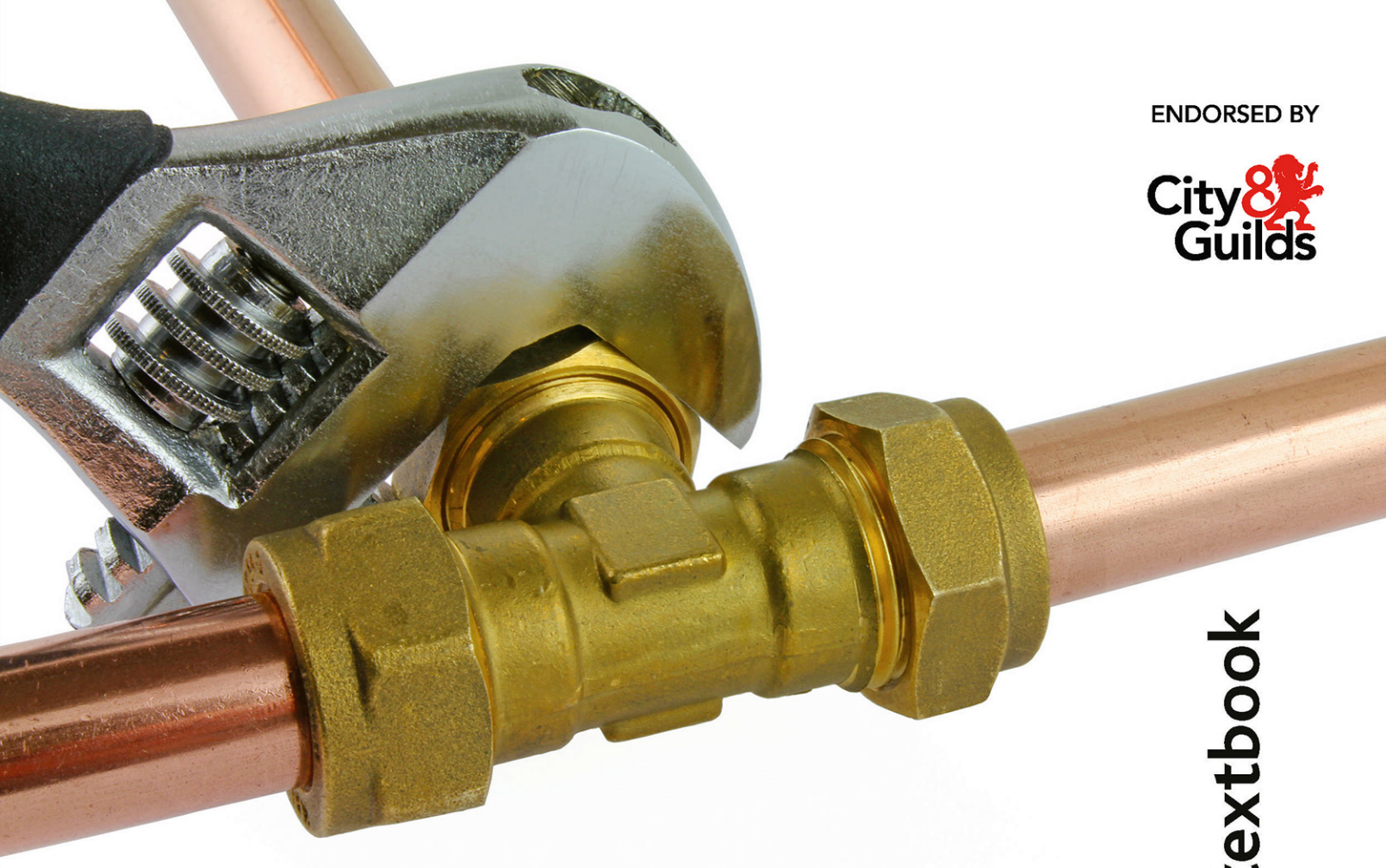

ENDORSED BY

City & Guilds

The City & Guilds textbook

Book 1

Plumbing

SECOND EDITION

REVISED & UPDATED EDITION

LEVEL 3 APPRENTICESHIP (9189)
LEVEL 2 TECHNICAL CERTIFICATE (8202)
LEVEL 2 DIPLOMA (6035)
T LEVEL OCCUPATIONAL SPECIALISMS (8710)

Stephen Lane
Peter Tanner

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Contents

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How to use this book

Throughout this book you will see the following features:

Industry tips and **Key points** are particularly useful pieces of advice that can assist you in your workplace or help you remember something important.

KEY POINT

It is vital that fuels are kept dry and that they are delivered in good condition for optimum combustion efficiency to occur.

INDUSTRY TIP

While many companies have their own style of working, others employ plumbers for specific tasks, i.e. those operatives that work on-site and those that work in private houses.

Key terms in bold purple in the text are explained in the margin to aid your understanding. (They are also explained in the Glossary at the back of the book.)

KEY TERM

Corrosion: any process involving the deterioration or degradation of metal components, where the metal's molecular structure breaks down irreparably.

Health and safety boxes flag important points to keep yourself, colleagues and clients safe in the workplace. They also link to sections in the health and safety chapter for you to recap learning.

HEALTH AND SAFETY

A fire extinguisher should always be available when using any form of soldering equipment.

Activities help to test your understanding and learn from your colleagues' experiences.

ACTIVITY

What would motivate you to improve your work? Make a note and discuss with your team to see what motivates them.

Values and behaviours boxes provide hints and tips on good workplace practice, particularly when liaising with customers.

VALUES AND BEHAVIOURS

It is good practice to keep customers informed of any inconveniences that could be caused by the work that may affect their day-to-day routine.

Improve your maths items provide opportunities to practise or improve your maths skills.

Improve your English items provide opportunities to practise or improve your English skills.

At the end of each chapter there are some **Test your knowledge questions** and **Practical tasks**. These are designed to identify any areas where you might need further training or revision.

Apprenticeship only flagging identifies content that is relevant to apprenticeship learners only.

HEALTH AND SAFETY PRACTICES AND SYSTEMS

INTRODUCTION

Plumbers that work on construction sites are at risk from hazards and accidents every day. Construction is one of the UK's largest industries and arguably the most dangerous. In the past 25 years, nearly 3000 people have been killed on construction sites or as a direct result of construction work. Recent years have seen a fall in the fatality figures, yet accidents continue to be a cause for concern within the industry. While total elimination of accidents is an impossibility, we can ensure that, by proper health and safety management, this figure is reduced still further.

The overriding factor that you need to remember is that health and safety is everyone's responsibility.

In this first chapter we will look at the health, safety and welfare of the people that work on construction sites, and the protection from hazards and harm of the general public. We will investigate the health and safety legislation that helps to keep us safe, as well as look at the methods we should employ for safe working at height, and in excavations and confined spaces. We will investigate how we should deal with toxic and dangerous substances, such as lead and asbestos, solvents, flammable materials and gases, and discuss how we can keep ourselves from harm by the correct use of personal protective equipment (PPE).

By the end of this chapter, you will have knowledge and understanding of the following areas of health, safety and welfare in the construction and building services industries:

- health, safety and welfare legislation and regulation
- recognising and responding to hazardous situations
- personal protection methods and equipment
- responding to accidents and incidents
- electrical safety in the workplace and the home
- safe working practices with heat-producing equipment
- safe working practices at height
- safe working practices in excavations and confined spaces.

1 HEALTH, SAFETY AND WELFARE LEGISLATION AND REGULATION

Hazards encountered by plumbers in particular include asbestos, strained muscles, broken bones, falls, slips, trips and noise. Diseases they risk include dermatitis, asbestosis and emphysema.

In many instances, when the work is subcontracted on a construction project, there is confusion as to who is responsible for safety. However, **legislation** is very clear that everyone has duties and responsibilities regarding health and safety, from the worker to each contractor, to the architect up to the client and the owner of the structure that is being built.

KEY TERMS

Hazard: a danger; something that can cause harm.

Legislation: a law or group of laws that have come into force; health and safety legislation for the plumbing industry includes the Health & Safety at Work Act and the Electricity at Work Regulations.

In this the first section of this chapter we will look at some of the many pieces of legislation surrounding health and safety in the construction industry.

INDUSTRY TIP

- You can access the Health and Safety at Work etc. Act 1974 (HASAWA) at: www.legislation.gov.uk/ukpga/1974/37
- You can access the Control of Substances Hazardous to Health (COSHH) Regulations 2002 at: www.legislation.gov.uk/uksi/2002/2677/regulation/7/made
- You can access the Personal Protective Equipment (PPE) at Work Regulations 1992 at: www.legislation.gov.uk/uksi/1992/2966/contents/made

Protecting the workforce and the general public

General health and safety legislation

The Health and Safety at Work etc. Act 1974

The Health and Safety at Work etc. Act 1974 (HASAWA) is the principal piece of legislation covering occupational health and safety in the UK.

The Act lays down the principles for the management of health and safety at work, enabling the creation of more specifically targeted legislation and codes of practice, such as the Control of Substances Hazardous to Health (COSHH) Regulations 2002 and the Personal Protective Equipment (PPE) at Work Regulations 1992. In other words, all other health and safety legislation has been written as an addition to and because of the HASAWA 1974.

The Act covers all people at work (except domestic servants in private employment) whether they are employers, employees or the self-employed. It is specifically aimed at people and their activities at work rather than premises or processes. It includes provisions for both the protection of people at work and members of the general public who may be at risk as a consequence of the workplace activities.

The main objectives of the HASAWA 1974 are:

- to secure the health, safety and welfare of all people at work
- to protect others from the risks arising from work activities
- to control the obtaining, keeping and use of explosives and highly flammable substances
- to control emissions into the atmosphere of noxious or offensive substances.

Sections 2, 3, 7 and 8 of the HASAWA 1974 cover more general duties that relate directly to you, your employer and the general public.

The general duties of the HASAWA 1974 – Section 2

Section 2 of the HASAWA deals specifically with the general duties of the employer towards its employees. It states that:

> 'It is the duty of every employer, so far as is reasonably practicable, to ensure the health, safety and welfare at work of their employees.'

More specifically, this applies to ensuring that:

- plant and systems are safe and without risk to health
- there is no risk to health in connection with the use, handling, storage and transport of articles and substances
- information, instruction and supervision with regard to the health and safety at work of employees is available
- the working environment for employees is safe, without risk to health, and adequate with regards to facilities and arrangements for their welfare at work
- the place of work is maintained in a safe condition and without risk to health, and the means of access to it and egress from it are safe and without risk.

This legislation also states that employers must have a health and safety policy and, if the company has five or more employees, that policy must be written down. It must be revised as necessary at regular intervals and all employees must have access to and be informed of any changes made to the policy.

Every employer must consult with health and safety representatives appointed by their employees with a view to making and maintaining arrangements that will enable co-operation between employer and employees in promoting and developing health and safety measures and checking their effectiveness.

HEALTH AND SAFETY

Every employer must consult with health and safety representatives. These people are appointed by employees of an organisation to act on their behalf. Their role is to make and maintain arrangements that will enable the employer and employees to promote and develop health and safety measures, and to check their effectiveness.

The general duties of employers and the self-employed to people other than their employees – Section 3

Every employer must ensure, so far as is reasonably practicable, that people not in their employment who may be affected by their work are not exposed to risks to their health and safety. These duties also apply to the self-employed.

Every employer and self-employed person must give to those people who are not in their employment information on the way that aspects of their work might affect the health and safety of others.

Additional employer responsibilities

In addition, the HASAWA 1974 tells us that any employer must:

- carry out risk assessments of all the company's work activities
- identify and implement adequate control measures
- inform all employees of the risk assessments and associated control measures
- review the risk assessments at regular intervals
- make a record of the risk assessments if five or more operatives are employed.

The general duties of employees at work – Section 7

It is the duty of every employee while at work to take reasonable care for the health and safety of themselves and others who may be affected by their acts or omissions at work, and to co-operate with their employer so far as is necessary to enable any duty or requirement to be performed or **complied** with.

KEY TERM

Comply: act in accordance with; meet the standards of.

Duty not to interfere with or misuse anything provided – Section 8

Section 8 is often referred to as the 'horseplay section'. According to the HASAWA:

> 'Employees must not intentionally or recklessly interfere with, or misuse, anything provided in the interests of health, safety or welfare, for example, the fooling with and the misuse of a fire extinguisher.'

INDUSTRY TIP

- You can access the PUWER Regulations at: www.legislation.gov.uk/uksi/1998/2306/contents/made
- You can access the Electricity at Work Regulations 1989 at: www.legislation.gov.uk/uksi/1989/635/contents/made

The Provision and Use of Work Equipment Regulations (PUWER) 2009

These Regulations lay down the minimum standards for the use of all work-related tools and equipment, and are usually used in conjunction with other more specific regulations, such as the Electricity at Work Regulations or similar. The requirements contained within the Regulations are aimed specifically at employers, who must:

- take notice of working conditions and hazards on-site and at work when selecting equipment
- provide work equipment that is fit for purpose and conforms to relevant safety standards
- ensure that the work equipment is used only for its intended purpose
- maintain all equipment in good working order
- ensure that appropriate safety devices are available
- issue operatives with appropriate instructions, training and supervision to enable them to use the work equipment safely
- make sure that all equipment is inspected regularly and at least after installation or assembly at a new location.

The Personal Protective Equipment at Work Regulations 1992

Employers have basic duties concerning the provision and use of personal protective equipment (PPE) at work wherever there are risks to health and safety that cannot be adequately controlled in other ways.

PPE is defined in the Regulations as all equipment that is intended to be worn or held by a person at work and that protects them against one or more risks to their health or safety. Examples of this would be safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses.

Hearing protection and respiratory (breathing) protective equipment (RPE) provided for most work situations are not covered by the PPE Regulations because other regulations are in force that deal specifically with these areas. However, these items need to be compatible with any other PPE provided.

The Regulations require that PPE is:

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

All employers must provide PPE free of charge whether the PPE is returnable or not (this also applies to agency workers not in the employer's full employment). There are no exemptions from using or wearing PPE. PPE must also be provided to members of the public who are at risk – for example, site visitors. If PPE is provided it must be used.

▲ Figure 1.1 Mandatory helmet sign

INDUSTRY TIP

You can access the Control of Substances Hazardous to Health Regulations 2002 at: www.legislation.gov.uk/uksi/2002/2677/pdfs/uksi_20022677_en.pdf

The Control of Substances Hazardous to Health (COSHH) Regulations 2002

The Control of Substances Hazardous to Health Regulations, known as COSHH, are intended to protect people from illness caused by exposure to hazardous substances. The Regulations require employers to:

- assess the risks to health and safety
- decide what precautions are needed to prevent ill health
- prevent or control exposure
- make sure that the control measures are used and maintained
- monitor exposure and carry out health checks if needed
- make sure that all employees are properly informed, trained and supervised.

To comply with COSHH, eight steps should be followed (Table 1.1).

▼ Table 1.1 The eight steps needed to comply with COSHH

1 Assess the risks	Your employer should 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 that 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 that 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.

Source: Health and Safety Executive (2005) *COSHH: A brief guide to the Regulations*

COSHH data sheets

There are many forms of hazardous substance for which manufacturers and suppliers produce COSHH data sheets. These are an invaluable source of safety information, designed to make you aware of the known hazards associated with a material or substance, advise you of safe handling procedures, and recommend the most effective response to accidents.

KEY POINT

There are many forms of hazardous substance, for which manufacturers and suppliers produce COSHH data sheets. The data sheet is an invaluable source of safety information and is designed to make you aware of the known hazards associated with a material or substance, advise you of safe handling procedures and recommend the most effective response to accidents.

Under the COSHH Regulations, hazardous substances include:

- chemicals – classified under 'Chemicals Regulations' and identifiable by red and white diamond-shaped warning symbols on the container; care should be taken with unmarked containers
- any substance that has been assigned a workplace exposure limit
- dusts in concentrations in air greater than 10 mg/m^3 for inhaled dust or 4 mg/m^3 of respirable dust
- biological agents such as bacteria, viruses, fungi and parasites
- asphyxiants such as carbon dioxide and nitrogen
- carcinogens such as radon gas or tobacco smoke.

Routes of entry into the body include:

- breathing in vapours, gases, dusts and fumes
- eating or drinking substances or foods contaminated by hazardous substances
- contact with the skin or absorption into the body through the skin, causing harm to internal organs, or via cuts or wounds, causing harm to internal organs
- contact with the eyes by fumes, vapours, liquids and dusts.

INDUSTRY TIP

You can access the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 at: www.legislation.gov.uk/uksi/2013/1471/contents

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013 apply to all work activities. They place a legal duty on your employer, the self-employed and people in control of work premises to report some work-related accidents, diseases and dangerous occurrences by the fastest means possible, usually first by telephone and then in writing. RIDDOR applies to all work activities but not all incidents are reportable. Those that must be reported are:

- deaths
- over-three-day injuries – where an employee or self-employed person is away from work or unable to perform their normal work duties for more than three consecutive days. This must be reported within 15 days
- injuries to members of the public or people not at work where they are taken from the scene of an accident to hospital
- certain work-related diseases, for example illnesses such as cancers which can be linked to hazards that a person may have been exposed to in their work
- dangerous occurrences – where something happens that does not result in an injury, but could have done.

Gas Safe-registered gas fitters must also report dangerous gas fittings they find, and gas conveyors/ suppliers must report some flammable gas incidents.

HEALTH AND SAFETY

How to report an incident

Call: 0845 300 9923

Email: riddor@connaught.plc.uk

Report online at: www.hse.gov.uk/riddor/report.htm

Write to: Incident Contact Centre, Caerphilly Business Park, Caerphilly CF83 3GG

INDUSTRY TIP

You can access the Electricity at Work Regulations 1989 at: www.legislation.gov.uk/uksi/1989/635/contents/made

The Electricity at Work Regulations 1989

The Electricity at Work (EAW) Regulations place legal responsibilities on employers and employees to ensure that fixed electrical equipment and portable appliances are tested (**PAT test**) and maintained, and regular inspections carried out to ensure they are safe to use. Verifiable evidence is required in the form of:

- documented inspection and testing records, such as portable appliance test (PAT) records and test certificates
- evidence that training has been carried out
- electrical authorisations
- the control of work activities
- **competent** persons.

KEY TERM

Portable appliance test (PAT test): the process of checking electrical appliances and equipment to ensure they are safe to use.

KEY TERM

Competent: having the necessary ability, knowledge or skill (trained, tested and received a certificate).

The Regulations ensure precautions are taken to avoid death or personal injury from electricity during work activities. The main requirements are to:

- make sure that all persons working on or near electrical equipment are competent
- maintain electrical systems in safe condition
- carry out electrical work safely
- ensure equipment is suitable and safe to use in terms of:
  - strength and capability
  - use in adverse or hazardous environments – for example, weather, dirt, dust, gases, mechanical hazards and flammable atmospheres
- ensure effective insulation of conductors in a system
- ensure effective earthing of the system
- ensure that if work is carried out to the earthing system that involves breaking the flow of current, other precautions are taken to maintain the earth continuity
- ensure all components of the electrical system are suitable and safe for use
- protect against system overload
- provide suitable means for cutting off the supply of electrical current to any electrical equipment and effective isolation of electrical equipment
- ensure that work is not carried out on or near a live conductor unless absolutely essential and suitable precautions are taken to prevent injury
- ensure adequate working space, access and lighting to all electrical equipment where work is undertaken.

INDUSTRY TIP

You can access the Work at Height Regulations 2005 at: www.legislation.gov.uk/uksi/2005/735/contents/made

▲ Figure 1.2 Electrical testing

The Work at Height Regulations 2005

The Work at Height Regulations 2005 apply to all work at height where there is a risk of a fall that may cause personal injury. They place duties on employers, the self-employed and any person that controls the work of others, such as managers, supervisors or building owners who may use contractors to work at height. As part of the Regulations, **duty holders** must ensure that:

- all work at height is properly planned and organised
- those people working at height are competent
- the risks from working at height are assessed and the correct work equipment is selected and used
- equipment for working at height is regularly inspected and properly maintained.

KEY TERM

Duty holder: a person who controls, reduces or eliminates health and safety risks that may arise during the construction of a building or during future maintenance. They must also provide information for the health and safety file.

Duty holders must also:

- ensure working at height is avoided where possible
- use work equipment or other measures to prevent falls where working at height is unavoidable
- where they cannot eliminate the risk of a fall, use work equipment or other measures to reduce the distance of the fall.

The Regulations also include requirements for existing places of work and means of access for working at height, collective fall prevention equipment such as guardrails and working platforms, collective fall arresters such as nets and airbags, personal fall protection such as harnesses and work restraints, and ladders.

▲ Figure 1.3 Working at height

The Manual Handling Operations Regulations 1992

The Manual Handling Operations Regulations apply to a wide range of manual handling activities, including lifting, lowering, pushing, pulling and carrying. In the Regulations, loads are described as being either inanimate – for example, a gas boiler – or animate, such as a person or animal.

The Regulations require employers to:

- avoid hazardous manual handling operations so far as is reasonably practicable
- assess any hazardous manual handling operations that cannot be avoided
- reduce the risk of injury so far as is reasonably practicable, including automating or mechanising the lifting process as much as possible.

Employees have a duty to make full and proper use of any system of work provided for employees by their employer, to reduce risks of manual handling injuries. A useful resource is 'Manual handling at work: a brief guide' on the HSE website.

INDUSTRY TIP

You can access the Manual Handling Operations Regulations 1992 at: www.legislation.gov.uk/uksi/1992/2793/contents/made

The Safety Signs and Signals Regulations 1996

The Safety Signs and Signals Regulations require employers to provide specific safety signs whenever and wherever there is a risk that has not been avoided or controlled in other ways, including the use of road traffic signs within workplaces to control road traffic movements. They also place a duty on employers to keep the safety signs in good condition and explain unfamiliar signs to their employees, giving instructions on what they need to do when they see a safety sign.

The Regulations apply to all places of work and cover other methods of conveying health and safety information, including the use of illuminated signs, hand and audible signals such as fire alarms, fire safety signs and the marking of pipework containing dangerous substances. These are in addition to the traditional safety signs such as prohibition and warning signs.

▲ Figure 1.4 Good manual handling at work

KEY POINT

The Safety Signs and Signals Regulations apply to all places of work, but do not include signs and labels used in connection with the supply of substances, products and equipment or the transport of dangerous goods.

INDUSTRY TIP

You can access the Safety Signs and Signals Regulations 1996 at: www.legislation.gov.uk/uksi/1996/341/made

The Control of Lead at Work Regulations 2002

The Control of Lead at Work Regulations apply to all work that exposes any person to lead in any form whereby the lead may be ingested, inhaled or absorbed into the body. This is relevant to plumbers as the lead may be absorbed through the skin when it is being handled or the fumes breathed in when they lead weld.

An Approved Code of Practice (ACOP), 'Control of Lead at Work', is available and should be used in conjunction with the Regulations.

The Regulations state that the employer must assess the nature and extent of the exposure to lead so that the measures of control will be adequate based on that assessment. Where there is 'significant' exposure to lead all the Regulations will apply, but below this level only some of the Regulations will apply.

The basic measure to protect employees from absorbing lead is the prevention of the escape of lead dust, fume or vapour into the workplace. Personal hygiene is important in controlling lead absorption, and the provision and use of adequate washing facilities and PPE is a basic requirement. Food and drink should not be consumed in any place that may be contaminated by lead and the employer should provide alternative arrangements.

Employees should be given sufficient information and training regarding hazards, precautions and duties under the Regulations.

Working with lead and the symptoms of lead poisoning will be covered in detail later in this chapter (see page 22).

INDUSTRY TIP

You can access the Control of Lead at Work Regulations 2002 at: www.legislation.gov.uk/uksi/2002/2676/contents/made

The Control of Asbestos Regulations 2006

The Control of Asbestos Regulations 2006 **prohibit** the importing, supplying and use of all forms of asbestos. They continue the ban introduced in 1985 for blue and brown asbestos and, in 1999, for white asbestos. The ban on the second-hand use of asbestos products, such as asbestos cement sheets and asbestos boards and tiles, also remains in place.

KEY TERM

Prohibit: prevent or forbid by law.

The ban applies to new use of asbestos. If existing asbestos-containing materials are in good condition, they may be left in place provided that their condition is monitored and managed to ensure they are not disturbed.

Asbestos will be covered later in this chapter (see page 24).

▲ Figure 1.5 Asbestos in poor condition

INDUSTRY TIP

You can access the Control of Asbestos Regulations 2006 at: www.legislation.gov.uk/uksi/2006/2739/contents/made

Health and Safety (First Aid) Regulations 1981 (with 2013 amendment)

These Regulations set out what employers need to do to address the issue of first aid provision in the workplace:

- Managing the provision, i.e. first aid kit, equipment, room etc.
- The requirement for training first aiders
- The requirement for appointed persons
- Making employees aware of these provisions
- First aid for the self employed
- Examples of where the Regulations do not apply.

Confined Spaces Regulations 1997

Under the HASAWA 1974, employees are responsible where the work carries a risk when working in confined spaces. This responsibility is outlined in the Confined Spaces Regulations 1997. The key duties are:

- to avoid working in confined spaces wherever possible by completing the work from the outside
- to follow a safe system of work, if confined space working cannot be avoided
- to put in place adequate emergency arrangements BEFORE work starts.

INDUSTRY TIP

You can access the Construction (Design and Management) Regulations 2015 at: www.legislation.gov.uk/uksi/2015/51/contents/made

INDUSTRY TIP

A summary of the duties of each party and how they are applied is given in Table 1.2. This is taken from the **Health and Safety Executive (HSE)** publication L153 *Managing health and safety in construction,* (published 2015), available on the HSE's website at: www.hse.gov.uk/pubns/priced/l153.pdf

KEY TERM

Health and Safety Executive (HSE): the government body in the UK responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare regulations and government legislation.

Construction-specific legislation

The Construction (Design and Management) Regulations 2015

The Construction (Design and Management) (CDM) Regulations 2015 are the principal piece of health and safety legislation specifically written for the construction industry. They came into force on 6 April 2015, replacing and updating previous regulations.

The main aim of the CDM Regulations 2015 is to combine health and safety into the management of large construction projects and to encourage everyone involved to work together to:

- improve the planning and management of projects from the very start
- identify hazards early on, so they can be eliminated or reduced at the design 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, and discourage unnecessary red tape.

The aim is for health and safety considerations to be treated as an essential part of a project's development and not as an afterthought or added extra. This ensures that the responsibility lies firmly with all individuals, from management at the highest level, the client, the designer (architect) and the main contractor, down to the subcontractors, tradespersons and apprentices on-site.

The CDM Regulations require the appointment of a principal designer whose job it is to advise the client on health and safety issues during the design and planning phases of construction work. They should:

- help the client prepare the pre-construction information, and ensure that this is received by the designers and principal contractor in good time
- ensure that the designers fulfil their roles
- plan, manage and monitor pre-construction phase, co-ordinating any matters relating to health and safety during this phase to ensure that the project is without health and safety issues
- eliminate and control any risks throughout the design work
- ensure that there is co-operation and co-ordination between all duty holders
- liaise with the principal contractor to share information relevant to the planning, management and monitoring of the construction phase, and co-ordinate any health and safety issues during construction
- prepare the health and safety file.

▼ Table 1.2 CDM roles and duties

CDM duty holders: who are they?	Summary of role/main duties
Clients are organisations or individuals for whom a construction project is carried out.	Make suitable arrangements for managing a project. This includes making sure: ● other duty holders are appointed ● sufficient time and resources are allocated. Make sure: ● relevant information is prepared and provided to other duty holders ● the principal designer and principal contractor carry out their duties ● welfare facilities are provided.
Domestic clients 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.	Domestic clients are in scope of CDM 2015, but their duties as a client are normally transferred to: ● the contractor, on a single contractor project, or ● the principal contractor, on a project involving more than one contractor. However, the domestic client can choose to have a written agreement with the principal designer to carry out the client duties.
Designers are those who, as part of a business, prepare or modify designs for a building, product or system relating to construction work.	When preparing or modifying designs, to: ● eliminate, reduce or control foreseeable risks that may arise during construction, and the maintenance and use of a building once it is built ● provide information to other members of the project team, to help them fulfil their duties.
Principal designers are designers appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role.	Plan, manage, monitor and co-ordinate health and safety in the pre-construction phase of a project. This includes: ● identifying, eliminating or controlling foreseeable risks ● ensuring designers carry out their duties ● preparing and providing relevant information to other duty holders. Provide relevant information to the principal contractor to help them plan, manage, monitor and co-ordinate health and safety in the construction phase.
Principal contractors are contractors appointed by the client to co-ordinate the construction phase of a project where it involves more than one contractor.	Plan, manage, monitor and co-ordinate health and safety in the construction phase of a project. This includes: ● liaising with the client and principal designer ● preparing the construction phase plan ● organising co-operation between contractors and co-ordinating their work ● ensuring suitable site inductions are provided ● taking reasonable steps to prevent unauthorised access ● consulting workers and engaging in securing their health and safety ● making sure welfare facilities are provided.
Contractors are those who do the actual construction work and can be either an individual or a company.	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, co-ordinate 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.
Workers are the people who work for or under the control of contractors on a construction site.	They must: ● be consulted about matters that affect their health, safety and welfare ● take care of their own health and safety, and that of others who may be affected by their actions ● report anything they see that is likely to endanger either their own or others' health and safety ● co-operate with their employer, fellow workers, contractors and other duty holders.

Source: Health and Safety Executive (2015) *Managing health and safety in construction*

INDUSTRY TIP

You can access the Building (Amendment) Regulations 2013 at: www.legislation.gov.uk/uksi/2013/1105/contents/made

The Building (Amendment) Regulations 2013

The Building Regulations in England and Wales come under the Building Act 1984. They set the standards for the design and construction of buildings to ensure the safety, health and welfare of the people who live and work in buildings, including provision for those people with a physical disability.

The Building Regulations are set out in a series of Approved Documents titled from A to R; these describe the technical detail.

Those documents listed below have specific implications for plumbers, heating engineers and building services operatives:

- **Approved Document A: Structure**
  Where the components of a system affect the loading placed on the structure of a building or excavations are close to the building. Has to be followed when joists are notched or drilled.
- **Approved Document B: Fire safety**
  Where holes in walls have to be made which could reduce the fire resistance of the building between areas.
- **Approved Document C: Site preparation and resistance to contaminates and moisture**
  Where holes are made in walls for pipes and fixings which may reduce the moisture resistance or allow moisture to ingress the building.
- **Approved Document D: Toxic substances**
  Prevents toxic substances and fumes from entering a property.
- **Approved Document E: Resistance to sound**
  Where holes in the building fabric may reduce the soundproof integrity of the building or systems may cause a noise nuisance to nearby buildings.
- **Approved Document F: Ventilation**
  Building ventilation and guidance on air quality within the building preventing the build up of condensation.
- **Approved Document G: Sanitation, hot water safety and water efficiency**
  Outlines cold water supply, flow and efficiency use within a property. States the daily usage per person. States the requirement for safe working temperatures and controls for hot water. Outlines suitable sanitary appliances within a property.
- **Approved Document H: Drainage and waste disposal**
  Outlines the requirements for soil stack and guttering installation and design.
- **Approved Document J: Combustion appliances and fuel storage systems**
  Outlines the safe installation and usage of heat producing appliances, including boilers, chimneys and flues, and offers advice on safe fuel storage installations, including solid fuel, liquid oil fuels and gas-fired heating.
- **Approved Document K: Protection from falling, collision and impact**
  Outlines the requirements for stairs, ramps and loading bays. The protection against impacts with glazing and use of safety windows and prevention from being trapped by doors.
- **Approved Document L: Conservation of fuel and power**
  Outlines the energy efficiency standards for properties including boilers, controls and insulation.
- **Approved Document M: Access to and use of buildings**
  Outlines the ease of access to and use of buildings, including facilities for disabled visitors or occupants, and the ability to move through a building easily including to toilets and bathrooms.
- **Approved Document P: Electrical safety**
  Outlines electrical safety in dwellings, including detailed information about what procedures need to be in place and who may carry these out, such as when a professional electrician must be hired. Details electrical safety to avoid injuries and fires caused by electrical installations, including the design, installation, inspection and testing of any electrical works made within a dwelling.

- **Approved Document Q: Security in dwellings**
  Outlines security in new dwellings, including measures taken to avoid any unauthorised entrance to dwellings and flats within a building.
- **Approved Document R: High-speed electronic communications networks**
  Outlines high-speed electronic communications networks, for example the use of physical infrastructures within a building to ensure it may be connected to a broadband network.
- **Approved Document 7: Material and workmanship**
  Outlines materials and workmanship, for example the use of the appropriate materials for a construction and how those who are working on the building must behave in a workmanlike manner.

INDUSTRY TIP

All Approved Documents can be accessed from the index at: www.gov.uk/government/collections/approved-documents

Building services-specific legislation

The term 'building services' is used to describe those activities not connected with the construction of the building but related to the services that are installed within the building as it is constructed. The services in a building are:

- water
- gas
- electricity
- heating and ventilation
- telecommunications.

The building services industry has specific legislation to ensure the health and safety of the general public.

The Water Supply (Water Fittings) Regulations 1999

These relate to the supply of safe, clean, wholesome drinking water to properties and dwellings, specifically targeting the prevention of contamination, waste, undue consumption, misuse and erroneous metering.

INDUSTRY TIP

- You can access the Water Supply (Water Fittings) Regulations 1999 at: www.legislation.gov.uk/uksi/1999/1148/contents/made
- You can access the Gas Safety (Installation and Use) Regulations 1998 at: www.legislation.gov.uk/uksi/1998/2451/contents/made

The Gas Safety (Installation and Use) Regulations 1998

These cover the safe installation, maintenance and use of gas and gas appliances in private dwellings and business premises, aimed at preventing carbon monoxide (CO) poisoning, fires and explosions. The Regulations state that all gas engineers must be registered on the Gas Safe Register to prove their competency, and it is the responsibility of landlords to ensure that their tenants' pipework and appliances are checked annually and certified safe to use. Homeowners and other gas consumers are also recommended by the HSE to have their appliances serviced and checked annually by a registered Gas Safe installer.

The 18th Edition IET Wiring Regulations (BS 7671)

These are the national standard to which all wiring – industrial or domestic – should now conform. All wiring must be designed to the specifications laid down in the Regulations, and any person involved in the design, installation, inspection and testing of electrical installations must have a sound knowledge of this document.

KEY POINT

The IET Regulations are produced by the Institute of Engineering and Technology (IET), the industry body that covers electrical installation. The 18th edition contains many major changes that align it with other similar European documents. To find out more, visit: http://electrical.theiet.org/bs-7671/

Health and safety responsibilities

According to the CDM Regulations, each member of the construction team has certain responsibilities towards health, safety and welfare during the planning stage, the construction stage and after the building is completed. The main document to be produced as a result of the CDM Regulations is the health and safety file, which must stay with the building until its demolition. The main responsibilities are as follows.

The employer

The responsibilities of the employer are vast and are detailed in law to comply with government legislation and regulation. The main duty is to ensure health, safety and welfare by providing a safe working environment for all employees. This includes providing safe systems of work, safe handling, storage, training and supervision. Employers are obligated to provide an up-to-date health and safety policy that is accessible for all employees and any site visitors.

The employee

Under the HASAWA, employees must act with due care for themselves and anyone else who may be affected by their acts or omissions. They must co-operate with the employer in respect of health and safety matters, and must not recklessly interfere with or misuse equipment that is provided for health and safety.

The client

The client must demonstrate an acceptable standard of health and safety by appointing a principal designer (see below) to monitor and advise on all health and safety matters. They must also make suitable arrangements for managing a project. This includes making sure that:

- other duty holders are appointed
- sufficient time and resources are allocated
- the relevant information is prepared and provided to other duty holders
- the principal designer and principal contractor carry out their duties
- welfare facilities are provided.

The principal designer

These are designers appointed by the client in projects involving multiple contractors. They can be an organisation or an individual with the knowledge, experience and ability to carry out the role, which includes planning, managing, monitoring and co-ordinating health and safety in the construction phase of a project.
This covers:

- liaising with the client and principal contractor
- preparing the construction phase plan
- organising co-operation between contractors and co-ordinating their work
- ensuring that:
  - 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.

Principal contractors

These are appointed by the client to co-ordinate the construction phase of a project where it involves more than one contractor. Their responsibilities include planning, managing, monitoring and co-ordinating health and safety in the construction phase of the project, which covers:

- liaising with the client and principal designer
- preparing the construction phase plan
- organising co-operation between contractors and co-ordinating their work
- ensuring that suitable site inductions are provided
- taking steps to prevent unauthorised site access
- consulting workers, and engaging them in securing their health and safety
- ensuring that welfare facilities are provided.

Contractors

Contractors are those who do the actual construction work and can be either an individual or a company.
Their role is to:

- plan, manage and monitor the construction work under their control so that it is carried out without risks to health and safety
- for projects involving more than one contractor, to co-ordinate their activities with others in the project team, and comply with directions given to them by the principal designer or principal contractor
- for single-contractor projects, prepare a construction phase plan.

Subcontractors

Subcontractors do not have direct contact with health and safety issues. However, they must abide by the law in respect to health and safety and be provided with relevant safety information and PPE. They must also complete an initial site induction before they are allowed on-site alone.

The legal status of health and safety guidance

Health and safety guidance can be divided into two distinct groups: **mandatory** and **advisory**.

KEY TERMS

Mandatory: required by law; compulsory.
Advisory: recommended but not enforced.

Those that are mandatory (the law) are:

- **Acts of Parliament:** these create a new law or change an existing one. Their implementation is the responsibility of a specific government department; in the case of health and safety acts, this is the Health and Safety Committee.
- **Regulations:** rules, procedures and administrative codes set by authorities or governmental agencies to achieve an objective. They are legally enforceable and must be followed to avoid prosecution.

Those that give guidance and advice are:

- **Approved codes of practice (ACOPs):** documents that give practical guidance on complying with regulations. Although it is not an offence not to comply with an ACOP, in the case of health and safety ACOPs, proof that their advice has been ignored could be seen as evidence of guilt if an employer or employee faces criminal prosecution under health and safety law. Following an ACOP is considered good practice.
- **Guidance notes:** these are produced by the HSE to help people interpret and understand what is required by a law, and to comply with it. They also give technical advice. Courses of action set out in guidance notes are not compulsory, but if the guidance is followed it is usually enough to comply with the law.

▲ Figure 1.6 Managing and working with asbestos

Who enforces health and safety regulations?

Health and safety law is enforced by the HSE and local authority working in partnership under the Health and Safety Executive/Local Authorities Enforcement Liaison Committee (HELA). Both employ health and safety inspectors whose job it is to ensure that the law is complied with.

The role of the health and safety inspectors

Inspectors have the legal right to enter your workplace without giving notice, although notice may be given where the inspector considers it appropriate. On a normal inspection visit, the inspector would look at your place of work, work activities, management of health and safety, and check that your employer is complying with health and safety law. The inspector may offer guidance and advice or talk to employees, take photographs and samples, serve improvement notices or take action if a risk to health and safety is perceived.

If a breach of health and safety law is found, the inspector will decide what action to take. The action will depend on the severity of the breach. The inspector should provide employees or their representatives with information relating to the breach and any necessary action.

There are several ways in which an inspector may take enforcement action to deal with a breach of the regulations. These are as follows.

- **Informal action:** where the breach of the law is comparatively small, the inspector will advise the duty holder what action to take in order to conform with the requirements of the law. If requested, this can be given in writing.
- **Improvement notice:** more severe breaches will receive a direct order to take specific action to comply with the law. The inspector will discuss with the duty holder the improvement notice and resolve points of difference before serving it. The notice will say what has to be done, why and by when. The time period to take the corrective action will be a minimum of 21 days, to allow the duty holder time to appeal to an industrial tribunal.
- **Prohibition notice:** where an activity involves a risk of serious personal injury, the inspector may issue a prohibition notice forbidding the activity either immediately or after a specified time period. This notice will not be lifted and work will not be allowed to resume until corrective action has been taken.
- **Prosecution:** in some cases, prosecution may be deemed necessary. Failure to comply with an improvement or prohibition notice, or a court remedy order, carries a fine of up to £20,000 or six months' imprisonment, or both. Unlimited fines and in some cases imprisonment may be given by higher courts.

2 RECOGNISING AND RESPONDING TO HAZARDOUS SITUATIONS AT WORK

We will now look at construction site safety from a general and personal point of view. We will examine general site hazards, and how we can either help or hinder our own health and safety and that of those around us.

Preventing accidents at work

Accidents do not just happen; they are caused. The first step towards preventing accidents is finding out what the causes are. Accident prevention is something that everyone needs to practise. It means being able to recognise and take steps to remove danger, and is the responsibility of everyone working, in any way, on a construction site.

KEY TERM

Accident: an unexpected or unplanned event that could result in personal injury, damage and, occasionally, death. When an accident occurs, there are always reasons for it and if there's a reason, then there is usually blame.

HEALTH AND SAFETY

Next time you are tempted to take a risk, STOP and THINK safety!

Learning to spot a dangerous situation is not difficult because accidents follow a regular pattern. Every day, the same set of dangerous conditions build up and the same unsafe acts take place. Consequently, the same kinds of accident happen over and over again.

ACTIVITY

Do any of the things you normally see and do at work add up to a source of danger? Write a list of potential accidents and, against each one, note down an action you could take to reduce the risk of it happening.

Identifying hazards at work

Hazards on-site can be divided into three specific groups:

1. general site and work area cleanliness, which can lead to trips, slips and falls
2. using equipment and PPE that is inadequate for the job, non-existent (in the case of PPE) or defective

3 personal conduct such as:
   - incorrect manual handling methods
   - incorrect methods of working at heights, in trenches and on excavations
   - not taking enough care and attention in dangerous environments
   - using equipment or carrying out activities without appropriate training
   - taking risks.

Here are a few examples of things that can lead to accidents in the workplace:

- 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
- lack of concentration due to distraction or lack of interest in the job
- PPE or clothing not used or worn
- inadequate training and supervision
- inadequate lighting, heating or noise
- poor storage of materials
- unsafe methods of handling and lifting
- defective tools and equipment
- poor weather conditions
- electrical faults
- failure to use guards provided
- working under the influence of drugs and/or alcohol.

In many cases, these can be prevented by following safe working practices, including the use of risk assessments, method statements and permits to work.

Risk assessments

A risk assessment is a detailed examination of any factor that could cause injury, so that you or your employer can assess whether sufficient steps have been taken to prevent harm. Other workers and the general public have a right under health and safety law to be protected from any harm that may be caused by the failure to take reasonable control measures. Your employer is legally required to assess the risks in the workplace and implement measures to control those risks. The law does not expect you to eliminate all risks, but you are expected to take steps to ensure health and safety as far as is reasonably practicable.

KEY POINT

Remember that a **hazard** is anything that may cause harm, such as chemicals, electricity, gas, working from ladders, etc. The **risk** is the chance, no matter how high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.

Risk assessment step by step

1 Identify the hazards.
   - Work out how people could be harmed by:
     – walking around the site
     – asking employees what they think
     – visiting the HSE website for practical guidance
     – contacting trade associations for advice
     – checking manufacturers' instructions and COSHH data sheets.

2 Decide who might be harmed and how.
   - Identify the groups of people at risk.

3 Evaluate the risks and decide on precautions.
   - Consider:
     – whether you can get rid of the hazard altogether
     – if not, how can you control the risks so that harm is unlikely?

4 Record your findings and implement them.
   - Ensure a proper check was made by:
     – asking who might be affected
     – dealing with all the significant hazards, taking into account the number of people who could be involved
     – making sure all precautions are reasonable, and the remaining risk is low
     – involving your staff or their representatives in the process.

5 Review your assessment and update it if necessary.
   - Ensure you review risk assessments every year taking into account whether:
     – more employees have joined the company
     – new machinery and/or equipment has been installed
     – any fellow workers have spotted any problems
     – anything has been learned from accidents or near misses.

RISK ASSESSMENT RA01: ALL OPERATIONS – CORE ASSESSMENT

Operation/Task:	All operations – core assessment	Employees at risk:	All site personnel
Location/Area:	Any	Other persons at risk:	General public
Assessor:		Key responsible personnel:	Contract managers and supervisors

Activity	Hazard	Risks	Pre-control risk ratings			Control measures	Post-control risk ratings			Comments
			1*	2**	1x2		1*	2**	1x2	
Construction plant operation	Plant and vehicle movement	Contact by Major injury	5	6	30	Controlled operations with use of banksman as necessary. Competent operators to CITB CTA, EPIC or CSCS standards where applicable. Clear and reasonable access/egress for plant. Well-maintained construction plant.	2	5	10	This is a general assessment only. See also assessments relating to specific items of construction plant.
Signing and guarding of works	Public, traffic, site traffic	Contact by Major injury	7	7	49	Signing and guarding to Chapter 8 of Traffic Signs Manual. Installation procedures consistent with those recommended by Chapter 8 and the Traffic Management Contractors' Association (TMCA). Competent operators carrying out the installation. Additional training for those carrying out signing etc. on high-speed roads.	2	6	12	This is a high-risk activity but methods of working and control measures keep risk to a minimum. Consequences can still be serious, especially on high-speed roads. High level of discipline required. See other signing specific Risk Assessments.
Driving around the site	Plant and vehicle movements, obstruction	Contact by Major injury Contact with	5	6	30	Site speed limit usually 15 m.p.h. High level of personal awareness. Rotating flashing amber beacon displayed prominently on top of vehicle.	2	2	4	See also task specific Risk Assessments.
Pedestrian activity	Plant and vehicle movement	Contact by	5	6	30	Personal awareness of operations on site. Use of pedestrian only routes where available/possible. Wearing high viz clothing to EN471.	2	5	10	See also task specific Risk Assessments.
All tasks	Incompetence	Various	4	6	24	All site personnel to be competent to perform the tasks they are asked to do. Compliance with the Site Managers' rules. Skills/competencies as per Company Health & Safety Policy.	1	5	5	High level of awareness and most operations of a 'pass-by' nature thereby minimising the Laeq values.
	Noise from operations	Hearing damage	3	4	12	All construction plant and vehicles constructed to national standards and industry norm that includes noise attenuation. Noise levels identified on machine when possible. Noise Risk Assessment carried out for various items of plant and hearing.	1	2	2	

▲ Figure 1.7 Example of a risk assessment form

Method statements

A method statement, sometimes called a safe system of work, is usually completed after the risk assessment. It is a document that details the work task or process, outlines the hazards involved and includes a step-by-step guide on how the work should be completed safely. The method statement must also detail which control measures have been initiated to ensure the safety of anyone affected by the task or process. Method statements are frequently requested as part of the tendering process as this allows the client to gain an insight into the company and the way it operates.

Permits to work

When work has been identified as high risk, strict health and safety controls are required. In this instance the work must be carried out against a pre-agreed permit to work. A permit to work is a document put together by those authorising the work and those carrying it out, which gives authorisation for named persons to carry out specific work within a nominated time frame. It lists the precautions that are required to complete the work safely based on a written risk assessment. It describes the work and how it will be carried out (more detail is given in the method statement). On completion of the work, and before equipment or machinery is reinstated, it will require a written declaration from the permit originator that normal practice may be returned to.

Work affecting the public and their health and safety

It is not only construction workers that suffer accidents as a result of construction work. Members of the public can also be killed and injured. Accidents can often occur when people are walking close to where buildings are being constructed, refurbished or demolished. It

must be remembered that work near to where the general public have access needs must be planned and executed correctly, taking into account people with pushchairs, people with disabilities and the elderly.

The best way of protecting the public from the dangers of construction sites is to restrict access – in other words, keep them out! Here are just a few pointers to remember:

- Erect a 2 m high perimeter fence. If parts of it need to be taken down for access, make sure these are 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:
  - cover trenches, excavations and scaffolds, removing all ladders
  - store materials so there is no risk of them toppling over
  - lock away hazardous substances
  - 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.

INDUSTRY TIP

These are just a few of the precautions you can take but there are many others. For more information, see the HSE website at: www.hse.gov.uk

Safety signs

Safety signs are used on construction sites where risks have not been avoided by other means. Employers are required to provide and maintain safety signs, and workers need to be trained in the recognition of safety signs and symbols so that they understand their meaning. To ensure that the correct number and type of safety signs have been used, an employer must carry out a number of simple tasks. They must:

- conduct a risk assessment
- ensure fire equipment and emergency exits are clearly indicated
- use signs to prohibit entry into dangerous areas
- make sure that mandatory requirements, such as wearing PPE, are clearly shown
- clearly indicate all first-aid areas and equipment
- use signs to show prohibited behaviour, such as 'no smoking'.

The signs used must communicate their message clearly and effectively, and many have to conform to strict legal and accessibility obligations. Safety signs must comply with the European Council's Safety Signs Directive (92/58/EEC), the purpose of which is to encourage the standardisation of safety signs throughout the European Union so that safety signs have the same meaning. Safety signs are divided into five separate groups as shown in Table 1.3.

INDUSTRY TIP

You can access more information on the European Council's Safety Signs Directive (92/58/EEC) via: www.unece.org/trans/danger/publi/ghs/pictograms.html

▼ Table 1.3 Six groups of safety signs

Category	Description	Example
Prohibition – 'Stop!'	**Colour:** 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 a certain behaviour is prohibited. **Meaning:** Stop / Do not / You must not	
Warning – 'Danger'	**Colour:** A yellow triangle with a black border and black symbol. **Purpose:** To warn of any type of hazard. **Meaning:** Danger / Hazard / Caution / Beware / Careful	
Mandatory – 'Obey'	**Colour:** 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	
Fire equipment – 'Fire'	**Colour:** A red rectangle or square with a white symbol. **Purpose:** To describe the location of fire-fighting equipment. **Meaning:** Location of fire-fighting equipment	
Safe condition – 'Safety'	**Colour:** 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	

Occasionally, a sign may be seen that is a mixture of many different types of signs on one signboard. These are known as combination signs; an example is shown in Figure 1.8.

▲ Figure 1.8 Example of a combination safety sign board

Book 1

Plumbing

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