation:** by breathing lead fumes when lead welding or soldering with leaded solder

Lead is a very toxic metal that can give severe health problems if it is used on a regular basis. The effects are cumulative. In other words, the poisoning effects happen over a long period of many years.

Lead is a very potent neurotoxin that affects the central nervous system that can lead to brain and blood disorders. Lead oxide, a fine white powdery substance is particularly dangerous. Lead oxide is the residue left over when lead corrodes. It was used for many years in lead-based paints.

The symptoms of lead poisoning are, headaches, tiredness, irritability, constipation, nausea, stomach pains, anaemia and weight loss.

More serious health problems could develop by continued exposure, such as kidney damage, nerve and brain damage and infertility.

**What you and your employer must do to protect your health at work when working with lead**

If, during your work, you are exposed to lead in any of its forms, such as lead compounds and oxides, lead dust, lead fumes or vapour from lead welding or smelting, then your employer must:

- Assess the risk to decide whether there is a ‘significant risk’ to health and decide which precautions should be put in place.
- Put in place such systems as fume and dust extraction to prevent/control the exposure lead.
• Provide proper washing facilities and places free from lead contamination, away from the work area, for eating and drinking.
• Provide information about the risks to health from lead working and the precautions the workforce should take.
• Initiate training into control measure and protective equipment, such as face masks and fume extraction.
• Provide fresh, clean workwear and arrange for it to be laundered.
• Measure the amount of lead in the air and publish the results to the workforce. If the exposure to lead cannot be kept below a certain level, then the employer MUST issue respiratory equipment.
• Arrange for the amount of lead in the body to be measured. This is done by a blood test administered by a doctor at the place of work. The workforce must be informed of the test results.

There are also ways you can help yourself:

• Make sure that you the information and training needed to enable you to work safely with lead. This must include what to do in an emergency, such as a sudden release of lead fume in the atmosphere.
• Use all PPE provided and use it correctly.
• Follow correct working practices, such as keeping the work area clean and tidy.
• Do not take any PPE, including workwear, home.
• Report damaged or defective PPE to your employer.
• Use a high standard of personal hygiene, washing hands, face and nails etc, and shower before going home.
• Do not miss medical appointments.

Working with Fluxes

Flux is a chemical compound in the form of a paste that helps solder to adhere to copper tubes and copper-based fittings. There are two basic types of flux used today in modern plumbing:

1. Traditional fluxes

Traditional grease-based fluxes often contain chemicals called ‘rosin’ (also known as ‘colophony’) and zinc chloride.

Rosin is a natural solid resin obtained from pine trees, which, when heated, releases acidic particles that can irritate the breathing. In extreme cases, this could lead to occupational asthma.

Zinc chloride is corrosive and can cause skin irritation, burns and eye damage if it gets in the eye. Again, you should exercise caution when using this kind of flux. COSHH data sheets should be consulted for further information regarding these products.
2. Self-cleaning fluxes

This type of flux is aggressive. In other words, it is acidic and cleans the copper as soon as it is applied to the copper tube. Because of this, it is also known as ‘active’ flux.

Most aggressive fluxes are based on zinc chloride or hydrochloric acid, both of which can cause burns and skin irritation and so careful handling and use is very important.

Other self-cleaning fluxes may use natural enzymes as cleaning agents but these too can irritate the skin. Again, the use of COSHH data sheets for further specific health and safety information regarding these products is advised.

Care should be exercised when handling fluxes. The use of a brush to apply the paste is recommended - always wash your hands thoroughly after use.

Working with Solvents

Solvents appear in many products in the construction industry. They can be found in paints, adhesives, epoxy resins and other products. Generally, exposure to excessive amounts of solvent vapour is higher when the solvents are used in enclosed or confined spaces. Care should be taken, especially when using solvent adhesives and cleaners to solvent weld PVCu pipes and fittings in confined spaces. They may:

- Irritate eyes, nose or throat
- Make you dizzy or sleepy
- Give you a headache or may cause you to pass out
- Impair your judgment/co-ordination
- Damage the body internally
- Irritate your skin

If you work with solvents, follow these basic rules:

- Avoid contact with the skin and eyes
- Only use in an open and well-ventilated space
- Keep away from naked flames. Many solvents are highly flammable
- Store in an area that well-ventilated and secure.

AC2.6 State the range of common building materials and services components that may contain asbestos

Within this Assessment Criteria, the range will cover:
• Flue, soil, rainwater pipes and gutters
• Tanks and cisterns
• Artex
• Small gaskets and seals

Asbestos is probably the most dangerous material ever used in the construction industry. On average, eighteen construction workers across the trades die from an asbestos-related disease every week.

During the past 100 years, asbestos was used widely in the plumbing industry. Occasionally, it may still be found in the following plumbing and heating components and fittings:

• Flue pipes, boiler gaskets and fire proof ropes
• Gutters and rain water pipes and soil and vent pipes
• Pipe insulation (both sprayed directly on to the pipe or applied in paste form and wrapped with linen)
• Cold water cisterns
• Cold water mains where the soil was aggressive and acidic
• Electrical wiring insulation

It could also be found in:

• Some older forms of artex
• Roof tiles, ceiling tiles, soffit boards
• Plaster coatings
• Floor tiles
• Asbestos sheeting and corrugated roofing

AC2.7 Identify the types of asbestos that may be encountered in the workplace

Within this Assessment Criteria, the range will cover:

• White asbestos (Chrysotile)
• Brown or grey asbestos (Amosite)
• Blue asbestos (Crocidolite)
• Asbestos cement materials

Asbestos is a naturally occurring fibrous material that has been used as a building material since the end of the 1940s and because asbestos is often mixed with other materials such as cement, it’s hard to know if you’re working with it or not. The problem is that if you work in a building built before the year 2000, it is likely that asbestos has been used during its construction in one form or another.

These may include asbestos pipe insulation, asbestos sheet roofing, asbestos fibres in wall plaster, asbestos
boiler flues and asbestos roof tiles.

There are three main types of asbestos:

**White asbestos (Chrysotile)**
A pure white fibre, chrysotile is a magnesium silicate. It can be found in 90% of asbestos in products and is a member of the serpentine group.

**Brown or grey asbestos (Amosite)**
Straight amosite fibres contain iron and magnesium and belong in the amphibole group.

**Blue asbestos (Crocidolite)**
Crocidolite is a sodium iron magnesium silicate and takes the form of blue, straight fibres. It is a member of the amphibole group.

**Asbestos cement materials**
Asbestos cement is mainly a mixture of chrysotile (white asbestos) and cement, moulded and compressed to produce a range of asbestos cement products. It can be found in many places inside and outside buildings, including:

- Asbestos cement roofs
- Asbestos wall cladding
- Asbestos downpipes and gutters
- Asbestos cement flues
- Asbestos cement and pitch fibre water and sewer pipes

**AC2.8 State the procedures that must be used to safely work with asbestos cement-based materials**

Within this Assessment Criteria, the range will cover:

- Protection of the workforce and members of the public
- Licensing requirements for asbestos removal organisations
- Safe disposal requirements

**If you work with asbestos**

- Use hand tools ONLY
- Keep materials damp (but not wet!)
- Wear a properly fitted, suitable mask (Disposable FFP3 type is adequate). DO NOT USE an ordinary dust mask. It will not protect you.
• No smoking, eating or drinking in the work area
• Double bag all asbestos waste and label the bags correctly
• Clean up as you go along and use a specific class H vacuum cleaner designed for hazardous dust.
• Do NOT use a brush when cleaning up, as this will throw fibres into the atmosphere
• Wear disposable type S overalls
• Always remove your overalls before removing your face mask
• Wear lace-less or slip-on boots or disposable boot covers
• Dispose of all items of disposable workwear correctly in the asbestos waste bags

Do not start work if:

• You are not sure if there is asbestos where you are working
• The asbestos materials are sprayed coatings, board or insulation and lagging on pipes and boilers. Only licensed contractors should work on these
• You have not been trained on non-licensed asbestos work. Basic awareness is not enough

You should only continue if:

• The work has been properly planned and the right precautions are in place and you have the correct equipment
• The materials are asbestos cement, textured coatings and certain other materials, which do not need a license. These are listed in HSE publication ‘Asbestos essentials’, and
• You have had training on working safely with asbestos.

Remember: if you are in any doubt at all, seek expert advice.

The existence of asbestos does not always mean that there is a risk to health. If the fibres are intact and undisturbed, then the actual risk is quite low. Only when the fibres are disturbed and enter the atmosphere does the risk from asbestos increase. It is the breathing in of asbestos fibres into the lungs, which causes asbestos related diseases.

Lung disease from exposure to asbestos is divided into three main types:

• Asbestosis. A process of scarring of the lungs
• Disease of the lining of the lungs, called the pleura. It has a variety of signs and symptoms and is the result of inflammation and the hardening (calcification) and/or thickening of the lining tissue
• Mesothelioma, a rare form of lung cancer

All of the common forms of asbestos used in the construction industry have been linked to cancerous and non-cancerous lung disease. Because of this, asbestos has not been allowed on new build construction projects for many years. The delay between the exposure to asbestos and the development of health issues related to it is generally around 20 years or so.
AC2.9 Identify the actions to be taken when asbestos is encountered while undertaking work activities.

What to do if asbestos is discovered

On renovation and refurbishment work, the presence of asbestos should have been identified by an asbestos survey beforehand. However, there is always the risk, no matter how small, that asbestos could be discovered once work has started. If you think asbestos is present, you MUST STOP WORK IMMEDIATELY and alert people that a suspected source of asbestos has been uncovered. Asbestos is very difficult to identify confidently by sight alone but it is much better to assume that a material does contain asbestos rather than assume that is does not. Do not return to the site until you have been advised that it is safe to do so.

The following advice is from the HSE website at:

http://www.hse.gov.uk/asbestos/tradesperson.htm

Licensed Asbestos Removal

The removal of asbestos requires a licence for all contamination where there is a high risk from airborne asbestos fibre contamination. This falls under the Health and Safety Executive Asbestos Licensing Unit who would issue the necessary documentation.

A licence to remove asbestos is only granted when a company can show that it has the appropriate skills, competency, expertise, knowledge and experience of work with asbestos, together with excellent health and safety management systems.

Licences, basically, are a permit to work. They are granted for a fixed time period only, after which they have to be reapplied for. When this happens, the recorded performance of the company, through HSE and Local Authority Inspectors, will be considered.

Disposal of Asbestos Waste

All asbestos and asbestos cement waste (Asbestos Containing Materials) should be disposed of by a licenced asbestos removal company. Dismantling the asbestos material yourself and transporting it to a licenced asbestos disposal site (these are licenced by the Environment Agency) is not recommended.

Most licensed waste sites will only accept certain types of asbestos containing materials in small quantities, usually these are:
• Asbestos produced by the householder from domestic properties
• Cement bonded asbestos in sheet, pipe, gutter or flue form and in pieces of 150mm or less
• Asbestos sheeting which is in pieces of 150mm or less, and
• A maximum of six small bags
Learning Outcome 3

Know the safe personal protection measures while working in the building services industry
Within this Learning Outcome, there are two assessment criteria:

**AC3.1.** State the purpose of, and application of protective equipment.

**AC3.2.** Identify the procedures for manually handling heavy and bulky items.

# AC3.1 State the purpose of, and application of protective equipment.

Within these Assessment Criteria, the range will cover:

- Clothing protection including high visibility
- Eye protection
- Hand protection
- Head protection
- Foot protection
- Hearing protection
- Respiratory protection
- Vibration protection
- Harnesses

Personal Protective Equipment (PPE) is designed to protect the worker from hazards in the workplace. Health and Safety Regulations state that:

a) An employer must try to make the wearing of PPE unnecessary where possible. If wearing PPE is unavoidable then:
   a. The employer MUST provide all necessary PPE
   b. The employer MUST train all employees in the use of PPE

b) The employee MUST wear the PPE provided

c) The employee MUST take care of the PPE

d) The employee MUST report lost or damaged PPE to their manager or supervisor

All construction operatives have a legal duty to protect themselves and others who may be affected by their acts or omissions. The provision of protecting yourself means wearing the correct PPE where required. The employer is legally bound to give you the means to protect yourself. This includes providing the following:

- Suitable protective clothing for working in adverse weather conditions
- Eye protection or eye shields
- Respirators to avoid breathing in dangerous dust, fumes etc
- Shelter accommodation for use when sheltering from inclement weather
- Storage accommodation for protective clothing and equipment when they are not used
- Ear defenders when noise levels cannot be reduced below 80 dB(A) 8 hour
- Protective clothing and local extraction units when exposed to lead, lead dust or fumes or paint
- Safety helmets for protection against falling materials and protruding objects
• Industrial gloves for handling rough abrasives, sharp and coarse materials or when handling toxic or corrosive materials

Safety Helmets

When working on a construction site, the danger from falling objects, falling into trenches and excavations, falling from scaffolds, or even hitting your head on protruding objects, is ever present. To give some protection from these obvious dangers, it is a mandatory requirement that personal safety helmets (known as hard hats) are worn in all areas. These should be adjusted to suit the correct head size so that it fits snugly but not tight. The helmet should not be defaced in any way by stickers or paint as these could reduce its effectiveness.

Safety helmets must conform to BSEN397 and are designed to withstand penetration of falling objects and reduce the shock absorber effect to the head and body. Hard hats should be replaced once a year or if the hard hat has been struck by an object. They are resistant to:

• Temperatures as low as -30°C and as high as +150°C
• Electrical resistance up to 440V
• Molten metal, marked as MM
• Side squeeze, marked LD, for lateral deformation.

Safety Footwear

On site, feet must be protected against the many hazards that could be found, including damp, cold, sharp objects, falling objects and crushing. Flimsy footwear such as trainers do not offer sufficient protection against these obvious dangers and so MUST not be worn.

A good pair of work boots must have steel toe caps to EN20345 and a steel midsole for underfoot protection. Good quality footwear is a mandatory requirement on all construction sites.

Safety footwear to EN 20345

Overalls and Workwear

There are many different types of workwear available from full boiler suits to separate jacket/sweatshirt and work pants. Good quality workwear has protective knee pad provision, which is especially useful for plumbers
and heating engineers.

Plumbers should always consider flame retardant types as these offer protection when soldering fittings.

**High Visibility Jackets and Vests**

High Visibility jackets and vests (known as hi-vis) are now a mandatory requirement on ALL construction sites. These can be supplied in either fluorescent yellow or fluorescent orange.

Good quality hi-vis jackets will be waterproof for protection when working in inclement weather.

**Eye Protection**

There are many eye injuries at work every day. Some of these will result in either partial or total blindness. A person’s eyes are one of the most vulnerable parts of the body and any injury can be life changing. The majority of these eye injuries are preventable if the correct eye protection is worn. There are a number of eye protection systems available, such as safety goggles, visors, spectacles and full face fixed shields.

Safety signs should be positioned where eye protection must be worn.

**Hazards that can cause eye injuries**

The following are some of the hazards and risks that might be encountered in the work place:

- Using hammers and chisels
- Threading steel pipe
- When welding or soldering
- Instruments and tools that emit intense light or lasers
- Coming in contact with corrosive and irritant substances such as acids and alkalis
- Gas or vapour under pressure
- Molten metal
- Abrasives and cutting wheels
- Chipped and broken tools

**Eye protection methods should conform to EN166 and EN172**

Eye protection is a requirement under regulation 4 of the Protective Personal Equipment at Work Regulations 1992 when work is undertaken in a hazardous area.
Impact resistant goggles  Protection against molten metals  Safety specs  Full face safety mask

In the event of an eye injury:

- Do not apply medication to the eye
- The injured eye should be washed with clean, cold water and covered with clean, dry material. if possible, cover the unaffected eye also as this will help to reduce eye movement
- Seek urgent and immediate medical attention
- A thorough eye examination should be carried out within 24 hours

Respirators (Respiratory Protective Equipment)

One of the biggest problems, when working on site, is from dust and fumes. These can come from common materials such as brick, stone, concrete, wood and plastics. Cutting and grinding these materials releases vast amounts of dust that can, if inhaled over long periods, create breathing problems, such as asthma, emphysema and bronchitis. Dust inhalation can also lead to problems in later years if it isn’t protected against now.

Fumes from mechanical machinery, such as diggers, earthmovers and dumper trucks can create many breathing problems if protection is not worn. Other fumes from solvents and adhesives can also be dangerous when used in confined/unventilated spaces.

The Personal Protective Equipment at Work Regulations 1992 make provision for the protection of employees at work and the general public who may be affected from dust and fumes. As well as providing Respiratory Protective Equipment, the employer must display suitable signs where people may come into contact with dust and fumes from hazardous substances.

It is the responsibility of the employer to carry out risk assessments to determine when or where Respiratory Protective Equipment is needed, and which type would be appropriate.

Selecting the Right Respirator

Respiratory Protective Equipment selection will depend on the hazard and must be carried out by a competent person. They will assess the following:

- The hazard from the material
- The amount of dust it will create
• How long the wearer will be exposed to the hazard
• The weather conditions when working outside
• Suitability for the wearer i.e. field of vision, communication etc.

The types of Respiratory Protective Equipment (RPE) available are shown below and include the following types:

• Disposable face masks
• Half dust respirators
• High efficiency dust respirators
• Ventilator visor
• Self-contained breathing apparatus (SCUBA)

Gloves

Hands can suffer a wide range of injuries from cuts and abrasions to hammer blows and chemical burns. Other extremes such as low temperatures can also be a hazard. These situations will require hand protection. The type of glove required will depend on the type of work being done.

All of the different hazards to hands make it vital that the right kind of glove for a given situation is chosen:

**EN407** – Gloves that protect against thermal hazards.

In other words, these gloves offer protection against heat and cold, whether it is heat in the form of conduction, convection and radiation or cold in the form of freezing outside temperatures or pipe freezing gases.
EN 374 – These gloves guard against chemicals and micro-organisms. Substances that could inflame, irritate or burn the skin can be classed as a chemical hazard. This type of glove offers protection against chemical splashing and micro-organism hazards and is recommended by the COSHH Regulations.

EN 12477 - is the standard for protective gauntlets for welders. They are heat resistant and flame retardant.

EN 421 - Protective gloves against ionizing radiation and radioactive contamination.

EN 388 – This is the classification for gloves designed to withstand mechanical abrasions such as sharp and rough objects.

Hearing Protection

Employers must make a risk assessment and provide information and training when the noise level reaches 80 decibels. The upper noise limit, taking into account hearing protection, is 87 decibels. The British Standards for ear protection are:

- Ear defenders BS EN 352 – 1: 2002
- Earplugs BS EN 352 – 2: 2002
- Ear defenders on safety helmet BS EN 352 – 3: 2002
- Level dependent ear defenders BS EN 352 – 4: 2001
- Active noise reduction ear defenders BS EN 352 – 5: 2002
- Ear defenders with electrical audio input BS EN 352 – 6: 2002
- Level dependant earplugs BS EN 352 – 7: 2002
Where the work is very noisy or of long duration, ear defenders would be the best solution, simply because they offer greater protection than ear plugs. Ultimately, the type of hearing protection required will depend on the kind of work being done.

Vibration Protection

Hand-arm vibration comes from the use of hand-held power tools and is the cause of significant ill health (painful and disabling disorders of the blood vessels, nerves and joints).

Employers under the Control of Vibration at Work Regulations 2005, which came into force in July 2005, must assess and identify measures to eliminate or reduce risks from exposure to hand-arm vibration so that they can protect their employees from risks to their health.

Hand-arm vibration is vibration transmitted from work processes into workers’ hands and arms. It can be caused by operating hand-held power tools, such as road breakers, and hand-guided equipment, such as powered lawnmowers, or by holding materials being processed by machines, such as pedestal grinders.

There are ways in which you can protect against vibration in your work by:

- Looking for different work methods that will eliminate or reduce exposure to vibration
- Use of personal protection equipment

Harnesses

The purpose of The Work at Height Regulations 2005 is to prevent death and injury caused by a fall from height. Employers and those in control of any work at height activity must make sure work is properly planned, supervised and carried out by competent people. This includes using the right type of equipment for working at height.

HSE have provided a guide on working at height, available at www.hse.gov.uk/pubns/indg401.htm

Where safety harnesses are to be used, a full risk assessment should have been carried out taking into account all working conditions and providing a safe system of work. When using any harness the manufacturer’s advice should always be followed with regard to shelf life or usage, but at the end of the day it is the person using the harness who has the responsibility to ensure that the equipment is safe for use.

As a general guide, HSE advice is that anchorages for fall arrest should be inspected at least every 12 months and energy absorbing lanyards at least every 6 months or, if used in arduous environments, every 3 months.
AC3.2 Identify the procedures for manually handling heavy and bulky items

Within these Assessment Criteria, the range will cover:

- Assessment of a safe load
- Safe kinetic lifting technique

Back injuries, caused by using incorrect lifting techniques, account for more working days lost than any other form of work related injury. In this assessment criteria we will investigate:

- Assessing the safe load limit that a person can lift
- How to correctly use the kinetic lifting technique
- Using simple mechanical lifting equipment
- Mechanical lifting on large construction sites

Manual handling and lifting operations can often cause immediate pain. This kind of injury is termed acute injury. Sometimes longer-term injuries occur, which require weeks, months and even years of treatment. These are termed chronic injuries.

As mentioned in Learning Outcome 1, the Manual Handling Operations Regulations 1992 control manual handling and lifting in the workplace. They require employers to reduce the risks from manual handling, and employees to adopt the safe working practices set by the employer.

Here are some points for you to consider before attempting any lifting or handling operation:

- Be aware of your own strength and lifting limits
- Decide if it is a one-person lift or if help is required
- Use mechanical equipment if it is available. However, you must ensure that you have the correct training on how to use them
- Be aware of the weight of the item before you attempt to lift it.
- Wear hand protection
- Wear safety boots at all times
- Ensure the area is clear and safe to carry out lifting procedure

Assessing the safe load limit that a person can lift

The assumption that the law specifies a maximum limit that a person can lift is a myth. There is actually no maximum weight limit to the load that any one person can lift. There are, however, varying degrees of risk.

The law places the onus on the employer to ensure that a proper assessment of lifting operations is carried out before the lift takes place, i.e. the strength, fitness and underlying medical conditions of the individual,
the weight and shape of the load being lifted, the distance it is to be carried and, most importantly, the availability of any equipment that would mean that the manual lifting operation would be reduced or eliminated.

If manual lifting is the only option then there are a number of points that can be done to reduce the risk. These include:

- Making the load smaller or lighter and easier to lift
- Breaking up large items into smaller, more manageable loads
- Reducing carrying distances, twisting movements, or the lifting of things from floor level or from above shoulder height
- Improving the environment, such as better lighting, flooring or air temperature can sometimes make manual handling easier and safer
- Ensuring the person doing the lifting has been trained in the correct lifting procedures

**Lifting and Handling Techniques (The Kinetic Lifting Technique)**

**Step 1:** Plan the lift. Can handling aids be used? Where are you moving the load to? Will you need help? Remove obstructions. For a long lift, think about resting the load halfway so you can change your grip.

**Step 2:** Adopt a stable position. The feet should be apart with one foot slightly in front of the other. Be prepared to move your feet during the lift to maintain stability.

**Step 3:** Get a good grip. Where possible the load should be pulled as close to your body as possible. This may be more comfortable than gripping it with the hands only.

**Step 4:** Begin the lift with a good posture. A slight bending of the back, the hips and the knees is preferable.

**Step 5:** Do not flex the back when lifting. When you lift the load, the legs do the work, not the back. The legs and the load should move together to avoid excessive back movement.

**Step 6:** Avoid twisting from the hip or leaning. This puts too much strain on the back muscles. Keep the shoulders level and facing the same direction as the hips. Change direction by moving the feet rather than twisting the body.

**Step 7:** Keep the load close to the body while lifting. Keep the heaviest side of the load next to the body to maintain the centre of gravity and to keep your balance.

**Step 8:** Keep the head up when handling. Look ahead. Do not look at the load and concentrate on where you are going.

**Step 9:** Move in smooth movements. Do not jerk the load as this can make you lose control, which increases the risk of injury.

**Step 10:** Don’t lift or handle more than you can easily carry. If the load is too heavy, get help.
The Two-Person Lift

When an object has been assessed as being too heavy or awkward for one person to lift, team lifting may be employed. This involves getting the help of other person(s) of roughly the same height and build to help with the lift. The same rules of lifting should be applied. A team leader should be appointed and their instructions followed.

The Use of Mechanical Lifting Aids

Using Simple Mechanical Lifting Equipment – a Sack Trolley

A sack trolley is a small, wheeled frame with a carrying plate at the bottom. It has two handles that enables small items that are no heavier than 200kg and no taller than 1.5m to be moved with little effort. They are used in a similar way to wheel barrows.

Before using a sack trolley, read the guidelines laid down by the HSE on manual handling:

1. Think about the task first.
   a. What are the hazards involved?
   b. Is it possible to carry out the task with other mechanical aids?
   c. Is there a better aid for the task?
   d. How heavy is the load?
   e. Can the load be moved with a sack trolley? Remember: No more than 200kg can be moved with the sack trolley.
   f. What are the dimensions of the load? It is recommended that the maximum height to be moved on a sack trolley is 1.5m. Large items can topple over; always get help before you start.
   g. Is the load too wide to move with the sack trolley?
   h. Do not work alone. It is safer to have two people involved in moving the load, do not try to do it on your own.

2. Is the load at floor level so that it can be moved by the sack trolley?
3. If the load has to be lowered to floor level do this correctly. Use the manual handling technique described above. Do not attempt to lower more than you know you can comfortably lift. Get help.
4. When loading items on to the sack trolley, take great care.
5. Be very aware when manual handling items on to and off the sack trolley of the possibilities of stress or strain injuries caused by pushing or pulling. Quite often the activity of lifting is given a lot of thought but the task of pushing or pulling is not.
6. Make sure you are wearing adequate footwear for the task.
7. Make sure the sack trolley handles are dry and that you can get a good comfortable grip of them.
8. Make sure the wheels of the sack trolley work correctly, that they spin evenly, do not wobble from side to side and are circular.
9. Check that the tubular frame and flat front plate have no cracks in them.
10. Check the route you are going to take. It should be flat and free from any loose material.
11. If there are any doors to go through, get help to open them. If door wedges are used, always remember to remove them when you have finished.
12. If there are any steps to go up or down, use the 3-wheel sack trolley instead of the 1-wheel version. Use a ramp where necessary on steps. Remember to remove the ramp when you have finished.
13. Do not push the sack trolley over steps or bumps. It is more stable when being pulled over them.
14. Make sure the floor is dry and not slippery.
15. When using the sack trolley outside, take extra precautions.
16. Where it is possible, secure loads to the sack trolley so that they do not slide off when being moved.

Mechanical Lifting on Large Construction Sites

There are many different types of lifting and manual handling equipment that can be used in the workshop and on construction sites. They range from small brick lifts, slings, barrows and dumper trucks, to fork lift trucks and cranes.

A pallet truck can be used on hard areas for moving heavy loads.

Wheel barrows are probably the most common load moving equipment on constructions sites.

A forklift truck is not often found on construction sites but they can be found in workshops and storage facilities. These can only be driven by operatives who hold a forklift truck qualification.

Most large construction sites will have a hired crane and this maybe a fixed tower crane or a mobile crane. Cranes are often the only method of getting heavy equipment and appliances to where they are needed. They are operated by trained personnel only.
For very large sites, the crane operator will be guided by a ‘banksman’ who uses hand signals to guide the crane operator to the load’s destination.

Care should be taken if cranes are on site. Construction operatives should be aware of where the jib (the lifting hook) is when walking around different areas of the site. The area the crane covers should be off-limits to all non-essential personnel.

Brick hoists are specifically designed to lift bricks and mortar from the ground floor to the upper floors of buildings during construction. They must not be used for lifting construction site operatives.
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Learning Outcome 5
Know how to respond to accidents that occur while working in the building services industry
Within this Learning Outcome, there are four Assessment Criteria:

- **AC5.1.** Identify the requirements for first aid provision while working
- **AC5.2.** Identify the actions that should be taken when an accident or emergency is discovered.
- **AC5.3.** State the procedures for dealing with minor injuries that can occur while working.
- **AC5.4.** State the procedures for dealing with major injuries that can occur while working.

**AC5.1 Identify the requirements for first aid provision while working**

Within this Assessment Criteria, the range will cover:

- On construction sites (new-build and refurbishment)
- In small occupied properties

Construction sites and any work location, such as occupied properties, are dangerous environments and people suffer major and minor injuries almost on a daily basis. Add to this the fact that people may become ill at any time and a good first aid provision becomes a necessity.

Good first aid provision can prevent a minor injury from becoming a major incident.

**What the Law says**

Health and Safety Regulations requires that adequate and appropriate first aid provision, facilities and personnel are available in the event of illness or injury. Although different working environments have different first aid needs, the minimum first aid provision for any working environment should include:

- A suitably stocked and maintained first aid box. HSE advice suggests it should include at least:
  - Twenty four wrapped sterile adhesive dressings in assorted sizes
  - Two sterile eye pads
  - Four individually wrapped triangular bandages
  - Six safety pins
  - Six medium sized and two large sized individually wrapped sterile un-medicated wound dressings
  - A pair of disposable gloves.
  - An appointed person to take charge of first aid arrangements
- Around the clock quick access to the first aid equipment
- A trained first aider at all times during working hours

**Appointed Person versus First Aider**

Health and Safety Regulations require that every workplace has both a trained first aider and an appointed person, but what are these two very different roles and what are their responsibilities?

**First Aider**

Any work appointed first aider must:

- Hold a current First Aid at Work Certificate; and,
- Have undertaken a HSE recognised first aid training course, such as those offered by the Association of First Aiders (aofa).

For more details on First Aid at Work courses, go to: [http://www.skillsforhealth.org.uk](http://www.skillsforhealth.org.uk)

**Appointed Persons**

In the work place, an appointed person has specific responsibilities:

- Take charge if a person is injured or falls ill (this including calling an ambulance, if required)
- Maintain the first aid box and replenish supplies as required
- Keep records of first aid administered
- Be available *at all times* during site working hours

The HSE state that:

*Where your assessment of first-aid needs identifies that a trained first-aider is not required in your workplace, you should appoint someone to take charge of first-aid arrangements. This is the minimum requirement.*

*’Even in a small, low-hazard business where first-aiders are not considered necessary, there is always the possibility that an accident or sudden illness may occur. It is therefore important that there is always someone available to take charge of these arrangements.’*

The appointed person must not give first aid for which they have not been trained and are not formally required to have any training, although it is desirable. Courses for appointed persons are available.

**The role of the employer when appointing first aiders and appointed persons**

- Under the law Employers are required to assess the significant risks of potential injury and ill health that may be present in the workplace. Where a number of significant risks exist, then more than one first aider may be required.
- Where there are specific risks, such as working with hazardous substances or dangerous
machinery/tools, then the employer must ensure that all first aiders receive extra training or equipment.

- Where different work areas present differing degrees of risk, an employer is required to ensure each area has sufficient first aid provision.
- Employers are required to review the accident record book to assess the type of injuries and how often they are occurring. This may impact on the number of first aid boxes and where they are likely to be located on site.
- If the work place is spread over a wide area or multiple floors, then first aid provision must be provided at all locations.
- Employers must ensure that sufficient first aid provision is provided during ALL working hours, including shift work.
- If any employees work alone, then employers should issue personal first aid kits and arrange for first aid training on its use.
- Although there are no legal responsibilities for first aid provision for site visitors and guests, it is considered good practice to include them.
- Employers are required to inform their staff of the first aid requirements. This is done by erecting notices and informing staff who and where the first aiders are and where the nearest first aid box is located. Provision should also be made for those employees who may have reading difficulties or those whose first language is not English.

AC5.2 Identify the actions that should be taken when an accident or emergency is discovered

How to React to an Emergency

When an emergency occurs, time is of prime importance. The quicker the emergency services are called, the greater the chance that lives will be saved.

Response times for the emergency services in the United Kingdom vary, but on average the emergency response from the initial 999 call to arriving at the scene is around 8 minutes, but we need to play our part too. When calling for assistance:

1. Dial 999 and ask for the service required. Police, fire service or ambulance
2. Once connected, speak clearly and slowly to the operator. Tell them the nature of the emergency, the location and the possible entry points to the workplace or site
3. Instruct work colleagues to wait at the entrances to the workplace for their arrival. From here, they can direct the emergency services to the incident. If necessary, have a chain of people waiting to direct them to where they are needed
4. DO NOT leave the injured party. Stay with them until the emergency services come to you
5. Stay at the scene until you are told that you are no longer required
6. Ask if someone should accompany the injured person(s) to the hospital and go with them, if
necesary.

7. Ask a work colleague to inform the next of kin. This should be done tactfully, so they are not alarmed unnecessarily.

Fire Evacuation

Operatives discovering a fire or other emergency that necessitates the evacuation of a building should sound the alarm. They should then notify the fire service of the exact location of the incident.

On hearing a fire alarm:

- All operatives working on the site must respond when the alarm sounds
- A named person will call the emergency services (DIAL 999) as necessary
- Operatives must evacuate to the designated assembly point(s)

Fire Fighting

The safe evacuation of all people in the workplace is an absolute necessity. Staff should only attempt to deal with small fires using the portable fire equipment designated if it is safe to do so without putting themselves or others at risk. The priority is:

1. Raise the alarm before you attempt to tackle the fire
2. Ensure that people leave the building by the nearest safe exit

AC5.3 State the procedures for dealing with minor injuries that can occur while working

Within this Assessment Criteria, the range will cover:

1. Cuts
2. Minor burns
3. Objects in the eye
4. Exposure to fumes

Minor accidents at work happen every day. Plumbers suffer minor cuts and burns during the course of their work often without even realising it.

Occasionally, a minor cut or burn will require a little more by the way of treatment and it is important that we know how to deal with these incidents.

Minor Cuts

Even the smallest cut should be treated to prevent dirt and grit getting into the wound as this can cause infection. Some minor cuts may bleed quite a lot depending on how deep the cut is and where it is. Head wounds, for instance, tend to bleed profusely.
The area around the wound should be cleansed with warm, soapy water and dried by dabbing around the wound and not directly on it. If it is still bleeding, apply a little pressure directly to the wound to stem the blood flow. Remember to always wear protective medical gloves.

Apply a little antiseptic cream to the cut as this will help keep infections at bay. The cut may be held together with butterfly bandages, if required. The wound can then be covered by a suitable sterile dressing such as a bandage or sticking plaster. Be aware that some people can suffer allergic reactions to the adhesive on sticking plasters so care should be taken.

**Burns**

Burns, no matter the severity, need treating immediately. The area should be cooled with cold running water directly from the cold tap for at least 10 minutes. If this is not possible, the burn can be immersed in a clean bucket filled with cold water. Immersing the burn in cold water is the most effective way of cooling the burnt area of skin. At this stage, remove any objects such as jewellery and watches, before the area begins to swell.

When the burn has cooled adequately, the area can be gently washed with clean water and covered with a sterile burns dressing. As a stop-gap measure, the burn may be covered in cling film to protect it from infection. Ointments and antiseptic creams should not be applied as these effectively seal in the heat inside the burn, which can intensify the pain. Do not pierce any blisters that form as this could result in infection.

If the burn is severe, medical help should be sought at the nearest hospital accident and emergency or doctor’s surgery.

**Important General Advice**

This advice is only for minor injuries. Expert medical advice should be sought if the wound appears more serious or the following symptoms present themselves:

- The wound continues to bleed
- The injury is to the eyes or the ears
- The wound was caused by a dirty or rusty object
- The cut is deep or wide
- Any burn that is larger than the palm of a person’s hand or is situated on a sensitive part of the body such as groin, neck, face, foot or back of the hand
- Signs of infection (redness to the skin) or fever
- The injured person last had a tetanus booster more than 10 years ago
- The injured person loses consciousness

**Objects in the Eye**

Anything that finds its way into the eye is both painful and irritating. Specks of dirt and eyelashes tend to float on the surface of the eyeball, causing scratches. Chemicals too can cause irritation and pain if they are accidently splashed onto the eye.
Specks of dirt and eyelashes can often be removed by rinsing the eye with fresh cold water. However, objects that penetrate the eye or rest on the coloured part of the eye must not be touched as permanent eye damage may result. Chemical splashes in the eyes should be washed with fresh, cold water or a sterile solution for at least 15 minutes. In this situation, immediate medical advice must be sought.

Common signs that the injured person may show are:

- Blurred vision
- Pain or discomfort
- Redness or watering of the eye
- Eyelids screwed up in spasms

Treatment to the eyes should be given with caution:

- Wash your hands first!
- Sit the injured person down facing the light
- Standing behind the person, gently part the eyelids with finger and thumb
- Examine the eye:
  - Ask the person to look up and then down
  - Ask the person to look left and then right If anything rests on the white of the eye, then:
    - Wash it away with clean cold water from a glass or directly from a cold tap by:
      - Tilting the person’s head toward the injured eye, placing a towel on the shoulder
      - Pour water from the bridge of the nose so that the water runs across the eye. This should wash the object out
    - If the object persists, then:
      - If the object can be seen, then try to lift the object from the eye with the corner of a clean tissue. If this does not work, then seek medical advice immediately

**ALWAYS REMEMBER:** Do not touch objects that are embedded in the eye. Place a sterile pad over the eye and take the person to the nearest Accident and Emergency department.

**Exposure to Fumes**

When faced with someone who has been overcome by fumes, the overriding concern is the safety of yourself. If care is not taken, the rescuer may become another victim of the same fumes! The most important points to consider are:

- Where have the fumes come from?
- What are they?
- Have they or can they be stopped?
- Can the area be sufficiently ventilated to ensure safety?
- Can I safely get the casualty out without becoming another victim of the same fumes?
If the victim is unconscious, getting them into the fresh air could literally be a matter of life and death. The following points should only be considered if you can minimise your own risk:

- The most important point is to minimise your own exposure to the fumes. If you feel any effects at all, then remove yourself from the area
- If possible, carry or drag the person from the affected area
- Loosen any restrictive clothing
- If the person has stopped breathing, begin cardiopulmonary resuscitation (CPR) but ONLY if you are trained to do so and continue until either the person begins to breathe again or help arrives
- Send for help as soon as possible

AC5.4 State the procedures for dealing with major injuries that can occur while working

Within this Assessment Criteria, the range will cover:

- Bone fractures
- Unconscious co-workers
- Placing the casualty in the recovery position
- Concussion
- Electric shock
- Removal from the supply
- CPR method

Bone Fractures

Good first aid care of fractures is always important. Moving the broken bones can increase pain and bleeding and can damage tissues around the injury. This could lead to complications in the repair and healing of the injury later on.

First aid for fractures is all about immobilising (limiting movement of) the injured area. Splints can be used for this. Control any external bleeding. Complicated breaks where a limb is very deformed may need to be realigned before splinting – only paramedics or medical staff should do this as well as managing any fractures of the head or skull, ribs and pelvis.

If you suspect a bone fracture, you should:

- Keep the person still – do not move them unless there is an immediate danger, especially if you suspect fracture of the skull, spine, ribs, pelvis or upper leg
- Attend to any bleeding wounds first. Stop the bleeding by pressing firmly on the site with a clean dressing. If a bone is protruding, apply pressure around the edges of the wound
• If bleeding is controlled, keep the wound covered with a clean dressing
• Never try to straighten broken bones
• For a limb fracture, provide support and comfort such as a pillow under the lower leg or forearm. However, do not cause further pain or unnecessary movement of the broken bone
• Apply a splint to support the limb. Splints do not have to be professionally manufactured. Items like wooden boards and folded magazines can work for some fractures. You should immobilise the limb above and below the fracture
• Use a sling to support an arm or collarbone fracture
• Raise the fractured area if possible and apply a cold pack to reduce swelling and pain
• Stop the person from eating or drinking anything until they are seen by a doctor, in case they will need surgery
• In an emergency, call triple nine (999) for an ambulance

Unconscious Co-workers

Unconsciousness is when a person suddenly becomes unable to respond to stimuli and appears to be asleep. A person may be unconscious for a few seconds (fainting) or for longer periods. People who become unconscious do not respond to loud sounds or shaking. They may even stop breathing or their pulse may become faint. This calls for immediate emergency attention. The sooner the person receives emergency first aid, the better their outlook will be.

If unconsciousness is due to low blood pressure, a doctor will administer medication by injection to increase blood pressure. If low blood sugar level is the cause, they may need something sweet to eat or a glucose injection.

If you see a co-worker who has become unconscious, take these steps:

• Check whether the person is breathing. If they are not breathing, have someone call 999 immediately. If they are breathing, position the person on their back
• Raise the person’s legs at least 12 inches above the ground
• Loosen any restrictive clothing or belts. If the person doesn’t regain consciousness within one minute, call 999
• Check the person’s airway to make sure there’s no obstruction
• Check again to see if the person is breathing, coughing, or moving. These are signs of positive circulation. If these signs are absent, perform cardiopulmonary resuscitation (CPR) until emergency personnel arrive

Medical staff should treat any injuries that caused the person to become unconscious.

Placing the Casualty in the Recovery Position

If a person is unconscious but is breathing and has no other life-threatening conditions, they should be placed in the recovery position. Putting someone in the recovery position will keep their airway clear and open. It
also ensures that any vomit or fluid will not cause them to choke.

To place a casualty in the recovery position, follow these steps:

- With the person lying on their back, kneel on the floor at their side
- Place the arm nearest you at a right angle to their body with their hand upwards, towards the head
- Tuck their other hand under the side of their head, so that the back of their hand is touching their cheek
- Bend the knee farthest from you to a right angle
- Carefully roll the person onto their side by pulling on the bent knee
- The top arm should be supporting the head and the bottom arm will stop you rolling them too far
- Open their airway by gently tilting their head back and lifting their chin, and check that nothing is blocking their airway
- Stay with the person and monitor their condition until help arrives

Concussion

A concussion is a type of traumatic brain injury that is caused by a blow to the head or body, a fall, or another injury that jars or shakes the brain inside the skull. Although there may be cuts or bruises on the head or face, there may be no other visible signs of a brain injury.

You do not have to pass out (lose consciousness) to have a concussion. Some people will have obvious symptoms of a concussion, such as passing out or forgetting what happened right before the injury. However, other people will not. With rest, most people fully recover from a concussion.

Electric Shock and Removal from the Supply

It may not be immediately clear, but if you think someone is suffering from electric shock, approach with extreme caution. The danger from an electrical shock depends on the type of current, how high the voltage is, how the current travelled through the body, the person's overall health and how quickly the person is treated.

An electrical shock may cause burns, or it may leave no visible mark on the skin. In either case, an electrical current passing through the body can cause internal damage, cardiac arrest or other injury. Under certain circumstances, even a small amount of electricity can be fatal.

The first step is to separate the person from the source of electricity as quickly as possible. The best way of doing this is to turn off the supply, for example, by unplugging the appliance or by turning the mains off at the fuse box (consumer unit).

If this is not possible, then try to remove the source of electricity from the person using a piece of insulating material, such as a length of wood.

NEVER touch the person receiving the electric shock, or you could suffer one too.

After removing the person from the source of electricity, if the person is unconscious, call for an ambulance.
immediately. Only those with the necessary knowledge and skill should carry out first aid.

CPR Method

Cardiopulmonary resuscitation (CPR) is a way to treat someone when they stop breathing or their heart stops beating. To minimize potential injuries, only those trained in CPR should perform rescue breathing. If you have not been trained, perform chest compressions until medical help arrives.

Chest compressions:

- Lay the person on their back on a firm surface
- Kneel next to the person’s neck and shoulders
- Place the heel of your hand over the centre of the person’s chest. Put your other hand directly over the first one and interlace your fingers. Make sure that your elbows are straight and move your shoulders up above your hands
- Using your upper body weight, push straight down on the person’s chest at least 1.5 inches for children, or 2 inches for adults. Then release the pressure. Repeat this procedure again up to 100 times per minute

Rescue breathing:

- Pinch the person’s nose closed and cover their mouth with yours, creating an airtight seal
- Give two one-second breaths and watch for the person’s chest to rise
- Continue alternating between compressions and breaths — 30 compressions and two breaths — until help arrives or there are signs of movement

Recording procedures for accidents and near misses at work

Accident Reporting

Every accident that occurs at work should be reported, no matter how trivial it may seem. Even a minor cut, for instance, can soon become a major infection. This would have serious implications for the injured person with regard to time off work and pay.

An accident report book should be kept on every site or workplace, usually in the charge of the site manager or person in charge. Serious injuries must be reported direct to the Health and Safety Executive or the Local Authority Administrator for Health and Safety under the RIDDOR Regulations mentioned earlier in the Unit. A major injury is specified as certain fractures, amputations, loss of sight or anything that requires hospital treatment for more than 24 hours.

Some accidents are more serious than others. An accident that results in death, major injury or more than 3 days absence from work are known as ‘reportable’ accidents and must be reported directly to the HSE as soon as possible. Accidents that require medical help or hospital treatment must be recorded at the place of work, regardless of whether treatment was given there or not.
Accident report books must be kept in a place that is accessible and is often found close to the first aid kit. Employers have a duty to ensure that all employees are aware of where the accident book is kept.

The following information must be recorded:

- Name, address and occupation of the injured person
- Signature of the person making the entry, their address, occupation and the date
- When and where the accident occurred
- Brief description of the accident, the cause of the accident and the nature of the injury
- Were there any witnesses to the accident and, if so, who were they?
- Was the victim wearing any PPE and if so, what?
- What, if any, was the first aid administered and who treated the victim?
- If the accident is of such a nature that it has be reported to the HSE

All accidents, whether fatal or otherwise, are investigated. Those involved in this investigation may include:

- The employer
- An investigator from an insurance company, acting on behalf of the employer or employee
- A safety representative usually from a trade union
- A health and safety inspector from the local authority or the HSE
Learning Outcome 6

Know the procedures for electrical safety when working in the building services industry

Within this Learning Outcome, there are six Assessment Criteria:
AC6.1. Identify the common electrical dangers encountered on construction sites and in private dwellings

AC6.2. Identify the methods of safely using electrical tools and equipment on site.

AC6.3. Identify how to conduct a visual inspection of a power tool for safe condition before use.

AC6.4. State the procedure that should be applied for tools and equipment that fail safety checks.

AC6.5. State the electrical industry safe isolation procedure that should be applied to building services equipment before carrying out work on them.

AC6.6. State the use of temporary continuity bonding when working on pipework components.

Employers are required by law to maintain their electrical systems and equipment in a good working and safe condition. The Health and Safety Executive state that periodic inspections and testing of electrical systems should be completed as part of the maintenance programme.

Every year, over 1000 electrical accidents and incidents that occur at work are reported to the HSE, and around 30 people die because of these accidents.

The HSE report that many deaths and injuries occur because of:

- Poorly maintained equipment
- Working near overhead cables
- Contact with underground cables during excavations
- Whilst working on 230V supplies
- Fires started by poor electrical installations and appliances

AC6.1 Identify the common electrical dangers encountered on construction sites and in private dwellings

Within this Assessment Criteria, the range will cover:

- Faulty electrical equipment
- Signs of damaged or worn electrical cables – power tools and property hard wiring system
- Trailing cables
- Proximity of cables to services pipework
- Buried/hidden cables
- Inadequate over-current protection devices

Electrical Dangers on Construction Sites and Private Dwellings

Electrical hazards are a major concern when working both on-site and in private dwellings. In most cases,
electrical hazards can be attributed to either:

• Lack of maintenance of electrical systems, cables and equipment
• Faulty, damaged, worn or misused electrical cables and equipment
• Trailing cables
• Buried or hidden cables
• Inadequate or incorrect fuse and over-current protection devices
• Overloading sockets and other outlets
• Using electrical equipment in damp or wet conditions

Working in Domestic Properties

When working in private dwellings, there are methods of working that will help to eliminate, as much as possible, those electrical hazards commonly found:

• Be aware of concealed cables in solid and studded walls. Using a good quality cable finder will help eliminate the potential hazard before any work is carried out on the wall
• Take care when lifting or replacing floorboards as there may be cables underneath
• Do not install pipework too near to electrical cables. Heating pipework can cause cables to overheat and faulty cables can arc across pipework causing a potential electric shock hazard. Pipework must be at least 25mm away from any cables and 150mm away from any electrical apparatus
• Do not overload sockets with too many electrical tools and appliances. This causes the sockets to overheat and is a potential source of fire. As a rule, one socket = one plug unless a recognised, independently fused multi-socket is used
• Keep a look out for any damaged cables, sockets, fitting and appliances and report any problems to the customer or the person in charge

AC6.2 Identify the methods of safely using electrical tools and equipment on site.

Within this Assessment Criteria, the range will cover:

• Battery powered supplies
• 110 volt supplies
• 230 volt supplies

Because of the dangers of 230V supply, construction sites use a reduced voltage system of 110V AC supply. Yellow coloured cables, plugs and sockets identify this. Where a workshop with fixed machinery is maintained on site, this is usually supplied via a 400V 3 phase supply (Colour coded Red), whilst site offices use a standard 230V supply (Colour coded Blue).

Other site and working conditions may use a variety of voltages depending on the working situation. Below
is a table showing the most common voltages, their uses and their colour coding:

<table>
<thead>
<tr>
<th>AC Operating voltage</th>
<th>Voltage colour coding</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>110V</td>
<td>Yellow</td>
<td>General site voltage</td>
</tr>
<tr>
<td>230V</td>
<td>Blue</td>
<td>Domestic and site offices</td>
</tr>
<tr>
<td>400V</td>
<td>Red</td>
<td>Fixed machinery</td>
</tr>
</tbody>
</table>

To avoid confusion, each of these voltages will have different plugs and sockets with different pin arrangements.

**110V Supply**

110V supply is used on construction sites mainly because it is much safer than the standard 230V supply used in domestic dwellings. With 100V supply, the effects of electric shock are reduced.

A 110V supply has a three pin configuration.

**230V Supply**

230V supply MUST NOT be used on construction sites unless it is supplied through a Residual Current Device, which immediately disconnects the supply in the event of a fault developing.

A 230V supply has a three pin configuration.

**400V Supply**

400V supply is used for supplying small industrial and commercial loads, usually for fixed machinery. A 400V supply has a four pin configuration.

**Battery Powered Cordless Tools**

Over the past few years, battery powered tools have become very popular on construction sites. Voltages range from 9V to 36V. They offer a freedom that can never be achieved with a power tool that you have to plug in to an electrical supply:

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wide range of tools available</td>
<td>• The power packs can wear out quickly with constant use and are expensive to replace</td>
</tr>
<tr>
<td>• They are generally smaller and lighter offering greater flexibility</td>
<td>• Most are not as powerful as mains supplied power tools</td>
</tr>
<tr>
<td>• No extension cords are necessary so tripping hazards are eliminated</td>
<td>• Multiple power packs are required because of the need for constant recharging</td>
</tr>
<tr>
<td>• Much less risk of a fatal electric shock</td>
<td>• An electric shock risk from the battery charger still exists</td>
</tr>
</tbody>
</table>
Cordless tools must still be inspected and tested with regard to:

- PAT testing of the battery charger
- Disposal of dead batteries in line with local authority guidelines as they contain nickel-cadmium
- Leaking batteries may contain acid, which is harmful if it comes into contact with the skin
- Dead batteries should not be incinerated as they are liable to explode

AC6.3 Identify how to conduct a visual inspection of a power tool for safe condition before use.

Within this Assessment Criteria, the range will cover:

- Checking for a valid PAT test
- Inspection for general condition

All electrical installations must comply with BS7671. The Health and Safety Executive recommends that this also includes an appropriate system of visual inspections and periodic testing. Many electrical hazards can be controlled by simply looking for visible signs of damage and wear and tear. This can be reinforced testing of systems and equipment, as necessary, by a competent electrician.

Visual Inspections and Testing

When an electrical system or piece of equipment is formally tested and inspected, the electrician will perform a number of tests to ensure that the system/equipment is fit for purpose. These include:

- A polarity test to ensure that the live and neutral are in the correct order i.e. the live is live and the neutral is neutral
- All fuses, RCDs and MCBs are working correctly and effectively
- All cables and cores are terminated securely and correctly
- All equipment is suitable for the working environment

Safety with Portable Power Tools

Before using any portable power tools, the following must be checked for:

- An in date Portable Appliance Test (PAT) label
- Signs of overheating, such as burn marks on the cable, plug, socket or the tool itself
- Bare and loose wires
- Signs of damage to the cable or flex such as cuts or abrasions
- The plug is in good condition and without damage
- The outer casing of the tool is free from cracks, scratches or other damage
- Non-standard or taped joints on the cable
- The power tool cable is of an appropriate length Extension cables must:
- Be positioned so that it is not a trip hazard
• Be fully unwound before use to prevent overheating
• Any RCD is working correctly
• The cable size is appropriate for the tool it is connected to
• If it is beyond repair, the plug and flex should be removed and the tool disposed of safely

Always remember!

• Wear appropriate PPE when using power tools
• Ensure the tool is switched off before connecting it to the electrical supply
• If the tool feels excessively warm during use, or it is sparking, have it checked by a competent electrician
• Disconnect the tool before adjusting blades and drill bits
• Use appropriate clamps or a vice to hold the work you are working on
• Tag any defective tool with an ‘Out of Service’ notice to prevent other staff using it
• Store power tools in dry, secure locations

Portable power tools such as drills, circular saws, jig-saws, angle grinders etc should be of the double insulated type. This means that the power tool has two levels of protective insulation built in to the tool. To check if a power tool is double insulated, simply look on the tool data plate for the symbol shown below:

Power tools must be subjected to rigorous safety tests. These include:

• User Checks – checking for worn and frayed cables, loose plugs, exposure of any conductive parts, casing cracks, loose attachments etc
• A formal inspection that must be scheduled in accordance with planned maintenance and the company health and safety policy
• A Portable Appliance Test (PAT), which must be carried out by a competent person, usually an external contractor.

Portable Appliance Testing

Portable Appliance Testing was introduced in 1989 to enable companies to comply with the Electricity at Work Regulations, which state that it is necessary to have in place a programme of inspection and testing of portable appliances. The correct name for the test is the ‘In-service Inspection & Testing of Electrical Equipment’ (as defined by IET/IEE and City and Guilds).
BPEC Level 2 Diploma in Plumbing Foundation

Records of tests and inspections must be kept up to date at all times. The test helps to:

- Ensure early recognition of any serious faults such as a poor earth
- Ensure the discovery of an inappropriate electrical supply
- Ensure the discovery of incorrect fuses
- Ensure that any misuse of the tool is monitored
- Ensure an increased awareness of hazards linked to electricity

The table below shows how often tools should be tested.

<table>
<thead>
<tr>
<th>Type of premises</th>
<th>Formal visual inspection</th>
<th>Combined inspection &amp; testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction sites 110V equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stationary equipment</td>
<td>Monthly</td>
<td>3 months</td>
</tr>
<tr>
<td>IT equipment</td>
<td>Monthly</td>
<td>3 months</td>
</tr>
<tr>
<td>Movable equipment</td>
<td>Monthly</td>
<td>3 months</td>
</tr>
<tr>
<td>Portable equipment</td>
<td>Monthly</td>
<td>3 months</td>
</tr>
<tr>
<td>Hand-held equipment</td>
<td>Monthly</td>
<td>3 months</td>
</tr>
</tbody>
</table>

AC6.4 State the procedure that should be applied for tools and equipment that fail safety checks.

Electrical power tools need to be treated with care if they are to give a long and useful life. Occasionally tools fail because of misuse or old age. If a defective tool is discovered during routine checks, then it is important
that the tool be taken out of use before it can do harm to the user.

The following procedure should be observed:

- The faulty tool should be reported to a competent person, manager or supervisor
- The fuse should be removed from the plug so that the tool cannot be used
- The tool should be labelled ‘Faulty. DO NOT USE’
- If it is beyond repair, the plug and flex should be removed and the tool disposed of safely

AC6.5 State the electrical industry safe isolation procedure that should be applied to building services equipment before carrying out work on them.

Plumbers are often required to work on electrical installations for replacement or repair of plumbing related electrical appliances and equipment, such as electric showers or central heating components. Plumbers are required, by law, to hold a recognized electrical qualification, such as the BPEC ‘Electricity for Plumbers’ certificate or Part P (BS7671) Certification if they are going to do any work on electrical systems. Part of this is knowing how to effect the safe isolation of electrical supplies so that the work can be undertaken.

In domestic properties, the electrical supply is 230V 50Hz AC single phase. The Electricity at Work Regulations state that working on ‘live’ installations must not be attempted unless it is impractical to work on the circuit dead. In other words, the electrical circuit must be ‘dead’ unless the only way to repair a faulty appliance is with the electricity on. In all other situations, the circuit must be switched off and the supply locked in the ‘off’ position. The circuit must then be proven as ‘dead’ before work is carried out. This MUST be carried out by using an approved voltage indicator such as a GS38 approved tester. Volt sticks, neon screwdrivers and multimeters are not suitable for proving a circuit is dead. Proving a circuit is dead is done using a recognized procedure called the ‘safe isolation procedure’. To safely isolate an electrical supply, you must:

1. Identify the circuit or the equipment to be worked on
2. Make sure that it is convenient to switch off the electricity supply
3. Isolate the supply at the consumer unit by switching off the Miniature Circuit Breaker (MCB) or Residual Current Device (RCD) and lock it off using a recognised lock. Keep the key to the lock with you
4. Place a warning notice at the consumer unit to indicate that the circuit is dead and must not be
switched on

5. Using an approved voltage indicator:
   a. Firstly, check the indicator is working on a known live supply; this is usually the proving unit
   b. Then use the voltage indicator to check that the circuit you wish to work on is dead by confirming there is no voltage between live and neutral, live and earth, neutral and earth. If the circuit is dead, there will be no reading of voltage
   c. Then re-check that the indicator is still working on the proving unit once again. When this is confirmed, the circuit is safe to work on.

**AC6.6 State the use of temporary continuity bonding when working on pipework components.**

Gas, water and central heating installations in domestic dwellings must be bonded to the main equipotential bonding of the electrical installation. In other words, the metal pipework must be earthed. When we cut into the pipework to make a connection, the earth bonding to the pipework is in effect disconnected downstream of the cut. If there is an earth fault on the electrical system, the pipework could become a lethal electric shock hazard. To prevent the pipework becoming live, temporary continuity bonding clips can be used to ensure that the earth bonding on the pipework is not interrupted.

Temporary Continuity Bonding involves the use of 2 crocodile clips joined by 10mm² multi-strand earth cable that must be installed either side of the cut before the cut into the pipe is made. After the connection has been completed, the clips can be removed.
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http://bpec.org.uk/qualification/18th-edition/
Learning Outcome 8

Know the methods of working safely with heat producing equipment in the building services industry
AC8.1 Identify the various types of gases used in pipe and sheet jointing processes

Within this Assessment Criteria, the range will cover:

- Bottle colours
- Properties of the gases used
- Uses within the industry including transport requirements and regulations

In the Building Services Industry, bottled gas, whether flammable or not, is a key part of everyday working. There are key gas types that we use for specific work situations. Bottled gas is dangerous and must be treated with respect if accidents and incidents are to be avoided.

Types of Gases used

The main gas types used are:

Propane (C₃H₈)

A highly flammable Liquid Petroleum Gas that has a boiling point of -45°C and a relative density of 1.5. This means that it is heavier than air, which can create dangerous situations because gas leaks will gather in the lowest spaces such as a drain, a cellar or under a floor.

Propane has a very distinctive smell of rotten eggs. The smell is created by adding a chemical called ethanethiol at the refinery. Propane is used during the soldering process.

Methyl Acetylene-Propadiene Propane (MAPP) (C₃H₄)

MAPP gas is a mixture of gases designed to give a hotter flame than normal propane. It was originally devised because the melting point of lead-free solders is higher than solder that contains lead and thus a slightly hotter flame is required.

It is supplied in small yellow cylinders and used for the soldering process. MAPP has a distinctive smell of
garlic and a relative density of 0.88, making it lighter than air.

**Acetylene (C₂H₂)**

Acetylene is used in conjunction with oxygen for welding and brazing. It is colourless and odourless but gives off a garlic-type smell when contaminated with impurities. Because acetylene burns with a very sooty carbon-rich flame, oxygen must be used to make the flame stable. It has a relative density of 0.9 making it lighter than air.

**Oxygen (O₂)**

Although not classed as a flammable gas, oxygen is a very powerful oxidising agent. This means that organic materials will burn fiercely when oxygen is present. It is used in conjunction with Acetylene to harden and stabilise the flame, increasing the flame temperature. Oxygen must never be used near jointing compounds or grease as oxygen reacts violently causing spontaneous combustion.

Oxygen has a relative density of 1.1 and so is slightly heavier than air.

**Bottle Colours**

<table>
<thead>
<tr>
<th>Bottled Gas</th>
<th>Cylinder Colour</th>
<th>Thread direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propane</td>
<td>SIGNAL RED</td>
<td>Left hand thread</td>
</tr>
<tr>
<td>MAPP (Methyl Acetylene-Propadiene Propane)</td>
<td>YELLOW</td>
<td>Left hand thread</td>
</tr>
<tr>
<td>Acetylene</td>
<td>MAROON</td>
<td>Left hand thread</td>
</tr>
<tr>
<td>Oxygen</td>
<td>BLACK</td>
<td>Right hand thread</td>
</tr>
</tbody>
</table>

**AC8.2 Identify how bottled gases and equipment should be safely transported and stored**

**Transporting compressed gas cylinders by road**

Transporting gas cylinders by road is subject to the Carriage of Dangerous Goods and Use of Transportable Pressure Receptacles Regulations 2009. Anyone carrying gas cylinders in vehicles must follow basic safety requirements.

Drivers should be trained in:

- The dangers and hazards of bottled gases
- The safe handling of gas cylinders
- Emergency procedures and the use of fire extinguishers

Records should be kept of any training undertaken by both the employer and employee and should be periodically supplemented by refresher training taking into account regulation changes.
Vehicles used to transport the cylinders should be open. If this is not possible, the vehicle must be well ventilated. Toxic gases MUST NOT be carried in closed vehicles under any circumstances, unless the vehicle has been specially adapted for the task. A 2kg dry powder fire extinguisher is a mandatory requirement on ALL vehicles carrying gas cylinders to fight cab and engine fires.

Cylinder valves must be closed whilst the cylinders are in transit and there must be no equipment fitted. All cylinders must be secured in the upright position and must not project beyond the sides or rear of the vehicle.

Any labels attached to the cylinders must not be removed as these are produced by the supplier in accordance with current regulations.

If a leak is suspected, the driver must park the vehicle in a safe place and contact the supplier immediately.

Storing Compressed Gas Cylinders

Gas cylinders are heavy and large. They are relatively unstable due to the small surface area in contact with the ground when compared to its height.

It is important to follow a few simple but important rules when storing gas cylinders. These can be found in the Liquid Gas Association Code of Practice 7 document.

1. Always store cylinders in a well-ventilated, covered area, preferably outside and on a level, well drained surface and in a lockable cage
2. Always store cylinders chained or secured in the upright position to stop them from toppling over
3. Store full and empty cylinders separately. Never mix full and empty cylinders
4. Empty cylinders should be marked ‘M/T’ (M/T means empty!)
5. Always rotate the cylinder stock so that the oldest cylinders are used first
6. Always separate the cylinders by the gas they contain i.e. flammable, inert, oxidant etc
7. Ensure that appropriate signs are in use
8. Never store LPG cylinders with other cylinders and ensure that there is at least 3m between LPG and other gases. The use of a fire wall as illustrated below is recommended
9. Locate gas stores away from sources of ignition and away from drains. Some gases are heavier than air and will settle near the floor and make their way into nearby drains and gulleys
10. Cylinders must not be stored or used below ground level or in high rise flats where LPG gas is prohibited by law
11. Do not keep LPG cylinders near to any corrosive, toxic or oxidant material
12. Propane cylinders may be used indoors in commercial and industrial premises only on a temporary basis, i.e. blowtorch use etc, but the cylinders must always be stored outdoors
14. When connecting hoses and blowtorches, always check for leaks with a suitable leak detection fluid
15. Always turn the cylinder off at the control valve when it is not in use

AC8.3 Identify the various types of heat producing equipment and how to check them for safety

Within this Assessment Criteria, the range will cover:

- Hoses (Colours used, thread directions, flashback arrestors)
- Control valves
- Gauges
- Blowpipes
- Direct connecting combined units (aeration in the nozzle)

Welding equipment – for use with oxy-acetylene gases

As well as the gas bottles, there are several vital pieces of equipment required before welding (be it steel welding, lead welding or brazing) can begin. The main components of a welding set are:

1. The cylinders of acetylene and oxygen. Each cylinder has a different thread for connecting the cylinder regulators. Acetylene has a left hand (reverse) thread while the Oxygen has a right hand thread.

2. A control valve to shut off the supply of gas. These are situated on the top of the bottle and require a square pattern bottle key to open and close them. Each bottle should have its own key, which should be left on the bottle so that a quick shut off can be initiated in the event of an emergency.
3. A **pressure regulator**, which is fitted to the control valve of the cylinder. These are used to regulate the pressure and flow of the gas from the cylinder. Most regulators work with a two-stage regulation system. The initial stage releases gas at a set rate from the cylinder with the second stage reducing the pressure. This is why each regulator has two pressure gauges. One gauge shows the gas left in the cylinder and the other shows the gas pressure being released.

4. A **flashback arrester** is fitted to prevent flame flashback into the cylinder. Flashback arresters must be fitted to both oxygen and acetylene gas lines to prevent any flame flashback reaching the gas regulators. Flashback is where the flame burns in the body of the torch. It is often accompanied by a high pitch whistling sound. It occurs when the flame speed exceeds the gas flow rate. The flame passes back into the mixing chamber and then back through the hoses.

5. **Welding hoses** convey the gas from the cylinders to the blowpipe. They are colour coded red for fuel gas and blue for oxygen. Hose fittings are threaded right hand thread for the oxygen line and left hand thread for the fuel gas line.

6. **Non-return valves**, fitted in conjunction with the flashback arresters, prevent the gas from flowing backwards in the fuel and oxygen lines.

7. The **welding blowpipe** is the part of the welding set that actually does the work. Most come with changeable nozzles so that different welding techniques can be used without the need for changing the whole blowpipe.

**AC8.4 Identify how gas heating equipment is safely assembled and used**

Within this Assessment Criteria, the range will cover:

- Equipment assembly sequence
- Leak detection procedures
- Safe purging procedure
- Safe lighting and extinguishing procedure
- Actions in the event of leakage
- Transportation

**Welding Equipment Safety Checks**

Before using welding equipment, it should be checked for its condition and its operation:

- Check that flashback arresters are fitted to both oxygen and acetylene lines
- The hoses are the correct colour with no sign of wear or damage
- The hoses are as short as possible to allow safe working, and not taped together
• The regulators are the correct for the type of gas being used
• A bottle key is fitted to each bottle
• The bottles are securely chained to the bottle trolley and that the trolley is in good condition

Over a longer period, it is recommended that:
• Oxy/acetylene bottles and equipment are serviced annually
• Regulators should be taken out of service every five years
• Flashback arrestors are replaced if flashback has taken place

Assembling of Heat Producing Equipment

Before assembling the equipment, you must check that:
• There are no physical signs of damage to the cylinder
• There are no signs of damage to the check valve assembly
• The acetylene and oxygen cylinders are in a vertical position and away from the direct work area
• The chains or other devices used to secure the acetylene and oxygen cylinders are secure

Then:
• Make sure that each regulator is the correct type for the cylinder and that the regulator is designed for the pressure of the cylinder
• Open the oxygen valve assembly briefly before attaching the oxygen regulator to eliminate any dust in the threads as this could cause an explosion
• NEVER open the acetylene control valve to ‘blow-out’ any dust. Acetylene is flammable and it could cause a fire
• Inspect the regulator and cylinder valve for any oil or grease. DO NOT USE if any are found
• Check the adjustment screw on the regulator for damage
• Wipe the connection seats with a clean, grease and oil free cloth
• Connect the gauges to the cylinders. Oxygen hoses are blue, and acetylene hoses are red. The acetylene hose will have left hand, male threads to prevent accidental switching of the two hoses/gauges. Tighten them with the correct size open-ended spanner. Care must be taken not to damage the brass threads. Do not overtighten or the brass thread could snap
• Check the condition of the flash back arrestors and non-return valves. Make sure they are correctly fitted to the gauges
• Inspect the torch. Check that:
  o Inlet connections are in good condition for a tight connection
  o Check for obvious physical damage on the torch
• Ensure the acetylene regulator is turned off. This is done by opening the regulator handle anti-clockwise a few turns. Once this has been done, the gas valve on top of the cylinder can be turned on. Only turn the control valve half a turn. This allows the bottle to be turned off quickly in an emergency. DO NOT allow acetylene gas pressure to exceed 15psi. Any higher than this and acetylene may become unstable and may ignite spontaneously or explode:
After turning on the acetylene cylinder control valve, open the regulator by turning the handle clockwise. This should be done very slowly, while watching the low pressure gauge. Open until the pressure is between 5 and 8psi.

Open the gas valve on the blow pipe to purge the air from the acetylene hose. Check the low pressure gauge to see if the pressure remains steady when the gas is flowing. This ensures you have the regulator set correctly.

Close the acetylene valve on the torch.

Check for leaks by using leak detection fluid suitable for oxy-acetylene equipment.

Turn the oxygen regulator pressure off by turning the regulator handle a few turns anti-clockwise.

To adjust the oxygen pressure:

- Open the oxygen cylinder control valve fully.
- Open the regulator valve slowly, watching the low pressure gauge at the same time until the pressure reads between 25 and 40psi.
- Open the oxygen valve on the blowpipe to allow the air to vent from the hose until the hose is purged. This takes around 3 to 5 seconds for an 8 metre long hose.
- Close the blowpipe valve.
- Check for leaks by using suitable leak detection fluid.

Both acetylene and oxygen hoses must be purged before igniting the torch otherwise serious injury to personnel and damage to the equipment could occur.

Safe lighting and extinguishing procedures for oxy-acetylene equipment

To light:

1. Open acetylene blowpipe valve ¼ turn and light the acetylene with a spark lighter (not gas lighter)
2. NEVER LIGHT THE OXY/ACETYLENE TORCH WITH A MIXED GAS CONDITION
3. Adjust acetylene flame to the correct velocity
4. For welding mild steel, open the oxygen blow pipe valve and adjust to neutral flame with a bright blue inner cone. This is equal amounts of acetylene and oxygen.
5. For Brazing or Bronze welding, open oxygen blowpipe valve and adjust to a slightly oxidizing flame with a light purple cone. This is achieved by having slightly more oxygen than acetylene.

Note: Too much acetylene will produce a cool, yellowish carburising flame that produces soot.

To extinguish:

6. Close acetylene blow pipe valve first, then close oxygen blowpipe valve
7. Turn off both acetylene and oxygen control valves on the cylinders
8. Turn the acetylene regulator handle anti-clockwise until it is loose
9. Open acetylene blow pipe valve to release the pressure off the regulator
10. Close the acetylene blowpipe valve
11. Turn the oxygen regulator handle anti-clockwise until it is loose
12. Open oxygen blow pipe valve to release the pressure off the regulator
13. Close the oxygen blow pipe valve

What to do in the event of leakage

If you smell acetylene:

- **NEVER** use a naked flame to check for leaks. Both acetylene and oxygen dangerous. Check for leaks using a leak detector solution that is compatible with oxygen and acetylene before starting work
- **NEVER** use a leaking cylinder. If the cylinder leaks:
  - Immediately close cylinder valve
  - Label the bottle as “leaking”
  - Take the cylinder outdoors as clear of any buildings as possible and post ‘no smoking’ and ‘keep clear’ signs
  - Call the gas supplier, inform them that a cylinder is leaking and request they collect the cylinder as soon as possible.

LPG (Propane) Regulators, Hoses and Blowtorches

The image to the right shows a typical layout for a traditional blowtorch used with LPG (Propane). There are five key components:

- The burner, often called the nozzle. This is the ‘business end’ of the torch. The burners are connected to the handle using threaded nipples. The burner size varies depending on the job it has to do. The larger the burner, the bigger the fitting that can be soldered
- The handle comes in many forms, some of which are ergonomically designed to feel comfortable in the hand when being used
- The regulator keeps the gas pressure constant so that the torch works constantly under all conditions. Some regulators are adjustable with different pressure settings
- The hose has to be fireproof to EN ISO 3821. Most come with anti-blowback fittings
- The LPG cylinder comes in many sizes. These range from 3.9kg to 47kg.

There are many different kinds of plumbers’ blowtorch available. Most have interchangeable aeration nozzles. Some blowtorches do not need a hose or regulator set as they connect directly on to a small 400g gas cylinder. Blow torches are manufactured to BS EN 9012:2011 and must conform to the Pressure Equipment Regulations 1999.

Assembling and testing LPG Blowtorches and Cylinders

Firstly, check that the blowtorch, hose and regulator are in good condition and free from damage. Where
required, blowtorches should only be used in conjunction with a British/European Standard regulator.

It is important to check that the regulator;

1. Gives the correct pressure for the blowtorch
2. Is suitable for the gas being used
3. Has a large enough maximum flow for the blowtorch

Before connecting a regulator to a cylinder, always check that the mating parts are clean, free from dirt and undamaged. Do not use jointing compound or PTFE tape. The unions on the regulator and the cylinder are ground faced and should be smooth and grease free. The connecting nut of the regulator must be spanner tightened to the cylinder valve. Care should be taken as the thread is left-handed. Do not overtighten the nut.

After connecting regulator, hose and blowtorch, check that there is no leak of gas before using. Propane has a distinctive smell and a leak can usually be detected immediately by this fact. If a leak is suspected, extinguish all naked lights and close the cylinder valve. NEVER look for a leak with a naked flame, but trace it by smell and confirm the leak by brushing leak-detecting fluid over the suspected joint. Equipment must not be used until the leak is cured.

**Turning off after use**

After using the blowtorch it is **IMPORTANT**:

1. That the cylinder valve is closed first as this allows the gas in the system to burn off
2. That the blowtorch control valve is then closed to ensure that when the torch is used again, turning on of the cylinder valve will not allow gas to escape from the blowtorch before being ignited

**AC8.5 Identify the three elements of the fire triangle and how combustion takes place**

Combustion is a chemical reaction in which a substance reacts violently with oxygen to produce heat and light. The substance is known as fuel and can be a solid such as wood or paper, a liquid such as petroleum spirit or a gas such as propane. A third element is required for the reaction to take place. This is known as a source of ignition.

These three elements combine into the ‘fire triangle’.

For the reaction to take place, all three elements need to be
present. Remove any one of them and combustion will not occur.

Fuel can be removed in 3 ways:

1. Natural removal as the fuel is consumed by the fire
2. Mechanical removal by taking the fuel away, or
3. Chemical removal by making the fuel incombustible

Removal of the oxygen will result in the fire extinguishing itself because the fuel has nothing to react with. This is called suffocation and there are several ways that we can do this:

- By removing the oxygen
- By replacing the oxygen with carbon dioxide, such as a CO2 fire extinguisher
- By the use of powder which starves the fire of oxygen, such as a powder fire extinguisher
- By the use of foam. This again denies the fire of oxygen and so the fire extinguishes itself

Without an ignition or heat source, fire will not begin. Remove the heat and the fire will die out. When water is poured on to, say, a solid material fire, then the water removes the heat in the form of steam. The heat from the fire is transferred to the water, which then undergoes a change in state to steam. This effectively removes the heat from the fuel and the fire goes out.

These basic processes are the basis for almost all firefighting techniques that are used to extinguish fires every day.

**AC8.6 State the dangers of working with heat producing equipment and how to prevent fires occurring**

As we have already discussed, there are three elements required before a fire will start – fuel, oxygen and ignition. In most working environments, it is virtually impossible for these not to be present. To prevent fires, the quantities and locations of fuel sources must be controlled and kept away from any source of ignition. However, in the plumbing industry, we actively work with both fuels AND sources of ignition almost every day.

**Common sources of ignition include:**

- Boilers
- Heaters
- Electrical tools and appliances
- Processes that use heat such as welding and soldering

**Hot working, fire prevention**

Hot work is any temporary or permanent operation involving open flames or producing heat and/or sparks. This includes, but is not limited to, brazing, cutting, grinding, soldering, torch applied roofing and welding. The definition of hot work can be applied to activities on a campus such as periodic/planned maintenance
activities, new construction work and emergency repairs.

Adequate precautions and control over any hot work is paramount in preventing fires occurring. To help prevent fire in the workplace, a risk assessment should identify what could cause a fire to start, i.e. sources of ignition (heat or sparks) and substances that burn, and the people who may be at risk.

Once you have identified the risks, you can take appropriate action to control them. Consider whether you can avoid them altogether or, if this is not possible, how you can reduce the risks and manage them. Also consider how you will protect people if there is a fire.

Key points to remember:

- Think about the risks of fire and explosions from the substances you use or create in your business and consider how you might remove or reduce the risks
- Use supplier safety data sheets as a source of information about which substances might be flammable
- Consider reducing the amount of flammable/explosive substances you store on site
- Keep sources of ignition (eg naked flames, sparks) and substances that burn (eg vapour, dusts) apart
- Get rid of flammable/explosive substances safely
- Review your risk assessment regularly
- Maintain good housekeeping, eg avoid build-up of rubbish, dust or grease that could start a fire or make one worse

Many companies require a written permit to work before any kind of work involving naked flames is allowed. This is known as ‘Hot working’. The permit details the type of work to be done, how and when the work is to be carried out and the estimated length of time the work will take. Anyone undertaking hot work MUST hold a public liability insurance cover.

For any hot work operations where combustible material exists, these are to be removed wherever possible. There may be times when a fire watch is needed when some hot work has been carried out where floors above and below the work area have been exposed to falling solder, sparks and smoke.

AC8.7 State the method for fighting small localised fires that can occur in the workplace.

Within this Assessment Criteria, the range will cover:

- Tackling fires to aid escape
- Types of extinguisher
- Selection of extinguisher by fire type
- Method of use
- Evacuation procedures
Tackling Fires

Work places must contain some method of fighting a fire. However, unless staff are properly trained in basic firefighting techniques, they put themselves and others at risk by using firefighting equipment. It is vital that all staff are made aware who is trained and when it is safe to attempt to control and contain a fire, rather than evacuate the area.

As a general rule, firefighting equipment should only be used to limit the spread of a fire to enable the building’s safe evacuation. In all situations, it is important that the fire alarm is raised immediately and the fire service called out.

The overriding concern with tackling any fire is personal safety. Firefighting should stop if:

- The safety of yourself and others is at risk
- There is a risk of the escape route being cut off
- The fire is beginning to spread
- The room is filling up with smoke
- The fire extinguisher is ineffective against the fire
- The fire extinguisher becomes empty

The overriding message regarding firefighting is a simple one – if in doubt, **GET OUT!**

Types of Fire Extinguishers and Fire Type

Before using a fire extinguisher it is vital that the type of material involved in the fire is identified:

- **Class A:** SOLIDS such as paper, wood, plastic etc
- **Class B:** FLAMMABLE LIQUIDS such as paraffin, petrol, oil etc
- **Class C:** FLAMMABLE GASES such as propane, butane, methane etc
- **Class D:** METALS such as aluminium, magnesium, titanium etc
- **Class E:** Fires involving ELECTRICAL APPARATUS
- **Class F:** Cooking OIL & FAT etc

Each of these classes of fire will require a specific fire extinguisher. New extinguishers should conform to BS EN 3, which requires that the entire body of the extinguisher be coloured red. A zone of colour of up to 5% of the external area can be used to identify the contents and these are shown below.

<table>
<thead>
<tr>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
<th>Class D</th>
<th>Class E</th>
<th>Class F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Special Wet Chemical fire extinguisher</td>
</tr>
<tr>
<td>Foam</td>
<td>Foam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Powder</td>
<td>Powder</td>
<td>Powder</td>
<td>Powder</td>
<td>Powder</td>
<td></td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>Carbon dioxide</td>
<td>Carbon dioxide</td>
<td>Carbon dioxide</td>
<td>Carbon dioxide</td>
<td></td>
</tr>
</tbody>
</table>
Water filled fire extinguisher

The cheapest and most widely used fire extinguisher. However, it is only suitable for use on Class A fires involving solid fuels such as wood, paper, fabrics etc.

Dry powder fire extinguisher

Often termed the ‘multi-purpose’ extinguisher, as it can be used on classes A, B & C fires. It is specifically used on liquid fires (Class B) and will effectively extinguish (Class C) gas fires. However, you should be aware that it could be dangerous to extinguish a gas fire (Class C) without first isolating the gas supply. Special powders are available for class D metal fires.

Foam filled fire extinguisher

Used for Classes A & B fires. Foam spray extinguishers are not recommended for fires involving electricity, but are safer than water if inadvertently sprayed onto live electrical apparatus.

CO2 fire extinguisher

Carbon Dioxide is ideal for fires involving electrical apparatus, and will also extinguish class B liquid fires, but has NO POST FIRE SECURITY and the fire could reignite. Care should be taken because CO2 effectively replaces the air to suffocate the fire and their use carries an asphyxiation risk, especially in confined spaces.

Method of use

The following information is from http://www.fire.london.ca/FireExtinguish.htm. It details the correct procedure for dealing with small fires:

There is a simple way to remember the steps to take when using a portable fire extinguisher. Start by standing at least 3 metres back from the fire, then follow the acronym P.A.S.S.

- **Pull** the pin on the extinguisher. The pin is there as a safeguard and locks the handle. Pulling it out enables it for use.
- **Aim** low. The hose or nozzle should be pointed at the base of the fire to be effective.
- **Squeeze** the lever above the handle. This will shoot the extinguishing substance from the hose or nozzle. Keep in mind that most small extinguishers will run out of their extinguishing agent in 10 to
25 seconds.

- **Sweep from side to side.** Move slowly toward the fire, keeping the hose or nozzle aimed at the base of the fire. If the flames appear to be out, release the handle and watch closely. If the fire re-ignites, repeat the process.

**Keep In Mind:**

- Before you use an extinguisher to fight small fires, make sure everyone has left the area and that the fire service has been called by dialling 999
- Always have an exit route behind you. Never let the fire get between you and your escape route
- Call the fire service to inspect the fire area, even if you are sure you have extinguished the fire

**Evacuation Procedure**

In most premises, the evacuation in case of fire will simply be by means of everyone reacting to the warning signal given when a fire is discovered, then making their way, by the means of escape, to a place of safety away from the premises.

In some cases, there may well be a fire emergency evacuation plan (FEEP) which is a written document that includes the action to be taken by all staff in the event of fire, and the arrangements for calling the fire brigade. It can include any relevant information in relation to the FEEP.

Fire safety and evacuation plans will include:

- A clear passageway to all escape routes
- Clearly marked escape routes that are as short and direct as possible
- Enough exits and routes for all people to escape
- Emergency exits and routes for all people to escape
- Emergency doors that open easily
- Emergency lighting where needed
- Training for all employees to know and use the escape routes
- A safe meeting point for staff
Learning Outcome 10

Know the methods of safely using access equipment in the building services industry
Within this Learning Outcome, there are five Assessment Criteria:

**AC10.1.** Identify the situations where it may be necessary to work at height.

**AC10.2.** Identify the types of equipment used to permit work at heights in the building services industry.

**AC10.3.** Identify how to select suitable equipment for carrying out work at heights based on the work being carried out.

**AC10.4.** State the range of safety checks to be carried out on access equipment before it is used.

**AC10.5.** State the method of assembly and use of access equipment.

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**AC10.1 Identify the situations where it may be necessary to work at height.**

Working at height remains one of the biggest causes of fatalities and major injuries. Common cases include falls from ladders and through fragile surfaces. ‘Work at height’ means work in any place where, if there were no precautions in place, a person could fall a distance liable to cause personal injury (for example a fall through a fragile roof).

There are many situations in the Building Services Industry where work is carried out above ground level. Some of this work will take place at heights up to 1.5m without the assistance of step ladders or some other working at height apparatus. However, there will be situations where working above 1.5m cannot be avoided. In these situations, the equipment we use needs to be chosen carefully and wisely if serious accidents are to be avoided.

There are many different types of equipment that can be used when working at height. Each of these has specific uses and should not be used outside of its limitations. Access for working at height equipment includes:

- **Stepladders** – generally used for light indoor work but can also be used outside provided that the ground is level and firm
- **Ladders** – These are used primarily for access to scaffolds but can be used for light work at high level such as fixing soil and vent pipes, rain water pipes etc
- **Roof ladders** – These are not stand-alone ladders and must be used in accordance with a standard extension ladder. They are used for light work that is required on the roof such as lining a chimney
- **Tower scaffolds (mobile and fixed)** – tower scaffolds are used where the work at high level is to continue for a period of time, such as fixing pipework at high level
- **Tubular scaffolds (fixed)** – there are many situations where a plumber might work from a scaffold, such as installing gutters or lead roof work
- **Mobile elevated working platforms and mobile mini tower scaffolds** – used for short duration work where the use of a ladder or fixed tower scaffold is impractical or impossible
The type of access equipment used on a job will depend on many factors. We must consider the following:

- First, assess the risk. The Working at Height Regulations gives specific guidelines for working at height. See image above:

- Factors to consider are:
  - Has a risk assessment been carried out?
  - Is a safe system of work in place?
  - Is the person doing the work competent to work at height?
  - The height of the work
  - The type of access equipment that will be used
  - How long will it take?
  - How often will the work be carried out?
  - The type and condition of the surface being worked on
  - The environment. Is the work outside or inside? What is the condition of the ground where the access equipment is to be erected?
  - The working conditions, ie the weather
  - The risks to safety of everyone in the area where the work is being carried out

The HSE state that wherever possible, working at height should be avoided. It recommends:

‘Avoid work at height where it’s reasonably practicable. This means balancing the level of risk against the measures needed to control the real risk in terms of money, time or trouble. However, you do not need to take action if it would be grossly disproportionate to the level of risk.’
‘Where work at height cannot be easily avoided, prevent falls using either an existing place of work that is already safe or the right type of equipment.’

‘Minimise the distance and consequences of a fall, by using the right type of equipment where the risk cannot be eliminated.’

AC10.2 Identify the types of equipment used to permit work at heights in the building services industry.

Within this Assessment Criteria, the range will cover:

- Step ladders
- Ladders
- Harnesses
- Roof ladders and crawling boards
- Mobile tower scaffolds
- Fixed scaffolds and edge protection
- Mobile elevated work platforms including scissor lifts and cherry pickers

**Step ladders**

Stepladders are manufactured from either timber, aluminium or glass reinforced plastic (GRP). They are available in various sizes and heights.

Modern stepladders incorporate a locking bar between the back and front frames so that the ladder can be locked into place to prevent the steps from collapsing. The locking bar also helps to maintain the ladders at the correct angle.

Timber step ladders are susceptible to damage, warping and twisting, whereas the aluminium and GRP type stepladders are much lighter, stronger and rot proof.

**Ladders**

Ladders are used mainly as access to scaffolds but can be used for light work at high level providing care is taken in their use.

All ladders that are manufactured and sold within the UK must comply with EU legislation, and classified correctly. These requirements apply to all portable ladders including stepladders, platforms, and extension ladders. However, special single use ladders such as pole ladders, all fixed access ladders such as loft ladders and static roof ladders are not included in the standards.

The standards are:

- Timber ladders manufactured to BS1129: 1990 (British)
- Aluminium ladders manufactured to BS2037: 1994 (British)
• Timber and Aluminium ladders to EN131: 1993 (European)

There are three classifications of ladder:

1. Class 1
2. Class EN131
3. Class 3

Each class of ladder indicates the safe working load that a ladder can support, including the weight of a single person and their equipment. It is known as the ‘maximum static load’.

<table>
<thead>
<tr>
<th>Duty Rating</th>
<th>Max Static Vertical Load</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I Industrial 175kg</td>
<td>130kg</td>
<td>175kg</td>
</tr>
<tr>
<td>Class EN131 Commercial 150kg</td>
<td>115kg</td>
<td>150kg</td>
</tr>
<tr>
<td>Class III Domestic 125kg</td>
<td>95kg</td>
<td>125kg</td>
</tr>
</tbody>
</table>

The standards detail dimensions, markings and testing requirements such as deflection, torsion, rigidity, straightness, loading and performance.

Ladders are colour coded, according to their classification, to make identification easier:

• Class 1 Ladders - blue
• Class EN131 Ladders - green or yellow
• Class 3 Ladders - red

Ladder Types

There are several different types of ladders and each one is used for a specific purpose:

1. **Single section ladders** – made to Class 1 standard from both aluminium and timber. They can be found up to 10m in length and are often called standing ladders.
2. **Extending or multi-section ladders** – these generally consist of two or three sections which can be opened up to make the ladder longer. Various lengths are available from 2.5m to 3.5m. When extended, a typical extending ladder can reach 8m and is suitable for most 2 storey properties. 3 section ladders extend to 10m.

Small multi-section ladders are often extended by hand. 3 section ladders may need a rope and pulley system to enable them to be extended.

Generally multi-section ladders are made from timber, aluminium or GRP.

3. **Roof ladders** – Often called Cat ladders, these are designed specifically for working on pitched roofs. They are not a standalone ladder and must always be used in conjunction with a scaffold and NOT a ladder.

The roof ladder is fitted with a set of wheels and this allows the ladder to be pushed up the roof without damaging the tiles. At the top is a hook which simply hooks over the roof ridge to stop the ladder from sliding down the roof. Care must be exercised when using a roof ladder and a safety harness should always be worn.

**Crawl boards** – These should be used with great care and should only be used for gaining access to fragile roofs. They work by spreading the weight of a person to prevent the roof from giving way. They should be used for access only and not for tools or materials.

**Harnesses (Work Restraint System)**

A work restraint system is a fall-prevention system, which relies upon personal protective equipment, consisting of a harness and a lanyard, which is adjusted or set to a fixed length that physically prevents the person from getting to the place where they could fall. This system requires close supervision. While it is normal to use a specific work-restraint lanyard for this purpose it is acceptable to use a fall-arrest lanyard, provided the lanyard and energy absorber are correctly sized and used.

Harnesses that form part of a personal fall arrest system; this system uses a harness connected to a reliable anchor point to prevent the user hitting the ground. The harnesses are designed to limit the forces on the body using an energy absorbing device.

It should be noted that this type of fall arrest harness should only be used where all other collective measures cannot be used.

**Mobile and Fixed Tower Scaffolds**

There are two types of tower scaffold. These are:

1. **Mobile towers** – these can be moved to different locations when required
2. **Static towers** – these are fixed in one position and cannot be moved without dismantling and re-erecting

Both of these can be made from individual tubular scaffold components and constructed in-situ. Most
modern tower scaffolds are made from proprietary components that simply fit together using standard sections. Correct erection is essential and certification in tower scaffold erection is essential.

1) Mobile Tower Scaffolds

These scaffolds are mainly used for light, short duration work such as installing soil and vent pipes. They are often made from light materials such as aluminium or glass fibre.

Mobile tower scaffolds should only be used where the ground is firm, smooth and reasonably level so that the stability of the scaffold is not compromised. All wheels must be lockable and kept locked in place when the scaffold is being used.

The scaffold must only be moved by pushing or pulling from the bottom of the scaffold and must never be moved by pulling from the top. Mobile tower scaffolds must never be moved with people or tools/materials still on them.

The Use of Outriggers

Outriggers are extensions to the scaffold base width that are used to stabilize the scaffold when erected. Outriggers can be used to increase the surface area of the scaffold and this would allow the scaffold to be raised to a greater height. For example:

If a tower scaffold measures across its base 2m x 1.5m, then by taking the short side of 1.5m and multiplying by 3:

\[ 1.5 \times 3 = 4.5m \]

In this case, the scaffold can be raised to 4.5m. Using outriggers, the base size is increased to say 3m x 2.5m, then:

\[ 2.5 \times 3 = 7.5m \]

The scaffold can be raised to 7.5m high.

2. Static Tower Scaffolds

This scaffold is constructed from standard tubular scaffold components using regular scaffold clips and is strengthened by the traditional scaffolding methods of horizontal ledgers and diagonal braces. It should be designed to carry a maximum weight of 150kgm², which should be spread over the whole of the working platform. Access to and from the scaffold can be via a ladder fixed inside the scaffold or by a ladder fastened to the outside of the tower. However, care must be taken when using external ladders that the stability of the tower is not compromised.

As an alternative, proprietary static tower scaffolds are available. These are constructed using ‘H’ shaped welded steel or aluminium sections that simply interlock together to form a strong tower. These scaffolds,
although very easy to erect, are often expensive, often heavy (being made from steel) and not as adaptable as other static towers scaffolds.

Tubular Scaffolds (Fixed)

There are two main types of tubular scaffold that can be found on construction sites. These are:

1. The independent scaffold
2. The putlog scaffold

The Independent Scaffold

This type of scaffold stands completely independent of the building. It is tied to the building for safety and stability. The main uses for the independent scaffold are:

- Access for brickwork/stonework on masonry buildings
- Access to solid or reinforced concrete structures
- Maintenance and repair work

The independent scaffold consists of two sets of vertical uprights, called standards, joined together by horizontal ledgers that support the scaffold boards. The structure is strengthened by diagonal tubes called transoms. The standards must be upright but tilted slightly toward the building. The inner row should be as near to the building as possible and but no more than 375mm away from the wall. Cross braces at every working platform (called a ‘lift’) add strength and stability by triangulation.

The ground that the scaffold stands on should be firm and level and base plates should be used under every standard. Wooden sole plates 225mm in width x 38mm thick should be used under the base plates. The scaffold is usually tied to the building through windows and openings.

The Putlog or dependent Scaffold

Also known as the ‘bricklayers’ scaffold’, the putlog scaffold has only one row of standards. This means that the building supports the scaffold with the ‘putlogs’, which are short scaffold tubes with one end flattened, directly inserted into the brick work joints.

The putlog scaffold is usually erected as the building progresses. The working platform is supported by the putlogs, which are in turn supported by the brickwork.

The putlogs should never be removed, or the scaffold may collapse. The scaffold should be tied to the building at least every 4m vertically and 6m horizontally.

General information for Fixed Tubular Scaffolds

a) Access and egress from tubular scaffolds – the usual way to access a scaffold is from a correctly fixed and secured ladder. A suitable gap must be left in the handrail and toe boards and the ladder must extend at
least 5 rungs (or 1m) past the working platform, the final rung ideally being slightly above the platform so that the operative steps down on to it. The gap between the ladder and the toe board/hand rail should be not more than 500mm.

b) **Guardrails and toe boards** – access platforms more than 2m high must have guardrails, brick guards and toe boards. These are necessary to prevent materials and tools etc. from either rolling off or being accidentally kicked off the edge of the working platform. They must be fixed to all open edges of the working platform.

c) **Working Platforms** – the following points should be observed:

- Materials must be spread as evenly as possible
- Gaps between working platform boards should be kept as small as possible
- Working platforms must be kept free from ice, snow, grease and all other hazards

- BS 2482 specifies timber scaffold boards must have a width of **225mm** and a thickness of **38mm**
- Boards must lay evenly on their supports
- Boards must not project more than 4 x its thickness beyond its end support, and no less than 50mm beyond
- All board ends must be bound with a steel strap to prevent splitting
- Split or damaged boards must be discarded.

**Mobile Elevated Working Platforms**

Mobile Elevated Working Platforms (MEWPs) include:

- Cherry pickers,
- Scissor lifts
- Vehicle mounted booms.

MEWPs provide a safe way of working at height when the use of a ladder or scaffold not possible or practical. They can be used inside or outside a building. They must only be used by trained operatives.

It must be remembered that:

- The employer must choose the right MEWP for the task; and
- Identify and manage the risks involved with using a MEWP

MEWPs are extremely dangerous if misused or not properly maintained. For this reason, a series of safety checks should be performed before they are used:

- All gates and safety barriers must be in the closed position before use
AC10.3 Identify how to select suitable equipment for carrying out work at heights based on the work being carried out.

Once the hazards and risks of working at height have been identified, steps can then be put in place to ensure that the hazards and risks are controlled and people are kept safe. Selecting the correct equipment for working at height means thinking about:

1. Eliminating the working at height hazards
2. Isolating people from the working at height hazards
3. Minimizing the distance and impact of the fall (nets, airbags etc)

Considerations for choosing the correct equipment

<table>
<thead>
<tr>
<th>ELIMINATE</th>
<th>ISOLATES the height hazard</th>
<th>WORK EQUIPMENT</th>
<th>GROUP CONTROL</th>
<th>PERSONAL CONTROL MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIRABLE</td>
<td>Eliminate the height hazard by avoiding work at height if you can. If you don’t need to go up there, don’t! For example, by assembly at ground level.</td>
<td>edge protection systems, barriers, scaffolding, guardrails, multi-user MEWP</td>
<td>total restraint system, single user MEWP, platform (podium), ladder, mobile guardrail system</td>
<td></td>
</tr>
<tr>
<td>UNDESIRABLE</td>
<td>Minimises height and the consequence of the height hazard</td>
<td>safety nets at high level, soft landing systems</td>
<td>work positioning systems, industrial rope access, fall arrest system</td>
<td></td>
</tr>
<tr>
<td>UNDESIRABLE</td>
<td>Minimises the consequence of the height hazard</td>
<td>safety nets at low level (&lt;6m), remote soft landing systems</td>
<td>lifejackets, inflatable airbags</td>
<td></td>
</tr>
<tr>
<td>UNDESIRABLE</td>
<td>Minimises through management controls</td>
<td>trestles, hop-up trestles, platforms</td>
<td>ladders, stepladders, stilts</td>
<td></td>
</tr>
</tbody>
</table>
Ground and working conditions

Soft ground, sloping ground, traffic and obstructions are just some of the working conditions that may need to be considered when choosing the correct equipment for working at height.

Distance to be negotiated for access and egress

Ladders are unlikely to be suitable for higher access and egress.

Distance and consequences of a fall

A safety harness would be ineffective if the deployment length was greater than the fall height because the user would hit the floor before the system could deploy.

Duration and frequency of use

Long duration, high frequency of use work may require a safer working platform eg a tower scaffold rather than a ladder. However, ladders may be suitable for short duration low-risk work.

Evacuation and rescue

If evacuation from a fixed platform, such as a tower scaffold, is going to be difficult, choose other work platform, for example a Mobile Elevated Working Platform (MEWP).

Additional risk posed by the installation and removal of work equipment

A Mobile Elevated Working Platform (MEWP) used by a single person may be less of a risk than two or three people erecting a tower or scaffold for one person to work safely.

AC10.4 State the range of safety checks to be carried out on access equipment before it is used

Within this Assessment Criteria, the range will cover:

- Step ladders
- Ladders
- Harnesses
- Roof ladders and crawling boards
- Mobile tower scaffolds
- Fixed scaffolds and edge protection
- Mobile elevated work platforms including scissor lifts and cherry pickers

‘Every employer shall so far as is reasonably practicable ensure that the surface and every parapet, permanent rail or other such fall protection measure of every place of work at height are checked on each occasion before the place is used.’ The Work at Height Regulations 2005.

Before using access equipment such as ladders, scaffolds, harnesses and any working platforms they must...
be checked to ensure that they are fit for use and suitable for the job to be done.

Stepladders

These must not be used if they are broken, damaged, show visible signs of repair or have parts missing. They should be checked to ensure:

- That they have not been painted. Painting can hide defects
- They are showing no signs of wood rot
- They have not warped or twisted in any way
- They are stable when erected
- That the rubber feet are intact and in good condition

If defects are found, then a notice should be displayed and the defects reported to a manager or supervisor.

Ladders

Ladders, roof ladders and crawl boards should not be used if any of the following points are found prior to use:

- Broken, missing or makeshift rungs
- Broken, weakened or repaired stiles
- Broken or defective ropes, guide brackets, latching hooks or pulley wheels
- They must not be painted. Paint can hide defects on wooden ladders
- If they have missing safety feet
- Ladders must be erected properly with a ratio of 4:1 or 75°
- Ladders must be properly lashed or secured to prevent slipping
- They must be checked to ensure that they are of the correct classification for the work to be done

Harnesses and Lanyards

There should be a regime for the inspection of harnesses and lanyards that is drawn up by a competent person.

These will include:

- The harnesses/lanyards to be inspected (including their unique identification)
- The frequency and type of inspection (pre-use checks, detailed inspection and, where appropriate, interim inspection)
- Designated competent persons to carry out the inspections
- Action to be taken on finding defective lanyards
- Means of recording the inspections
- Training of users
A means of monitoring the inspection regime to verify inspections are carried out accordingly

All harnesses and lanyards should be subject to:
- pre-use checks
- check for small cuts of 1mm in the edges
- softening or hardening of fibres
- ingress of contaminants
- detailed inspections
- interim inspections (as appropriate)

Static Tower Scaffolds

Points to remember:

- Towers must be inspected annually by a competent person and must be correctly erected
- Scaffold tubes and boards must not be painted
- Tubes must be straight
- Tubes and fittings must be undamaged and corrosion free
- The ground that the tower is erected on must be firm and even, if possible
- Base plates must always be used. Adjustable base plates can be used on ground that has different levels or is uneven
- If the tower is to be used on soft ground, sole plates must be used to provide even weight distribution
- All couplers must be load bearing
- Horizontal members must be fixed to uprights with the exception of transoms under the working platform
- Towers must be diagonally braced
- Foot ties must be fitted as low as possible
- The working platform must always be close boarded
- Overhanging boards must not exceed 4 x the thickness of the boards and must not be less than 50mm past the support
- All working platforms must have toe boards and if working above 2m these must be at least 150mm high
- Working platforms above 2m high must have guard rails between 920mm and 1150mm high
- Access ladder must be lashed vertically, preferably on the inside of the tower
- The minimum base measurement for any tower scaffold is 1.25m
- When erected indoors, the height of the tower must exceed than three and a half times its smallest base measurement and when erected outdoors, the height of the tower must not exceed three times its smallest base measurement
- Towers higher than 6.4m must either be tied to the building or have adequate outriggers fitted for stability
- **ALWAYS** use towers on firm even ground
• NEVER use tower scaffolds on sloping ground
• NEVER place stepladders on a tower scaffold
• NEVER ‘sheet out’ a tower with tarpaulins
• Castors must only be fitted to the standards (mobile tower scaffolds only)
• Castors must have locks to prevent unexpected movement, and be of the swivel – type (mobile tower scaffolds only)
• Castors must be able to be fixed into the standards to prevent them from falling out (mobile tower scaffolds only)

Fixed Scaffolds

The requirements for fixed scaffolds are as follows:

• Scaffolds must be inspected annually by a competent person and must be correctly erected
• Scaffold tubes and boards must not be painted
• Tubes must be straight
• Tubes and fittings must be undamaged and corrosion free
• The ground that the tower is erected on must be firm and even
• Base plates must always be used. Adjustable base plates can be used on ground that has different levels
• Sole plates must be used to provide even weight distribution if the tower is to be used on soft ground
• Any couplers used must be load bearing
• Horizontal members must be fixed to uprights with the exception of transoms under the working platform
• Scaffolds above 2m high must have toe boards fitted at least 150mm high and guard rails between 920mm and 1150mm high
• Access ladders must be in good condition and unpainted
• Working platform to have edging protection

Roof Ladders and Crawl Boards

Like all access equipment, roof ladders should be thoroughly checked before use. Check for:

• General condition. What is the general condition like? Does it look fit for purpose?
• Has it been repaired in any way?
• Has it been painted? Painting hides defects
• Has it been checked by a competent person?
• Are any ropes/pulleys fitted, in good working order?
• Are any of the rungs missing or damaged?
• Is it showing any signs of rot or corrosion?
Mobile Elevating Working Platforms

A programme of daily visual checks, regular inspections and servicing schedules should be established in accordance with the manufacturer’s instructions.

Prior to use checks will include:

- Machines have full charge for use
- All tyres are in good working condition
- All operational controls are in working order
- Safety handrails are in place and in good condition

Operators should be encouraged to report defects or problems. Reported problems should be put right quickly and the MEWP taken out of service if the item is safety critical.

AC10.5 State the method of assembly and use of access equipment.

Within this Assessment Criteria, the range will cover:

- Step ladders
- Ladders
- Harnesses
- Roof ladders and crawling boards
- Mobile tower scaffolds
- Fixed scaffolds and edge protection
- Mobile elevated work platforms including scissor lifts and cherry pickers

Method of Assembly and use of Stepladders

- Stepladders should only be used on even, firm ground
- They must be inspected before use (from http://www.hse.gov.uk/pubns/indg455.pdf)
  - Check the stiles – make sure they are not bent or damaged, as the ladder could buckle or collapse
  - Check the feet – if they are missing, worn or damaged the ladder could slip. Also check ladder feet when moving from soft/dirty ground (eg dug soil, loose sand/ stone, a dirty workshop) to a smooth, solid surface (eg paving slabs), to make sure the foot material and not the dirt (eg soil, chippings or embedded stones) is making contact with the ground
  - Check the rungs – if they are bent, worn, missing or loose the ladder could fail
  - Check any locking mechanisms – if they are bent or the fixings are worn or damaged the ladder could collapse. Ensure any locking bars are engaged
  - Check the stepladder platform – if it is split or buckled the ladder could become unstable or collapse
  - Check the steps or treads on stepladders – if they are contaminated they could be slippery;
if the fixings are loose on steps, they could collapse


- Check all four stepladder feet are in contact with the ground and the steps are level
- Only carry light materials and tools;
- Don’t overreach
- Don’t stand and work on the top three steps (including a step forming the very top of the stepladder) unless there is a suitable handhold
- Ensure any locking devices are engaged
- Try to position the stepladder to face the work activity and not side on. However, there are occasions when a risk assessment may show it is safer to work side on, eg in a retail stock room when you can’t engage the stepladder locks to work face on because of space restraints in narrow aisles, but you can fully lock it to work side on
- Try to avoid work that imposes a side loading, such as side-on drilling through solid materials (eg bricks or concrete)
- Where side-on loadings cannot be avoided, you should prevent the steps from tipping over, eg by tying the steps. Otherwise, use a more suitable type of access equipment
- Maintain three points of contact at the working position. This means two feet and one hand, or when both hands need to be free for a brief period, two feet and the body supported by the stepladder

Method of Erection and use of Ladders

Before using a ladder, a pre-check should be carried out (from http://www.hse.gov.uk/pubns/indg455.pdf):

- By the person using it
- At the beginning of every working day, and
- It the ladder has been dropped or moved from a dirty working environment to a clean one.

As with stepladders, checking ladders follows a familiar pattern:

- **Check the stiles** – make sure they are not bent or damaged, as the ladder could buckle or collapse
- **Check the feet** – if they are missing, worn or damaged the ladder could slip. Also check ladder feet when moving from soft/dirty ground (eg dug soil, loose sand/stone, a dirty workshop) to a smooth, solid surface (eg paving slabs), to make sure the foot material and not the dirt (eg soil, chippings or embedded stones) is making contact with the ground
- **Check the rungs** – if they are bent, worn, missing or loose the ladder could fail
- **Check any locking mechanisms** – if they are bent or the fixings are worn or damaged the ladder could collapse. Ensure any locking bars are engaged
- **Check the steps or treads on ladders** – if they are contaminated they could be slippery; if the fixings are loose on steps, they could collapse
The Task

- Will the job involve awkward or bulky loads being handled while climbing the ladder or doing the task (e.g. installing soil pipes, solar panels, or gutters)?
- Does the task require power tools or other equipment designed to be operated with two hands (e.g. hammer drills)?
- Will the job involve the use of heavy tools such as stilsons or chain dogs that require a high degree of leverage, thereby increasing the risk of a person overbalancing and falling?
- Will the task require working on a ladder for long periods, thereby introducing a fatigue hazard?
- Will the task require someone to work outside of the ladder stiles and possibly over-reach?
- Will the user be unable to maintain ‘three points of contact’ whilst going up, down or working from the ladder? (ie two feet, one hand)
- Does the task require personal protective equipment that may introduce additional risks (eg wearing safety goggles that may restrict the vision)?

Erecting the Ladder

If the ladder is long, or of the extending ladder type weighing more than 25kg, or where conditions complicate the task, it is always better to get help with erecting it:

- Place the ladder on the floor facing the position where the ladder is be placed
- Support the ladder against the helper’s feet
- Grab hold of the top rung with both hands, raise the top of the ladder above the head and walk towards the base of the ladder. Grab the rungs in centre to maintain stability
- Move the erect ladder to the correct position and lean it against the building
- When lowering a ladder, the previous instructions should be followed in reverse order
- When erected, the ladder must be at an angle of 75° or 4 up, 1 out. If this cannot be achieved because the ladder is either too short, too long or something is in the way, then DO NOT use it
- There must be at least 0.9m overhang (for access purposes) and secured at the top
- Do not place the top of the ladder against anything fragile, such as plastic guttering or glass

Using the Ladder

- Do not stand on the top three rungs, and make sure the ladder extends at least 1m above where the work is or, if used to access a scaffold, 1m above the working platform
- Always secure the top of a ladder when using it to access a platform or scaffold
- Always secure the ladder at the base to ensure that the ladder does not slip away from the building
- If securing the ladder cannot be achieved, then get a work colleague to stand on the bottom rung. This is called ‘footing a ladder’
- Face the ladder when climbing up or down – maintain 3 point contact
- Do not carry materials in your hands
• Make sure that only one person at a time is on the ladder
• Don’t stretch or reach beyond the stiles of a ladder as a shift in the centre of gravity could cause the ladder to slip
• Assess hazards that may be present in the work area. Identify and where possible keep work away from power lines. If you must work near power lines, ensure that you know where they are and always use a fiberglass ladder – NEVER work with a metal ladder around power lines

Using Mobile Elevating Work Platforms

The most common mobile elevating working platform dangers arise from operation and use of the machine. Risks associated with each mobile working platform have to be taken into account, these will include:

• Confined overhead working
• Ground conditions
• Outriggers
• Guardrails
• Arresting falls
• Falling objects
• Weather
• Handling materials
• Nearby hazards

Mobile elevating work platform operators should have attended a recognised operator training course and received a certificate, card or ‘licence’ listing the categories of mobile elevating work platforms the bearer is trained to operate.

Planning to Work at Height

• Is a tower scaffold the most suitable means of access for working at height? Conduct a risk assessment and seek advice from a supervisor or manager.

Tower Construction

• Anyone erecting or dismantling a tower scaffold should be competent to do so and should hold a relevant qualification
• Erect and dismantle the tower scaffold in accordance with the manufacturer’s instructions
• Site the tower on firm level ground wherever possible and always use footplates and soleplates
• Ensure adequate edge protection at platform level – secure hand rails at approx. 1m height, with mid-rails and footboards
• Prior to use, thoroughly inspect the tower to ensure it meets the supplier’s design instructions. Inspect it regularly thereafter to ensure this remains true
• Ensure that wheels are locked, if the tower is the mobile type
Ensure that outriggers are in place where possible. Alternatively, tie the scaffold to the building

Using a Tower Scaffold

- Position the tower away from pedestrian rights-of-way, vehicle routes and overhead power lines, if possible
- Never move the tower with tools, materials or people on the working platform
- Raise and lower tools and equipment via the internal trap doors or via rope and pulley system
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Learning Outcome 12

Know the methods of working safely in excavations and confined spaces in the building services industry

Danger!

Deep Excavations
Within this Learning Outcome, there are five Assessment Criteria:

**AC12.1** Identify the situations in which it may be necessary to work in excavations.

**AC12.2** State how excavations should be prepared for safe working.

**AC12.3** State the measures that need to be applied to prevent persons or equipment falling into excavations.

**AC12.4** Identify where work in confined spaces may be required.

**AC12.5** State the potential dangers when working in confined spaces.

### AC12.1 Identify the situations in which it may be necessary to work in excavations

The need for a plumber to work in an excavation is limited. Most of the below ground services, such as gas, water and building drainage that we may work with are often dealt with by the company supplying them. However, there may be a need for a plumber to work in shallow excavations when working on:

- Water supplies from the boundary stopvalve to the dwelling/building
- Some aspects of below ground drainage work
- Water/heating/gas/drainage on sites not covered by the utility companies i.e. hospitals, universities, colleges etc.

### AC12.2 State how excavations should be prepared for safe working

Within this Assessment Criteria, the range will cover:

- Safe access into the excavation
- Trench support systems

An excavation can be described as a cavity that has been formed by cutting, digging or scooping. In construction, the term refers usually to a trench that has been cut for the sole purpose of laying and burying the services that are used by the building.

The CDM Regulations 2015, mentioned in LO1, make the following definition with regard to trenches and excavations: "excavation" includes any earthwork, trench, well, shaft, tunnel or underground working.

Working in trenches, although a dangerous operation, can be made safe provided careful management of the process is in place and there is an awareness of the hazards involved. These include:

1. Collapse of the sides of the excavation
2. Materials falling onto the people working in the excavation
3. People and vehicles falling into the excavation

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4. The undermining of nearby structures causing their collapse into the excavation
5. Damage to underground services during excavation work causing electrocution, explosion, gas escape, flooding etc.
6. Ingress of water causing flooding

Plumbers only rarely work in trenches and excavations. Most of this type of work is undertaken by specialist trades such as ground workers and the service companies (gas, water, electricity). The maximum depth that a plumber is likely to work is 0.750m to 1.35m when laying a mains cold water supply to a building. In some instances, construction workers may work in deep excavations, especially when working on street sewers and drains, mains gas and mains electric supplies.

The maximum depth that a trench can be dug without the need for support is 1.2m. On the average person, 1.2m would fall near the waist. The significance of 1.2m is that, in the event of trench collapse, only the lower half of the body would be buried. The top half (the chest, lungs etc.) would be free so that breathing would not be restricted in any way.

After this depth, the trench sides should either be:

- Benched – a process where the sides are cut into steps away from the point of work
- Battered – a process where the sides are sloped upwards away from the area of work at around 45° depending on the ground type
- Supported by a recognised trench walling or support system
- All trench systems should be accessible with access and egress points along the trench length, usually ladders placed at strategic points that are appropriate for the trench length.

**Trench Support Systems**

Trenches are usually supported by one or, in some instances, a combination of methods. Sloping or benching the trench walls is usually the first choice because it is quicker and cost effective. Trench supports, or shoring, are used when no other method is practicable. There are many different types, depending on the type of excavation.

**Soldier Piles and Lagging**

Drilled or driven H-section beams with wood or steel plate lagging to hold back the trench walls.

**Sheet Piling Shoring**

These are interlocking steel piles that lock together to form a wall.
Speed Shores

These are aluminium sheets braced by hydraulic jacks that support an almost vertical trench wall.

Trench Box

This is a rigid frame, designed to protect operatives from soil that is collapsing.

Modular Shoring

These are a commercial system of panels, piles and struts that are prefabricated in sections. Each of the above methods has variations that are adjusted to suit the specific site conditions.

AC12.3 State the measures that need to be applied to prevent persons or equipment falling into excavations.

Within this Assessment Criteria, the range will cover:

- Use of warning signs
- Use of barriers for pedestrians
- Vehicle proximity to excavation edges

The general requirements for a well-planned, well-dug trench are:

1. Ladders, used for access and egress, should be fastened to the trench supports.
2. Long trenches should have access points placed at regular intervals as means of escape in an emergency.
3. To prevent trench collapse, the spoil from digging the trench should be positioned at least 1m away from the edge of the trench.
4. A 2m high barrier must be erected around the trench and be at least 1m away from the edge of the trench to prevent personnel or the general public from falling in. It must also have toe boards fitted to stop tools and materials from being accidentally kicked in.
5. Vehicle stops must be used to prevent vehicles and items of plant, such as dumper trucks and diggers, travelling too near to the edge of the trench. These also help to stop the build-up of poisonous carbon monoxide fumes within the trench itself.
6. Warning notices should be placed at regular intervals along the entire length of the trench.
7. The use of propane gas is strictly forbidden in trenches as propane is heavier than air and a leak will gather in the bottom of the trench.
General Trench Safety

- Always wear a high viz jacket and hard hat when working in trenches and any other PPE that is deemed necessary such as safety boots etc.
- Never work in an unsupported trench deeper than 1.2m.
- Never work ahead of the trench supports. The trench will not be supported and may collapse.
- Make yourself aware of the nearest access point and ladders. This could be vital in an emergency.
- Always be aware of site vehicles approaching the trench

AC12.4 Identify where work in confined spaces may be required.

Within this Assessment Criteria, the range will cover:

- Drainage systems
- Plant rooms
- Main service duct-rooms
- Tanks, cylinders, boilers or cisterns
- Under suspended timber floors
- In roof spaces

A confined space is a place that is closed in where there is a very real risk of death or serious injury/illness from:

- A hazardous substance
- Lack of oxygen
- Being overcome by fumes

During plumbing operations, you may be required to work in:

- Large tanks or cisterns
- Large boilers
- Trenches
- Sewers (drainage systems)
- Plant rooms
- Flues
- Ductwork
- Unventilated or poorly ventilated rooms
- In small roof spaces, under a floor or in a small cellar

All of these work situations are classed as confined spaces and are subject to the Confined Spaces Regulations 1997. These regulations contain the following key duties:

- Avoid entry to confined spaces, eg by doing the work from the outside
- If entry to a confined space is unavoidable, follow a safe system of work, and
• Put in place adequate emergency arrangements before the work starts

Employers and the self-employed are required to carry out a full risk assessment when operatives are working in confined spaces. This means identifying the hazards present, assessing the risks and determining what actions to take.

AC12.5 State the Potential Dangers when Working in Confined Spaces

Within this Assessment Criteria, the range will cover:

• Inadequate ventilation
• Inadequate lighting
• Flooding
• Obstruction of an escape route

Every year, people are killed and injured when working in confined spaces. Those victims include not only those working in the confined space but also those who attempt rescue without the proper training or equipment.

Dangers occur because of:

• Lack of breathable air (inadequate ventilation)
• Inadequate lighting
• Flooding
• Poisonous fumes and gases
• Liquids or solids suddenly entering the space
• Fire, explosions and smoke inhalation
• Left over residues from previous works or as a result of chemical reactions which give off toxic vapours
• Hot working conditions
• Obstruction of an escape route

With proper planning, training and precautions these can be avoided.

Legal Duties and Obligations when Working in Confined Spaces

The Management of Health and Safety Regulations 1999 and the Confined Spaces Regulations 1997, require employers to assess the risks for all works carried out in confined spaces so that decisions can be made on the measures required to manage and, if possible, eliminate those risks. In most cases the risk assessment will consider:

• The task
• The working environment
• The suitability of those carrying out the task
• Arrangements for emergency rescue
• Tools and materials required
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BPEC’s End-point Assessment Organisation (EPAO) are approved by the Education and Skills Funding Agency (ESFA) and are included on the Register of End-point Assessment Organisations (RoEPAO).

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