By the end of this chapter you should be able to demonstrate understanding of the following health and safety topics. This will assist you in completing the knowledge assessment in the Safety in Plumbing Activities Unit of the Level 2 Certificate in Basic Plumbing Studies:

- Health and safety legislation
  - Health and safety policy
  - The Health and Safety at Work Act
  - The Construction, Design and Management Regulations
  - Construction (Health, Safety and Welfare Regulations)
  - The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
  - The Electricity at Work Regulations
  - The Fire Precautions Act
  - The Safety Signs and Signals Regulations
  - The Provision and Use of Work Equipment Regulations
  - The Manual Handling Operations Regulations
  - The Personal Protective Equipment at Work Regulations
  - The Lifting Operations and Lifting Equipment Regulations
  - The Work at Height Regulations
  - The Control of Substances Hazardous to Health Regulations
  - The Control of Asbestos at Work Regulations
  - The Control of Lead at Work Regulations.

- Personal safety and the safety of others
  - Using personal protective equipment
  - Electrical power tools
  - Work at heights
  - Work in excavations
  - Work with hazardous substances
  - Work with LPG gas heating equipment
  - Fire safety
  - First-aid arrangements.
Main items of health and safety legislation in plumbing

Health and safety policy

There are two main organisations that deal with health and safety:

- the Health and Safety Commission (HSC) – responsible for health and safety regulation in the UK, i.e. setting policy
- the Health and Safety Executive – responsible for enforcement of the health and safety regulations.

The Health and Safety at Work Act (HASAWA)

The Health and Safety at Work Act (HASAWA) 1974 lays down responsibilities for employers, the self-employed, manufacturers or suppliers of materials and employees in carrying out work safely.

Main employer responsibilities under the regulations are:

- the provision and maintenance of plant and systems of work that are safe and without risk to health (this includes the supply of all necessary personal protective equipment)
- safety in the use, handling, storage and transport of articles and substances
- the provision of information, instruction, training and supervision as necessary to ensure the health and safety at work of employees
- the provision of access to and exit from the workplace that is safe and without risk
- the provision of adequate facilities and arrangements for welfare at work.

Main employee responsibilities under the regulations are:

- take reasonable care at work of your own health and safety and that of others who may be affected by what you do or do not do
- do not intentionally or recklessly interfere with or misuse anything provided for your health and safety
- co-operate with your employer on health and safety matters. Assist your employer in meeting their statutory obligations
- bring to your employer’s attention any situation you think presents a serious and imminent danger
- bring to your employer’s attention any weakness you might spot in their health and safety arrangements.

HASAWA in addition requires that employers:

- produce a health and safety policy statement when employing five or more operatives
- undertake risk assessments associated with the work activities carried out, identify safety control measures necessary to minimise the risks,
inform employees of the risk and train them in the effective application of the control measures and periodically review the risk assessments

- the risk assessments must be in writing if more than five persons are employed by the firm.

**Types of safety controls used by firms**

There are a variety of control systems that can be used by plumbing companies:

- risk assessments – an identification of the work activities carried out by the plumbing firm that could cause harm to staff or others. In undertaking the risk assessment, safety control measures are then identified that will minimise the risk to the lowest practicable level; the firm’s employees are then advised of the results of the risk assessment, including the safety controls that have to be applied when carrying out the work

- method statements – firms produce method statements for high-risk activities such as working at height to line a flue system. The method statement draws together the findings/control measures of all the risk assessments associated with the activity, such as working at heights, working with flue-liner materials, working with mortar mixes, etc. into one simple document which is provided to employees, co-contractors, etc. to provide guidance on how the work activity will be carried out

- permit-to-work systems – a permit-to-work system is used as a safety control for very high-risk or potentially fatal activities. The permit-to-work is essentially a fixed checklist of tasks that must be completed before an activity is carried out. The permit-to-work will usually be counter-signed by a supervisory level company official. A permit-to-work system could apply to high-risk activities such as working with gas heating equipment in potential fire-risk areas, working on electrical equipment and working in confined spaces such as sewers.

**The Construction Design and Management Regulations**

The main objectives are:

- the CDM Regulations are aimed at improving the overall management and co-ordination of health, safety and welfare throughout all stages of a construction project to reduce the large numbers of serious and fatal accidents and cases of ill health that occur every year in the construction industry

- the CDM Regulations place duties on all those who can contribute to the health and safety of a construction project. The Regulations place duties upon clients, designers, contractors and planning supervisors, and require the production of certain documents – the health and safety plan and the health and safety file.

Did you know?

Risk assessment should be carried out before the work is started.

Did you know?

CDM Regulations

These apply to large construction projects, requiring all those involved in the project to safely work together.
Construction (Health, Safety and Welfare Regulations)

These regulations lay down key requirements for the safety of construction sites:

- generally ensuring a safe place of work
- precautions against falls from height or into excavations
- protection against falling objects
- protection against structural collapse (while work is taking place), i.e. the building falling down!
- safeguards when working in excavations
- prevention of drowning (falling into water)
- provision of safe traffic routes (on sites)
- prevention and control of emergencies (site emergency evacuation procedures, etc.)
- provision of welfare facilities – WCs, washing facilities, canteens/rest areas, shower facilities (if required)
- provision of site-wide issues – clean and tidy sites, adequate lighting, constant and fresh air supply, etc.
- training, inspection and reports – proper training of staff, use of properly trained staff to do the work, proper supervision of staff and monitoring the work carried out by staff to ensure it is carried out in a safe manner.

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

RIDDOR lays down the requirements for the employer reporting the following to the Health and Safety Executive:

- injuries – fatalities (including members of the public) or injuries resulting in three days off work
- diseases – if a doctor advises that an employee is suffering from a work-related disease listed under RIDDOR
- dangerous occurrences – something that happened that could have resulted in a reportable injury, e.g. the collapse of an excavation.

Detail of reportable accidents should be forwarded by the employer to the HSE on form F2508. If a fatality is being reported then this must take place within ten days.

The HSE will make a decision based on the report form forwarded regarding the level of investigation and subsequent action required, which may include legal action for breaches of health and safety regulations.

A firm should maintain an accident book for recording detail of all types of injury that occur while carrying out work, however minor. The accident book is used by the employing firm to monitor the level of accidents that occur and establish whether any additional safety controls are required to do the work.
If an accident occurs (whether it is RIDDOR reportable or not), an employee may be required to complete an accident report form; this should preferably be completed by the injured employee as soon after the accident as possible. If it is completed by a third party, then the employee must carefully check that the details are a clear identification of the events that took place, as once signed, an accident report could be used in legal proceedings!

The Electricity at Work Regulations

These regulations lay down requirements for safe working with electricity:

- duties of those involved in undertaking the electrical work
- systems, work activities and protective equipment
- strength and capability of electrical equipment
- insulation, protection and placing of conductors
- earthing and other suitable precautions
- integrity of reference conductors
- making connections
- means for protecting from excess current
- means of cutting off the supply and isolation
- precautions for work on equipment made dead
- work on or near live conductors
- working space, access and lighting
- competence to prevent danger and injury.

The Fire Precautions Act

Employers’ duties include safety in relation to fire hazards, both from the work processes and activities carried out, and general fire safety in the workplace. Employers must carry out a fire-risk assessment. The risk assessment is to enable employers to identify and then take steps to eliminate, reduce or control safety risks (including risks from fire) to make sure that no one gets hurt or becomes ill. Where more than 20 people are employed at a property, the property will require a fire certificate from the local enforcing authority.

General fire precautions that an employer may provide include:

- means of detecting and giving warning in case of fire
- escape routes
- fire-fighting equipment
- training of staff in fire safety.

The Safety Signs and Signals Regulations

The Safety Signs and Signals Regulations provide a standardised approach for displaying safety signs in the workplace.
The Provision and Use of Work Equipment Regulations (PUWER)

The Regulations require risks to persons’ health and safety from equipment that they use at work, to be prevented or controlled. Work equipment includes all tools (power or hand) and work equipment such as threading machines and bending machines. In general terms, the Regulations require that equipment provided for use at work is:

- suitable for the intended use
- safe for use, maintained in a safe condition and, in certain circumstances, inspected to ensure this remains the case
- used only by people who have received adequate information, instruction and training
- accompanied by suitable safety measures, e.g. protective devices, markings, warnings.

Did you know?
The safe condition of hand tools such as hammers and spanners is covered by PUWER.

Did you know?
The use of abrasive wheels is now covered by PUWER; all staff using such equipment need to be properly trained, informed and supervised.

Figure 1.1 Safety signs

Did you know?
Cartridge-fixing devices

PUWER has laid down new requirements for the use of cartridge-fixing devices, based on a risk assessment of the work and proper training of staff; any age restriction detailed in previous legislation has been removed.

The Manual Handling Operations Regulations

These Regulations lay down requirements for moving loads by hand; this could involve pushing, pulling, lowering the load, etc. The following control measures are identified in the Regulations:

- avoid hazardous manual handling operations so far as is reasonably practicable, for example by using a mechanical lifting aid such as a sack trolley to move the load
- make a suitable and sufficient risk assessment of any hazardous manual handling operations that cannot be avoided
- reduce the risk of injury from those operations so far as is reasonably practicable, providing such controls as training staff in safe or kinetic lifting techniques.
A risk assessment for manual handling will include taking into account the following five factors:

- the task
- the load
- the working environment
- individual capability (of the person carrying out the lifting)
- other factors, for example use of protective clothing.

The Personal Protective Equipment at Work Regulations (PPE)

PPE is defined in the Regulations as ‘all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety’, e.g. safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. The provision of respiratory and hearing protection is the subject of separate legislation.

The main requirement of the PPE at Work Regulations is that personal protective equipment is to be supplied and used at work wherever there are risks to health and safety that cannot be adequately controlled in other ways.

The Regulations also require that PPE:

- is properly assessed before use to ensure it is suitable
- is maintained and stored properly
- is provided with instructions on how to use it safely
- is used correctly by employees.

Under the Regulations, PPE must be supplied by the employer on a free-of-charge basis to the employee.
The Lifting Operations and Lifting Equipment Regulations

The Regulations aim to reduce risks to people’s health and safety from lifting equipment (such as cranes, pulleys, ropes, slings, etc.) provided for use at work. Generally, the Regulations require that lifting equipment provided for use at work is:

- strong and stable enough for the particular use and marked to indicate safe working loads
- positioned and installed to minimise any risks
- used safely, i.e. the work is planned, organised and performed by competent people
- subject to ongoing thorough examination and where appropriate, inspection by competent people.

The Work at Height Regulations

The Work at Height Regulations apply to all work at heights where there is a risk of a fall liable to cause personal injury. They place duties on employers, the self-employed, and any person who controls the work of others. The Regulations require duty holders to ensure that:

- all work at height is properly planned and organised
- all work at height takes account of weather conditions that could endanger health and safety
- those involved in work at height are trained and competent
- the place where work at height is done is safe
- equipment for work at height is appropriately inspected
- the risks from fragile surfaces are properly controlled
- the risks from falling objects are properly controlled.

The Control of Substances Hazardous to Health Regulations (COSHH)

The Regulations require employers to control exposure to hazardous substances to prevent ill health. They have to protect both employees and others who may be exposed by complying with the Control of Substances Hazardous to Health Regulations. To comply with the COSHH regulations an employer must:

- assess the risks
- decide what precautions are needed
- prevent or adequately control exposure
- ensure that control measures are used and maintained
- monitor the level of exposure to the substance
- carry out appropriate health surveillance where required
- prepare procedures to deal with accidents and emergencies
- ensure employees are adequately informed, trained and supervised.
The Control of Asbestos at Work Regulations

Key requirements of the Regulations are:

- asbestos insulating materials or linings of white, blue and brown asbestos must only be removed/worked on by licensed contractors
- on identifying high-risk white, blue or brown asbestos materials, work must be stopped in order that a risk assessment may be conducted in relation to working with/or working in the proximity of the asbestos material
- work with asbestos material must be the subject of a risk assessment with appropriate control measures provided, e.g. on-site washing facilities
- asbestos materials must be properly disposed of in approved packaging (preventing the spread of any fibres) and asbestos materials must be properly disposed of at approved waste sites
- operatives undertaking work in the proximity of asbestos or in the removal of asbestos materials must be properly informed, instructed and trained.

Work with asbestos cement-based materials does not present as high a risk and this may be carried out by non-licensed contractors provided a risk assessment is undertaken and effective control measures are used to prevent the spread of any material and to protect workers, e.g. the use of effective protective clothing and respiratory protective equipment.

The Control of Lead at Work Regulations

The regulations require the following to be put in place:

- duties – employers and employees alike are responsible for protecting themselves and others on premises where leadwork is being carried out or who are likely to be exposed to lead from that work
- training – operatives should be provided with proper information, instruction and training on the safe use of lead
- assessment of risk of exposure – if there is a risk of exposure to lead in a form that may be inhaled or ingested, the level of risk must be assessed and the findings properly recorded. Correct working practices and proper controls should be established and appropriate protective and safety equipment provided before the work proceeds
- control measures – the employer and employee must ensure, as far as is reasonably practical, that all measures are taken to restrict and control exposure
- protective clothing – each employee should be provided with and should wear adequate protective clothing
- respiratory equipment and ventilation – suitable masks or respiratory equipment must be provided and used where there is a risk of exposure to airborne lead dust or fumes.

---

**Did you know?**

There are three types of asbestos, commonly known as chrysotile, amosite and crocidolite (white, blue and brown respectively).

**Safety tip**

**Asbestos can be deadly!**

Breathing in asbestos dust can lead to chronic (long-term) fatal diseases such as mesothelioma (cancer of the inner chest lining), lung cancer or asbestosis (scarring of the lung).

**Did you know?**

Asbestos is more likely to be found in properties built before 1980.

**Did you know?**

Use of lead

Plumbers may encounter old lead pipe in buildings or sheet lead used as weatherproofing on the outside of buildings.
• washing facilities and canteen areas – adequate washing and changing facilities should be provided. Washing of the hands is essential before eating, drinking or smoking and before leaving the workplace. Food and drink should not be consumed in any area where leadwork is being carried out. Washing of hands and face and changing of contaminated clothes should take place before entering canteen areas
• spread of contamination – both employer and employee should take such steps as are reasonably practicable to prevent lead contamination from spreading beyond the workplace or storage area
• waste and scrap – old lead sheet being replaced should be removed with care. Scrap and dust should be taken to approved collectors to facilitate recycling. Vehicles transporting scrap and dust should be thoroughly washed and cleaned after use
• lifting lead – lead is heavy. Proper lifting equipment and additional staff should be available and always used to ensure the safety of operatives lifting and moving lead sheet
• medical surveillance – the blood lead level of operatives regularly working with lead should be monitored at regular intervals
• maintenance records – it is the duty of the employer to provide and maintain adequate records that show details of risk assessments, information and training provided, precautionary measures taken, medical surveillance and ventilation and respiratory equipment provided.

Did you know?

**Lead-welding**

When lead-welding indoors for long periods, it may be necessary for a local exhaust ventilation system to be provided, or alternatively proper respiratory protection devices may be required.

Did you know?

Typical safety glasses used for lead welding are not suitable eye protection when using a hammer drill: the lenses need to be high-impact resistant.

**Personal safety and the safety of others**

Using personal protective equipment

**Eye protection**

*Figure 1.3 Example of eye protection (safety glasses)*
Eye protection comes in the form of:

- safety glasses – a typical application could be lead welding
- safety goggles – these provide a higher level of protection than safety glasses, as they should fit closely to the face
- welding goggles – these include specialist coloured lenses.

Eye protection that is used to guard against the threat created by flying objects should include lenses that are of the high-impact resistant type.

**Hand protection**

Hand protection that is normally used in plumbing includes:

- general-purpose gloves – these help protect against cutting or puncture wounds; an example of their use could be lifting concrete blocks or lifting steel tube
- specialist gloves – these are typically used to deal with hazardous substances such as dry ice used in pipe-freezing applications
- rubber gloves – these help protect against contact with used soil and waste systems and sanitary appliances.

Gloves also provide protection against a disease known as dermatitis, which is caused by the hands coming into contact with materials classed as irritants.

**Head protection**

It is a mandatory requirement to wear a safety helmet on new-build and major construction sites. In addition a safety helmet will need to be worn when work is taking place at heights or above the point where you are working – that could be in a trench. A safety helmet must:

- be properly adjusted to fit you
- be replaced if it becomes defective or damaged.

---

**Figure 1.4 General-purpose gloves**

**Did you know?**

Rubber gloves help protect against a very serious disease primarily spread by rats, known as Weil’s Disease (Leptospirosis).

**Remember**

**Barrier creams**

These are often used as a form of hand protection to prevent substances entering through cuts in the skin. A typical application is when handling sheet lead.
Foot protection

It is important to wear adequate foot protection for the majority of plumbing installation work carried out, owing to the weight of the components used. Adequate foot protection (which can be in the form of a safety shoe) usually includes:

- metal toe protection
- strong rubber soles and sturdy uppers.

In addition, some forms of safety footwear can provide additional protection against electric shock.

Knee protection

Did you know?

When working on many construction sites you will be required to wear a high-visibility jacket or vest to guard against site traffic dangers.

Plumbing work can include a certain amount of kneeling, which can lead to painful conditions such as Housemaid’s Knee. Knee protection should therefore be considered which can be in the form of:

- external fasten-on knee pads, or
- knee pads built into workwear.

Protective overalls

Protective overalls, alternatively known as workwear, will need to be worn for most plumbing activities. Protective overalls are available in many styles, they essentially:

- protect the worker’s clothing
- assist in preventing the removal of hazardous or contaminated substances from the work-site.

Disposable overalls are available and tend to be used for more specialist activities such as work on drains or sewers, or working with asbestos.
Ear protection

Ear protection should be worn when working in noisy areas or with equipment that generates high levels of noise. Ear protection is usually in the form of:

- ear defenders, or
- ear plugs.

The need to wear ear protection may be indicated by safety signs or through risk assessments carried out by construction or plumbing companies.

Respiratory protection

There are many forms of respiratory protection:

- simple dust mask – an example of its use could be working with loft insulation
- cartridge-type respirator – these can guard against a range of substances such as high levels of dust or fumes; different disposable cartridges are required to protect against different types of substances
- full breathing apparatus – usually used in specialist work in confined spaces such as drains or sewers.

Electrical power tools

The Electricity at Work Regulations lay down the requirements for electrical power tool safety. Here are some of the key requirements:

- low-voltage (cordless) power tools tend to be preferred to their mains-fed counterparts, as they are safer to use
- on construction sites in particular, 110-volt power tools tend to be used as an alternative to the standard 240 volts found in domestic properties – lower voltage is again safer by design
- all power tools should be visually checked for signs of damage before they are used – damaged cables, plugs and casings, etc. Damaged tools must be taken out of service until disposed of or repaired
- all power tools should be subject to a Portable Appliance Test (PAT), this is a periodic check for electrical safety by a competent trained person, the recommended frequency of test for construction applications is three-monthly; all tested appliances should include a test label showing that the appliance has passed the test and the date of the next test should be displayed
- a Residual Current Device (RCD) is a type of electrical protection device that can be used in the electrical circuit supplying the power tool in order to provide added protection to the user
- power tools, e.g. circular saws, may also be supplied with adjustable guards. The tool must always be used with the guard firmly in place – it’s there to protect the user! On no circumstances must it be removed to make the job easier.
Work at heights

Ladders

Falls from ladders account for a high proportion of accidents in the construction industry. Here are some of the key points of ladder safety:

- A ladder should only be used to gain access to a work platform such as a scaffold, or for short-term work of usually less than 30 minutes’ duration. Work at heights for longer periods should be carried out using safer access equipment such as a mobile tower scaffold.
- There are a number of classes of ladder – Class 1 (industrial ladders) should normally be used for construction activities.
- The ladder should be checked for safety and for visible signs of damage each time it is used – if in any doubt the ladder should not be used.
- Care must be taken when transporting the ladder around site and when erecting it.
- The ladder must only be used on firm, level ground.
- If the ladder is to be used on or near a public footpath or road, there should be barriers around its base.
- The angle of the ladder to the building should be 75°, or 4 up to 1 out.
- The ladder should preferably be secured at the top and bottom, footing by a co-worker is an alternative method of securing at the bottom.
- The top of the ladder should project 1m or approximately five rungs above a working platform or roof access point.
Roof ladders

Roof ladders are only suitable for short-term working, e.g. limited work on chimney stacks. Here are the key points of roof ladder safety:

- the ladder should be properly manufactured and tested for safety, home-made roof ladders are not acceptable
- carry out a visual inspection of the roof ladder each time it is used, to make sure it is in a safe condition
- the supports under the ladder must rest fully on the roof when fitted
- the ladder should be the correct length for the roof
- the ladder gaining access to the roof ladder must be securely fixed at the top and be sited next to the roof ladder
- the use of roof ladders usually requires two people, one to work on the roof, the other to safely provide tools and equipment.

Step ladders

Step ladders are commonly used by plumbers; the following covers the key points related to their use:

- the step ladder should be visually checked for any signs of damage before use
- the step ladder should only be used on firm, level ground so that it may fit squarely on the ground
- the step ladder must be properly extended at all times and be of the correct height for the job, working off the top step is not permitted as it is unsafe
- step ladders are only suitable for relatively short-term working, for longer-term working a safer alternative would be to use access equipment such as a mobile elevated work platform (scissor lift).

Mobile tower scaffolds

Mobile tower scaffolds provide a safer solution to gaining access for plumbers working at heights. Here are the main points associated with their use:

- they should only be erected by those who have been properly trained
- a tower scaffold over 2m from floor height must be fitted with toeboards and guard rails. A guardrail must be fitted between 0.4m and 0.7m above the working platform. The hand rail should be no more than 910mm above the working platform
- when in use, the scaffold wheels must be locked
- the platform should not be moved whilst holding people or materials
- the tower must be stable, there should normally be a 1:3 base to height ratio
- outriggers may be used to increase the height of the tower and its stability
- towers above 9m in height should be firmly secured to the building
- towers should not normally be used above 12m in height
- the tower should include a purpose-designed ladder securely fixed inside the structure to gain access to the working platform.
Work in excavations

Work in excavations can be particularly hazardous and therefore a risk assessment must be conducted before the work is commenced to ensure that proper control measures are applied to safely do the work. The following are typical measures:

- an assessment of the ground material type must be undertaken to determine the need for shoring
- only properly trained plumbers must work in excavations
- any work carried out should be in pairs, one plumber carrying out the work in the trench, the other passing tools and materials
- fencing must be erected around trenches over 2m in depth to prevent persons falling into the trench
- material removed from the trench should be safely stored so that it may not fall back into the trench
- barriers such as vehicle stop-blocks may need to be used where dump trucks are being used in the vicinity of the trench, this is to prevent the vehicle falling into it.

Work with hazardous substances

Work with hazardous substances falls under the COSHH Regulations, requiring an assessment of the risk of using the substance to be carried out before the work begins. Manufacturers of substances in support of the risk assessment process are required to adequately package the product,
Health and safety

Figure 1.9 Categories of hazardous substance

showing the dangers that the substance presents, and provide instruction on its use. Hazardous substances tend to fall into the following categories:

- **toxic** – poisonous liquids and gases
- **harmful** – a general term that is used as a classification for many hazardous substances
- **corrosive** – products that may corrode such as bleach
- **irritant** – products, such as loft insulation, that may cause irritation to parts of the body
- **extremely flammable** – substances that may lead to fire, e.g. LPG
- **oxidising** – these are substances that remove oxygen from the surrounding air, e.g. ABS cement for jointing plastic pipework.

Work with LPG gas heating equipment

Work with gas heating equipment can be a particularly dangerous activity as it can lead to:

- risk of fire through the ignition of combustible substances in the vicinity of the work area. Many insurance companies, in order to provide insurance to plumbing companies, require them to cease using LPG gas heating equipment at least 1 hour before leaving a site, so that any burning material is seen to be properly extinguished, and on high-risk jobs plumbing contractors may be asked to use a permit-to-work system.
• Risk of gas leakage:
  - gas heating equipment must be properly assembled and checked for leaks using soap solution
  - leaking gas, as it is heavier than air, will sink to the lowest points in a room, with the ability to form an explosive concentration
  - storage of cylinders should preferably take place in an open-air secure compound, all cylinder valves should be fully closed and protective dust caps should be in place, cylinders should be kept in an upright position.

Transportation of LPG
Transportation of LPG falls under the Packaged Goods Regulations. Specific measures required to be in place include:

• labels on vehicles to identify hazardous LPG contents
• two dry-powder fire extinguishers must be carried on the vehicle
• it is preferable that the storage cabin of the vehicle is ventilated, this is essential if large quantities are carried
• if significant quantities are being transported the driver will need to undertake special training in order to receive a TREMCARD, necessary for moving significant quantities of LPG.

Fire safety
Plumbers need to be aware of the fire risk that may be associated with their work. Some of the dangers are:

• igniting combustible materials in the location of hot working
• faults caused by electrical work.

In order for a fire to occur the following need to be present:

• fuel – combustible material
• oxygen – air supply
• heat – ignition source.

Remove any of these three items and fire will not take place.

Classes of fire
Fires are classed into groups according to the fuel type:

• Class A – fires involving solid materials, extinguished by water
• Class B – fires involving flammable liquids, extinguished by foam or carbon dioxide
• Class C – fires involving flammable gases, extinguished by dry powder
• Class D – fires involving flammable metals, extinguished by dry powder.

Did you know?
If the draw-off rate from an LPG cylinder is too high, freezing of the equipment can occur, resulting in potential freeze burns and a situation where the control valve cannot be turned off!

Figure 1.10 The fire triangle
Fire-fighting equipment

There are a variety of different types of fire-fighting equipment. In undertaking plumbing work you are more likely to come across the fire extinguisher as the main source of protection; here are some points to its use:

- an extinguisher should be kept in the immediate work area when hot working, e.g. using LPG gas heating equipment
- a fire extinguisher should only be used when it is safe to do so, personal safety must come before attempts to contain a fire
- fire extinguishers should only be used by those trained in their use
- the following shows the colour coding for extinguishers for dealing with the different types of fire.

<table>
<thead>
<tr>
<th>Type of extinguisher</th>
<th>Colour code</th>
<th>Main use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Red</td>
<td>Wood, paper or fabrics</td>
</tr>
<tr>
<td>Foam</td>
<td>Cream</td>
<td>Petrol, oil, fats and paints</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>Black</td>
<td>Electrical equipment</td>
</tr>
<tr>
<td>Dry powder</td>
<td>Blue</td>
<td>Liquids, gases, electrical equipment</td>
</tr>
</tbody>
</table>

**Figure 1.11 Fire extinguisher colour code**

Action in the event of a fire

Your employer will normally have procedures for actions in the event of a fire; if it’s a larger site then the client or main contractor will have their own procedures. Whatever the case, you must be familiar with those procedures, which will include:

- the various fire escape routes from the building
- the location of designated safe fire assembly points, which you must go to in the event of an emergency
- if you discover the fire
  - raise the alarm immediately
  - leave by the nearest exit
  - ensure that the emergency service is summoned.

Summoning the emergency services

These procedures apply to a range of different type of emergencies including fire:

1. find a telephone in a safe environment, well away from the emergency
2. dial the emergency service number: 999
3. keep calm, and when asked by the operator, give the name of the emergency service required, e.g. fire
4. when you get through, provide the location of the emergency first and then the nature of the emergency, e.g. fire in cellar; also provide details of any specialist hazards that the emergency service may encounter, e.g. storage of flammable liquids
5. when the call has been completed, ensure that someone is available to meet the emergency service and to show them the location of the incident.

First-aid arrangements

The requirements for providing first aid are laid down in the First Aid at Work Regulations, which require the employer to conduct a risk assessment of first-aid arrangements for the company, this will include establishing the need for first-aid kits and trained first-aiders.

The following shows the typical contents of a first-aid kit.

The kit should only contain items for first aid, no other medicines must be stored in the kit (this includes headache tablets). Where plumbers are working in domestic properties it is normal practice for a first-aid kit to be provided on each company vehicle and for each plumber to receive a basic level of first-aid training.
Typical areas for first-aid training

A typical first-aid course for a plumber will cover:

- electric shock – removing the casualty from a live supply using an insulating material such as wood; Cardio Pulmonary Resuscitation (CPR); dealing with unconsciousness (no sign of breathing)
- placing the injured person in the recovery position (so long as they do not bear signs of a damaged back), and keeping them warm until the emergency services arrive
- treatment for burns – flood the injury with cold clean water
- dealing with broken bones – prevention of movement at the site of the injury until it is properly secured and supported
- substance in the eye – bathing the eye in eye-wash (clean water).
Short answer questions
1. Under the Health and Safety at Work Act, an employer must prepare a health and safety policy statement when employing how many operatives?
2. When should a risk assessment of a work activity be carried out?
3. What type of stringent safety control system may be required when ‘hot working’ indoors with LPG gas heating equipment?
4. Under RIDDOR, what type of injuries must be reported to the HSE?
5. What type of device may be used as a safer alternative to manual handling?
6. What action must be taken on finding white asbestos insulating material on site?
7. What type of safety equipment may be required in order to carry out lead welding indoors for prolonged periods of time?
8. What type of safety glasses are required when working with a percussion drill?
9. What action should be taken if a safety helmet is found to be cracked?
10. What is the safest type of power tool to use on construction sites?

Multiple-choice test
1. Who is responsible for providing PPE to plumbers?
   a) The plumber    b) The site agent  c) The employer  d) The architect
2. The Health and Safety at Work Act applies to which of the following working on construction sites?
   a) All operatives  b) Management only  c) Site visitors only  d) Full-time staff only
3. The organisation responsible for the enforcement of health and safety legislation is called the:
   a) Health & Safety Enforcer  b) Health & Safety Commission  c) Health & Safety Directorate  d) Health & Safety Executive
4. Blue asbestos material found on construction sites must be removed by:
   a) Licensed contractors  
   b) Any operative finding it  
   c) Any operative finding it who has the correct PPE  
   d) Supervisory staff who have the correct PPE
5. The provision of which of the following is a requirement of the Construction (Health, Safety and Welfare) Regulations?
   a) First-aid equipment  b) Personal protective equipment  c) Canteen facilities  d) Accident book
6. What type of PPE is essential when lead welding outdoors for short periods of time?
   a) Full breathing apparatus  b) Dust mask  c) Safety glasses  d) Welding mask
7. What type of hand protection will provide the highest level of protection when working on used soil pipework?
   a) Barrier cream  b) Rubber gloves  c) General-purpose gloves  d) Leather gloves
8. Which disease can be spread by rats via the drainage system?
   a) Hodgkin’s disease  b) Parkinson’s disease  c) Weil’s disease  d) Smithson’s disease
9. What is the minimum level of respiratory protection required when removing a solid fuel fire back boiler?
   a) No protection is required  b) Full breathing apparatus  c) Half-face respirator  d) Dust mask
10. A 110-volt transformer for use on a construction site is colour coded:
   a) Blue  b) Red  c) Green  d) Yellow
11. What is the recommended interval for a Portable Appliance Test (PAT) on a circular saw used on a construction site?
   a) 1 month  
   b) 3 months 
   c) 6 months  
   d) 12 months

12. Before working with a mains-fed power tool:
   a) It should be visually inspected for signs of damage  
   b) It should be stripped down and serviced  
   c) It must only be used if operating at 440V  
   d) All guards must be removed so the tool can be used properly

13. What type of ladder should normally be used for construction work?
   a) Domestic class  
   b) Class 1 
   c) Class 2  
   d) Class 3

14. The approximate angle that a ladder should be set to a building is:
   a) 45°  
   b) 60° 
   c) 75°  
   d) 90°

15. What is the approximate height that a ladder should project above a working platform?
   a) 500mm  
   b) 750mm 
   c) 1000mm  
   d) 1200mm

16. What item of equipment must be fitted to a mobile tower scaffold that is 2m or more above floor level?
   a) Rails  
   b) Outriggers 
   c) Shoring  
   d) Pulley system

17. The COSHH regulations control the use of:
   a) Personal protective equipment  
   b) Electricity at work 
   c) First aid at work  
   d) Hazardous substances

18. Propane is classified as what type of substance?
   a) Toxic 
   b) Corrosive 
   c) Extremely flammable  
   d) Irritant

19. What type of injury may occur when coming into contact with an LPG cylinder where gas is being drawn from it at too high a rate?
   a) Freeze burns  
   b) Dermatitis 
   c) Broken bones  
   d) Cuts through flying metal

20. The following safety sign (white symbol on a blue background) is an example of a:
   a) Prohibition sign  
   b) Mandatory sign 
   c) Warning sign  
   d) Information sign

21. The safety sign below identifies which of the following hazards:
   a) Hard hats must be worn  
   b) Danger electric shock 
   c) Wear eye protection  
   d) No smoking

22. Burning wood is classed as which type of fire?
   a) Class A  
   b) Class B 
   c) Class C  
   d) Class D

23. What type of fire extinguisher is marked with a cream panel?
   a) Water  
   b) Carbon dioxide 
   c) Dry powder  
   d) Foam

24. What is the first item of information to provide to the emergency service when reporting an emergency?
   a) The location of the incident  
   b) The number of people involved 
   c) Nature of any injuries  
   d) The caller’s name

25. On finding a fire in a building a plumber’s first action should be to:
   a) Raise the alarm  
   b) Fight the fire 
   c) Leave the building  
   d) Carry on working
26. Which of the following should not be kept in a first-aid kit?
   a) Sterile dressings  c) Eye dressing
   b) Plasters  d) Headache tablets

27. A first-aider should treat a severe burn by:
   a) Washing it with cold water
   b) Washing it with hot water
   c) Coating the burn with antiseptic cream
   d) Coating the burn with after-sun lotion

28. A person being electrocuted should be removed from the live supply by means of:
   a) A length of metal pipe
   b) Length of dry timber
   c) Length of wet timber
   d) Scaffold pole

29. The danger from ‘mushrooming’ on cold chisels is:
   a) Damage to the hammer head
   b) Flying splinters
   c) Hearing damage
   d) Respiratory damage

30. Abrasive wheels may only be used by plumbers:
   a) Who are over 18 years of age
   b) Who are over 21 years of age
   c) Who have been properly trained and instructed in their use
   d) Who are deemed to be registered abrasive wheel contractors