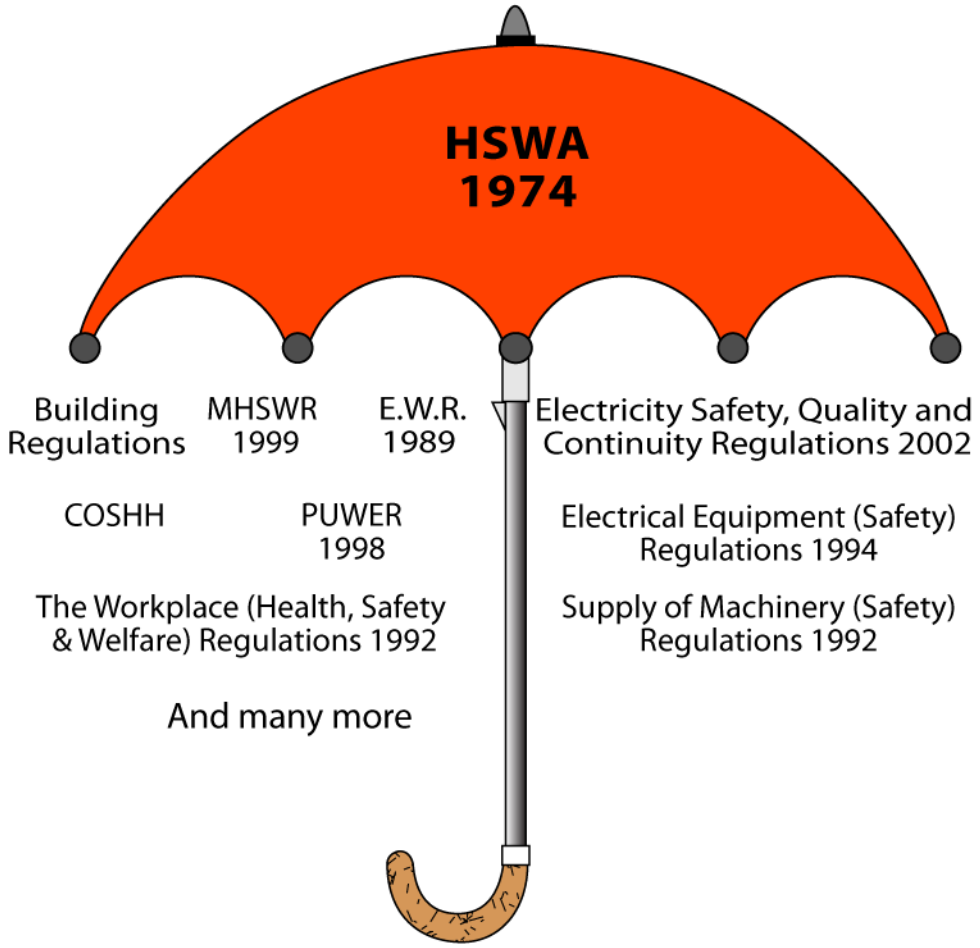
Level 3 Diploma in Installing Electrotechnical Systems & Equipment

C&G 2357

Unit 301 - Health and Safety & Legislation



B&B Training Associates Ltd
Learning Materials for the Electrical Industry

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Aims and objectives

Outcome 1	Outcome 2	Outcome 3	Outcome 4
Specify your own roles and responsibilities and those of others with respect to current relevant legislation.	State the procedures that should be followed in the case of accidents which involve injury, including requirements for the treatment of electric shock/electrical burns.	State the procedures for producing risk assessments and method statements in accordance with their level of responsibility.	Identify warning signs for the seven main groups of hazardous substances as defined by The Chemical (Hazard Information and Packaging for Supply) Regulations (CHIP).
Specify particular Health and Safety risks which may be present and the requirements of current health and safety legislation for the range of electrotechnical work operations.	Specify appropriate procedures which should be followed when emergency situations occur in the workplace.	Describe the procedures for working in accordance with provided, pre-determined method statements.	Define what is meant by the term hazard in relation to Health and Safety legislation in the workplace.
	State the limitations of their responsibilities in terms of Health and Safety in the workplace.	Describe the procedures that should be taken to remove or minimise risks before deciding PPE is needed.	Identify specific hazards associated with the installation and maintenance of electrotechnical systems and equipment.
	State the actions to be taken in situations which exceed their level of responsibility for Health and Safety in the workplace.	State the purpose of PPE.	Describe situations which can constitute a hazard in the workplace.
	State the procedures that should be followed in accordance with the relevant Health and Safety Regulations for	Specify the appropriate protective clothing and equipment that is required for identified work tasks.	Explain practices and procedures for addressing hazards in the workplace.

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Outcome 1	Outcome 2	Outcome 3	Outcome 4
	reporting health, safety and/or welfare issues in the workplace.		
	Specify appropriately responsible persons to whom health and safety and welfare related matters should be reported.	State the first aid facilities that must be available in the work area in accordance with health and safety regulations.	Identify the correct type of fire extinguisher for a particular type of fire.
		Explain why it is important not to misuse first aid equipment and/or supplies and to replace first aid supplies once used.	Explain situations where asbestos may be encountered.
		Describe safe practices and procedures in the working environment.	Specify the procedures for dealing with the suspected presence of asbestos in the workplace.

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1: Legislation

In this session the student will:

- Gain an understanding of how health and safety legislation developed.
- Gain an understanding of the duties for employers and employees.

History

Since the industrial revolution, factories have been built to produce goods. The industrial drive led many of these new industrialists (factory owners) to keep the working conditions at the factory at levels that were very unsafe. Young children worked down coalmines and climbed chimneys, as well as working in mills. Many lives were lost and many more injuries occurred due to poor safety standards and practices.

During the nineteenth century, a number of people, such as Lord Shaftsbury, used their influence to improve the way workers were treated. The activity to improve working conditions was generally done on an ad-hoc and voluntary basis and often did not force owners to improve working conditions. Legislation was required as was a more consistent approach with regard to the value of life.

In 1901 the Factories and Workshop Act was introduced which began to control dangerous activities in a workplace.

In 1908, the Electricity (Factories Act) Special Regulations was passed as electricity was becoming to be considered dangerous, which it obviously is.

In 1944 and 1961, the Factories Act was amended yet again whilst retaining its form until the ***Health and Safety at Work etc Act 1974*** came into force.

The table below details some of the health and safety issues and laws that has been raised or brought in over the years. This is not an exhaustive list with many items of legislation being brought in over the last ten or so years.

Dates	Occurrence
1556	Book on mining had a section on miner's diseases.
1567	Paper written on the diseases in miners.
1690	First judgement that made the employer responsible for what the employee did at work.
1700	Book on trade diseases published.
1700s	Industrial revolution.
1784	Fever epidemic in Lancashire claims many lives.
1795	Manchester Board of Health set up.
1800	Outlawing of trade unions
1802	First health and safety act- It was an act for the preservation of health and morals of apprentices and others in cotton mills.
1819	Children under nine forbidden from working in mills and limits set on other child labour.
1824	Trade unions become lawful.
1832	First book on occupational diseases published in English.
1833	Inspectors of factories set up and limits placed on child and women labour.
1842	First act relating to coal mines banning the use of child and women labour.
1844	First act regarding machinery with additional limits on hours worked-applied only in mills.
1864	Laws extended to factories other than mills.
1871/75	850 boiler explosions leading to death and injury.
1878	First act to consolidate health and safety legislation with extension to most factories.
1881	Law relating to boilers.
1897	First compensation act.
1901	Factory and Workshop Act-It was the first act to permit a Minister to make regulations.
1906	Compensation act extended to all wage earners within limits.
1937	Consolidation to Factories Act.
1961	Last consolidation to Factories Act.
1972	UK become part of EEC (Common Market).
1974	Health and Safety at Work Act.
1986	Single European Act.
1992	Series of EU regulations adopted into UK law with repeal of many older acts.
1992	Single market established.

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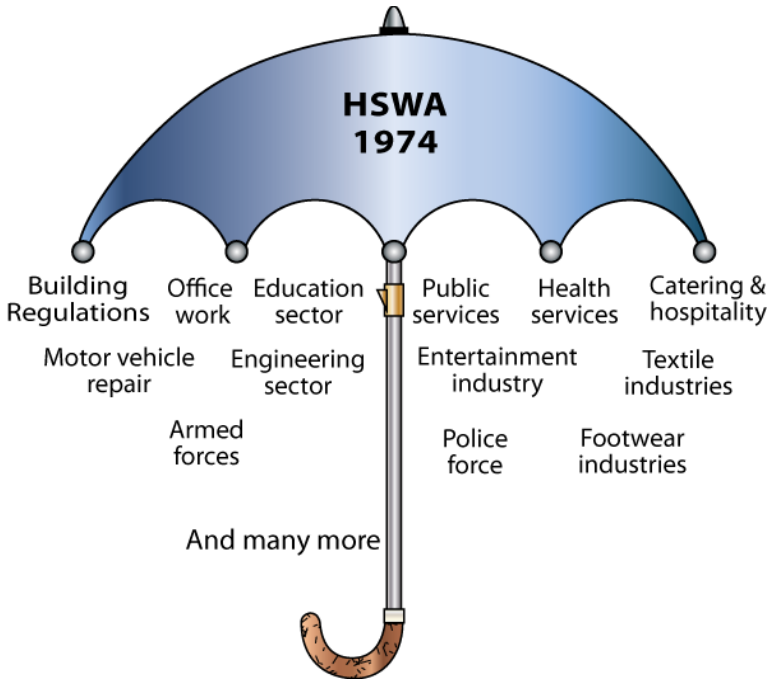
The Health and Safety at Work etc Act 1974 (HSWA)

The HSWA (Health and Safety at Work etc Act 1974) is a very important piece of legislation. The 1974 Act acts like an umbrella, in that it now draws all other statutory safety regulations under its reach.



The Health and Safety at Work Act of 1974 is split into four parts. Part 1 was brought into effect in October 1974, and this established the Health and Safety Commission (HSC). Part 1 also sets out the general purpose of the act.

Health and Safety Commission and the Health and Safety Executive (HSC/HSE)

On April 1st 2008 the Health and Safety Commission (HSC) and the Health and Safety Executive (HSE) merged to form a single national regulatory body responsible for promoting the cause of better health and safety at work. The merged body will be called the Health and Safety Executive and will provide greater clarity and transparency whilst maintaining its public accountability.

These are the general objectives of the act and are further explained and amplified as the act progresses, and are applied specifically as they relate to a particular hazard or risk.

The act is quite specific in that it relates solely to 'work' activities. This means that somebody doing some DIY at home for themselves in not 'at work', and therefore the act does not cover them. Neither does the act cover those who work in domestic service. However, when payment has been received in cash or kind, then the person carrying out the work is 'at work' and is therefore required to comply with the requirements of the act.

Part 2 of the act came into force in January 1975 and relates to the setting up of the Health and Safety Executive (HSE).

The merger between the HSE and the HSC (now called the HSE) means:

- There is a single national regulatory body responsible for promoting the cause of better health and safety at work
- Existing Commissioners are appointed as non-executive directors of the new Executive for the remainder of their term of office with the relevant responsibilities of the new roles
- The potential size of the Board of the new Executive will be no more than eleven members plus the Chair and members will continue to be appointed by the Secretary of State
- All the fundamental contents of the Health & Safety at Work Act remain
- None of the statutory functions of the previous Commission and Executive is removed
- There is no change in health and safety requirements, how they are enforced or how stakeholders relate to the health and safety regulator – no health and safety protections will be removed

The HSE is split into a number of divisions, such as factories, agriculture, nuclear etc. The HSE has a number of offices spread throughout the country that seek to promote good health and safety practise. They are not merely 'policemen' but are there to encourage all companies to maintain best health and safety practise. For example, if you were uncertain about a particular way of disposing of certain types of light fitting, a phone call to the HSE office would help you to find out what you need to know.

The HSE also has '***teeth***'. It has wide powers and any company that tried to bypass their requirements could find themselves in serious trouble.

HSE Powers

The HSE have a wide range of power available to them. An inspector has the power to:

- enter premises at reasonable times, with the support of the police if necessary
- make examinations as necessary
- stop work progressing whilst examination takes place
- make records (photographic etc.) as necessary
- take samples
- have items/equipment dismantled for examination
- take possession of any article for as long as is necessary for examination and/or evidence
- require people to give information
- require the production of all relevant paperwork
- require people to provide them with necessary facilities.

These powers are wider than those that a police constable has! No warrant is required for the Health and Safety Inspector.

Improvement

An **improvement notice** is served on a company, employer or employee if the Inspector believes that a breach in the law has, or may have, taken place. The notice has a time limit attached. This time limit sets the maximum time in which the employer/employee must put the matter right.

If there is a failure to comply with the notice then, either a prohibition notice is given or a prosecution is initiated.

Prohibition

A **prohibition notice** can be served on a company, employer or employee. A prohibition notice can be given when there is an immediate danger from activities being carried out. It is important to remember that a prohibition notice does not have to be given out after an offence has occurred, but only when the Inspector believes that danger may occur.

Penalties

These are the punishments that are available because of a failure to comply with either prohibition or improvement notices, or if an accident, which involved the breaking of the law has occurred.

The Health and Safety (Offences) Act 2008 details the mode of trial and the maximum penalties applicable to certain offences relating to health and safety.

Schedule 3A of the Health and Safety (Offences) Act 2008 details the mode of trial and the maximum penalties.

It is worth noting that a level 5 fine currently equates to £5000 and a statutory maximum fine is £5000 in England and Wales and £10000 in Scotland.

In a Crown Court, there is no upper limit to the fine, and if a death has occurred, then a manslaughter charge can be brought.

Definition of terms used

It is worth re-stating that the HSE is not primarily set up to prosecute employers. It is set up to promote good practice, and that they are more than willing to help companies or individuals who are uncertain about their actions.

It is worthwhile just taking a moment to restate what the purpose of the HSWA is:

- It is to provide the legal framework to promote, stimulate and encourage high standards of health and safety at work.

The Act covers everybody who is at work except those who are domestic servants in private households. The Act itself is quite a small document, but that does not say anything about its importance. It is essential that you have a clear understanding of the Act and the consequences of not complying with the Act.

Absolute	If the requirement in a regulation is 'absolute', for example if the requirement is not qualified by the words 'so far as is reasonably practicable', the requirement must be met regardless of cost or any other consideration.
Reasonably practicable	Someone who is required to do something 'so far as is reasonably practicable' must assess, on the one hand, the magnitude of the risks of a particular work activity or environment and, on the other hand, the costs in terms of the physical difficulty, time, trouble and expense which would be involved in taking steps to eliminate or minimise those risks.
Hazard	Is something (e.g. an object, a property of a substance, a phenomenon or an activity) that can cause adverse effects? For example: • Water on a staircase is a hazard, because you could slip on it, fall and hurt yourself. • Loud noise is a hazard because it can cause hearing loss. • Breathing in asbestos dust is a hazard because it can cause cancer. (Risk Management: ALARP at a Glance. HSE http://www.hse.gov.uk/risk/theory/alarpglance.htm).
Risk	A risk is the likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect. It is a two-part concept and you have to have both parts to make sense of it. The effect can be described in many different ways. For example: • The annual risk of a worker in Great Britain experiencing a fatal accident [effect] at work [hazard] is less than one in 100,000 [likelihood];

	• About 1500 workers each year [likelihood] in Great Britain suffer a non-fatal major injury [effect] from contact with moving machinery [hazard]; or The lifetime risk of an employee developing asthma [effect] from exposure to substance X [hazard] is significant [likelihood]. (Risk Management: ALARP at a Glance. HSE http://www.hse.gov.uk/risk/theory/alarpglance.htm).

Duties of employers and employees.

There are a number of duties that are laid on employers and employees.

The Health and Safety at Work etc Act state that the duties of employers to their employees are:

1) It shall be the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees.

2) Without prejudice to the generality of an employer's duty under the preceding subsection, the matters to which that duty extends include in particular

a) the provision and maintenance of plant and systems of work that are, so far as is reasonably practicable, safe and without risks to health;

b) arrangements for ensuring, so far as is reasonably practicable, safety and absence of risks to health in connection with the use, handling, storage and transport of articles and substances;

c) the provision of such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees;

d) so far as is reasonably practicable as regards any place of work under the employer's control, the maintenance of it in a condition that is safe and without risks to health and the provision and maintenance of means of access to and egress from it that are safe and without such risks;

e) the provision and maintenance of a working environment for his employees that is, so far as is reasonably practicable, safe, without risks to health, and adequate as regards facilities and arrangements for their welfare at work.

3) Except in such cases as may be prescribed, it shall be the duty of every employer to prepare and as often as may be appropriate revise a written statement of his general policy with respect to the health and safety at work of his employees and the organisation and arrangements for the time being in force for carrying out that policy, and to bring the statement and any revision of it to the notice of all of his employees.

An employer has a duty to maintain mutual trust and confidence in his/her employee. An employer must not, without reasonable and proper cause, conduct themselves in a manner calculated, or likely, to destroy, or seriously damage the relationship of trust and confidence with his/her employee. This duty obliges employers to ensure an employee is treated with dignity at work, and deals with any complaints fairly and seriously.

The duties of employers and the self-employed to persons other than their employees are:

1) It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment who may be affected thereby are not thereby exposed to risks to their health or safety.
2) It shall be the duty of every self-employed person to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that he and other persons (not being his employees) who may be affected thereby are not thereby exposed to risks to their health or safety.
3) In such cases as may be prescribed, it shall be the duty of every employer and every self-employed person, in the prescribed circumstances and in the prescribed manner, to give to persons (not being his employees) who may be affected by the way in which he conducts his undertaking the prescribed information about such aspects of the way in which he conducts his undertaking as might affect their health or safety.

The duties of an employee are as follows:

It shall be the duty of every employee while at work

a) to take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions at work; and

b) as regards any duty or requirement imposed on his employer or any other person by or under any of the relevant statutory provisions, to co-operate with him so far as is necessary to enable that duty or requirement to be performed or complied with.

The next two sessions will briefly consider some of the health and safety regulations that apply to the electrical industry.

2: Statutory regulations 1

In this session the student will:

- Gain an understanding of statutory regulations.

All of the regulations listed below, other than the HSWA, are what are termed ***Principal Regulations***; i.e. they come under the overall umbrella of the HSWA and are equally legally binding and lay duties on employers, the self-employed and employees equal to those within the HSWA.

- The Health and Safety (etc) at Work Act 1974
- The Electricity at Work Regulations
- The Management of Health and Safety at Work Regulations
- Workplace (Health and Safety and Welfare) Regulations
- Control of Substances Hazardous to Health (COSHH) Regulations
- Working at Height Regulations
- Personal Protective Equipment at Work Regulations
- Manual Handling Operations Regulations
- Provision and Use of Work Equipment Regulations
- Health and Safety (Display Screen Equipment) Regulations
- Control of Asbestos at Work Regulations.

These Regulations state certain ***principles*** with regard to practice rather than being specific. Effectively this means that a degree of interpretation is required.

Having briefly considered The Health and Safety at Work Act in the previous session, this session will briefly consider the following regulations:

- The Electricity Safety, Quality and Continuity Regulations 2002
- The Electricity at Work Regulations
- The Management of Health and Safety at Work Regulations
- Workplace (Health and Safety and Welfare) Regulations
- Control of Substances Hazardous to Health (COSHH) Regulations
- Working at Height Regulations

Electricity Safety, Quality and Continuity Regulations 2002

Although not included within the C&G2357 syllabus, it is important for the electrician to be aware of the requirements of The Electricity Safety, Quality and Continuity Regulations 2002 (as amended) ESQCR.

ESQCR was introduced in 2002 and replaced The Electricity Supply Regulations 1988. These regulations have been further amended in 2006. The aim of ESQCR is to provide for the safety of the public and to provide for an electrical supply. The supply must be of an appropriate quality and reliability.

Regulation 31 of ESQCR places a duty on those working on, or owning power network apparatus such as generators, distributors, meter operators and others to report injuries, near misses or fires or explosions which have occurred as a result of work on or near to electrical systems by others, or incidents arising from leisure and other non-work activities in proximity to electrical plant, or from equipment failure.

The table below details the incidents that have occurred over the last eleven years.

Incident type	1999/ 2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/ 2010p
Fatal injuries	18	13	13	10	9	12	11	20	11	15	12
Non-fatal injuries	436	370	383	314	277	280	299	318	300	354	424
Near misses	2 965	3 346	2 758	2 701	2 738	3 139	4 239	4 045	3 831	4 287	5 072
Fires/ Explosions	317	345	218	243	401	350	297	327	211	290	320
Total	3 736	4 074	3 372	3 268	3 425	3 781	4 846	4 710	4 353	4 946	5 828

ESQCR is important in particular for the designer and installer of electrical installations in Part 7 (SUPPLIES TO INSTALLATIONS AND TO OTHER NETWORKS). This Part of the regulations details the requirements with regard to protection against supply failure, equipment on consumer's premises, connections to installations or other networks, disconnection of supply, refusal to connect and resolution of disagreements, declaration of phases, frequency and voltage at supply terminals, Information to be provided on request and discontinuation of supplies.

ESQCR also details, through its guidance, the limitations of the use of protective multiple earthing (PME) supplies for caravans, marinas and the like.

Electricity at Work Regulations 1989

The Electricity at Work Regulations (EWR) is concerned with anything that is electrical and used at work. Essentially anything from a battery put in a torch up to a 400 kV power line may be covered.

The document is the key form of legislation for anybody working within the electrotechnical industry, but it has to be recognised that it also applies to anyone who works on any electrical item whilst they are at work.

Part II of the EWR covers the general aspects of electrical work. These are:

- Regulation 4 systems, work activities and protective equipment
- Regulation 5 strength and capability of electrical equipment
- Regulation 6 adverse or hazardous environments
- Regulation 7 insulation, protection and placing of conductors
- Regulation 8 earthing or other suitable precautions
- Regulation 9 integrity of referenced conductors
- Regulation 10 connections
- Regulation 11 means for protecting from excess of current
- Regulation 12 means for cutting off the supply and for isolation
- Regulation 13 precautions for work on equipment made dead
- Regulation 14 work on or near live conductors
- Regulation 15 working space, access and lighting
- Regulation 16 persons to be competent to prevent danger and injury.

The impact of these regulations on all aspects of electrical work within the industry has been enormous.

It is not within the scope of this study book to unpack all the implications of the EWR. It is sufficient to note that before work may commence on anything three things must have occurred:

- **the person who is working must be competent to do the task**
- **the task must have been planned in such a way that no live working takes place**
- **where live working cannot be avoided, the risks to injury must be limited.**

Management of Health and Safety at Work Regulations 1999

Although introduced in 1992 the Management of Health and Safety at Work Regulations (MHSWR) regulations were amended in 1994 and 1999 and are a key set of regulations in that they define what an employer is required to do to manage health and safety under the Health and Safety at Work Act.

The MHSWR places duties on employers to introduce specific control measures to ensure the health, safety and welfare of employees and any others who are affected by work activities. There are twelve specific requirements of MHSWR:

- to carry out formal risk assessments
- to have formal management control systems
- to have specific protective and preventative measures set in place by the employers
- to carry out health surveillance
- to appoint competent persons
- to arrange the necessary contacts with external services
- have procedures set in place for serious and imminent danger
- to provide information for employees
- to encourage and ensure inter-employer cooperation
- to provide job/task specific training
- to assess the capability of those working
- to encourage and detail employee duties.

As with most of these regulations there is an immense amount of work that can be carried out in this area.

We will be going into more detail later, but briefly it is in MHSWR that we see the need for risk assessments and information dissemination.

Workplace (Health, safety and Welfare) Regulations 1992

As with so many other items of health and safety legislation the Workplace (Health, safety and Welfare) Regulations were introduced in 1992.

These regulations aim to ensure that workplaces meet the health, safety and welfare needs of all members of the workforce, including people with disabilities.

Health	
Ventilation	Workplaces need to be adequately ventilated. Fresh, clean air should be drawn from a source outside the workplace, uncontaminated by discharges from flues, chimneys or other process outlets, and be circulated through the workrooms. Ventilation should also remove and dilute warm, humid air and provide air movement which gives a sense of freshness without causing a draught. If the workplace contains process or heating equipment or other sources of dust, fumes or vapours, more fresh air will be needed to provide adequate ventilation.
Temperatures in indoor workplaces	Environmental factors (such as humidity and sources of heat in the workplace) combine with personal factors (such as the clothing a worker is wearing and how physically demanding their work is) to influence what is called someone's 'thermal comfort'. Individual personal preference makes it difficult to specify a thermal environment which satisfies everyone. For workplaces where the activity is mainly sedentary, for example offices, the temperature should normally be at least 16 °C. If work involves physical effort it should be at least 13 °C (unless other laws require lower temperatures).
Work in hot or cold environments	The risk to the health of workers increases as conditions move further away from those generally accepted as comfortable. Assessment of the risk to workers' health from working in either a hot or cold environment needs to consider both personal and environmental factors. Personal factors include body activity, the amount and type of clothing, and duration of exposure. Environmental factors include ambient temperature and radiant heat; and if the work is outside, sunlight, wind velocity and the presence of rain or snow.

Health	
Lighting	Lighting should be sufficient to enable people to work and move about safely. If necessary, local lighting should be provided at individual workstations and at places of particular risk such as crossing points on traffic routes. Lighting and light fittings should not create any hazard.
Cleanliness and waste materials	Every workplace and the furniture, furnishings and fittings should be kept clean and it should be possible to keep the surfaces of floors, walls and ceilings clean. Cleaning and the removal of waste should be carried out as necessary by an effective method. Waste should be stored in suitable receptacles.
Room dimensions and space	Workrooms should have enough free space to allow people to move about with ease. The volume of the room when empty, divided by the number of people normally working in it, should be at least 11 cubic metres. All or part of a room over 3.0 m high should be counted as 3.0 m high. 11 cubic metres per person is a minimum and may be insufficient depending on the layout, contents and the nature of the work.
Workstations and seating	Workstations should be suitable for the people using them and for the work they do. People should be able to leave workstations swiftly in an emergency. If work can or must be done sitting, seats which are suitable for the people using them and for the work they do should be provided. Seating should give adequate support for the lower back, and footrests should be provided for workers who cannot place their feet flat on the floor.

Safety	
Maintenance	The workplace, and certain equipment, devices and systems should be maintained in efficient working order. Such maintenance is required for mechanical ventilation systems; equipment and devices which would cause a risk to health, safety or welfare if a fault occurred; and equipment and devices intended to prevent or reduce hazard.
Floors and traffic routes	'Traffic route' means a route for pedestrian traffic, vehicles, or both, and includes any stairs, fixed ladder, doorway, gateway, loading bay or ramp. Open sides of staircases should be fenced with an upper rail at 900 mm or higher, and a lower rail. A handrail should be provided on at least one side of every staircase, and on both sides if there is a particular risk. Additional handrails may be required down the centre of wide staircases. Access between floors should not be by ladders or steep stairs.
Falls into dangerous substances	The consequences of falling into dangerous substances are so serious that a high standard of protection is required. Dangerous substances in tanks, pits or other structures should be securely fenced or covered. Traffic routes associated with them should also be securely fenced.
Transparent or translucent doors, gates or walls and windows	Openable windows, skylights and ventilators should be capable of being opened, closed or adjusted safely and, when open, should not pose any undue risk to anyone.
Doors and gates	Doors and gates should be suitably constructed and fitted with safety devices if necessary. Doors and gates which swing both ways and conventionally hinged doors on main traffic routes should have a transparent viewing panel. Power-operated doors and gates should have safety features to prevent people being struck or trapped and, where necessary, should have a readily identifiable and accessible control switch or device so that they can be stopped quickly in an emergency.
Escalators and moving walkways	Escalators and moving walkways should function safely, be equipped with any necessary safety devices, and be fitted with one or more emergency stop controls which are easily identifiable and readily accessible.

Welfare	
Sanitary conveniences and washing facilities	Suitable and sufficient sanitary conveniences and washing facilities should be provided at readily accessible places. They and the rooms containing them should be kept clean and be adequately ventilated and lit. Washing facilities should have running hot and cold or warm water, soap and clean towels or other means of cleaning or drying. If required by the type of work, showers should also be provided. Men and women should have separate facilities unless each facility is in a separate room with a lockable door and is for use by only one person at a time.
Drinking water	An adequate supply of high-quality drinking water, with an upward drinking jet or suitable cups, should be provided. Water should only be provided in refillable enclosed containers where it cannot be obtained directly from a mains supply. The containers should be refilled at least daily (unless they are chilled water dispensers where the containers are returned to the supplier for refilling). Bottled water/water dispensing systems may still be provided as a secondary source of drinking water.
Accommodation for clothing and facilities for changing	Adequate, suitable and secure space should be provided to store workers' own clothing and special clothing. Changing facilities should also be provided for workers who change into special work clothing. The facilities should be readily accessible from workrooms and washing and eating facilities, and should ensure the privacy of the user, be of sufficient capacity, and be provided with seating.
Facilities for rest and to eat meals	Suitable and sufficient, readily accessible rest facilities should be provided. Seats should be provided for workers to use during breaks. These should be in a place where personal protective equipment need not be worn. Rest areas or rooms should be large enough and have sufficient seats with backrests and tables for the number of workers likely to use them at any one time, including suitable access and seating which is adequate for the number of disabled people at work.

Welfare	
	Where workers regularly eat meals at work, suitable and sufficient facilities should be provided for the purpose. Such facilities should also be provided where food would otherwise be likely to be contaminated. Work areas can be counted as rest areas and as eating facilities, provided they are adequately clean and there is a suitable surface on which to place food. Where provided, eating facilities should include a facility for preparing or obtaining a hot drink. Where hot food cannot be obtained in or reasonably near to the workplace, workers may need to be provided with a means for heating their own food. Suitable rest facilities should be provided for pregnant women and nursing mothers. They should be near to sanitary facilities and, where necessary, include the facility to lie down.

Control of Substances Hazardous to Health 2002

Industry uses in excess of 40000 different substances, and all have the potential to cause harm in one form or another. The Control of Substances Hazardous to Health (COSHH), as with the other regulations was introduced in 1992 and amended again in 1999 and 2002. It requires adequate assessments to be made regarding the health risk and so much more. With MHSWR it is a key piece of legislation with far reaching consequences.

A substance hazardous to health includes any material or mixture that is harmful to people's health. This includes not only the substance, but also the by-products and not only the workers, but also those who are affected by the work activity.

The duties placed on employers are:

- not to carry out work which is liable to expose an employee to a hazardous substance unless an assessment has been made of the risks to health and safety
- to carry out the risk assessment in the light of appropriate data sheets and to record the findings regularly reviewing them
- ideally to prevent the exposure, but if the risk of exposure cannot be removed then adequate precautions should be taken with PPE not to be treated as the norm.

There are a number of options with regard to the hazard:

- remove the hazard
- swap the substance for a less hazardous one
- enclose the substance and extraction.

Any control measures must be maintained. There is a real risk of slackening off a system and allowing bad habits to form.

Most of the risks within the industry fall into two areas:

- materials used
- areas worked in.

The issue of the nature of the materials used in most circumstances is related to substances such as:

- cutting grease
- adhesives
- soldering and welding.

The areas worked in provide much greater problems:

- old tanks that used to hold chemicals
- carrying out maintenance in hazardous atmospheres.

Once we start to work within an area where COSHH applies then information, training, instruction and emergency procedures must be in place.

The Work at Height Regulations 2005 (as amended)

The Work at Height Regulations 2005 apply to all work at height where there is a risk of a fall liable to personal injury. This implies that a fall could occur at ground level or even below ground level.

The regulations cover:

- existing places of work and means of access for work at height
- collective fall prevention (for example guards rails)
- working platforms
- collective fall arrest (for example nets)
- ladders and stepladders
- inspection reports
- revocations.

A dutyholder must:

1. avoid working at height where possible
    a. use work equipment or other measures to prevent falls where they cannot avoid working at height, and
        i. where they cannot eliminate the risk of a fall, use work equipment or other measures to minimise the distance and consequences of a fall should one occur.

The dutyholder's responsibilities include:

- all work at height must be properly planned and organised
- all work at height must take 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.

3: Statutory regulations 2

In this session the student will:

- Gain an understanding of statutory regulations.

This is the second session which considers statutory regulations. The following list details the remaining statutory regulations listed within the syllabus. However, it should be noted that there are many other statutory regulations that will apply to the electrician working within the industry.

These include:

- Personal Protective Equipment at Work Regulations
- Manual Handling Operations Regulations
- Provision and Use of Work Equipment Regulations
- Health and Safety (Display Screen Equipment) Regulations
- Control of Asbestos at Work Regulations.

Three further statutory regulations are also worth introducing:

- Reporting of Incidents, Diseases and Dangerous Occurrences Regulations
- Noise at Work Regulations
- Consumer protection – The Electrical Equipment (Safety) Regulations

Personal Protective Equipment at Work Regulations 1992

The Personal Protective Equipment at Work Regulations (PPEWR) place significant duties on employers to provide and ensure the correct use of safety equipment. This will include enforcing the wearing of appropriate equipment and the regular maintenance and reporting of damaged equipment.

The PPE regulations are not put in place so that we can ignore the need to think about safety. The idea that we can simply put on a pair of boots and then think that we have dealt with the health and safety issues of protecting the feet is patent nonsense. Sites are still expected to be tidy to limit the risk, with boots acting as the backup.

There are eight main requirements of PPEWR:

- to ensure that PPE are provided as a final option
- that a suitable assessment is made as regards the risks
- that any items chosen as PPE are compatible with each other when they are used
- that items are maintained properly and replaced when necessary
- that PPE are stored properly and safely
- that proper information, instruction and training is provided in the use of the equipment
- that all items of PPE are used properly
- that a system is in place that allows damaged or lost equipment to be reported and replaced or repaired as necessary.

Manual Handling Operations Regulations 1992 (as amended 2002)

More than a third of all over-three-day injuries reported each year to HSE and local authorities are caused by manual handling. The aim of the Manual Handling Operations Regulations 1992 (as amended 2002) is to prevent and control musculoskeletal disorders (MSOs).

A recent survey suggested that over 1 million self-reported work-related injuries were caused by injury to problems with the muscles and bones.

There are many working days lost due to injuries caused by moving or lifting objects in an incorrect way. The object itself does not have to be large or bulky. Problems can be caused by not seeing obstacles or leaning over too far for an object.

The key duties of an employer are:

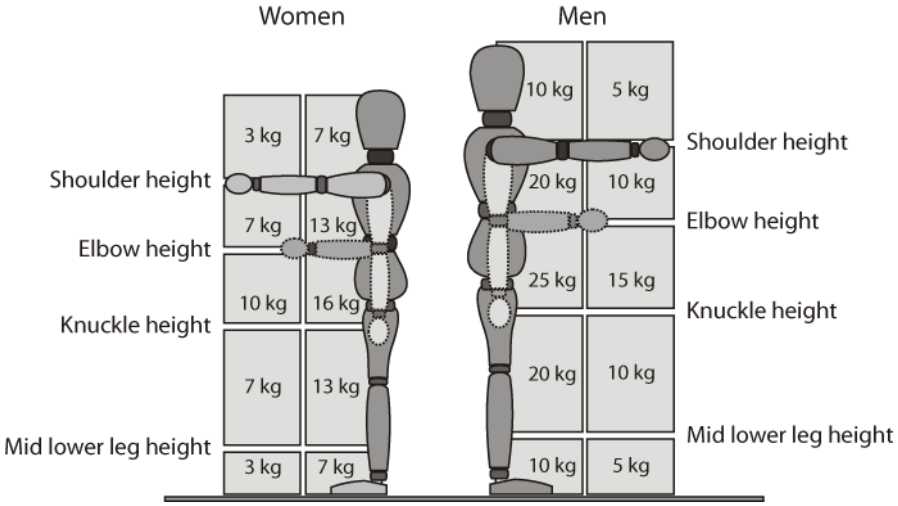
- avoidance if possible you should avoid having to move an object
- assessment make a judgement about the likely risk of injury that can't be avoided
- reduction in the risk associated with manually handling the object.

An employer or supervisor need to be able to make appropriate judgements. For example, when considering how to avoid the possible manual handling, does an object need to be moved? It might be preferable for a large machine to be left alone and the necessary activity carried out while it is situ. Perhaps thought might be given to using mechanical aids such as hoists or pallet trucks.

The best way to move an object depends on many factors. Before anything is touched, the risks must be assessed. A few simple points will help:

- size up the load. If you believe that the object is too heavy or bulky, ask for help.
- check that the load will not obscure your vision. The lightest of loads can sometimes be large, and so they can be dangerous
- move anything that is in your way. Plan your route and stick to it.

No lifting is ever perfectly 'safe'. A twist of the back at a key moment and even moving a light load will cause harm. However the recommended maximum loads for both male and female workers are listed below. Notice that the maximum loads vary according to the position of the arms. Remember that this is only guidance and not a substitute for a proper assessment!



Provision and Use of Work Equipment Regulations 1998

As with MHSWR, the Provision and Use of Work Equipment Regulations (PUWER) were first introduce in 1992 under European directive and have recently been updated.

The primary aim of these regulations is to make sure that equipment used to perform work is used without risks to health and safety. This takes account of its age or origin – it must be safe to use and used safely whatever it is and wherever it comes from.

Work equipment covers everything we use to carry out our work – tools, machinery, plant etc. PUWER requires the following:

Work equipment must be suitable	Constructed properly, suitable for use in the conditions and used only in those appropriate conditions.
Work equipment must be maintained	Kept in an efficient state, good working order and kept to a good level of repair.
Work equipment must be inspected	Where the safety of the work equipment depends on the conditions in the installation then it must be inspected and records kept.
Work equipment having specific risks	Only those trained to use the equipment must use it. All people using work equipment they should have adequate information, instruction and training in its use. Access to rotating machinery must be controlled with barriers and interlocked switching and braking. Additional factors to take into account include variations in temperature, the control equipment, isolation and protection against specific hazards, stability of the work equipment, lighting levels, access equipment, warning signs, and good maintenance.

PUWER forms a single overview of the requirements for the safety in use of equipment, and as with so much the burden of responsibility falls on the employer for maintaining equipment, training in the use of equipment, inspecting of equipment and so much more.

Health and Safety (Display Screen Equipment) Regulations

The Health and Safety (Display Screen Equipment) Regulations (DSE) aim to protect the health of people who work with DSE.

The Regulations were introduced because DSE has become one of the commonest kinds of work equipment. So there is potential to make work more comfortable and productive for very large numbers of people by taking a few simple precautions.

The health problems associated with VDU work are:

- upper limb disorders (including pains in the neck, arms, elbows, wrists, hands, fingers). Often known as repetitive strain injury or 'RSI';
- back ache;
- fatigue and stress;
- temporary eye strain (but not eye damage) and headaches.

Briefly, the Regulations require employers to:

- analyse workstations to assess and reduce risks;
- ensure that workstations meet specified minimum requirements;
- plan work activities so that they include breaks or changes of activity;
- provide eye and eyesight tests on request, and special spectacles if needed;
- provide information and training.

Control of Asbestos Regulations 2006

When work with asbestos or work which may disturb asbestos is being carried out, the Control of Asbestos Regulations 2006 require employers and the self-employed to prevent exposure to asbestos fibres. Where this is not reasonably practicable, they must make sure that exposure is kept as low as reasonably practicable by measures other than the use of respiratory protective equipment. The spread of asbestos must be prevented. The Regulations specify the work methods and controls that should be used to prevent exposure and spread.

The HSE have published many items of practical guidance for those who either come into contact with, or work with the removal of asbestos.

These publications include:

- Advice to managers and sole traders on 'asbestos essentials'
- What to do if you uncover or damage material that may contain asbestos
- The management of asbestos in non-domestic premises

The Electrical Safety Council have also published information relating to the safety of asbestos:

- Asbestos kills.

Reporting of Injuries, Diseases and Dangerous Occurrences Regulations

As with so many others this was originally introduced in 1992 as part of a European directive. The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) requires that specific incidents, injuries and diseases are reported to the appropriate authorities. RIDDOR provides lists of injuries, incidents and diseases with set forms to be filled in or accident books to be provided where the incident is minor.

The duty to notify and report these events rests with the 'responsible person'.

What needs to be reported include the following:

Deaths

All deaths arising out of or in connection with work.

Reportable major injuries

a) Fracture other than to fingers, thumbs or toes

b) Amputation

c) Dislocation of the shoulder, hip, knee or spine

d) Loss of sight (temporary or permanent)

e) Chemical or hot metal burn to the eye or any penetrating injury to the eye

f) Injury resulting from an electric shock or electrical burn leading to unconsciousness or requiring resuscitation or admittance to hospital for more than 24 hours

g) Any other injury: leading to hypothermia, heat-induced illness or unconsciousness; or requiring resuscitation; or requiring admittance to hospital for more than 24 hours

h) Unconsciousness caused by asphyxia or exposure to a harmful substance or biological agent

i) Acute illness requiring medical treatment, or loss of consciousness arising from absorption of any substance by inhalation, ingestion or through the skin

j) Acute illness requiring medical treatment where there is reason to believe that this resulted from exposure to a biological agent or its toxins or infected material

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Reportable dangerous occurrences

a) Collapse, overturning or failure of load-bearing parts of lifts and lifting machinery

b) Explosion, collapse or bursting of any closed vessel or associated pipework

c) Failure of any freight container in any of its load-bearing parts

d) Plant or equipment coming into contact with overhead power lines

e) Electrical short circuit or overload causing fire or explosion

f) Any unintentional explosion, misfire, failure of demolition to cause the intended collapse, projection of material beyond a site boundary, injury caused by an explosion

g) Accidental release of a biological agent likely to cause severe human illness

h) Failure of industrial radiography or irradiation equipment to de-energise or return to its safe position after the intended exposure period

i) Malfunction of breathing apparatus while in use or during testing immediately before use

j) Failure or endangering of diving equipment, the trapping of a diver, an explosion near a diver, or an uncontrolled ascent

k) Collapse or partial collapse of a scaffold over 5 metres high, or erected near water where there could be a risk of drowning after a fall

l) Unintended collision of a train with any vehicle

m) Dangerous occurrence at a well (other than a water well)

n) Dangerous occurrence at a pipeline

o) Failure of any passenger restraint or load-bearing part of fairground equipment, or derailment or unintended collision of cars or trains

p) A road tanker carrying a dangerous substance overturns, suffers serious damage, catches fire or the substance is released

q) A dangerous substance being conveyed by road is involved in a fire or released

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The following dangerous occurrences are reportable except in relation to offshore workplaces:

r) Unintended collapse of: any building or structure under construction, alteration or demolition where over five tonnes of material falls; a wall or floor in a place of work; any false-work

s) Explosion or fire causing suspension of normal work for over 24 hours

t) Sudden, uncontrolled release in a building of:

100 kg or more of a flammable liquid;

10 kg or more of a flammable liquid above its boiling point; or

10 kg or more of a flammable gas; or 500 kg of these substances if the release is in the open air

u) Accidental release of any substance which may damage health

Note: additional categories of dangerous occurrences apply to mines, quarries, relevant transport systems (railways etc) and offshore workplaces.

Reportable diseases include:

a) Certain poisonings

b) Some skin diseases such as occupational dermatitis, skin cancer, chrome ulcer, oil folliculitis/acne

c) Lung diseases including occupational asthma, farmer's lung, pneumoconiosis, asbestosis, mesothelioma

d) Infections such as leptospirosis, hepatitis, tuberculosis, anthrax, legionellosis and tetanus

e) Other conditions such as occupational cancer, certain musculoskeletal disorders, decompression illness and hand-arm vibration syndrome

The full list of reportable diseases, and the work activities they relate to, can be found in regulation 5 and Schedule 3 to the Regulations.

Control of Noise at Work Regulations

Exposure to noise will lead to problems with hearing. A number of noise control regulations and codes of practice have been introduced over the years; however in January 1990 the Noise at Work Regulations came into force and provided a framework for managing the exposure to noise whilst people are at work or members of the public affected by the work activity; these regulations have been superseded by the Control of Noise at Work Regulations 2005.

The Noise Regulations 2005 require employers to prevent or reduce risks to health and safety from exposure to noise at work. Employees have duties under the Regulations too.

The Regulations require you as an employer to:

- assess the risks to your employees from noise at work;
- take action to reduce the noise exposure that produces those risks;
- provide your employees with hearing protection if you cannot reduce the noise exposure enough by using other methods;
- make sure the legal limits on noise exposure are not exceeded;
- provide your employees with information, instruction and training;
- carry out health surveillance where there is a risk to health.

The study of sound is a complex one and requires an understanding beyond what is required at this level of work. However, the Noise Regulations require you to take specific action at certain action values. These relate to:

- the levels of exposure to noise of your employees averaged over a working day or week; and
- the maximum noise (peak sound pressure) to which employees are exposed in a working day.

The values are:

- lower exposure action values: – daily or weekly exposure of 80 dB; – peak sound pressure of 135 dB;
- upper exposure action values: – daily or weekly exposure of 85 dB; – peak sound pressure of 137 dB.

The actions you need to take are described in the rest of this leaflet. Figure 2 will also help you decide what you need to do.

There are also levels of noise exposure which must not be exceeded:

- exposure limit values: – daily or weekly exposure of 87 dB; – peak sound pressure of 140 dB.

These exposure limit values take account of any reduction in exposure provided by hearing protection.

Consumer protection – The Electrical Equipment (Safety) Regulations

There are no specific regulations that relate to the need to carry out portable appliance testing. However, when we look at PUWER, the EWR and, under consumer protection, The Electrical Equipment (Safety) Regulations etc, we can see that there is a need to maintain electrical equipment and appliances to a safe standard – this will include carrying out portable appliance testing and maintaining appropriate records (PAT).

The Electrical Equipment (Safety) Regulations require that electrical equipment is safe, constructed properly and meets the principal elements of the safety objectives for electrical equipment. This means:

- Used safely
- Used for its purpose
- Properly made
- Protects people and animals from harm under fault conditions
- Protects people from excess temperature, arcs, radiation
- Protects people from non-electrical danger
- Insulated properly
- Resistant to environmental conditions.

In addition under the EWR there is a requirement for electrical equipment to be:

- Fit for use – maintained and checked
- Used properly
- Appropriate for the task.

Unit 301 - Health and Safety & Legislation

End of outcome 1 written questions

Attempt all questions, the marks available are shown in the right-hand margin.
You should aim to pass with an 85% minimum score.

1.	Which are the most important legally, statutory or non statutory regulations?	1
2.	Name the two sets of people who are not covered by the HSW act.	2
3.	Write four powers that the Health and Safety Executive have.	4
4.	The Heath inspector can issue two types of notices, name them and briefly state what each does.	2
5.	What does the term ‘absolute’ mean?	3
6.	What does the term ‘reasonably practical’ mean?	3
7.	What does the term ‘hazard’ mean?	3
8.	What does the term ‘risk’ mean?	3
9.	Name four duties imposed on an employer, to ensure the health, safety and welfare of their employees.	4
10.	What are the two duties of employees at work regarding health and safety?	2
11.	What is the difference between a Statutory and a non-statutory regulation?	4
12.	Name four statutory regulations that you will come across in electrotechnical work.	4
13.	Name two non-statutory regulations that you will come across in electrotechnical work.	2
14.	What are the three things that the Electricity at Work state must be in place before any work takes place?	3
15.	What are the five steps of a risk assessment?	5
16.	What do the letters COSHH stand for?	5
17.	Name three types of PPE you might use to protect your head whilst at work.	3
18.	On average how many electricians die every week from asbestos related illnesses?	1
19.	Name three occurrences that must be reported to comply with RIDDOR.	3
20.	Name three alternative aids you could use to move heavy loads.	3
	Total marks	60

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4: Reporting accidents

In this session the student will:

- Gain an understanding of the process of accident reporting.
- Gain an understanding of the process of investigating an accident or incident.

The accurate investigation and reporting of accidents and incidents is essential and a logical thought process is part of that process.

The principles behind accident investigations are:

- All accidents have a cause – nothing just happens!
- Both direct and indirect causes of accidents can be determined and once known be eliminated.

The national statistics of the HSE for both manufacturing and construction shows the number and types of both fatal injuries and non-fatal injuries that required more than three days off work.

Construction	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**	**03/04**	**04/05**	**05/06**	**06/07**
Fatal	65	81	105	80	70	71	69	60	77
Non-fatal	9576	10504	9796	9695	9578	8995	8288	8384	7857
Manufacturing	**98/99**	**99/00**	**00/01**	**01/02**	**02/03**	**03/04**	**04/05**	**05/06**	**06/07**
Fatal	69	41	50	48	43	30	43	45	35
Non-fatal	39264	39460	38187	35034	33195	30042	26408	24220	21769

From this table we can see that there are many more people who are injured within the manufacturing sector – including the employed, self-employed and the general public, when compared with the construction industry. However, the fatalities on construction sites are significantly higher.

What should be investigated?

Quite simply any accident should be investigated, however only accidents with a significant risk factor need thoroughly investigating.

As an example, a person slipping and falling over might be simply a joke. However, as we saw in the last session, slips falls and trips lead to the largest number of injuries and fatalities. So even a slip leading to a fall requires us to understand why it happened and eliminate the cause(s). This may simply be a case of tidying a worksite up.

As well as investigating accidents we also need to investigate incidents. Incidents cover a wide range of possibilities and it is good practice that all are investigated.

Responsible person

Who should investigate and incident/accident? Any investigation is the responsibility of the line manager or anyone with sufficient abilities and standing within the organisation. In many cases the investigator will be the site foreman, but it could also be the safety officer. Usually it will be someone who is already involved with the workplace because:

- they know the site
- they know the workers
- they are directly affected by the work taking place on the site
- they can take the necessary action so that repetition does not occur
- can effectively talk to the workers
- demonstrates practical concern for the workers and the workplace.

When should an investigation take place?

This should happen as soon after the incident/accident as possible. Although it may not be immediately possible due to practical circumstances to begin the investigation, the site should be secured and witnesses found before details are forgotten. The advantages are:

- facts are fresh to the witnesses. Time tends to lead to thoughts being rationalised or incidents forgotten
- there is little time for talk and story alteration to agree with common position;
- the site is least affected by changes
- people are available. There has been insufficient time for dispersion
- immediate action can be taken to eliminate the chance of the accident happening again

What method should be used?

There is a basic investigation method that should be used:

- collect the facts – and not opinion
- gather the facts and analyse the information obtained
- compare the gathered information with current legislation and codes of practice as well as company policy so that conclusions can be drawn
- make the changes that follow from the investigation.

When investigating an incident there are three elements that are useful:

- walking around the scene of the accident taking observations helps to 'picture' the events, the type of material, access equipment etc. and the nature of the injury sustained
- documentation – site diaries, training records, safe systems of work, permits to work are all useful in determining the processes that the organisation followed
- interviews with witnesses gives a broad picture of the events that both occurred and led up to the accident. The way in which interviews takes place may vary, but they should cover the five main questions:
    - What?
    - When?
    - Where?
    - Who?
    - How?

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Blame is not the issue, but rather a getting to the facts so that things are not repeated. Investigation is a learning process.

All accidents split into immediate and underlying causes.

Intermediate causes	Might deal with the way in which people were acting, whether they were the right people doing the work and whether they were properly trained. Other immediate causes will relate to the condition of the site itself, the method of work and the common working practices.
Underlying causes	Take into account site management, supervision, training, provision of PPE, the nature of the H&S policy, information and training given, the nature of the reviews and lessons learned from previous incidents etc.

Over the next two pages are two sides of a reasonable investigation form. The front page covers detail and conclusion, with the rear page dealing with the nature of the event and who the witnesses were.

Incident/Accident Report Form

Injured person_____Date of accident: __/__/____. Time _____am/pm

Position_____Place of event_____.

Department_____Details of injury_____.

Investigator_____.

Position_____.

Estimated absence from work_____.

Brief description of accident (detail and photographs should be added)

Immediate causes	**Underlying causes**

Conclusions

Action to be taken

Completion date__/__/___.

Ensure that an investigation report is sent to head office within 48 hours of the incident occurring.

Accidents involving major injuries or dangerous occurrences must be reported to the HSE/local authority by telephone.

Signature_____.

Copy to:_____.

Date:__/__/____.

Injured person_____.

Sex_____. Age_____.

Address:_____.

_____.

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Type of worker

Employee ☐ Agency ☐ Contractor ☐ Visitor ☐ Trainee ☐ Member of public ☐

(Tick one)

Nature of accident (Highlight the type of accident that led to the injury)

Contact with moving machinery 1	Injury while carrying or handling 2	Drowning or asphyxiation 3	Injured by animal 4
Hit by moving, falling, or flying object 5	Slip or trip on the same level 6	Exposure to fire 7	Electrical shock 8
Hit by moving vehicle 9	Fall from height of _____m 10	Violence 11	Hit something stationary 12
Explosion 13	Trapped by falling or collapsing object 14	Harmful substance 15	Other 16

Comment on any machinery, chemicals etc. involved

Accident reported to:_____.

Position:_____. Section:_____.

First aider:_____.

Doctor:_____.

Surgery ☐

Hospital ☐ Name:_____.

Witnesses

Name	Position & Section	Statement
_____.	_____.	☐
_____.	_____.	☐
_____.	_____.	☐

Date reported to HSE or Local Authority _____/____/_____.

Telephone ☐ Form F2508 ☐

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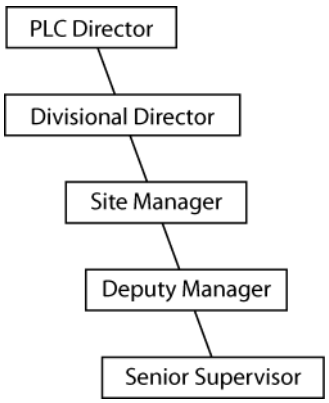
Any investigation form should cover:

- Date and location
- Circumstances surrounding
- Immediate cause/s
- Underlying cause/s
- Recommendation/s
- Date of investigation
- Signature of investigator
- Nature of accident/incident
- Witnesses and their statements.

There is a responsibility for health and safety from the top of an organisation right down to the bottom and that a health and safety culture needs to grow within an organisation. This means that a clear line of reporting responsibility must exist.

Both in the corporate structure and in the project organisation structure health and safety has an important part to play. Effectively there is a clear line of responsibility.



A nominated senior manager is the person responsible for taking day-to-day responsibility for safety – he/she must be proactive. The senior person must oversee the implementing and monitoring of the safety policy and must report regularly to the senior director or owner of the business.

Named people must be held accountable for both the actions and inactions of the organisation and must have specific responsibilities to ensure that the safety policy is carried out.

The responsibilities of Directors' have been stated by the Chair of the HSC[1] as:

> "Health and safety is a boardroom issue. Good health and safety reflects strong leadership…The Company whose chair is the champion of health and safety sends the kind of message which delivers good performance on the ground."

At least one person needs to be appointed as a competent person to help managers comply with their responsibilities under health and safety legislation. This person is called a Safety Officer. However, having a Safety Officer does not take away responsibility from the line manager but rather acts as an adviser.

The Health and Safety Officer:

- supports the provision of dependable and independent advice
- reports directly to directors on matters of policy and has the power to stop work if it breaches agreed standards and puts people at risk
- is responsible for professional standards and systems.

Supervisors

In the event of an incident or accident, or even where there is a concern that a hazard exists then this needs to be brought to the attention of the site supervisor. As a trainee you have very little power to action change, but you do have eyes and can see those things that are a problem. The report to a supervisor will commonly be verbal, but might include a written note to ensure that a record existed of any concerns that had been raised.

Safety officer

This is the senior qualified person within an organisation. He/she reports to the senior management team and acts as both advisor and enforcer on and of health and safety. A supervisor should be able to access the safety officer directly, both to seek advice and to help in any investigation. It is also reasonable to assume that a trainee will be able to meet with a safety officer, although this is more likely to ask for advice than to try to tell him his job. Once again a

[1] Now renamed the HSE and is part of the new HSE.

verbal report may be the initial starting point, but records must be kept with logs, site diaries, data sheets etc. all kept ready for access should an investigation be required.

Works rescue team

Dependent on the nature of the site and the company a works rescue team may exist. This team will be called out under specific emergency circumstances and will commonly have all the appropriate equipment. The callout arrangements for a particular team will vary from place to place but will be a set process. In many ways they function like a private fire brigade. It is rare to find such teams on construction sites, and only exist in a very few places in the country.

Fire officers

The need to call out the fire brigade will depend on the nature of the incident. They are by far the best trained and equipped to handle not only fire, but also chemical spills and rescue. As a trainee you would normally try to raise the alarm by calling out and getting the electrician or the supervisor to take responsibility.

If you are the only one present you have a responsibility to call 999. You are not trained or equipped to manage a fire or other problem.

I know of at lest one building that burnt down because a trainee thought he could put out a fire started by plumbers soldering pipes. The trainee waited too long before dialling 999 and the blaze had taken too much of a hold.

5: Accident and Emergency Procedures

In this session the student will:

- Gain an understanding of the process involved in the event of an accident or emergency.

It is Regulation 8 of MHSWR that requires procedures to be established and operated to deal with serious and imminent danger to persons at work.

Just spending some moments thinking about the causes of accidents should lead you to some awareness that there are both direct causes, such as someone kicking a set of ladders whilst someone is halfway up them, and indirect causes, such as the ladders not being tied down and properly 'footed'.

Causes of accidents

There are two general causes of accidents, direct and indirect. Each of these two areas can be further sub-divided:

Indirect causes

- Personal factors
- Source causes.

Direct causes

- Unsafe acts and/or omissions
- Unsafe conditions.

For each of the four headings listed under direct and indirect causes of accidents investigate and comment on the factors that apply to each.

Cause	**Factors and examples**
Personal factors	*e.g. ill health*
Source causes	*e.g. poor weather*
Unsafe acts and/or omissions	*e.g. not using safety equipment*
Unsafe conditions	*e.g. untidy workspace*

What to do in the event of an accident

We should be planning accidents away, however we don't live in the real world and so we have to have some idea of what to do when an accident occurs.

If there has been an accident, never fall into the trap of running over to help him/her. Without careful thought there is an increased risk of the person helping also ending up needing help themselves. For example, if fumes have overcome a person, then what's to stop the person helping being overcome by those same fumes?

Person found injured

If the following procedures are observed, however, everything should be fine.

Assess the situation – This may involve checking that no electrical equipment is on or that the injured person is not in contact with a live source; checking that there is no danger from chemicals or fumes; checking that no other objects are falling or are about to fall etc.

If possible do not touch the person – with little training you may cause more problems. However, if there is a real risk of more injury or death then you can move them.

Shout/phone for help – getting the emergency services to the site for resuscitation purposes is always better than waiting to call them when it is too late.

If breathing – make them comfortable by keeping them warm. Try not to move them and don't give them anything to eat or drink.

If not breathing – carry out resuscitation procedures until help arrives.

Secure the site – this is necessary for investigation.

Fire escape

People must be able to escape quickly and safely. In any escape route:

- people need to be able to turn away from a fire as they escape
- if a single-direction escape route is a corridor then additional fire barriers will be needed
- stairs act as chimneys and will require fire barriers.

Escape routes should cover at least the following:

- where more than one escape route is needed they should lead in different directions;
- escape routes should be as short as possible
- people should be able to get to the open air without returning to the area where the fire exists
- people should be able to easily move away from the building
- escape routes should be wide enough for the amount of people using them. As an example, a 750 mm door opening will allow 40 people to escape in 60 seconds
- escape routes should be properly lit with the light levels ideally set at 1 lux when the power fails and a minimum of 0.2 lux
- indicators signs should be used to direct people down escape routes – where appropriate they should be lit (exit doors etc.).

People should be able to escape from a building within 3 minutes at worst. This will take into account those who have to escape down stairs, which naturally leads to slower evacuation times.

Fire drills should be carried out to ensure that people can escape within the maximum timeframe, and to check how those with particular problems, such as wheelchair users.

When a fire alarm sounds people should:

- leave work alone but turn off any electrical items
- lock doors where the fire does not exist as you leave the room
- leave the building by the shortest safe route
- assemble at a meeting point well away from the building/site
- only return to the site/building when the all-clear has been given.

Legislation

There were a range of items of legislation that apply to a workplace and that relate to fire, such as the Fire Precautions Act 1971 and the Fire Precautions (Workplace) Regulations 1997 as amended in 1999. These two items of legislation have now been superseded by the Regulatory Reform (Fire Safety) Order 2005. This very important item of legislation now places significant duties on the client to carry out an appropriate risk assessment regarding the dangers associated with fire, smoke and the nature of the building and the users of the building.

The government has published a series of very helpful books to help property owners to come to appropriate decisions regarding their responsibilities. Take a look at http://www.communities.gov.uk/fire/firesafety/firesafetylaw/ to get the downloads.

In addition it may be necessary to consider aspects of the Building Regulations 2000. There are also elements of The Construction (Health, Safety and Welfare) Regulations 1996 and The Management of Health and Safety at Work Regulations 1999, with these Regulations enforced by the Fire Authority, unless dealing with high risk plants such as chemical plants.

As part of the Safety Policy of an organization there will be a policy for what to do in the event of a fire. The policy will detail many things and will in all likelihood include the following:

- General action in the event of fire

  This will deal in general terms with the procedures to follow for all people on site, and will include:

  - What to do when a fire is discovered, including:
  - Calling the telephone operator giving details of the location of the fire. Such information to include, where possible, floor and room numbers.
  - Evacuation procedures.
  - Fire fighting advice (left to the professionals).
  - Designated Fire Assembly Point. Assembly points are indicated on Fire Action Notices throughout the building.
  - At all times during the emergency, staff and students should comply with all instructions given to them by the Fire Convenor, Chief Fire Warden, Fire Wardens, Security Officers or Estates Managers.
  - Re-entry procedures.
  - What to do with those with disabilities.

6: First aid

In this session the student will:

- Describe where first aid facilities should be kept.
- Explain why prevention is better than cure.

In this next session we are going to see how first aid facilities are to be set up and at the necessary procedures involved in ensuring that due precautions are taken so that the first aid facilities don't need to be visited.

The Health and Safety (First Aid) Regulations 1981 pre-date the pack of six that were introduced in 1992 and requires employers to provide adequate and appropriate facilities and personnel to enable first aid to be given to employees on site or at work. For any worksite the minimum facilities are:

- A properly provisioned first aid box – not just a roll of plasters!
- A named person to manage first aid arrangements.

The general stock levels of a first aid box for up to fifty people should include:

- 1 leaflet giving first aid guidance
- 40 plasters
- 4 sterile eye pads
- 6 triangular bandages – individually wrapped
- 6 safety pins
- 8 unmedicated, individually wrapped wound dressings
- 10 individually wrapped wipes
- 1 Paramedic cutters
- 2 pairs of latex gloves
- 2 bottles of sterile eyewash where no clean running water exists.

The named person does not have to be a first-aider, but is someone who bears responsibility for taking charge when someone is injured or needs treatment; who looks after the first aid equipment and maintains the box; and who keeps the records of the treatments given. The named person should only give first aid if he/she is competent to give it.

A first-aider is by definition someone who is trained in administering first aid. However, the number of first-aiders depends on the level of inherent risk that exists and the number of people who work there.

Risk category	**Number employed**	**Appropriate numbers of first aiders**
Lower risk		
Shops, offices, libraries etc.	Fewer than 50 50-100 More than 100	1 1 1+1 for every additional 100.
Medium risk		
Light engineering and assembly work; food processing and warehouses.	Fewer than 20 20-100 More than 100	1 1+1 for every additional 50 or part of 50. 1+1 for every additional 100.
Higher risk		
Construction, chemical manufacture, dangerous machinery, sharp instruments etc.	Fewer than 5 5-50 More than 50	1 1 1+1 for every additional 50.

The first aid box and the first-aider should be locatable. In most circumstances a sign indicating where the first aid box is, is sufficient. However, special arrangements will need to take place to keep those with reading or language difficulties informed.

Safety procedures to prevent injury or discomfort

There are some practical things that we can do or wear to ensure that both we and those we work with are protected from damaging eyes, skin, hands or limbs. These will include:

- Personal hygiene
- Skin protection
- Care of eyes
- Loose clothing
- Excess hair.

Personal hygiene

Tests were performed on the remains of a bowl of peanuts that had been left on a bar. It was found that there were an amazing amount of bacteria, all from people who had gone to the toilet and not washed their hands, and who had then put there hands into the bowl of peanuts.

Hygiene matters with diseases like gastro-enteritis being a common feature, and with salmonella and other diseases being reportable, care must be taken.

Skin protection

There are many different materials and substances used within the electrical industry. These range from glues used in PVC conduit to cutting grease and fluxes. All of these substances may cause skin complaints in some people.

Dermatitis is a skin complaint that can vary in degrees of severity. Whatever form is very ‘itchy’ and care needs to be taken. To avoid any skin complaint then avoidance is by far the best option, but where this is not then gloves and/or arm shields are available. The use of gloves should be used in conjunction with barrier creams. Pre-work barrier creams provide a barrier between the harmful substance and the skin. After-work creams act to replace the natural oils in the skin and are no different to moisturisers.

Care of eyes

We know just how important eyes are and that any long-term damage is often irreparable. With this in mind it is essential that the appropriate precautions are taken. Damage can come from splinters, hot metal from drilling and milling, brick chippings and dust, arc-eye from welding and substances pushed into the eye by rubbing with our own mucky fingers.

Eye protection comes in a variety of forms:

- Safety glasses – good for protection against low speed particles
- Goggles – good for protection against dust and solvents as they form a closed area around the eyes
- Visors – protect the face as well as the eyes and tend not to steam up.

To prevent arc-eye then visors or goggles that rapidly darken should be used – arc-eye can blind!

Clothing

Hopefully we all wear clothing on site! Clothes perform a number of functions other than ones related to modesty. Clothing on site is used:

- To provide protection from dirt, dust and other substances
- To provide warmth when working in the cold or wind
- To provide visibility
- To provide protection from sunlight – cancer problems.

When working on any site then the risks from loose clothing are greater than you think. Any tears in the clothing can lead to pockets being snagged; loose sleeves can be caught by a piece of rotating equipment like a drill chuck.

Overalls should be kept free from loose or torn edges.

Head and hair

Head injuries are far too common and we think little about our heads until it is too late. Objects dropped from scaffolds or bangs and bumps can lead too discomfort at best and death at worst.

Hats should be worn at all times on building sites and should be worn in the manufacturing sector when the need arises.

Long hair can be a problem with loose hair getting caught in rotating equipment. Where there is a risk then hair should be tied back or hidden under a covering.

Risk to others

When we consider the risk to others we have to account for the nature of the people around us. For example, people visiting the site may have no idea about the risks that exist, whilst others may be even better informed than we are. Those who visit the site should be equipped with all that is necessary to protect them form the hazards that exist and they should be kept away from areas where their inexperience may lead to increased risk.

When we consider those we work with then we need to ensure that our work practices are controlled and managed in such a way as to reduce the risk to an acceptable level.

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7: Treatment for electric shock

In this session the student will:

- Describe the isolation process.
- Explain what to do in the event of an electric shock.
- Describe the general rules on checking electrical equipment.

Everyone believes that they know what an electric shock is, but it is very rarely defined, so here is a definition.

> An unpleasant sensation produced by the nerves response to a passage of electric current through a part of the body.

To receive a shock you must from part of a circuit. If no circuit is present then there can be no shock.

The severity of a shock depends on a number of factors, such as age, sex, state of health, excitement, and environmental factors, particularly where there is an increase in moisture.
The effects on the body vary, what is known however is that the heart can be seriously affected by an electric shock, which can cause it to beat irregularly leading to death. You can also receive very severe burns to parts of your body, after all when you are connected in a circuit; you have just become a resistor!

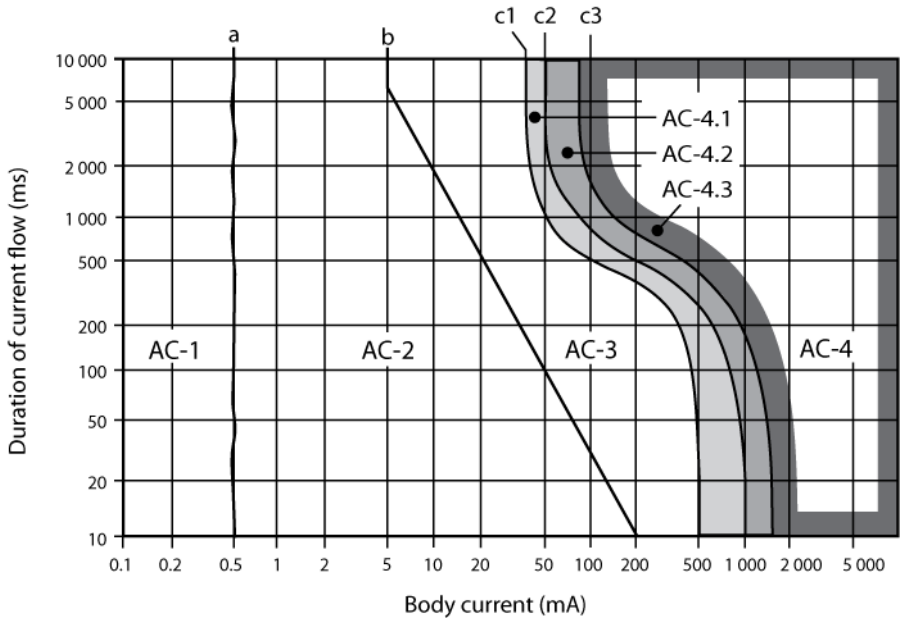
What does electrical energy do to a body?

Consider the table below.

Zone label	Zone limits	Physiological effects
*AC-1	Up to 0.5 mA – to line a	Usually no reaction.
AC-2	0.5 mA – to line b	Usually no harmful effects.
AC-3	Line b to line c_1	Usually no organic damage. Cramp-like muscular contractions and difficulty in breathing for current flows greater than 2 s.
AC-4	Beyond c_1	Above c_1 there is greater danger of cardiac arrest, breathing arrest and severe burns. c_1-c_2 – Probability of ventricular fibrillation increases by 5% c_2-c_3 – Probability of ventricular fibrillation increases by 50% Beyond c_3 – Above 50% probability of ventricular fibrillation.

* Stands for a.c. (alternating current)

The diagram below expresses this table in a slightly clearer form.



Now that we are aware of some of the effects of electric current we have to consider what to do in the event of an electric shock.

In the event of a shock

There is a clear process to follow when you believe someone has received an electric shock. This is:

- Raise the alarm – call for help or get someone to go for help
- If possible switch off the power
- Call for an ambulance
- If the power cannot be immediately switched off then push or pull the person away from the power source using a good insulator like a length of wood or a chair (not a metal one!). Make sure that you are standing on an insulator while you are trying to remove them from the source.
- If the victim is breathing, place them in the recovery position and maintain an open airway
- If the victim is not breathing apply appropriate resuscitation techniques
- Treat burns by flooding the site with plenty of cold water, and then place a sterile dressing (non-fluffy) over the burns to protect them from infection (do not apply any lotions)
- If the person regains consciousness then treat for shock
- Stay with the person until emergency services arrive or they are taken for treatment.

> A man was leaning against an electrical cabinet as he steadied himself to shake a stone from his shoe. Because he was shaking his foot, a fellow worker thought he was receiving a shock and promptly hit him over the head with a shovel to remove him from the supply. This certainly had the desired effect and he was removed from the non-existent electric shock and spent a further five weeks in hospital with a fractured skull!

There are a couple of items that need further clarification. It must be stressed however, that any book is no substitute for proper, practical training carried out by organisations such as the St. John Ambulance or their equivalent. It is also worth mentioning that the authorised manual for first aid is called the First Aid Manual and is published by Dorling Kindersley Ltd.[2]

[2] First Aid Manual – 8th Edition Dorling Kindersely Ltd. ISBN 0 7513 3704 8

Recovery position

Putting someone in the recovery position is a stage-by-stage process.

1. Kneel beside the victim and remove bulky objects.

2. Ensure that the victim's legs are straight.
3. Place the nearest arm to you at right angles to the body, with the elbow bent and the palm facing upwards.

4. Bring the farthest arm across the victim's chest and hold the back of that hand against his cheek nearest to you.

5. Pull the farthest leg up to right angles with the foot flat to the ground.

6. With the hand still against the cheek pull the farthest leg over to you (acts as a lever) and settle the victim on his side.

7. Adjust the upper leg so that the knee and hip are bent at right angles.

Adult resuscitation

The process to follow is simple and effective when there is no other help around.

1. Check the response – a gentle shake of the shoulders, taking care not to cause any damage yourself, particularly if there is a neck injury.
2. Assuming no response then open the airway by gently tilting the head backwards until the mouth falls open – remove any obstructions.
3. Check the breathing by watching for chest movement or hearing sounds.

4. Assuming no breathing then give two rescue breaths – hold the nose, take a deep breath, place your lips around the victim's and breath out.

5. Check for circulation – is the victim breathing/coughing/moving. Wait no longer than 10 seconds. If circulation is present the continue rescue breathing for 1 minute and then check for circulation again.
6. If circulation is not present then carry out CPR alternating 30 chest compressions with 2 rescue breaths.
    a. To find the right place run your fingers along the bottom of the ribcage until you reach the bottom of the breastbone.

b. Place palm of your other hand next to the fingers.

c. Grip both hands together and begin compressions.

There is no substitute for practical lessons and it is strongly recommended that this takes place as soon as possible.

Precautions against electric shock

We can all recognise the hazards that exist whenever any electrical equipment is used:

- electric shock from loose or damaged leads or failure of earthing
- burns caused by loose connections or poor positioning of heaters
- damage to limbs and clothing caused by rotating plant.

There are some general rules that we can follow when it comes to checking the leads, plugs and earthing of electrical equipment.

Good housekeeping

Check that the equipment is installed and operated in accordance with the manufacturers' instructions. Notwithstanding the manufacturers' instructions, the following are examples of items which should be checked:

- cables should not be located where they are likely to be damaged, snagged, or create trip hazards
- the means of disconnection or isolation from the mains supply are readily accessible;
- the space around the equipment is adequate for ventilation and cooling with ventilation openings clear
- cups, plants and work material are not placed where their contents could spill into equipment
- any equipment is not positioned so close to walls and partitions that the cord is forced into a tight bend as it exits the equipment
- the equipment is only operated with protective covers in place and doors closed
- multi-way adaptors and trailing socket-outlets are avoided
- unprotected cables are not run under carpets.

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The condition of the equipment

When checking any electrical equipment the following items need to be inspected:

- Is the flexible cable in good condition? Is it free from cuts, fraying and damage?
- Is the flexible cable run where it could be damaged or cause a trip hazard? Is it too long, too short or in any other way unsatisfactory?
- Is there any signs of overheating at the socket-outlet or flex outlet?
- Is the socket-outlet free from cracks and other damage?
- Does the appliance work? Does it switch on and off properly? Is it free from cracks or damage to the case or damage which could result in access to live parts?
- Can the appliance be used safely?

Some of the following checks may not be possible for equipment fitted with a non-rewirable plug:

- Check that detachable power supply cords to Class I equipment incorporate a continuous protective conductor
- Look for signs of overheating - this may be caused by a fault in the plug or by a faulty socket-outlet (or connection)
- Check that the flexible cable is properly secured in the cord anchorage.
- If the plug is of the non-rewirable type, the cable grip should be tested by firmly pulling and twisting the cable. No movement should be apparent.
- Check that the cable core terminations are tight, the plug is correctly connected, there is no excessive removal of insulation, that there are no loose strands and the cable cores are not strained
- Check that the fuse is securely gripped, and shows no signs of overheating.
- Check that the fuse is to BS 1362 and is approved - an ASTA mark shows that it has been approved for safety. Check the rating of the fuse.
- When replacing the plug cover check that it fits properly and will not come loose during use.
- Check that the flexible cable connections and anchorage at the equipment are sound.

You also need to ensure that the equipment is suitable for the task at hand and that those who are using it know what they are doing.

Safe isolation

For the testing of a potentially live source, two pieces of test equipment are required. These are:

Approved voltage tester

Voltage proving unit.

A neon screwdriver is ***not*** an approved voltage tester; after all, who in their right minds would want to become part of the circuit in the test procedure! A neon screwdriver only works on the principal that you are touching one end of it and in contact with earth.

To trust in the limited protection that a neon screwdriver provides is foolish in the extreme and you should be very aware of the danger you are placing yourself in by using them!

There is an instrument called a '**Runbaken Testoscope**' that looks a bit like a neon screwdriver that can be used to check for polarity.

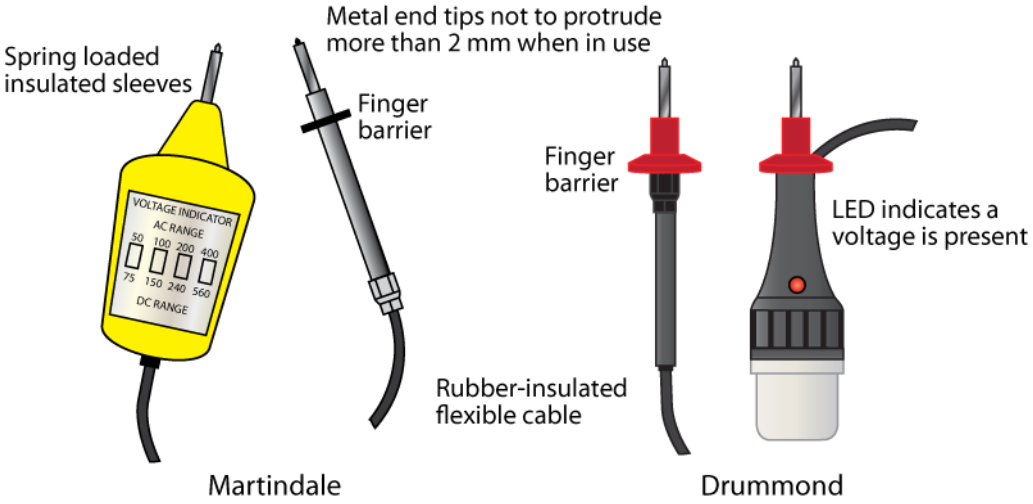
The '**Runbaken**' must not be used for '***proving dead***' it is solely used for checking polarity.

GS 38 provides a set of values that should be followed for test leads. In this instance, it is reasonable to assume that an approved voltage tester falls into this criterion. Many of the following will apply to an approved voltage tester, although not necessarily all. Remember that GS 38 applies to all test leads.

- Adequate insulation. This may depend on the environmental conditions present.
- Have coloured leads to distinguish one lead from another.
- Have finger barriers to stop accidental slipping of hand.
- Be insulated so that the tip of the probe shows no more than 4 mm of bare metal; it is strongly recommended that this is kept to less than 2 mm.
- Be flexible and robust enough for their use.
- Be sheathed to prevent mechanical damage.
- Be long enough for their purpose.
- No part accessible to fingers, even if a lead becomes loose.
- Have fused leads.

You can see that a neon screwdriver does not meet any of the above criteria.

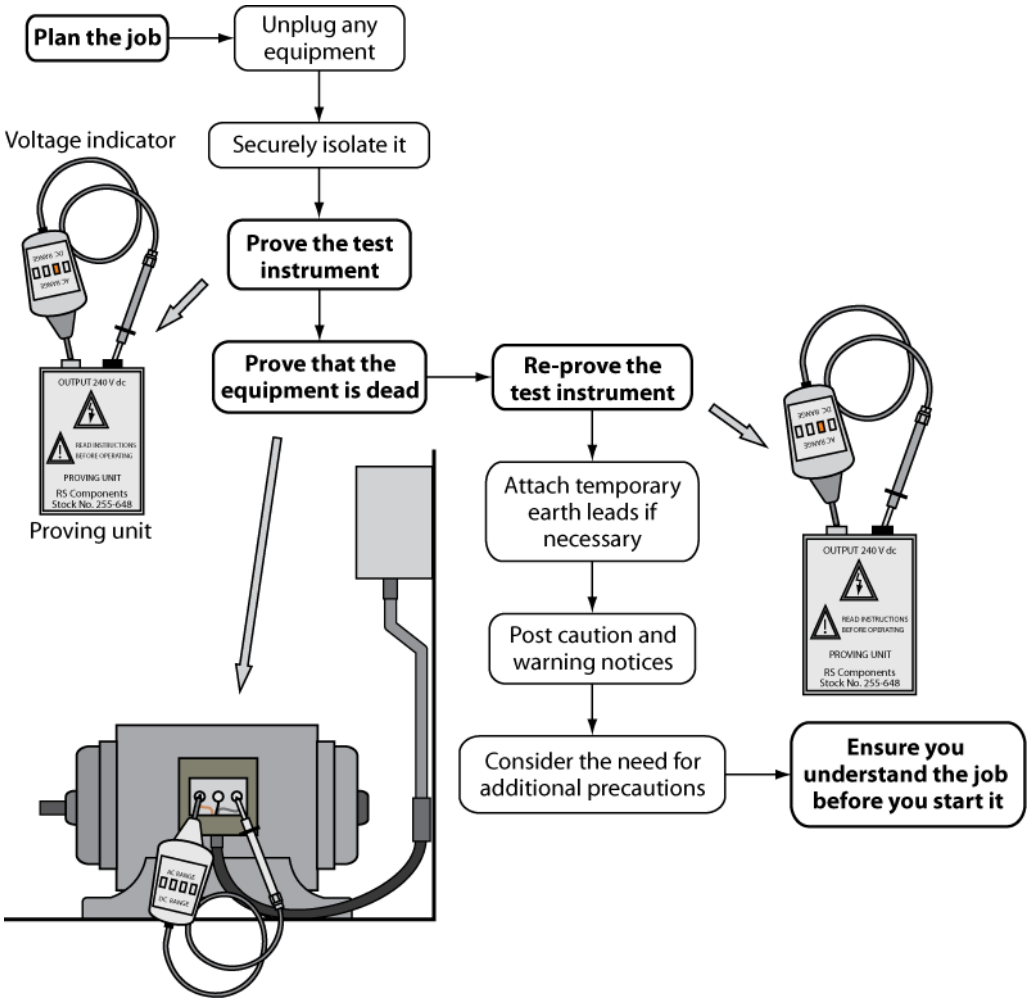
Obviously, there are many varieties of voltage tester and as long as they meet the requirements of GS 38 then you will be fine.



A tester is no use if we cannot guarantee its effectiveness. This is where the proving unit comes into its own.

A proving unit is a d.c. voltage source that checks its own status and is then a known reference voltage against which the voltage tester can test itself. Without this, we cannot guarantee the voltage tester, at which point it is useless.

The diagram below shows the procedure you should use for the safe isolation of a piece of equipment or plant.



This process is essential for the safe isolation of a supply. Don't be tempted into taking a short cut. Equally, you should not use a live source other than an appropriate proving unit to test your voltage tester.

Some may believe that it is appropriate to use a known voltage source to test the voltage tester. The implication of such action is that you are now working on something live, and so the EWR come into force. This means that you have to ask yourself whether you are justified in this action.

Obviously, the process of isolating is unnecessary for an installation that hasn't been connected to the main supply.

There will be many occasions when you'll need to inspect all or part of an existing installation – the

process of isolation is always the same.

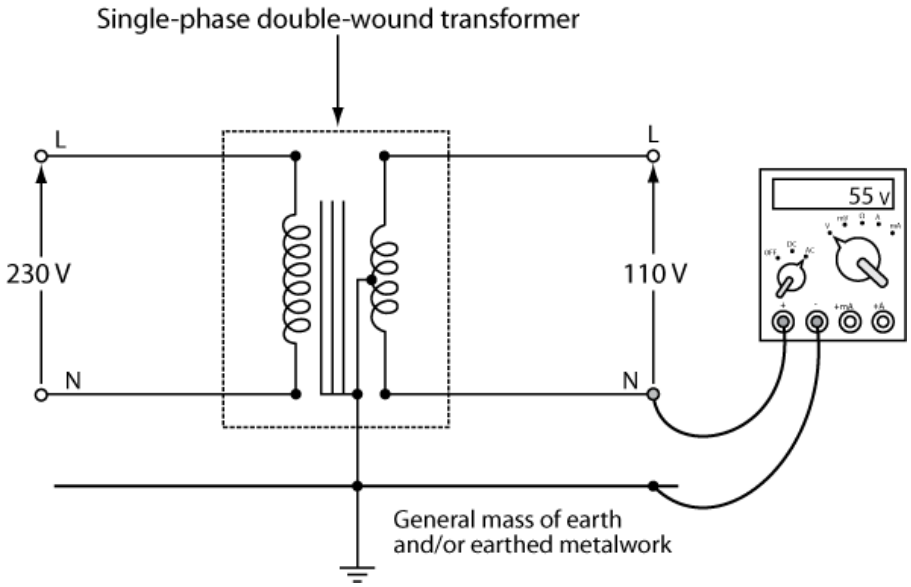
I also recognise that you are more used to holding the voltage tester onto a live circuit and then turning each circuit-breaker, or pulling each fuse in turn. As far as the HSE are concerned you are working live when performing in this way, and as such, should things go wrong, you really have very little defence in law.

Reduced voltage systems

One method of reducing the risk of electric shock is to limit the level of voltage present when using portable power tools. There are two ways in which this is done:

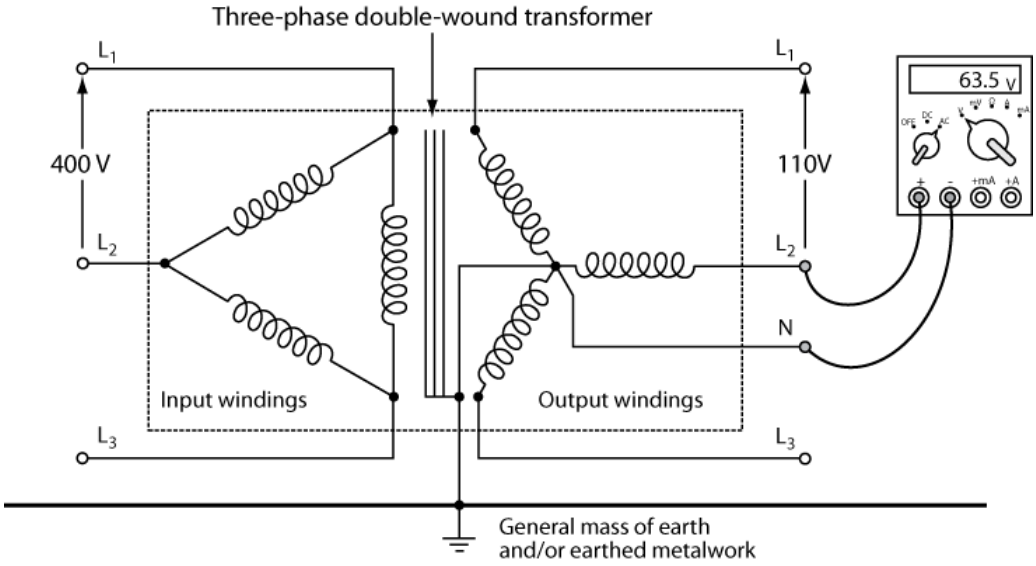
- battery tools
- reduced voltage.

With a reduced voltage arrangement the voltage is limited to 110 V between lines and never more than 55 V to Earth. What happens is that a double wound transformer is supplied at a standard 230 V, but the secondary is centre-tapped to Earth. This means that no more than 55 V can appear between any line and Earth.



Something similar happens with a three-phase supply. A standard three-phase supply is connected to a three-phase double wound transformer with 110 V between lines. This means that between any line and the star point of the transformer no more than 63.5 V appears.

$$U_0 = \frac{110}{\sqrt{3}} = \underline{\underline{63.5V}}$$



Training and signs

Training is required at every level of an organisation. This training will range from simple instructions to long-term, organised training like an apprenticeship.

There is no excuse for not maintaining your knowledge at a current level. Updating should be the norm and it is the absolute responsibility of each one of us to ensure that we are current in our knowledge. Remember that ignorance is no excuse in law.

The signs that are used in relation to work on electrical systems generally relate to warnings. These include voltage levels, accessibility issues, first aid and resuscitation.

Sign states the danger but is not of durable material, neither is it securely fixed to the switch

Sign shows the old voltage but is of durable material and securely fixed

Unit 301 - Health and Safety & Legislation

End of outcome 2 written questions

Attempt all questions, the marks available are shown in the right-hand margin.
You should aim to pass with an 85% minimum score.

1.	Why should accidents at work be reported?	2
2.	What type of accident needs investigating?	2
3.	Name three types of accident that need to be reported to the HSE.	3
4.	Name two intermediate causes of accidents	2
5.	Name two underlying causes of accidents	2
6.	Briefly describe what you should do if you found an injured person at work	5
7.	Briefly describe what you would do if you discovered a fire at work.	5
8.	What colour is the sign for a fire alarm call point?	1
9.	What are the minimum first aid facilities your work place should have?	3
10.	How would you know where the first aid post was in a building?	1
11.	What is your main priority when dealing in an emergency?	1
12.	If someone was severely bleeding what should you do?	2
13.	Why should items of first aid equipment be replaced immediately?	3
14.	What must you become part of, to receive an electric shock?	1
15.	If you find someone who is receiving an electric shock what should you do?	5
16.	What should you use to remove someone from a live power source, if you could not switch the power off?	2
17.	Briefly, how would you give resuscitation to someone who has stopped breathing?	3
18.	Name some things that should be checked on equipment as a precaution against electric shock?	3
19.	What do you need to safely test a live source?	2
20.	What should you do before you test any piece of equipment?	2
	Total marks	50

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8: Employers' responsibilities in maintaining safety

In this session the student will:

- Describe the role of an employer to maintain site safety:
  - Example of site access equipment.
- Gain an understanding of safe systems of work and permits to work.

In all situations that are considered we have to be conscious that we are in partnership between employer and employee as well as partnership between employers on site and between different trades working on that site. So what we cover must be seen in the overall context of site safety.

Site access

Site access is not simply a problem for those working on the site, but also for those who might inadvertently gain access to the site like children. There have been a number of instances where children have been injured and killed by playing on construction sites after they close down for the night.

As a definition we can assume that a construction site is '**any area where building or construction work is being carried out**'.

Entrances to construction sites must have a notice indicating the nature of the work that is being carried out, the names of the companies present on site and those who are responsible for the site.

You can see that on this site the main contractor is listed, along with a contact number, the consultants of all varieties as well as the architect.

Access to a site is now under the control of the Planning Supervisor. This individual has responsibility under the Construction Design and Management Regulations (CDM) for ensuring that safety requirements have been met and creates a health and safety plan for the construction/building work.

At its most basic anyone entering a site must only be able to enter at a set point. This access position should be set up in such a way that the responsible person can check in those entering the site by signing them in and out and making sure that they are aware of the site safety issues and procedures, which may include a video presentation, provision of personal protective equipment and anything else that may be required to maintain safety on site.

The pictures below and over the page show a range of the site safety instructions that are posted on a number of different construction sites.

On each picture the contractor is highlighted and the basic site rules. Both of the pictures also show that any visitors are to report to the site office on entering the site.

It would also be normal for a site diary to be kept. The site diary would be used not only to monitor visitors, but also to track deliveries and the type and names of contractors on site.

Safe plant and equipment

We have to recognise that although the main responsibilities fall on employers there is still a general duty under the HSWA for employees to take reasonable care of themselves and others who may be affected by the work that you are doing.

With the best will in the world we cannot cover all the elements that an employer is responsible for when dealing with the Provision and Use of Work Equipment Regulations which is the specific set of regulations that cover an employer's responsibility with regard to maintaining safe plant and equipment.

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Those items of equipment that have a specific risk, such as abrasive wheels etc, requires that the employer recognises that there is a hierarchy of controls. These are:

- Eliminate the risks
    - Take physical measures to control the risks – guards etc
        - Build in a process for use – use a safe system of work.

All of this still requires that an employer only uses those who are trained properly to work on specific items of equipment.

There is a proverb that states, 'knowledge is power', and in a very real sense this is true. To this end there is a responsibility for an employer to share knowledge to his workers. The sharing of knowledge takes a variety of forms, but will certainly include:

- Providing information
- Giving instruction
- Providing training.

Maintenance is also a key element of an employer's responsibility as it relates to work equipment. This maintenance falls into three areas:

- Planned preventative maintenance
- Condition based maintenances
- Breakdown based maintenance.

Safe place of work

A safe site is not solely created by the things that we do or don't do, but rather by the attitude and approach of people on site to health and safety.

Sites must be safe to get in and out of. This requires that:

- ladders, scaffolds etc. are safe to use, with handrails, tied up ladders, proper platforms, footboards, clear gangways
- holes and hazardous areas are fenced off with signs positioned so that clear warning is given
- the site is kept tidy, with plant and materials stored away when not in use and waste disposed of properly and at regular intervals so that a build up doesn't occur
- lighting is appropriate for safe access with the right type at the right levels
- site security is maintained even when it is not in use. Those working in the construction industry must ensure that even horrible children are kept away from a dangerous place. This site security will include:
    - lockable gates and good warning signs
    - secure and undamaged fence around the perimeter
    - ladders secured at the end of the day with the rungs boarded
    - holes are covered
    - plant is made safe and no fuel is left in the equipment when that is practical
    - safe storage of flammable equipment
    - if necessary security patrols.

In 2005/06 falls from height accounted for 46 fatalities at work and approximately 3350 major injuries. Falling from heights is the single biggest cause of workplace deaths and one of the main causes of major injury.

An electrician and his apprentice were installing trunking underneath a ceiling. They were using an aluminium mobile scaffold and they were about 3 m (10 ft) above the ground. Instead of climbing up the inside of the scaffold the electrician and his apprentice both started to climb up the outside of the scaffold on the same side. The scaffold tipped over and both men were injured.

You may consider the above incident was merely an accident waiting to happen, and that everyone knows not to climb up the outside of a scaffold. The reality is however that the most ridiculous of accidents ***do*** occur.

In this part of the study book, we will look at ladders, scaffolds, in fact anything that can be used as access equipment. We will also see what precautions can be taken to minimise the risk.

The use of access equipment comes under the Work at Height Regulations 2005 (as amended). Much guidance has been produced by the HSE in this area including HSG150 Health and Safety Construction and INDG402 Safe Use of Ladders and Stepladders.

What we will do is look at each type of access equipment in turn and highlight particular areas of concern.

Ladders

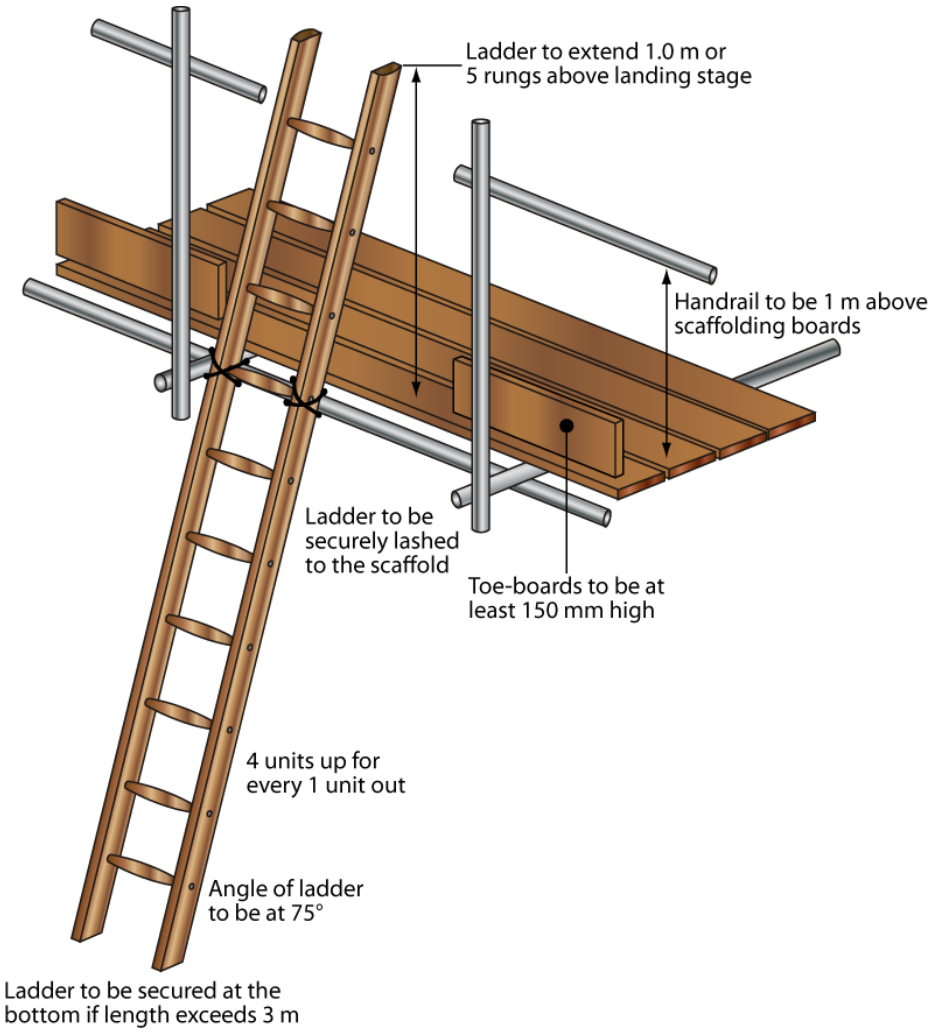
There are a variety of types of ladder. These can be wooden or aluminium, they can be single, double or triple extension. As far as we are concerned, there are a number of basic safety issues to consider.

- If we are working on or near anything electrical it would probably be wisest to avoid the use of an aluminium ladder, as aluminium conducts electricity.
- No work should take place within 6 m of overhead power lines.
- If we are using a wooden ladder we must check for the following:
    - Broken or missing rungs
    - Broken or missing stiles
    - Broken or defective ropes etc.
- Rungs should be free from grease and clean
- Ladders should never be painted, because this may be used to hide any repairs made to a ladder.
- Ladders over 3 m long should be secured at the top or bottom, or another person should '***foot***' the ladder at the bottom rung.
- Ladders should be erected at an angle of 75°. This is approximately a four to one ratio (1 out from the wall to four up the wall).

- Ladders used to gain access to a platform should extend beyond the platform 1 m or five rungs. This allows for something to hold on to when getting on and off the ladder.

All ladders and stepladders must have a current detailed visual inspection. These should be done in accordance with the manufacturer's instructions. Ladders that are part of a scaffold system still have to be inspected every seven days.

Furthermore, all ladders and stepladders must be suitable for work use. Use Class 1[3]4 or EN 131[5] ladders or stepladders at work because domestic (Class 3) ones are not normally suitable for use at work.



3 BS 1129: 1990 Specification for portable timber ladders, steps, trestles and lightweight stagings.

4 BS 2037: 1994 Specification for portable aluminium ladders, steps, trestles and lightweight stagings.

5 BS EN 131-1 Ladders. Terms, types, functional sizes (2007) and BS EN 131-2 Ladders. Specification for requirements, testing, marking (1993) and BS EN 131-3 Ladders. User instructions (2007) and BS EN 131-4 Ladders. Single or multiple hinge-joint ladders (2007).

You can see from the ladder set-up above what makes up good practice.

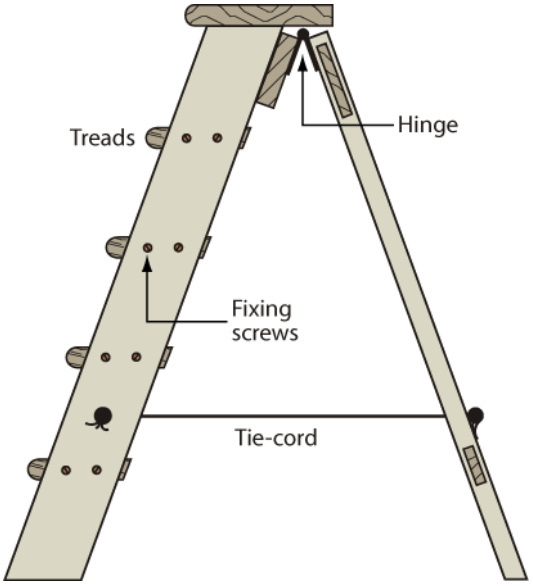
What is missing off the scaffold is a barrier at knee height. A handrail is no longer sufficient and must be supplemented with an additional barrier at approximately 0.5 m above the platform.

Never take ladders for granted; it may be your life on the line. Remember that you also have a duty of care for your colleagues. Don't make mistakes, and report any areas of concern.

A roofing contractor fell to his death from a height of approx. 4.5 m. He was climbing a double extension, timber ladder with aluminium rungs. The ladder failed when both stiles snapped near the bottom of the upper section of the ladder. It was found that the ladder had been overloaded.

Step ladders

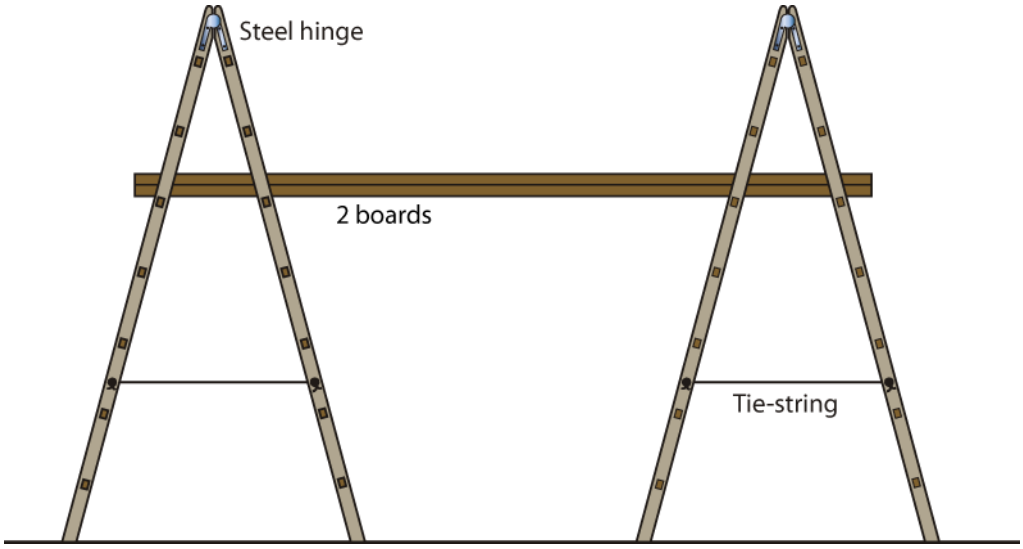
The same rules apply for stepladders, as far as checking them out goes. The only additional items to consider are whether the hinges are secure and the cord is adequate.



Remember that you should always be able to hold on to a part of the stepladder. Do not stand right on the top, and don't get into the habit of leaning out. If you do need to lean then it is better to move the steps rather than risk an accident.

Trestles

Although the use of trestle scaffolding is still permitted it is certainly not a preferred method of access.



HSE key messages is that trestles can be used if the risk assessment shows that the risk of a person falling and injuring themselves is low and the work on top of the trestle is in short bursts.

Steel or aluminum trestles are used in conjunction with scaffold boards or staging. Guardrail systems are available for trestles and you would need to show that installing a guardrail has been looked at and why it was not considered necessary, if you do not install them.

Trestles having a height of up to 3.6 m can be found.

Tower scaffolding in all its many variants is a much preferred option.

Tower scaffolding

To reach greater heights, and yet retain flexibility, tower scaffolding can be used. It comes in a variety of shapes and sizes, using steel and aluminium as materials.

The safety precautions for tower scaffolds are the same for either the bolt-on or the interlocking types.

The HSE have issued guidance on the erection of tower scaffolds in CIS 10 (Rev 4) Tower Scaffolds.

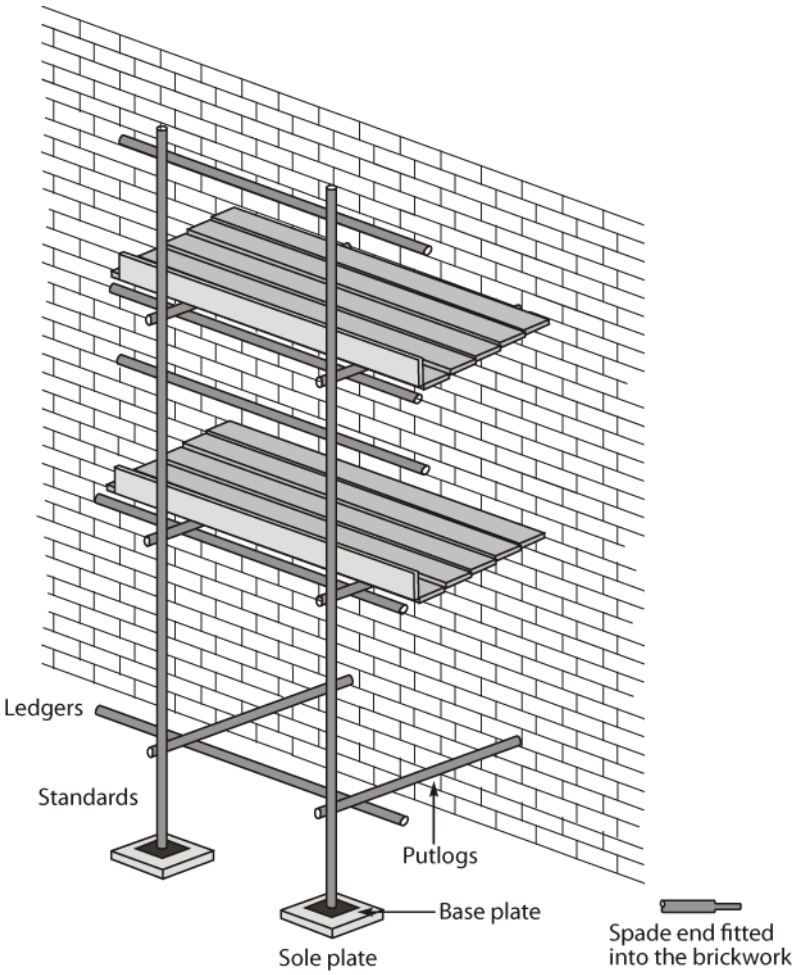
The other thing that you need to consider very carefully is the erecting and taking down the scaffold. It should be no less safe when you are doing this than when you are working on it. Never work on your own, always wear your hard hats and make sure that the type of knot that you use to lift up the parts of the scaffold is safe.

The Prefabricated Access Suppliers' and Manufacturers' Association (PASMA) was formed in 1974, and comprises the major manufacturers of alloy access towers in the UK. The Association's original objectives were to promote the safe use of alloy access towers and to promote the interests of its members to the regulatory and standards authorities.

The PASMA Code of Practice, which has come to be the definitive access tower reference document for managers, supervisors, health & safety professionals and users alike, and which has been completely updated to incorporate the requirements of the Work at Height Regulations 2005, was also first produced in the 1980s.

Putlog scaffold

This is the type of scaffold most commonly seen on building sites.



Unless a scaffold is a basic configuration described in recognised guidance the scaffold should be designed by calculation, by a competent person, to ensure it will have adequate strength and stability.

A non-scaffolder who has attended a suitable scaffold inspection course and has the necessary background experience would be considered competent to inspect a basic scaffold (for example, a site manager).

To prevent use by unauthorised persons of incomplete scaffolds, relevant warning signs identifying the areas where access is not permitted should be displayed at the access points to these areas. In addition, access to the incomplete areas should be prevented by suitable physical means.

All types of scaffold need to be erected by a competent person, but with this type of scaffold, a professional scaffolding company is most often used.

Safe system of work

A safe system of work is the integration of personnel, articles and substances in a laid out and considered method of working which takes proper account of the risks to employees and others who may be affected, such as visitors and contractors, and provides a formal framework to ensure that all of the steps necessary for safe working have been anticipated and implemented.

At a basic level a safe system of work looks at all the possible hazards and tries to remove them in a structured form. A safe system of work:

- look at the job as a whole
- analyses all foreseeable hazards
- ties together all precautions taking into account design, monitoring, material precautions, procedures and protective equipment.

The nature of the precautions will be based on an assessment of risk and we will look at this in a later session.

A safe system of work is not a set way of doing things, but rather allows for flexibility to allow a system to be devised that properly matches the risk potential. The elements to be considered will include:

- type and extent of risk
- the complexity of the operation
- what the past experience of loss and accidents are
- what the relevant health and safety authorities require
- what type of documentation is required
- what resources are required to implement the safe system of work.

In many instances much of the work that contracting electricians are involved with reduces the need for a set safe system of work. However, within the maintenance sector safe systems of work are the norm and as such require that an employer prepares adequately.

Designing a safe system of work

There are five steps to carrying out a safe system of work:

1. Assess the task
2. Identify the hazards
3. Define safe methods
4. Implement the system
5. Monitor the system

Assessing the task	Assess all aspects of the tasks and its risks. Consider health hazards as well as safety. Take account of: • What is used • Who does what • Where the task is carried out • How the task is done
Identify the hazards	Spot the hazards and evaluate the risks. Where possible, eliminate hazards and reduce the risks before you rely upon a safe system of work.
Define safe methods	Define orally, by simple written procedures or by permits to work. To set up a safe system of work a process must be followed. A typical one for electrical hazards might be as follows: Involve the people who will be doing the work – their practical knowledge of problems can help avoid unusual risks and prevent false assumptions being made.
Implement the system	Safe systems of work must be communicated properly, understood by employees and applied correctly. Ensure supervisors know they should implement and maintain the system of work. Ensure adequate training is carried out for employees and supervisors. Stress the need to avoid short cuts – part of the system should be to stop work when faced with an unexpected problem until a safe solution can be found.

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Monitoring the system	Periodically checking that: • Employees continue to find system workable. • Procedures laid down are being carried out and are effective. • Any changes in circumstances which require alterations to the system of work are taken into account.

Method statement

A method statement is, fundamentally, a written safe system of work, or series of safe systems of work. Method Statements are agreed between:

- a client and principal contractor; or
- a principal contractor and contractor,

and are produced where work with a foreseeable high hazard content is to be undertaken.

A method statement should specify the activities to be undertaken on a stage-by-stage basis and the precautions necessary to protect site operators, the client's employees and members of the public who could be affected by site activities. In certain cases, method statements may be produced and agreed between a client and principal contractor for a range of high-risk activities prior to commencement of work.

What goes into a Method Statement?

Whilst there is no standard format for a method statement, the following aspects may need consideration:

- working systems to be used
- arrangements for access, for example, to roofs
- methods for safeguarding existing structures
- structural stability precautions, for example, temporary shoring arrangements
- arrangements for protecting the safety of members of the public
- plant and equipment to be used
- health protection arrangements, such as the use of local exhaust ventilation and respiratory protection, where hazardous dusts and fumes could be created
- procedures to prevent local pollution

- segregation of specific areas; and
- procedures to ensure compliance with legal requirements under, for instance, Control of Noise at Work Regulations; Work at Height Regulations; Control of Lead at Work Regulations; and Construction (Design and Management) Regulations.

The method statement may also incorporate information and specific requirements laid down by clients, enforcement officers, the police, local fire authority, manufacturers and suppliers of plant, equipment and substances and health and safety specialists. In certain cases, the method statement may identify training needs for those carrying out the work and the use of competent persons or specially-trained operators for certain activities.

What are Method Statements and how do I write them?

A method statement is a method of control that is used after a risk assessment of an operation has been carried out. The method statement is always 'Site Specific' and is used to control the operation and to ensure that all concerned are aware of the hazards associated with the work and the safety precautions to be taken.

Method statements must be written by a competent person familiar with the work processes.

In addition, construction method statements are used on site. For a particular section of similar work, they detail its boundaries, materials and plant requirements and temporary works designs.

Method statements should also contain information concerning the order and method of construction with reference to work procedures. On some sites they are in fact a contractual requirement, requiring submission to the Principal contractor, client or engineer for approval prior to the commencement of works.

Sample method statement for removing cables from roof space.

Background information	
Company Details	Company name: Address: Tel: Fax: e-mail:
Site Address	Contact name: Address: Contact No.:
Activity - Risk	To access and work safely in the roof space during the replacement of lighting circuit.
Implementation and Control of Risk	
Hazardous Task - Risk	**Method of Control**
Access roof space	Access to the roof space will be via a suitably secured stepladder of the correct height for the task.
Access working area	Walk boards will be used to walk across ceiling joists. Electric lead lights to illuminate access and work areas.
Replacement of existing cables	Circuits will be confirmed as isolated. Cables will be disconnected and pulled out.
Removal of cables from roof space	The cables will be carefully lowered through the loft.
Safe deposit of cables	Cables to be double bagged and deposited at the scrap merchant by the contractor.
Site control	
Inspection of equipment	All equipment such as stepladder and electrical equipment shall be regularly inspected before commencement of work.
Customer awareness	The customer will be made aware of all potential dangers throughout the contract.

Permit to work

A permit to work system within a safe system of work lays down a set, organised series of procedures for doing some task or other. In this way the safety of the worker should be maintained. It is important to note that this is only true if all the steps are followed precisely. The basic points covered in a permit to work scheme are:

- the issuer of the permit must be satisfied that the equipment is safe
- the issuer of the permit must be satisfied that the person to whom the permit is given is competent to receive it
- the information in the permit is precise and accurate
- the time when the permit comes into effect
- the issuer must also cancel the permit after the task has been completed
- the person who holds the permit is responsible to make sure that it is followed absolutely.

> A contracting company was carrying out some work for a major oil refining company. This company had very strict safety rules and operated a 'permit to work' system. One of the contractor's men was seen in breach of the system and was severely reprimanded.

A permit to work is an actual piece of paper that would be given to an appropriate person so that certain work is carried out. It would only be given to someone with the requisite level of competence.

Sample Permit to Work form

To: Company: Location: **Every item must be completed or deleted as appropriate**	
A: JOB DETAILS	
Area or equipment to which this permit applies	Work to be done
B: ISOLATIONS (Specify)	Initial and comment
Circuit breaker locked out/fuses removed/isolator locked off YES☐ NO☐ Circuit confirmed to be dead YES☐ NO☐	
C: PRECAUTIONS (to be taken as indicated, additional to those specified on other permits)	
Protective clothing YES☐ NO☐ Respiratory equipment YES☐ NO☐ Protected electrical equipment YES☐ NO☐ Additional precautions required – state none if there are none.	
D: ADDITIONAL PERMITS AND SIGNATURES REQUIRED BEFORE WORK STARTS	
Confined space entry YES☐ NO☐ HV electrical YES☐ NO☐ Other YES☐ NO☐	In my opinion, the engineering precautions are adequate Signed (Engineer) Date In my opinion, the precautions against special hazards within my knowledge are adequate Signed (Engineer) Date
E: ISSUE AND RECEIPT BEFORE WORK STARTS	
Issue I have examined the area specified and permissions is given for the work to start, subject to the conditions here stated, under the control of Signed Date	**Receipt** I have read and understood the conditions of this permit Signed Date This permit is valid from hours to hours (Max. 24 hours)
F: CLEARANCE AND CANCELLATION AFTER WORK	
Clearance All workers under my control have been withdrawn. The permitted work is/is not complete Signed Time Date	**Cancellation** Work complete Yes☐ No☐ Isolations removed Yes☐ No☐ Area/equipment is safe to use Yes☐ No☐ I have notified those affected. This permit is cancelled. Signed Time Date

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9: Risk assessment

In this session the student will:

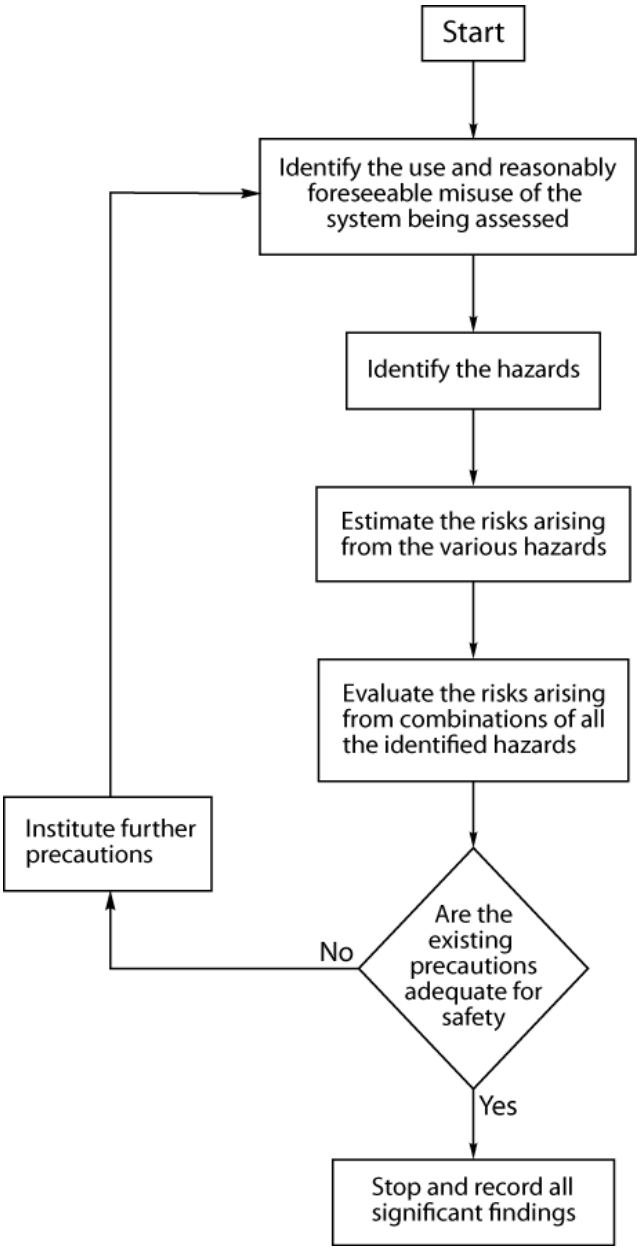
- Describe how a risk assessment is carried out.

Risk assessments are a common feature within many sectors of industry and not limited to construction and its related fields. However, it certainly does have to be understood within the construction and manufacturing sector. Risk assessment is a technique for analysing the risks associated with certain tasks as they relate to health and safety legislation.

There are three key elements to any risk assessment:

- identifying the hazard
- determining the risk
- measures to prevent and protect.

The diagram over the page gives a typical way of approaching any risk assessment.



Identification of hazard

This is essential and should only involve significant hazards with smaller ones ignored. When seeking to identify the hazard you would visit the area, talk to the people already working there is relevant and look at the accident/incident logs. In addition you would look up data sheets, manufacturer's instructions and approved codes of practice.

The nature of the risks will vary, but a list helps to clarify thoughts.

Nature of risk	Example
Equipment or mechanical	Caught in machinery; Friction or abrasion Cutting and shearing; Impact or crushing Getting pulled in; Air of fluid injection Part ejection; Pressure or vacuum Display screens; Hand tools
Transport	Works vehicles; Mechanical handling People and vehicles working closely together
Access	Slips, trips and falls; Falling and moving objects Obstructions; Working at height Confined spaces; Excavations
Handling and lifting	Manual handling; Mechanical handling
Electricity	Fixed installations; Portable tools
Chemicals	Dust, fumes and gas; Toxic substances Irritants; Sensitising of skin when exposed Corrosive substances; Carcinogens (cancer causing) Nuisance
Fire and explosion	Flammable materials – gases or liquids Explosions; Means of escape
Particles and dust	Breathing in; Taking into stomach Abrasion of skin or eyes
Radiation	Ionising; Non-ionising
Biological	Bacterial; Viral; Fungal
Environmental	Noise; Vibration; Light; Humidity Ventilation; Temperature; Overcrowding
Human factors	Not suited to work; Long hours High work rate; Violence Unsafe behaviour; Stress Pregnant or nursing; Young people
Other	Poor maintenance; Supervision Training; Information; instruction; Unsafe system

Evaluation of risk

When evaluating any risk we consider two elements:

- the severity of any harm that may occur
- the likelihood that any harm or event may occur.

Once these two elements are known and a number attached then a simple calculation will give us a degree of risk.

$$\text{Degree of risk} = \text{Severity of harm} \times \text{Likelihood of the event occurring}$$

So, where do we get the number from?

Severity of hazard	**Likelihood of occurrence**	**Assigned number**
Description	**Description**	
Minor injury – no first aid required	Remote – almost certain not to occur	1
Illness – chronic injury	Unlikely – exceptional circumstances	2
Accident – first aid needed	Possible – circumstances would influence occurrence	3
Reportable injury – RIDDOR	Likely – can occur under normal circumstances	4
Major injury – RIDDOR	Probable – good chance of occurring	5
Death	Certain – 100% probability	6

What we can see that for an event to be 100% certain and cause death a numerical value of 36 (6×6) would be attached, whilst a very remote chance of an event occurring leading to only a minor injury would have the number 1 (1×1) attached.

The use of this will give us a wide range of values. How are we to judge the actual priority that we should attach?

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What we do is band the values into low, medium and high priority levels of assessment. So:

Range	Priority
1-4	Low priority
6-16	Medium priority
18-36	High priority

There are other ways in which the level of risk can be judged; the main thing however is to remember that the number provides a way to judge the way and the rate at which risk reduction can be implemented.

In some cases an assessment made purely on personal judgement will be adequate. This is called a qualitative assessment.

The form shown below might be a way of organising your risk assessment thoughts.

Risk assessment										
Designer: _____.			**People at risk**	**Project:** _____.				**Date:** __/__/____.		**Sheet** _ **of** _.
Ref. No.	**Work element**	**Potential hazard/risk**		**Risk rating**			**Action at design stage**	**Action**		**Risk control possibilities**
				L	**S**	**R**		**By**	**When**	
Risk ratings: L = Likelihood = 1-6; S = Severity = 1-6; R = Degree of risk = 1-36 = L x S; 1-4 low level; 6-16 medium level; 18-36 high level										

Example:

A three-phase induction motor is to be installed in a farm. The motor is in an area of high levels of dust and is accessible to rats and mice. The starter and isolator are situated in a clean area free from dust and inaccessible to rats and mice. The motor and the control gear are to be installed while the farm is working with farm workers having access at all times.

Carry out a risk assessment for the task.

Risk assessment

Designer: F. Bloggs.			**People at risk**	**Project: Installation of a 3Φ motor and associated control gear.**				**Date: 25/05/2008.**		**Sheet 1 of 1.**
Ref. No.	**Work element**	**Potential hazard/risk**		**Risk rating**			**Action at design stage**	**Action**		**Risk control possibilities**
				L	**S**	**R**		**By**	**When**	
001	Site preparation	Slips, trips and falls.	Installer and trainee.	4	4	16	Tidy up site before starting work.	Installer.	Start of work.	Wear boots and overalls and face mask
		Dust explosion.		6	5	30	Agree with farmer to carry out work when mill is not working.	Employer.	Prior to work starting.	
002	Motor setup	Handling - back.		4	4	16	Two people to lift motor.	Installer.	During work.	
		Dust explosion.		6	5	30	See above.	Installer.	During work.	
		Power tools.		4	4	16	Cover leads			
003	1st and 2nd fix	Power tools.		4	4	16	As above.	Installer.	During work.	
		Handling - back.		4	4	16	As above.			
004	Power up and Commission	Electric shock		3	5	15		Installer.	During work.	
		Mechanical - crush/pull in		4	3	12				Check guard prior to turning on

Risk ratings: L = Likelihood = 1-6; S = Severity = 1-6; R = Degree of risk = 1-36 = L x S; 1-4 low level; 6-16 medium level; 18-36 high level

You need to break the task down into its constituent parts and then consider the level of risk attached to each element.

When this has been done then you think about what risks can be designed out prior to the work starting and then consider how you can control and risks that then remain.

There are other risk assessment forms that are available and other ways in which the numbering takes place. However they all follow a similar theme.

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10: Personal protective equipment

In this session the student will:

- Recognise the types and uses of personal protective equipment.

Personal protective equipment (PPE) should be supplied where there is a risk to health and safety which cannot be avoided any other way.

Under the Personal Protective Equipment at Work Regulations, PPE should be regarded as the last resort to protect against risks to health and safety. Engineering controls and safe systems of work should be considered first.

The HSE provides guidance in their publication INDG163(rev2) Five steps to risk assessment which sets out the principles for controlling risks.

In taking action ask yourself:

a) Can I get rid of the hazard altogether?

b) If not, how can I control the risks so that harm is unlikely?

In controlling risks the following principles should be applied, if possible in the following order:

a) Try a less risky option, for example, use lower voltage power tools.

b) Prevent access to the hazard, for example by guarding.

c) Organise work to reduce exposure to the hazard, for example, if there is a risk of falling objects, ensure restricted entry to that area if possible.

d) If after all the above there is still a residual risk, you will need to provide PPE.

There are a number of reasons for making PPE the last resort.

1. PPE protects only the person wearing it, whereas measures controlling the risk at source can protect everyone at the workplace.
2. Maximum levels of protection are seldom achieved with PPE in practice and the actual level of protection is difficult to assess. Effective protection is only achieved by suitable PPE, correctly fitted and maintained and properly used.
3. PPE may restrict the wearer to some extent by limiting movement or visibility.

PPE is not necessary where the likelihood of a worker being made ill or injured by a work-based hazard is so low as to be insignificant. For example, in most workplaces there will be some risk of people dropping objects onto their feet, but it is only when there is manual handling of objects which are heavy enough to injure the feet that the risk will be high enough to require the provision of safety footwear.

Any PPE should be properly assessed to ensure that:

- it is suitable for use
- maintained and stored safely
- instruction on its use given
- it is used properly

Personal protective clothing or equipment is free to everyone including agency workers. Returning the equipment on leaving employment will depend on the contract of employment.

What hazards should each of the body parts be protected from, and what type of protective clothing and equipment might be required?

	Type of protection
Eyes and face	Safety spectacles Goggles Faceshields
Head	Industrial safety helmets Bump caps Firefighter's helmets Transport helmets Leisure helmets
Protective clothing	Separates – jackets, trousers that only cover part of the body. Aprons Overalls, coveralls and bodysuits
Hands and arms	Gloves Gloves with cuff Gauntlets/sleeves/long gloves Sleeving/arm protection
Foot protection	Safety boots or shoes Wellington boots Clogs Footwear for specific tasks
High visibility clothing	Class 1 – least conspicuous (waistcoats and most trousers). Class 2 – more conspicuous than Class 1 (waistcoats, jackets and some trousers). Class 3 – the most conspicuous (jackets and coveralls).
Hearing protection	Ear plugs Earmuffs
Respiratory protective equipment	a. Respirators that rely on filtering contaminants from workplace air – include simple face-pieces, respirators and power-assisted respirators. b. Breathing apparatus, which gives and independent supply of air.

	Type of protection
Personal fall protection	Work-restraint Work-positioning Rope-access Rescue Fall-arrest

Everyone using PPE must be trained in its use, know why they need it and be aware of its limitations.

PPE is to be used only when all other means of keeping safe have been considered. It must be used even if the task will only 'take a few seconds'. Employers/managers should check that PPE is being worn. Safety signs help as reminders. The equipment should be stored safely and checked regularly for damage and/or wear. PPE should have a CE mark and conform to Personal Protective Equipment Regulations 2002.

11: Safety signs and signals

In this session the student will:

- Recognise the different types of warning signs and signals.

The Health and Safety (Safety Signs and Signals) Regulations require that safety signs are provided and maintained where risks to health and safety have not been avoided by other means. This is not an excuse not to put those other means in place and to simply use safety signs, but rather a recognition that at times any amount of control will still leave potential hazards.

The Regulations cover a range of safety signs:

Sign	Description
Safety and/or health	Provides information or instruction. This can be given by a signboard, a colour, an illuminated sign or sound, speech or hand signal
Signboard	A sign providing information or instruction by a combination of shape, colour and symbol, and is often lit. Signboards can be of the following type: • Prohibition • Warning • Mandatory • Emergency escape or first aid.
Safety colour	A colour with a specific meaning
Symbol or pictogram	Must give the meaning
Illuminated sign	Lit from inside or the rear to give the appearance of a luminous surface
Acoustic signal	Warning that is not a human or artificial voice
Verbal communication	A specific predetermined spoken message
Hand signal	A recognised hand and/or arm signal guiding people who are manoeuvring
Fire safety signs	Provides information on escape routes and emergency exits and give warning in case of fire as well as providing information on the identification and location of fire-fighting equipment.

In terms of colours:

Colour	Meaning	Instruction and information
Red	Prohibition sign. Danger alarm.	Dangerous behaviour, stop, shut-down, emergency, cut-out devices, evacuate.
Yellow or amber	Warning sign.	Be careful, take precautions, examine.
Blue	Mandatory sign	Specific behaviour or action, e.g. wear PPE.
Green	Emergency escape. First aid sign.	Door, exits, escape routes, equipment, facilities.
[Blank]	No danger.	Return to normal.

If the hearing or sight of any employee is impaired for any reason, for example, by wearing personal protective equipment, additional measures may need to be taken to ensure that employees can see or hear the warning sign or signal, for example by increasing the brilliance or volume.

In some cases more than one type of safety sign may be necessary, for example, an illuminated warning sign indicating a specific risk combined with an acoustic alarm meaning 'general danger' to alert people, or hand signals combined with verbal instructions.

Fire alarms

The aim of a fire alarm is to ensure that people in the workplace are alerted to any outbreak of fire well before it becomes life threatening. The warning system sets in motion a planned routine for evacuating the premises.

Fire alarms are included in the term 'acoustic signal'. The definition in the Regulations is 'a coded sound signal which is released and transmitted by a device designed for that purpose, without the use of a human or artificial voice'. In practice it is important that the acoustic signal for a fire alarm:

a) has a sound level considerably higher than the level of ambient noise so that the warning signal can be heard throughout the workplace;
b) is easily recognisable and distinct from other acoustic signals and ambient noise; and
c) is continuous for evacuation.

Unit 301 - Health and Safety & Legislation

End of outcome 3 written questions

Attempt all questions, the marks available are shown in the right-hand margin.
You should aim to pass with an 85% minimum score.

1.	Explain the purpose of the Management of Health and Safety at Work Regulations	3
2.	What is the main purpose of carrying out a risk assessment?	4
3.	What must employers provide their employees with under the regulations?	2
4.	Identify five electrical work activities which would require a risk assessment to be carried out before commencing work.	5
5.	What is the difference between a risk and a hazard?	2
6.	How are the risks controlled when using such tools as cartridge guns and grinders?	4
7.	List the most common type of risks that an apprentice/electrician is likely to come into contact with during their typical working career.	6
8.	Briefly state what a safe system of work is.	3
9.	What is a method statement and who should write it?	3
10.	What is a permit to work and what are the duties of the issuer and holder?	3
11.	What regulations cover the provision and use of PPE?	1
12.	What does the law require an employer to do with regard to PPE?	2
13.	What does the law require of you as an employee to do with regard to PPE?	2
14.	Who should decide whether PPE and RPE are required and what actions must be taken to determine this?	2
15.	State the importance of safe storage of tools.	3
16.	State the importance of safe storage of materials.	3
17.	Describe the two approved methods recommended by PASMA?	4
18.	State why your behaviour at work must be correct at all times.	3
19.	What the minimum first aid facilities required on a site?	3
20.	How does the size of a site affect the required first aid facilities?	2
	Total marks	60

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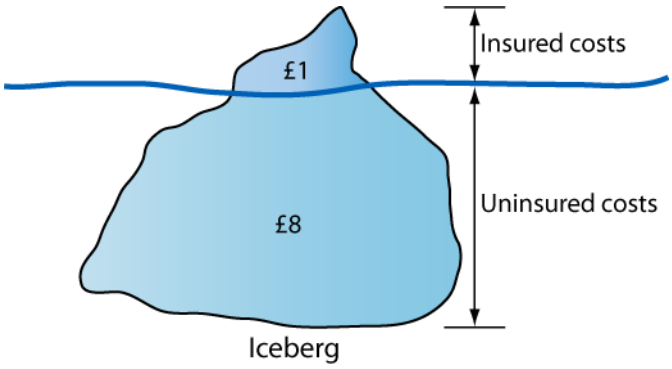
12: Health and safety risks, precautions and procedures

In this session the student will:

- Recognise the different types of warning signs and signals.

In these first two sessions we are going to consider why accidents occur, the factors that apply in almost all circumstances and what can be put in place to limit and hopefully eliminate accidents altogether.

For the period 2005/2006 2 million people were suffering from an illness they believed was caused or made worse by their current or past work, of which 523000 were new to 2005/2006. In that same period, 212 workers were killed at work, 146 076 other injuries were reported under RIDDOR and 328000 reportable injuries occurred. In addition 30 million days were lost to work-related ill health and 6 million due to workplace injury.



The financial losses that accrue when an accident occurs are not just the obvious ones of claims for injury and any damage. The on-costs also include legal costs, cleaning up of the site, delays in production, loss of expertise, lost orders, the time it takes for the investigation and fines. It has been reckoned that for each one pound (£1) of insured costs there is over eight pounds (£8) of uninsured costs.

Causes of accidents

The causes of accidents are split into two general areas; ***unsafe acts*** and ***unsafe conditions***. It is important however not to get too entangled by the terms as some crossover naturally occurs and they take no account of the context in which the accident occurred, with a third category of ***indirect causes*** also needing to be applied.

Indirect causes

Pressure from management, which might include:

- Financial restrictions
- Lack of commitment – not a team player
- No health and safety policy or one that is not adhered to
- Poor standards of work practice and equipment
- Lack of knowledge and information
- Poor or incomplete training.

Social pressures which might include

- Attitude amongst those you work with
- Custom and practice
- Tradition
- Attitude to risk taking
- Behaviour that is considered 'acceptable' – this falls into the 'everyone was doing it' sort of excuse.

It is always better to prevent an accident than try to put things together later. With this in mind strategies should be set in place that:

- Avoid risk altogether by eliminating hazards
- Deal with risks at source – e.g. it is better to deal with the mechanical ventilation system than giving everyone breathing apparatus
- Design work areas that are suitable for the people who are to use it
- Use technology to improve work conditions
- Make a work area safe rather than giving an individual safety equipment

- Provide adequate and well understood information along with good training
- Ensure that health and safety management is accepted by everyone and applies to all areas of work practice.

Risk assessment

We have already introduced the idea of the risk assessment earlier in this study material and therefore we will not spend too much time repeating what we have already covered. However, in the last ten years there has been such an increase in the need for adequate risk assessments that it is no bad thing to repeat some of the work.

We have already defined risk as '***the likelihood of a substance, activity or process to cause harm***', then a hazard is '***the potential of a substance, activity or process to cause harm***'.

The objective of a risk assessment is:

- **'to determine the measures required by an organisation to comply with relevant health and safety legislation and so reduce the level of injury/ill health'.**

There are two types of risk assessment, ***quantitative*** and ***qualitative***. The quantitative method uses probability to assess the likelihood of an event occurring and attaching a number to it. The qualitative method uses personal judgement and attaches a high, medium or low risk factor to assess the level of risk.

Now much of this sounds a little too much like a textbook and it would be worthwhile looking at something like 'An Introduction to Health and Safety at Work'[6]. However, we need to start considering the practical outworking of the theory. There is a process to risk assessment.

[6] Introduction to Health and Safety at Work – The handbook for the NEBOSH National General Certificate – Phil Hughes and Ed Ferrett. Elsevier Butterworth Heinemann ISBN 0 –7506-5730-8

The HSE (Health and Safety Executive) use a five-step approach:

- Look for the hazards
- Decide who might be harmed and how
- Evaluate the risks and decide whether the existing precautions are adequate or whether something else should be done
- Record the significant findings
- Review the assessment and update it where/when necessary.

Consider an example

1) You are expected to be working with a handheld 110 V power drill in a workshop in a college. The drill is fed from a centre-tapped 110 V transformer with a potential to earth of 55 V. The lead is 3 m long and is attached to the transformer via a BS EN 60309 plug and socket-outlet. The workshop is relatively clean and power tools are stored in a locked cupboard.

So dealing with each of the five steps in turn.

1) Identify hazard(s)

- Holding the drill
- Wandering lead that can be tripped or damaged
- Dust from hole
- Chips from brickwork or metal
- Noise, particularly in an enclosed space
- Rotating shaft.

2) Who might be harmed and how

Person using the drill:

- Getting sleeve caught in shaft
- Shock from handle or lead
- Trip over the lead
- Dust or particles in eyes
- Noise from hammer action in an enclosed space.

People surrounding the user:

- Trip over lead
- Shock from the lead
- Noise from percussion action in an enclosed space.

3) Risk evaluation

- Check if the drill has been PAT tested – low risk if checked, medium if not.
- Has the drill and lead been checked as it leaves the cupboard? – low is checked by competent person but medium if not.
- Are overalls used and loose clothing is tied up? – low risk.
- Are goggles and ear protectors used? – low risk in open area, medium in an enclosed space for noise but medium risk for chippings if goggles are not used.
- Are other users limited in their access to areas where work is taking place? – low risk if other people are limited in their access.

4) Significant findings

- PAT test drills every term or semester and record findings. Many different types of people use the drill and as such risk increases.
- Drill and lead must be checked for damage each time it is taken from the cupboard.
- Transformer to be PAT tested each year.
- Transformer lead to be checked each time it is taken from the cupboard.
- Only authorised person to check and hence have access to the key for the cupboard.
- Only people with correct overalls and footwear are permitted to have access to power tools and work area.
- Goggles and ear protectors are required each time the drill is used.
- Maintain work area in a tidy fashion to eliminate risk from tripping.

5) Review

- This can only be carried out after the work processes have been monitored for a time, but must be done each year at least.

Now, all of this process is pointless if all you then do is ignore the safety checks, goggles, ear defenders etc. You may think that nothing will ever happen to you. What you should be thinking is that it happens to someone, why not me?

So remember the five elements.

- Look for the hazards;
- Decide who might be harmed and how;
- Evaluate the risks and decide whether the existing precautions are adequate or whether something else should be done;
- Record the significant findings;
- Review the assessment and update it where/when necessary.

13: Risk control

In this session the student will:

- Gain an understanding of risk control and why it is necessary.

In any risk assessment there has to be control of the risk itself. In most places some elements of control will already be in place.

In any work area the risk controls will need continuous assessment to ensure that they are doing what we intend them to do. Think about a guard on a machine. It is pointless interlocking the guard with the electrical supply if it can be bypassed. You see the control is in place but it can be effectively ignored.

In any aspect of risk control the Management of Health and Safety at Work Regulations 1999 (MHSWR) specifies the general principles of prevention. These principles are set out within a European Directive and provide an ordered list (hierarchy) of how to manage risk.

Hierarchy of risk control measures

So here is the list:

1) Elimination

It is always better to remove the risk that put other controls in place. This should be the first choice.

2) Substitution

Can something having less risk be introduced instead of the main item?

3) Engineering controls

Is safe isolation in place? Are correct ventilation systems in place? Are safety interlocks in place and not bypassed?

4) Reduce or limit the exposure

This is when dealing with hazardous or dust-rich atmospheres.

5) Good housekeeping

A tidy site with clear walkways is a safer site.

6) Safe systems of work

This is a formal procedure resulting from an assessment of the necessary task/s, the risk/s and the method of work to eliminate or control that risk. This is an area of study in itself.

7) Training and information

Ignorance is no excuse, but neither is inadequate training and information. No one can be expected to perform safely if they have not been shown how to use equipment correctly.

8) Personal protective equipment

It matters that it is worn as within the hierarchy we are now assuming that the risk cannot be removed but that the individual has to be protected from it.

9) Welfare

This is a recognition that first aid and/or a site nurse and/o, health monitoring may be necessary where risk cannot be removed. For example someone who works with hazardous fumes may need a health check every three months.

10) Monitoring and supervision

Any risk control measures are pointless without the means of ensuring their effectiveness. It may be that staff need disciplining for ignoring safe working practices. Do management ensure safe working or are they part of the problem trying to maintain production levels?

11) Review

Any control systems need monitoring, but periodically a review needs to take place to ensure that the policy works. If there are loopholes then changes will need to be made.

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Now much of this may seem sensible when you see it laid out in a list. Of course it is better to get rid of this risk without having to wear protective clothing. In one area however, we need to give a little more thought, and this is with the safe system of work.

14: Safety procedures

In this session the student will:

- Describe safety procedures for personal protection, safety from electricity and in case of emergency.
- Gain an understanding of personal attitudes to safety and recognise why they influence behaviour.

In this session we will consider the individual's own contribution to safety and the ways in which personal attitudes affect the way in which people behave at work.

The personal factors that affect health and safety include attitude, motivation, training and human error as they interact with the physical, mental and perception of the individual.

Attitude

This is the tendency for people to behave a certain way under a particular set of conditions. This is usually a function of the culture of the organisation including its management. If a particular way of working is considered acceptable and that is what an individual has grown up with, when they move to another place of work, and they function as they always did, that person may be surprised to find that other workers think those work practices are dangerous.

Attitudes can be adjusted by training and enforcement of safety rules.

Motivation

This is what makes a person 'tick'. Motivation and its converse, de-motivation, is affected by involvement in the decision-making processes, incentives, promotion or demotion, job security and satisfaction.

Perception

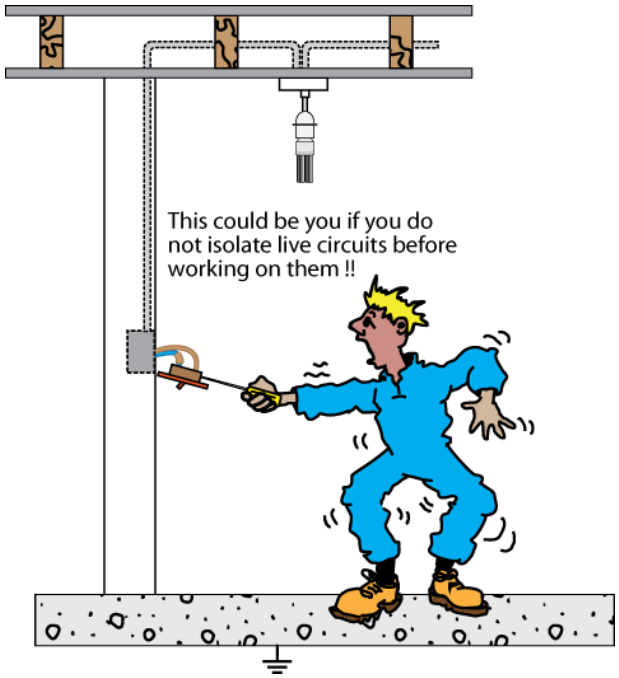
This is the way in which people think about and understand the environment in which they find themselves; their perception may be right or wrong, but people who don't think that there is a risk cause or are affected by many accidents. Classic examples would include the person who refuses to wear a hard hat because it makes his head sweat or he feels silly. Other examples might include fluorescent lighting situated near rotating machinery creating a stroboscopic effect with people thinking that the machinery is standing still when it is probably rotating at 3 000 rpm.

The HSE has issued guidance on personal factors in HS(G)48 (Reducing error and influencing behaviour) and provides a checklist.

- Has the job specification been drawn up and included age, physique, skills, qualifications, experience, aptitude, knowledge, intelligence and personality?
- Have the skills and aptitudes been matched to the job requirements?
- Have the personnel selection policies and procedures been set up to select appropriate individuals?
- Has an effective training system been implemented?
- Have the needs of special groups of employees been considered?
- Have the monitoring procedures been developed for the personal safety performance of safety critical staff? (Are safety critical staff monitored to ensure they know what they are doing – a little like Homer Simpson being the safety officer for the nuclear plant!)
- Have fitness for work and health monitoring been provided when needed?
- Has counselling and support for ill health and stress been provided?

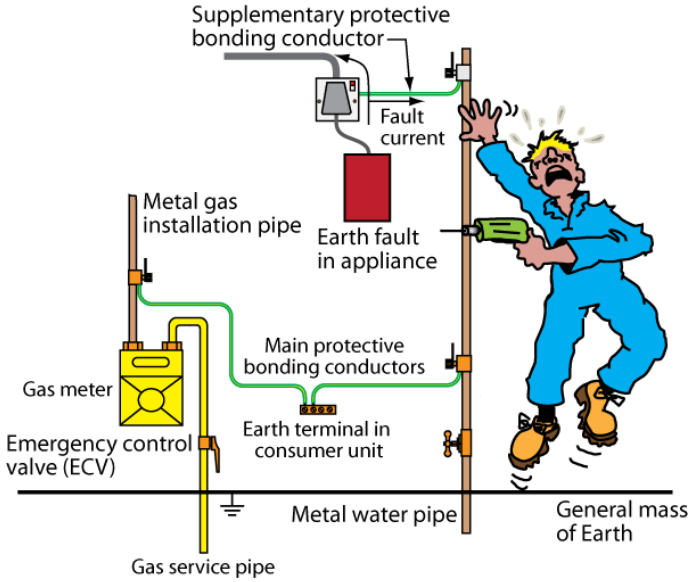
Safety from electricity

The two ways in which an individual can come into contact with a source of electricity is either by direct contact or indirect contact. Protection against this is by the provision of basic insulation protection and through fault protection.



Direct contact occurs when an individual touches a live source directly. This can be due to a deliberate choice to touch a bare conductor that is live, or because there has been some failure in the basic insulation surrounding the conductor.

Indirect contact occurs when there is a fault and an individual comes into contact with a conductive part that has become live.



The way in which an electrical installation is designed should take into account both direct and indirect contact. The means of protection that BS 7671 are called Basic Protection (that is protection against direct contact) and Fault Protection (that is protection against a fault that might occur on the system).

We have already seen how dangerous electricity is and we'll briefly review what you should be aware of when dealing with portable equipment and what to do in the event of an electric shock. In this brief section we will consider the sort of checks that you should make on portable equipment.

Checking of portable equipment

- Is there any damage apart from light scuffing to the cable sheath – also check that insulation tape is not holding things together?
- Is the plug undamaged – pins solid and casing whole without cracks etc?
- Are there any inadequate joints in the lead – taped joints etc?
- How is the cable sheath secured in the equipment or plug – does the cord grip work?
- What conditions is the equipment to be used in and does the lead and tool meet the requirements of the environmental conditions – wet, humid, corrosive etc?
- Is there any damage to the equipment with screws missing or vents blocked?
- Is there any evidence of overheating – this would show up as discolouring of the leads or even a strange 'fishy' smell?

You should check any portable equipment like this every time you use it.

A young electrician was holding two ends of an open flex thinking they were dead. He touched the neutral held in one hand and at the same time touched the phase conductor in the other. The trainee who was with him ended up having to hit him repeatedly with a wooden brush handle to get him to let go. The electrician was hospitalised and off work for a time.

Be aware that this procedure is only adequate for low voltage (less than 1000 V a.c. or 1500 V d.c.) supplies. With high voltage (in excess of 1000 V a.c. or 1500 V d.c.) supplies, there is no safe approach method. Where you believe someone is in contact with a high voltage supply then you must shout for help to ensure that the power is turned off before any approach can be safely made.

It is highly likely that someone receiving a high voltage shock will die, either from the massive current flowing through their body or from electroporation. Electroporation is a condition where the cells in the body begin to burst open steadily causing necrosis to set in.

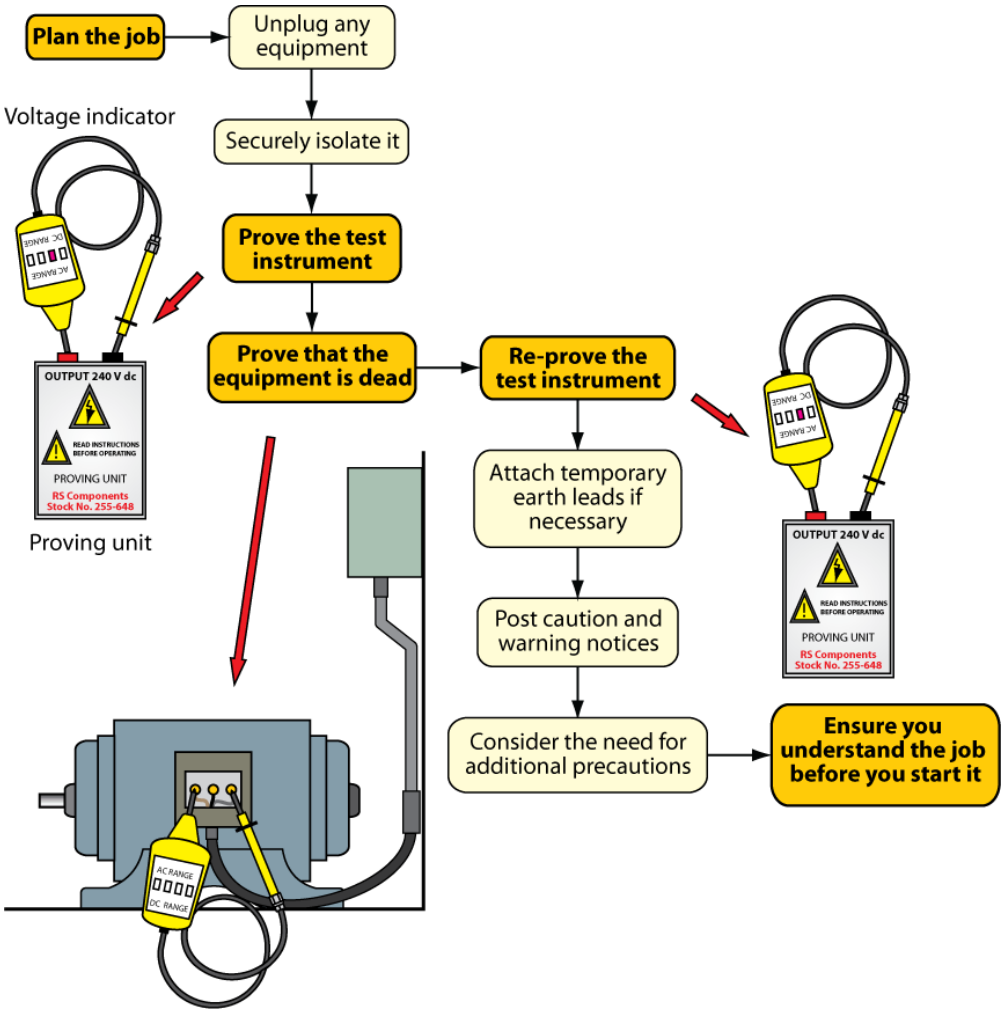
If you attempt any more you could cause more problems than you cure. Remember the experts have more chance of resuscitating a person than you so call for help immediately!

Isolation

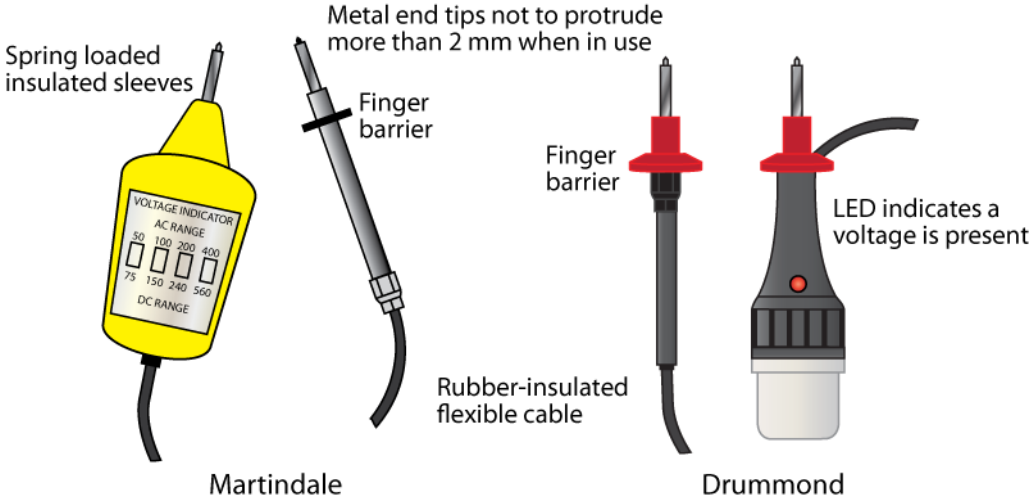
There is no apology for covering safe isolation a second time. The number of deaths and injuries caused by incorrect isolation is too high and therefore people need constantly reminding of its importance.

Isolation is the means of cutting off the electrical supply to enable skilled people to work on or near live parts. Both the SELECT in their publication, Guidance on Safe Isolation Procedures and the Electrical Safety Council (ESC) in their Best Practice Guide, Guidance on the Management of Electrical Safety and Safe Isolation Procedures for Low Voltage Installations have produced guidance on safe isolation.

You require the appropriate test equipment and tools for safe isolation. These will include an approved voltage tester (to GS38 – Electrical Test Equipment for use by Electricians) and a voltage proving unit.



There are many voltage testers that meet the current requirements. However the diagram over the page shows some of the points that the voltage tester must have.



Notice that the metal tip should have a maximum of 4 mm protruding, and even this dimension should preferably be 2 mm or less.

There is a well insulated, flexible and robust lead joining the two probes and you would also find that the leads were fused. Notice also the finger barriers to stop hands slipping on to potentially live parts.

From the order of things on the previous page that testing to determine whether a circuit is live, ought to be carried out dead! You should not leave things turned on while you test, but you should isolate before you test for a voltage. You are proving that something is '***dead***'' not that something is '***live***'.

Think before you act, and try to make sure that you have considered the implications of each type of installation.

15: Site security and waste disposal

In this session the student will:

- Gain an understanding of why it is important to keep tools and equipment safe.
- Describe the requirements for waste disposal.

It is important that a place of work is kept tidy. This will include keeping the site tidy, making sure that tools and equipment, as well as material, are kept securely and ready for use and what to do with waste.

Keeping a site tidy

The HSE has issued health and safety guidance specifically for those involved in the construction industry. HSG150, Health and Safety in Construction, is a very helpful publication giving practical guidance on how a site might be set up for safety. This includes, amongst many other things, a section on good order, storage areas and waste materials. The HSE estimate that 49 % of all accidents result from bad site housekeeping.

The CIOB (Chartered Institute of Builders) held a workshop in 2003 to look at the issue of site conditions. The comment from one was, 'A pig that has always lived in muck has no expectation of doing anything else and our current workforce will have to go through a major programme to learn to expect something else'. The workshop came up with a summary of key solutions which included:

- higher expectations from contractors and clients
- improved kit and clothing, showers, glove policy, clean boot policy
- people realise the value of a clean and tidy site
- retraining of the workforce to change site behaviour
- improve self-respect of people so they take more care
- fines for those who breach health and safety items.

It can be clearly seen that a clean and tidy sight has a very high priority for both the HSE and for the CIOB. Why should it be any different for those of us in the contracting arena?

As part of the planning involved in the setting up of a site the HSE suggest how the site might be kept tidy and how housekeeping will be actively managed:

- Keep walkways and stairways free of tripping hazards such as trailing cables, building materials and waste. This is especially important for emergency routes. Make sure that all flammable waste materials (such as packaging and timber offcuts) are cleared away regularly to reduce fire risks;
- Keep inside floor areas clean and dry;
- Outdoor footpaths should be level and firm and should not be used for storing materials.

Designate storage areas for plant, materials, waste, flammable substances (for example, foam plastics, flammable liquids and gases such as propane) and hazardous substances (for example, pesticides and timber treatment chemicals). Flammable materials will usually need to be stored away from other materials and protected from accidental ignition. Do not store materials where they obstruct access routes or where they could interfere with emergency escape, for example, do not store flammable materials under staircases or near to doors or fire exits (see Figure 5).

If materials are stored at height (for example, on top of a container or on a scaffold gantry), make sure necessary guard rails are in place if people could fall when stacking or collecting materials or equipment.

Keep all storage areas tidy, whether in the main compound or on the site itself. Try to plan deliveries to keep the amount of materials on site to a minimum.

Decide how the waste stream will be managed to ensure it is timely and effective. You might want to consider whether you will require the contractors to be responsible for collecting their own waste or whether you will provide someone to do this for the site. Don't forget that waste materials also need storing safely before their removal from the site and make sure that you allow sufficient space for waste skips and bins.

If you are collecting waste in skips you will need to decide where the skips can be positioned and

how often they will need to be collected.

Consider waste generated inside and whether you need to provide wheeled bins to enable it to be brought out of the building safely.

Waste disposal

There are a number of different types of waste that the electrical industry generates. Some of the waste is general and covers building materials like wood, cardboard and brick and block dust. Some waste material however carries a greater level of risk.

- Mercury – from mercury switches, fluorescent lamps, high-pressure lamps and old rectifiers. Mercury is very poisonous and can lead to brain damage. There is enough mercury in a single fluorescent lamp to poison large amounts of water.
- Sodium – from low-pressure and high-pressure sodium lamps. Sodium reacts violently with the moisture in the air and gives off hydrogen, which can explode.
- Asbestos – was used in many areas to limit the heat transmission surrounding heaters etc. As long as it remains in a solid form it is less dangerous, but in a fibre form it can cause mesotheleoma (a type of lung disease), which is always fatal.
- PCB – PCBs were used in many items of electrical equipment. They were an excellent insulator and in many old fluorescent ballasts, and in transformers as well as other items they are still around. It has been recognised that PCBs are also cancer-causing substances (carcinogens).

There is much guidance on how to handle, or avoid handling, asbestos. The HSE have published many task sheets specific to processes and industries. For example, Sheet a26 (Asbestos essentials) deals with drilling and boring through textured coatings, such as older style artex.

The issue with waste disposal is one of legislation. New controls have been introduced on hazardous waste that applies in England and Wales. Hazardous wastes are subject to the Hazardous Waste Regulations 2005, and specific wastes are listed in the List of Wastes (England) Regulations 2005.

The new controls:

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- define hazardous waste
- describe how to notify premises producing hazardous waste to the Environment Agency
- describe the form (consignment note) you must use before you can get rid of hazardous waste
- set out procedures for multiple collections of waste
- describe the form (consignee return) that people receiving waste must complete and send to the Environment Agency
- describe the records that must be kept
- set fees for premises notification and consignments
- restrict mixing of wastes
- set out penalties for non-compliance

No longer is at acceptable simply to throw old tubes and lamps, or anything else for that matter, onto the waste tip.

Depending on the nature of your business the regulations will apply in different ways. For example, where you produce less than 200 kg of hazardous waste you will not be required to register with the Environment Agency.

Typically, an electrical contractor will produce hazardous waste at more than one premise. Normally, this would require notification of each premise. However, as it is likely that you operate a mobile service that visits premises that you don't own or occupy then you may notify the premises that you run your business from. However, where you produce more than 200 kg of waste from each premise then each premise would need to be registered.

What is the process?

- If you want to get rid of waste you are the producer or holder. Before the hazardous waste is removed from the premises Part A and Part B of a consignment note must be completed.

Form HWCN01v051

The Hazardous Waste Regulations 2005: Consignment Note

Environment Agency

PRODUCER'S/HOLDER'S/CONSIGNOR'S COPY (Delete as appropriate)

PART A Notification details

1 Consignment note code: [ ][ ][ ][ ][ ][ ] / [ ][ ][ ][ ][ ][ ]

2 The waste described below is to be removed from (name, address, postcode, telephone, e-mail, facsimile):

3 Premises code (where applicable): [ ][ ][ ][ ][ ][ ]

4 The waste will be taken to (name, address and postcode):

5 The waste producer was (if different from 2) (name, address, postcode, telephone, e-mail, facsimile):

PART B Description of the waste

If continuation sheet used, tick here ☐

1 The process giving rise to the waste(s) was:

2 SIC for the process giving rise to the waste: [ ][ ] . [ ][ ] / [ ][ ]

3 WASTE DETAILS (where more than one waste type is collected all of the information given below must be completed for each EWC identified)

Description of waste	List of wastes (EWC code)(6 digits)	Quantity (kg)	The chemical/biological components of the waste and their concentrations are:		Physical form (gas, liquid, solid, powder, sludge or mixed)	Hazard code(s)	Container type, number and size
			Component	Concentration (% or mg/kg)			

The information given below is to be completed for each EWC identified

EWC code	Packing group(s)	UN identification number(s)	Proper shipping name(s)	UN class(es)	Special handling requirements

PART C Carrier's certificate

(If more than one carrier is used, please attach schedule for subsequent carriers. If a schedule of carriers is attached tick here. ☐)

I certify that I today collected the consignment and that the details in A2, A4 and B3 are correct and I have been advised of any specific handling requirements.

1 Carrier name:

On behalf of (name, address, postcode, telephone, e-mail, facsimile):

2 Carrier registration no./reason for exemption:

3 Vehicle registration no. (or mode of transport, if not road):

Signature

Date [D][D][M][M][Y][Y][Y][Y] Time [H][H][M][M]

PART D Consignor's certificate

I certify that the information in A, B and C above is correct, that the carrier is registered or exempt and was advised of the appropriate precautionary measures. All of the waste is packaged and labelled correctly and the carrier has been advised of any special handling requirements.

1 Consignor name:

On behalf of (name, address, postcode, telephone, e-mail, facsimile):

Signature

Date [D][D][M][M][Y][Y][Y][Y] Time [H][H][M][M]

PART E Consignee's certificate (where more than one waste type is collected all of the information given below must be completed for each EWC)

Individual EWC code(s) received	Quantity of each EWC code received (kg)	EWC code accepted/rejected	Waste management operation (R or D code)

1 I received this waste at the address given in A4 on: Date [D][D][M][M][Y][Y][Y][Y] Time [H][H][M][M]

2 Vehicle registration no. (or mode of transport if not road):

3 Where waste is rejected please provide details:

I certify that waste management licence/permit/authorised exemption no(s).

authorises the management of the waste described in B at the address given in A4.

Name:

On behalf of (name, address, postcode, telephone, e-mail, facsimile):

Signature

Date [D][D][M][M][Y][Y][Y][Y] Time [H][H][M][M]

HWCN01v051

If you are not the producer of the waste, but are simply responsible for the removal of the hazardous waste then you are the consignor.

- If you are to move the waste then you are a carrier. It is your responsibility to check that the information given in Part A and Part B of the consignment note is correct. When you are happy that the form is correctly filled in then you must fill in Part C of the note. The consignor or producer must then complete Part D of the form with copies being given to all interested parties.
- The person who receives the hazardous waste is the consignee. He/she must sign the copies of the note given by the producer in Part E of the form.

The Environment Agency wants an audit trail of the waste material. Although this seems tedious, in many ways this is simply a variant on maintaining a clean and tidy site. After all no site can be clean or tidy where poisons exist in the dust or atmosphere from broken tubes.

Site security

On any site, one of the main areas of concern is site security. Items of plant are expensive, and any loss from theft or reckless damage due to lack of care matters, on top of which the main contractor remains responsible for the site even when everyone has gone home. Children are a constant source of irritation as they find building sites such a good playground!

Receipt and checking of delivery

There should be some notification from the supplier that a delivery is to be made. It is for the foreman to organise the site ready for the delivery.

Delivery notes should accompany delivered goods and must be presented as proof of delivery. To sign for the content and quality of the goods can be a more problematic issue. Often it is impossible to count or examine the goods. However, delivery notes should not be signed until the foreman is convinced that everything has been delivered as agreed.

If material is being delivered from the main office or store of the company then an order must be made to the store. This allows for best use of material.

Off-loading and handling

Careless off-loading and handling of materials adds to cost, and it is necessary for the foreman to take particular care at this stage.

The method of off-loading will depend on the material that is being delivered. It may be that some form of crane/winch/truck is required. A prior arrangement made with the deliverer will lead to the best possible means of delivery that will help with this process.

Storing and protecting

This is a material dependent issue. On many sites a steel container is provided for security (we'll look at this in a moment). This can be used for the storage of material in a manner that takes account of the frequency of use, health and safety and accessibility.

It is normal for the most used material to be set to the front of the store, so that there is minimum disturbance. Small items, such as clips etc. should be placed on a rack so that they don't get dragged all around the floor.

Power tools should be positioned to make them easy to access and away from anything that might affect their working. For example, power tools should not be hung by their leads; transformers, which can be heavy, should be set fairly low to the ground to avoid being a falling danger.

If a steel container is not available, a secure room should be used that has been cleaned out. This room may also double as a site office.

Of course one of the key benefits to good security is cheaper insurance costs. After all, which insurance company is going to keep premiums low if you are a poor risk?

Issuing and distributing

Much material is wasted at this stage. It is essential that an efficient store-keeping system is in place. You don't want to be working on a site to suddenly find yourself short of cable, just because no account was taken of the material on hand.

A booking out system may prove to be the most sensible way in which material is logged-out of the store. It is the site foreman's job to monitor the flow of this material.

Use of materials

There are always people who are less than careful when they think that they are working with someone else's money. The misuse of material will include leaving off-cuts of cable on drums, wasting conduit by poor bending and cutting skills, clips/screws etc. left on floors or in pockets, siphoning off material for use at home!

Quality control and supervision

BS 7671 states in Regulation 134.1.1 requires that:

- **Good workmanship by competent persons or persons under their supervision and proper materials shall be used in the erection of the electrical installation.**

Indeed, this requirement is reinforced by regulation 7 of the Building Regulations for England and Wales (which is legislation).

It is not uncommon for the architect or their agent to inspect samples of the materials that are to be used in the installation.

Another good check is to randomly sample the materials, such as looking in every other box at a socket or switch etc.

16: Hazards within the electrical industry

In this session the student will:

- Identify warning signs for the main groups of hazards.
- Identify specific hazards created by electricity.

CHIP 4

CHIP refers to the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009, which came into force on 6 April 2009. These regulations are also known as CHIP 4.

CHIP is the law that applies to suppliers of dangerous chemicals. Its purpose is to protect people and the environment from the effects of those chemicals by requiring suppliers to provide information about the dangers and to package them safely.

CHIP requires the supplier of a dangerous chemical to:

- identify the hazards (dangers) of the chemical. This is known as 'classification';
- give information about the hazards to their customers. Suppliers usually provide this information on the package itself (for example, a label); and
- package the chemical safely.

The current system uses the following symbols.

	Example of hazard	Example of statement
	Dangerous for the environment	Very toxic to aquatic organisms, may cause long term adverse effects in the aquatic environment.
	Toxic	Harmful in contact with skin.
	Corrosive	Causes burns.
	Flammable	Highly flammable
	Explosive	Risk of explosion by shock, friction, fire or other sources of ignition.

	Example of hazard	Example of statement
	Irritant	May cause sensitisation by skin contact.
	Oxidising	Contact with combustible material may cause fire.

From 2015 CHIP 4 will come to an end and the CLP Regulations will come into force. The new system is called the Classification, Labelling and Packaging of substances and mixtures. These new regulations are being introduced to bring into law the agreed Globally Harmonised System of Classification and Labelling of Chemicals (GHS).

These new symbols will be:

	Example of hazard statement	**Example of precautionary statement**
	May intensify fire; oxidiser.	Take any precaution to avoid mixing with combustibles.
	Heating may cause fire.	Keep only in original container.
	Heating may cause an explosion.	Keep away from heat/sparks/open flames/hot surfaces – no smoking.
	Toxic if swallowed.	Do not eat, drink or smoke when using this product.
	Causes serious eye damage.	Wear eye protection.

	Example of hazard statement	Example of precautionary statement
	This is a new pictogram and is to be used where the containers hold gas under pressure. May explode when heated.	None.
	This is a new pictogram which reflects serious longer term health hazards such as carcinogenicity and respiratory sensitisation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.	In case of inadequate ventilation, wear respiratory protection.
	Toxic to the aquatic life, with long lasting effects.	Avoid release to the environment.
	This is a new pictogram which refers to less serious health hazards such as skin irritancy/sensitisation and replaces the CHIP symbol  May cause an allergic skin reaction.	Contaminated work clothing should not be allowed in the workplace.

Hazards caused by electricity

BS 7671 Requirements for Electrical Installations, also called the 'Regulations' or the 'Regs' have gone through a number of changes over the years. These regulations are **not** and never have been a set of legal documents.

In 1993, the IEE Wiring Regulations were made a British Standard (BS), which placed them on an equal setting with the rest of Europe. It is of passing interest to note that BS 7671 is based on an IEC Standard; IEC 60364, and as updated versions of BS 7671 come on line they must align more with that standard. This generally means that there is little flexibility for national bodies to alter the standard as it filters down to the users level.

BS 7671 relates to:

> *'the design, selection, erection, inspection and testing of electrical installations, whether permanent or temporary, in and about buildings generally and to agricultural and horticultural premises, construction sites and caravans and their sites'.*

It is also important to note that compliance with BS 7671 is likely to achieve compliance with relevant aspects of the Electricity at Work Regulations 1989. It is important to note however, that BS 7671 does not relate to voltages greater than 1000 V a.c. or 1500 V d.c. or to mines, oil rigs, equipment on vehicles, public electricity supplies and explosion protection. Further guidance on the safe use of electricity at work may be found in HSG85 Electricity at Work – Safe Working Practices.

BS 7671 is split into seven different parts, covering a vast range of areas. These parts are then split into a number of chapters, which are further sub-divided into the specific requirements.

It will take you some time to become familiar with them, and even then there will be much that you will find difficult to understand. Do not worry about it yet. With practice, you will be able to find your way around. It would be worthwhile for you to get your own set of BS 7671.

Another useful publication is the ***Guide to the Requirements***. This guide helps to put BS 7671 into a more domestic setting, with common practical problems being dealt with.

Around 1000 electrical accidents at work are reported to the HSE each year: about 25 people die of their injuries.

BS 7671 is intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations. In electrical installations, risk of injury may result from:

- electric shock
- excessive temperatures likely to cause burns, fires and other injurious effects
- ignition of a potentially explosive atmosphere
- undervoltages, overvoltages and electromagnetic influences likely to cause or result in injury or damage
- mechanical movement of electrically actuated equipment, such as motors and the like
- power supply interruptions and/or interruption of safety services, such as fire alarm systems
- arcing or burning, likely to cause blinding effects, excessive pressure and/or toxic gases.

Unit 301 - Health and Safety & Legislation

Outcome 4, written questions

Attempt all questions, the marks available are shown in the right-hand margin.
You should aim to pass with an 85% minimum score.

1.	What are hazardous substances?	4
2.	How might you be exposed to harmful substances?	4
3.	What information should be available to inform you if a product was hazardous?	3
4.	What does CHIP stand for and what is its purpose?	2
5.	What does the abbreviation COSHH mean?	1
6.	How do the new European symbols differ from the old ones for denoting hazardous materials?	4
7.	What rules govern the transportation of hazardous waste materials?	6
8.	What makes a construction site such a hazardous environment?	4
9.	If you produce hazardous waste, who must you register your premises with?	1
10.	What notices should be displayed at the entrance to a construction site?	5
11.	What percentage of all electrical accidents involves portable electrical appliances?	1
12.	The hazards that are associated with the use of electrical equipment can be thought of as primary and secondary, what does this mean?	4
13.	What user checks can be made on electrical equipment?	10
14.	What are the three conditions for combustion to occur?	3
15.	If you discover a fire in the workplace, what is the correct procedure to follow?	7
16.	Explain how the following types of fire extinguishers are identified and what types of fire they are suitable for use on; a) Dry powder, b) Water, c) CO_2 d) Foam.	10
17.	What legal duties are imposed upon employers and owners of buildings by fire protection legislation?	8
18.	What is asbestos and what are dangers from working with it?	6
19.	What were the typical applications for asbestos?	6
20.	What are the main do's and don'ts of handling asbestos?	10
	Total marks	60

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