MY REVISION NOTES

HODDER EDUCATION

City & Guilds

Level 2 Technical Certificate (8202-20)

ELECTRICAL INSTALLATION

- Plan and organise your revision
- Reinforce skills and understanding
- Practise exam-style questions

Peter Tanner

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City & Guilds Level 2 Technical Certificate (8202-20)
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Level 2 Advanced Technical Diploma (8202-20)

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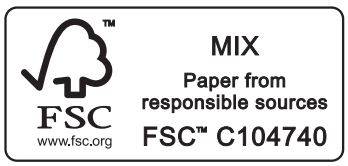
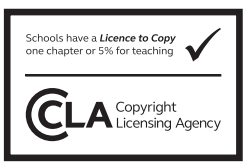




Get the most from this book

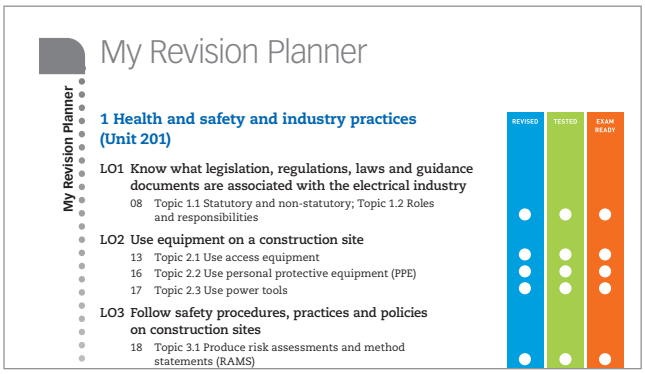
Everyone has to decide his or her own revision strategy, but it is essential to review your work, learn it and test your understanding. These Revision Notes will help you to do that in a planned way, topic by topic. Use this book as the cornerstone of your revision and don't hesitate to write in it – personalise your notes and check your progress by ticking off each section as you revise.

Tick to track your progress

Use the revision planner on pages 4–6 to plan your revision, topic by topic. Tick each box when you have:

- revised and understood a topic
- tested yourself
- practised the exam questions and gone online to check your answers.

You can also keep track of your revision by ticking off each topic heading in the book. You may find it helpful to add your own notes as you work through each topic.


My Revision Planner

My Revision Planner

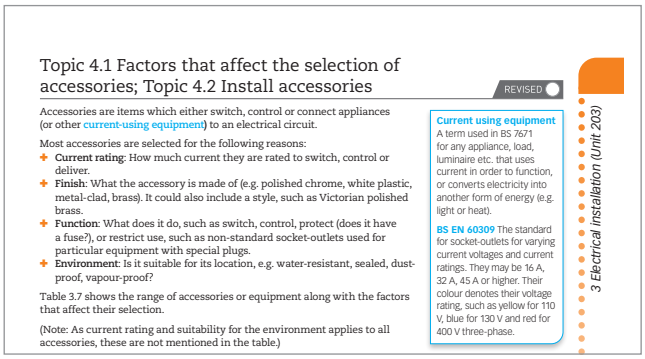
1 Health and safety and industry practices (Unit 201)

REVISED TESTED EXAM READY

LO1 Know what legislation, regulations, laws and guidance documents are associated with the electrical industry
08 Topic 1.1 Statutory and non-statutory; Topic 1.2 Roles and responsibilities

LO2 Use equipment on a construction site
13 Topic 2.1 Use access equipment
16 Topic 2.2 Use personal protective equipment (PPE)
17 Topic 2.3 Use power tools

LO3 Follow safety procedures, practices and policies on construction sites
18 Topic 3.1 Produce risk assessments and method statements (RAMS)


Topic 4.1 Factors that affect the selection of accessories; Topic 4.2 Install accessories

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Accessories are items which either switch, control or connect appliances (or other current-using equipment) to an electrical circuit.

Most accessories are selected for the following reasons:
- **Current rating**: How much current they are rated to switch, control or deliver.
- **Finish**: What the accessory is made of (e.g. polished chrome, white plastic, metal-clad, brass). It could also include a style, such as Victorian polished brass.
- **Function**: What does it do, such as switch, control, protect (does it have a fuse?), or restrict use, such as non-standard socket-outlets used for particular equipment with special plugs.
- **Environment**: Is it suitable for its location, e.g. water-resistant, sealed, dust-proof, vapour-proof?

Table 3.7 shows the range of accessories or equipment along with the factors that affect their selection.

(Note: As current rating and suitability for the environment applies to all accessories, these are not mentioned in the table.)

Current using equipment A term used in BS 7671 for any appliance, load, luminaire etc. that uses current in order to function, or converts electricity into another form of energy (e.g. light or heat).

BS EN 60309 The standard for socket-outlets for varying current voltages and current ratings. They may be 16 A, 32 A, 45 A or higher. Their colour denotes their voltage rating, such as yellow for 110 V, blue for 130 V and red for 400 V three-phase.

3 Electrical installation (Unit 203)

Features to help you succeed

Exam tips

Expert tips are given throughout the book to help you polish your exam technique in order to maximise your chances in the exam.

Typical mistakes

The author identifies the typical mistakes that candidates make in exams and explains how you can avoid them.

Now test yourself

These short, knowledge-based questions provide the first step in testing your learning. Answers are available online.

Definitions and key words

Clear, concise definitions of essential key terms are provided where they first appear.

Exam checklist

The exam checklists provide a quick-check bullet list for each topic.

Exam-style questions

Practice exam questions are provided for each topic. Use them to consolidate your revision and practise your exam skills.

Online

Go online to check your answers to the exam questions at **www.hoddereducation.co.uk/myrevisionnotesdownloads**

Check your understanding

These questions test your basic understanding of the information as you work through the course. Answers are available online.

Exam breakdown

For guidance on how you will be assessed and how to prepare for your exam, see the end of this book (page 117).

My Revision Planner

1 Health and safety and industry practices (Unit 201)

LO1 Know what legislation, regulations, laws and guidance documents are associated with the electrical industry

LO2 Use equipment on a construction site

LO3 Follow safety procedures, practices and policies on construction sites

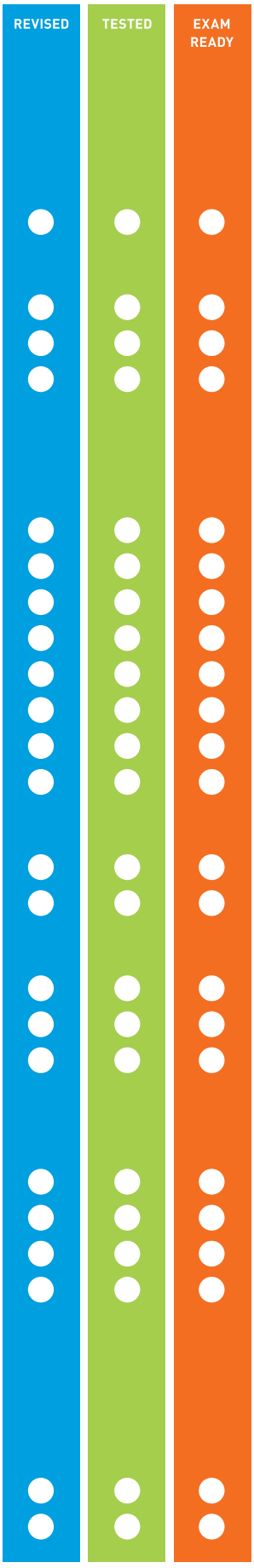
LO4 Carry out electrical safety procedures and practices

LO5 Understand environmental protection

LO6 The structure and roles of individuals and organisations within the construction industry

2 Electrical science (Unit 202)

LO1 Apply mathematical principles



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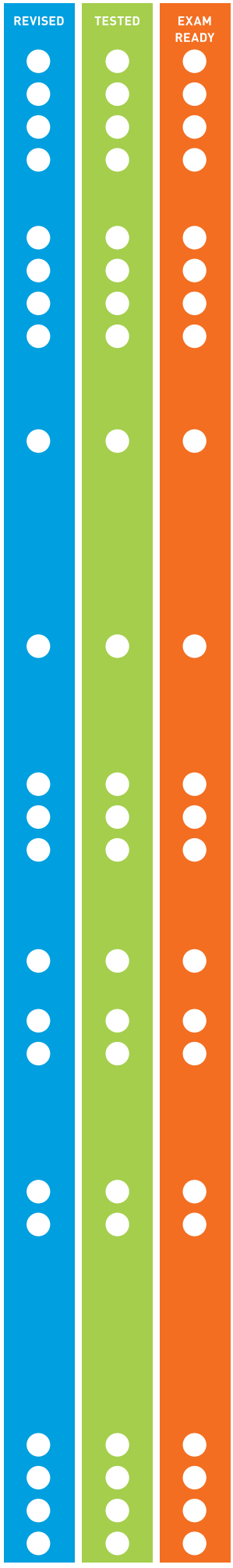

REVISED | TESTED | EXAM READY

Countdown to my exams

6–8 weeks to go

- Start by looking at the specification — make sure you know exactly what material you need to revise and the style of the examination. Use the revision planner on pages 4–6 to familiarise yourself with the topics.
- Organise your notes, making sure you have covered everything on the specification. The revision planner will help you to group your notes into topics.
- Work out a realistic revision plan that will allow you time for relaxation. Set aside days and times for all the subjects that you need to study and stick to your timetable.
- Set yourself sensible targets. Break your revision down into focused sessions of around 40 minutes, divided by breaks. These Revision Notes organise the basic facts into short, memorable sections to make revising easier.

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2–6 weeks to go

- Read through the relevant sections of this book and refer to the exam tips, summaries, typical mistakes and key terms. Tick off the topics as you feel confident about them. Highlight those topics you find difficult and look at them again in detail.
- Test your understanding of each topic by working through the 'Now test yourself' questions in the book. Look up the answers online.
- Make a note of any problem areas as you revise, and ask your teacher to go over these in class.
- Look at past papers. They are one of the best ways to revise and practise your exam skills. Write or prepare planned answers to the exam practice questions provided in this book. Check your answers online at **www.hoddereducation.co.uk/myrevisionnotesdownloads**
- Track your progress using the revision planner and give yourself a reward when you have achieved your target.

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One week to go

- Try to fit in at least one more timed practice of an entire past paper and seek feedback from your teacher, comparing your work closely with the mark scheme.
- Check the revision planner to make sure you haven't missed out any topics. Brush up on any areas of difficulty by talking them over with a friend or getting help from your teacher.
- Attend any revision classes put on by your teacher. Remember, he or she is an expert at preparing people for examinations.

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The day before the examination

- Flick through these Revision Notes for useful reminders, for example, the exam tips, typical mistakes and key terms.
- Check the time and place of your examination.
- Make sure you have everything you need – extra pens and pencils, tissues, a watch, bottled water, sweets.
- Allow some time to relax and have an early night to ensure you are fresh and alert for the examinations.

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My exams

8202-20: Advanced Diploma in Electrical Installation

Date: .....

Time: .....

Location: .....

1 Health and safety and industry practices (Unit 201)

Each year, many deaths and thousands of injuries occur in the workplace, with a large proportion occurring in the construction and building service industries. A positive approach to health and safety legislation and an understanding of the **hazards**, **risks** and risk reduction methods will go a long way to reducing those figures.

This chapter revisits the legislation, procedures and practices that will help you in your future career, as well as your forthcoming exam. We will also take another look at environmental protection requirements, practices, and the structure and roles within the construction industry.

Hazard Something that is dangerous and could cause harm (e.g. working at height).

Risk How likely a hazard is to cause harm and how much harm it could cause.

LO1 Know what legislation, regulations, laws and guidance documents are associated with the electrical industry

The construction industry is regulated by many statutory and non-statutory documents. While you do not need to know them all inside out, you do need to know they are there.

Topic 1.1 Statutory and non-statutory; Topic 1.2 Roles and responsibilities

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There are many **statutory** and **non-statutory** regulations, guides and laws that control or regulate site-based activities. The tables below show each of these documents, their legal status, what they regulate and who they apply to. Many of the statutory regulations are maintained and enforced by the **Health and Safety Executive (HSE)**.

Tables 1.1 to 1.16 show the statutory legislation and regulations that you must know.

Statutory The regulations are law and must be followed.

Non-statutory Not law but following them is considered as best practice.

Health and Safety Executive (HSE) The UK body responsible for shaping and reviewing health- and safety-related regulations, producing research and statistics, and enforcing the law.

Table 1.1

The Health and Safety at Work etc. Act	
Legal status and who maintains it:	Statutory UK parliament and enforced by HSE
What does it cover?	+ It is known as an enabling act – it gives powers to the HSE to produce detailed regulations that are specific to work-related tasks. + It provides general legislation, covering occupational health and safety and voluntary work (hence the 'etc.' in the title).
Who does it apply to?	It sets out the general duties that: + employers have towards employees and others such as members of the public + employees have to themselves, as well as co-workers + it also applies to self-employed persons in the same way.

Exam tip

The Health and Safety at Work etc. Act can be abbreviated in exams to HSWA or HASWA.

Table 1.2

The Electricity at Work Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	Most of the regulations are directed at building electrical installations. Installations must: + be of proper construction + have conductors which are properly insulated (or other precautions taken) + have a means of cutting off the power for electrical isolation. There are also some regulations stating principles of safe working practice (e.g. Regulation 14, which covers live working, is very important). There are also regulations specific to hazardous locations such as mines.
Who does it apply to?	+ All persons working on or near electrical systems (anyone at work). + A building or facility must appoint a duty holder who is responsible for ensuring electrical safety is maintained. + Persons working on electrical systems have a duty to protect themselves and others.

Table 1.3

The Management of Health and Safety at Work Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	It requires employers to: + carry out risk assessments + then to make arrangements to implement safety measures based on the assessment + appoint competent people + arrange for appropriate information and training relating to safety
Who does it apply to?	Employers and self-employed persons.

Table 1.4

Workplace (Health, Safety and Welfare) Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	A wide range of basic health, safety and welfare issues such as ventilation, heating, lighting, workstations, seating and welfare facilities.
Who does it apply to?	+ Employers who provide facilities for employees. + Includes a section relating to temporary work sites.

Table 1.5

Control of Substances Hazardous to Health (COSHH) Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	Persons must assess the risks from hazardous substances and take appropriate precautions.
Who does it apply to?	+ Employers and self-employed have a duty to make the assessment. + Employees must follow precautions.

Check your understanding

1 What is the document number that is the Approved Code of Practice for the COSHH regulations? (You can have a look on the HSE website.)

Table 1.6

Working at Height Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	+ Preventing death and injury caused by a fall from height. + It also includes requirements on the maintenance and use of access equipment (e.g. ladders and scaffolding).
Who does it apply to?	+ Employers and those in control of any work at height activity must make sure work is properly planned, supervised, and carried out by competent people. + Employees have general legal duties to take care of themselves and others who may be affected by their actions.

Table 1.7

Personal Protective Equipment (PPE) at Work Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	PPE should be used as a last resort. Wherever there are risks to health and safety that cannot be controlled in other ways, the Regulations require PPE to be supplied. The Regulations also require that PPE is: + properly assessed before use to make sure it is fit-for-purpose + maintained and stored properly + provided with instructions on how to use it safely + used correctly by employees.
Who does it apply to?	+ Employers should provide PPE and use it correctly. + Self-employed persons.

Exam tip

Always remember when choosing methods of risk reduction, PPE is a last resort.

Table 1.8

Manual Handling Operations Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	These regulations apply to any transporting or supporting of a load (e.g. lifting, putting down, pushing, pulling, carrying or moving by hand or bodily force).
Who does it apply to?	All persons involved in the activity of manual handling – but employers should provide suitable equipment.

Table 1.9

Provision and Use of Work Equipment Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	These regulations place responsibilities on businesses and organisations whose employees use work equipment – it must be safe, suitable and persons must be suitably trained to use it.
Who does it apply to?	Employers and self-employed persons.

Table 1.10

Control of Asbestos at Work Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	+ Gives minimum standards for protecting employees from risks associated with exposure to asbestos. + Has requirements for certain types of non-licensable work with asbestos, notification of work, designating areas where you are working on asbestos, medical checking and record keeping (such as an asbestos register).
Who does it apply to?	+ Building owners or occupiers and those working on materials containing asbestos.

Table 1.11

Environmental Protection Act	
Legal status and who maintains it:	Statutory Secretary of State for Environment, Food and Rural Affairs/ Environment Agency
What does it cover?	Gives the minimum requirements and responsibilities for waste management and control of emissions into the environment.
Who does it apply to?	Anyone undertaking waste disposal or emitting polluting substances into the air, land or water.

Table 1.12

The Hazardous Waste Regulations	
Legal status and who maintains it:	Statutory Secretary of State for Environment, Food and Rural Affairs/ local authorities
What does it cover?	Places a 'duty of care' on businesses to ensure hazardous waste produced, handled or transported causes no harm.
Who does it apply to?	Employers and self-employed

Table 1.13

Pollution Prevention and Control Act	
Legal status and who maintains it:	Statutory Secretary of State for Environment, Food and Rural Affairs/ local authorities/the Environment Agency
What does it cover?	+ Covers installations that emit pollution. + Places a duty on the operator to eliminate or reduce the pollution to harmless levels. + These installations must be licensed.
Who does it apply to?	Installation operators

Table 1.14

Control of Pollution Act	
Legal status and who maintains it:	Statutory The Environment Agency
What does it cover?	Allows powers to the Environment Agency to produce regulations on waste disposal, water pollution, noise and atmospheric pollution, as well as public health.
Who does it apply to?	Anyone involved in acts involving any pollution.

Table 1.15

The Control of Noise at Work Regulations	
Legal status and who maintains it:	Statutory HSE
What does it cover?	Ensure that workers' hearing is protected from excessive noise at their place of work. Aims to avoid workers losing their hearing and/or suffering from tinnitus (permanent ringing in the ears).
Who does it apply to?	Anyone at a place of work.

Check your understanding

2 What two items of PPE can protect your ears from loud noise while at work?

Table 1.16

The Waste Electrical and Electronic Equipment (WEEE) Regulations	
Legal status and who maintains it:	Statutory The Environment Agency
What does it cover?	+ Gives requirements for the recovery, reuse, recycling and treatment of most forms of electrical and electronic waste (any equipment that has a plug, power supply or battery). + All manufacturers and distributors of electrical products to establish an infrastructure where all households have a facility for returning those goods. + Figure 1.1 shows the WEEE symbol, which is displayed on products covered by the Regulations.
Who does it apply to?	Anyone disposing of a WEEE-covered product should take it to a suitable recycling centre.

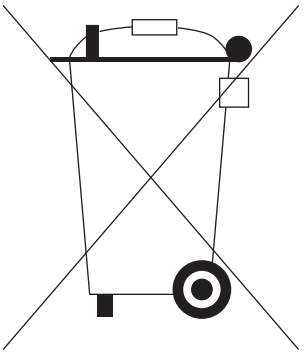

Figure 1.1 The WEEE symbol found on products covered by the Regulations

Tables 1.17 to 1.20 cover the non-statutory legislation and regulations that you must know.

Table 1.17

BS 7671: Requirements for Electrical Installations	
Legal status and who maintains it:	Non-statutory The Institute of Engineering and Technology (IET)/British Standards Institute (BSI)
What does it cover?	+ Technical requirements for all electrical installation work in the UK (but not those covered by specific legislation, e.g. mines). + Covers design, installation and maintenance (periodical inspections) of electrical systems in buildings and structures up to 100 V AC and 1500 V DC – including the erection of data and signal cables.
Who does it apply to?	Anyone installing electrical systems in or on buildings, structures or facilities.

Check your understanding

3 Which IET guidance publication are you allowed to take into your Level 2 exam?

Table 1.18

IET Guidance	
Legal status and who maintains it:	Non-statutory IET
What does it cover?	There are eight Guidance Notes (GN) – these detail specific parts of BS 7671, e.g. earthing (GN8), selection and erection (GN1), or inspection and testing (GN3).
Who does it apply to?	Anyone installing electrical systems in or on buildings, structures or facilities.

Table 1.19

HSE Guidance Publications	
Legal status and who maintains it:	Non-statutory HSE
What does it cover?	✚ The HSE produces many guidance documents and publications to simplify statutory regulations. ✚ The documents are coded depending on what they cover (e.g. INDG documents are industrial guidance – posters or charts providing easy-to-follow guidance). ✚ Health and safety guidance (HSG) documents give health and safety guidance on specific situations (e.g. Avoiding Danger from Underground Services (HSG47)). ✚ Legal guides (L documents) contain statutory regulations and guidance on how to comply with those legal duties (e.g. L25 covers PPE regulations).
Who does it apply to?	Anyone who requires guidance on how to comply with statutory duties.

Table 1.20

Approved Codes of Practice (ACOP) and Codes of Practice (CoP)	
Legal status and who maintains it:	Non-statutory, but following the guidance will lead to compliance with statutory documents. CoP are maintained by either the HSE or institutes responsible for sectors of industry such as the IET.
What does it cover?	✚ The HSE produce a wide variety of ACOPS. ✚ Many industry bodies (e.g. the IET) produce codes of practice (CoP), such as the IET CoP for the in-service inspection and testing of electrical equipment. It states how to comply with the Electricity at Work Regulations in relation to electrical appliances.
Who does it apply to?	Anyone who requires guidance on how to comply with statutory duties.

LO2 Use equipment on a construction site

Many of the accidents that occur on construction sites, or while carrying out work activities, happen when specialist equipment is being used, such as access equipment or power tools.

Topic 2.1 Use access equipment

REVISED

The Working at Height Regulations cover the use of access equipment. HSE guidance, such as INDG455, provides easy-to-follow guidance on how to safely use particular types of access equipment.

Your exam could have questions relating to four items of access equipment. These are:

- ✚ steps or stepladders
- ✚ ladders
- ✚ mobile scaffold towers
- ✚ platforms.

Here is some detail for each item relating to pre-use checks, suitability, erection and use.

INDG455 An industry guidance document published by HSE on the safe use of ladders and stepladders. INDG guides are free to view on the HSE website at https://www.hse.gov.uk

With all access equipment, if any task is being undertaken while using the access equipment, the equipment should be positioned to prevent over-reaching and the user should only ever carry lightweight materials or tools.

Pre-user checks: Steps, stepladders and ladders

- Check the stiles:
  - Make sure they are not damaged, as the ladder could collapse.
- Check the feet:
  - If they are missing, worn or damaged, the ladder could slip. Also check ladder feet when moving from soft or dirty ground. Debris on the feet could cause the ladder to slip on a smooth surface.
- Check the rungs or treads:
  - If they are bent, worn, missing or loose, the ladder could fail, causing a fall from height. Check for contamination making them slippery.
- Check any locking mechanisms:
  - Check they are not bent, or if any fixings are worn or damaged, as the ladder could buckle and collapse. Ensure any locking bars are fully engaged.
- Check the stepladder platform:
  - This acts as part of the locking mechanism – if it is split or buckled, the ladder could become unstable or collapse.

Some organisations use ladder tags attached to the steps or ladders. These tags show an inspection has been undertaken. If it has, you must still check it before use.

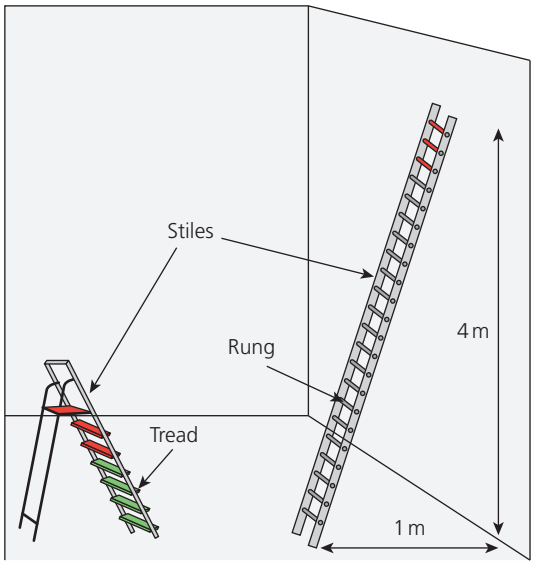

Figure 1.2 Using ladders and stepladders

Using stepladders

- Check all four feet are in contact with the ground and the ground is level.
- Do not stand on the top three steps (including the top step) unless there is a suitable handhold.
- Try to position the stepladder so you are facing what you are working on. If this isn't possible due to space, and you work side on, tie the steps to secure them from tipping.
- Always maintain a minimum three points of contact with the stepladder. If using two hands to carry out a task, two feet and the body should be supported by the ladder but this stance should be adopted only for short periods.

Setting up ladders

When setting up ladders, the following should be observed:

- Ladders should never be rested against soft materials such as guttering. Use a **stand-off** where needed.
- Never extend a ladder while standing on a rung.
- Always erect a ladder one unit from the wall for every four units up.
- Only stand a ladder on firm ground.
- Always secure a ladder by tying at the top, or the bottom, or by a wall tie near the base. If it cannot be secured, or during securing at the top, the ladder should be footed by another person.
- Where no alternative exists, ladders may be tied part way down around a suitable structural support such as an open window.
- Ladders used to access platforms should always extend 1 m above the landing point to give suitable handhold.

Stand-off A sturdy attachment to a ladder that enables the ladder to rest standing off from a wall around 0.5 m, leaving the top of the ladder clear from resting against brittle surfaces such as gutters or windows.

Now test yourself TESTED

1 A ladder needs to reach a vertical distance of 4 m to a landing platform and maintain the correct ratio and handhold requirements. How long should the ladder be?

2 Which HSE guidance document details safe and practical use of ladders?

Exam tip

Exam questions may need you to apply trigonometry when working out ladder lengths. You can revise this in Chapter 2 of this book.

When using ladders for carrying out a task

- Maintain three points of contact with the ladder at all times.
- Always face the ladder while climbing and descending.
- Avoid carrying items; try to use a tool-belt.
- Do not work within 6 m of any powerline unless it has been made dead.

Erecting and using mobile scaffold towers and other platforms

Mobile scaffold towers and **platforms** are used to perform tasks at height where a ladder or steps are unsuitable. This could be due to the duration of the task or because heavier objects are needed, such as tools or materials.

Platforms Defined by the Working at Height Regulations as any surface above ground height used as a place of work or as means of access to a place of work and includes scaffold, suspended scaffold, cradles and mobile platforms.

Check your understanding

4 What is an MEWP?

Rules regarding mobile scaffold towers and work platforms include the following:

- Tower scaffolding and other platforms over 2 m in height from the ground should have a documented inspection carried out on it following installation.
- Always erect towers and platforms using the instructions.
- Never rest ladders or other access equipment onto a tower or platform.
- Never use a tower in strong winds.
- Never move a tower which is 4 m or more in height.
- Always check for obstructions or potholes on the route before moving equipment.

Check your understanding

5 Research the HSE website for information on erecting and using tower scaffolding. Who has a duty to provide instructions for erecting the tower?

Topic 2.2 Use personal protective equipment (PPE)

REVISED

Table 1.21 shows the most common types of PPE, their purpose and any specific variations of each type.

Table 1.21

General item	Purpose	Variants
Footwear	+ To protect toes from falling objects or being crushed. + To protect the underside of the foot from hazardous objects (e.g. nails). + To protect other parts of feet and ankles from abrasion, oils or chemicals. + To keep feet dry. + To provide good grip.	+ Steel-toe capped or hardened boots/shoes/trainers + Wellingtons (wellies) + Rigger boots
Pads	+ To protect knees when frequently kneeling down to carry out tasks. + Elbow pads are sometimes used to protect elbows in tight spaces from bashing against nearby surfaces.	+ Separate pads that attach to knee + Incorporated into trousers + Kneeling cushions
Harness	+ To limit the risk of falling from a height by attaching to a fixed anchor by a fall-arrest lanyard.	+ Belt harness + Full body harness
Suits	+ To protect the body or clothing from getting wet or damage by oils/chemicals/splashes.	+ Cloth coverall (boiler suit) + Disposable coveralls + Bib and brace + Waterproofs

Gloves	+ To protect hands against:
	  + abrasion
	  + cuts
	  + burns
	  + chemicals
	  + contamination
	+ To provide good grip when using tools etc.
		+ Gloves
		+ Mitts
		+ Gauntlets
		+ Rigger

High visibility clothing (hi-vis)	+ Ensures a person can be easily seen by others who may be operating moving machinery, such as cranes or vehicles, to avoid accidents.	+ Vests + Jackets + Trousers + Sashes + Body-warmers

Eyewear	+ To protect eyes from:
	  + contamination by dust, dirt, swarf, splashes, sprays, etc.
	  + arcing, such as welding.
		+ Glasses
		+ Goggles
		+ Visors

Respiratory	+ To prevent or reduce breathing in contaminants or fumes or provide an oxygen supply.	+ Dust masks + Respirators + Powered air units
Ear wear	+ To prevent or reduce hearing damage from noise.	+ Ear plugs + Ear defenders
Headgear	+ To protect the head from falling objects or above head/head height hazards.	+ Hard hats + Bump caps

Check your understanding

6 Research the internet to see which HSE guidance document provides key information relating to PPE.

Exam tip

Do not confuse PPE with items used to protect the fabric of the building such as boot covers. They are there to protect the carpets and floors – not you.

When selecting and using PPE, remember:

- PPE is considered the last line of defence. All other risk reduction measures must be taken before PPE is used as a means of protection.
- PPE may increase risk. It should be assessed for suitability (e.g. dust masks may stop someone from communicating properly).
- Items must be compatible (e.g. will a dust mask make eye protection difficult to fit correctly?).

Check your understanding

7 Why should gloves be avoided when operating machinery such as a bench drill?

Topic 2.3 Use power tools

REVISED

Power tools are risky items that can cause harm, especially when used on construction sites. This is because it can be a hazardous environment, which increases the risk of damage or deterioration due to:

- mechanical damage to casings, extension leads or flexible cables
- chemical damage to leads and cables
- failure of connections and cable grips due to stretching and pulling cables
- poor functioning of machinery due to contamination or poor maintenance.

One major risk with using power tools that have become damaged is electric shock as the casings and cable insulation provide basic protection against electric shock.

Table 1.22 shows the risk from power tools is also dependent on other factors.

Table 1.22

Voltage	+ 110 V power tools are preferred to 230 V versions. + If suitable, battery-operated tools are safer.
Rating	+ Higher-rated appliances (in watts) can create a higher risk of injury. + For example, drill snatch – when a drill bit gets stuck, causing the drill body to spin. Users have more chance of controlling lower-rated tools. + On average, users have more chance of controlling tools up to 300 W.

Class	There are three common classes of power tool. They apply to tools that are connected to an external power source, such as a socket-outlet:
	+ **Class I:**
	  + Have earthed metal parts that could become live if a fault occurred.
	  + It is essential the **earth** connection remains well connected to protect the user from the risk of shock by causing the circuit to disconnect.
	+ **Class II:**
	  + These parts have reinforced insulation, protecting the user from the risk of shock.
	  + They are preferred to Class I items – but this is not always possible if the tool has multiple metallic parts.
	+ **Class III:**
	  + These are items that have a suitable extra-low voltage supply, such as a 25 V hand-lamp.
	Battery-operated devices will fall under the class system if plugged in to charge. This is usually Class II or III.

Mechanical damage Damage such as tears, cuts, abrasion, crushing (or similar).

Basic protection A technical term used in BS 7671 – refers to the insulation around live parts, or the barriers and enclosures housing live parts, which prevent users from touching live parts.

Earth Also known as 'terrafirma' from the French word for 'earth' – 'terre'. Many international electrical regulations are written in French, so 'T' is the symbol for 'earth' when looking at earthing arrangements.

Exam tip

Remember the plug and socket voltage colours.

Check your understanding

8 What do the symbols in Figure 1.3 indicate?

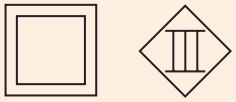

Figure 1.3

User checks

Before using power tools (or any electrical appliance) a **user check** should be carried out. This includes checking the following items, as listed in Table 1.23 below.

Table 1.23

Plugs	+ Check for signs of damage, such as bent pins; case has no cracks or damage. + No signs of overheating. + Cable grips are secure, and the cable doesn't move. + Plug does not rattle, which indicates loose internal parts.
Flexible cable	+ In good condition. + Free from cuts, grazing or damage. + Not located in a position where it could be damaged. + No signs of temporary repairs such as tape on joints. + Not too tightly bent. + Not a trip hazard. + If using an extension lead, is it fully uncoiled to avoid overheating.
Socket-outlet	+ No sign of overheating or damage.
RCD on lead or socket	+ Check the RCD function by pressing the test button, then re-set.
Equipment casing	+ Free from cracks, chemical corrosion or damage. + Flexible cable secure as it enters casing and not pulled or stretched. + No signs of overheating.
Suitability	+ Equipment is suitable for the environment and the intended use.

User check A term used in the IET Code of Practice for in-service inspection and testing of electrical equipment (CoP ISITEE), which is considered a vital safety precaution before using any electrical equipment.

Always remember that between tasks, power tools may become damaged because of other site activities or poor storage. **Always** consider a user check before using.

LO3 Follow safety procedures, practices and policies on construction sites

Construction sites are very hazardous places. Following specified policies and procedures is essential for the safety of everyone. Always remember: your actions can put you and others at risk.

Topic 3.1 Produce risk assessments and method statements (RAMS)

REVISED

A risk assessment is a fairly simple task which most people do on a day-to-day basis. The only difference between a day-to-day assessment and a *documented* risk assessment is writing it down to prove it has been made, and for you and others to refer to it.

Method statements are documented instructions on *how* to carry out a task to comply with the risk assessment and be as safe as possible.

Method A set way to do something; a method statement is the method in writing.

For example: when you need to cross a busy road, which is a hazard, you check the risk of being hit by a vehicle before stepping into the road. You stop, look for vehicles in both directions and listen for vehicles you may not be able to see.

This is effectively a risk assessment to see how likely you are to be hit, decide on how safe it is to cross, or to look for alternative safer methods of crossing the road, such as a bridge or pedestrian crossing.

If the road is very busy but a suitable crossing is nearby, you follow a set method to use the crossing:

- Stop on the pavement.
- Press the crossing button.
- Wait for the green crossing light to indicate it may be safe to cross.
- Check that all traffic has stopped and the crossing is clear.
- Cross to the other side while continuing to scan the traffic.
- Step onto the pavement on the other side.

If this procedure was documented, it would be a method statement.

Five steps to completing a risk assessment

The HSE has created a five-step approach to completing a risk assessment. This is shown in Table 1.24.

Table 1.24

Step	Action
1 Identify the hazard	What are you about to do: use a power drill, work at height, or carry a heavy object? Nearly every single task is a potential hazard.
2 Who might be harmed	Think about who may be harmed, and how, by the hazard. This gives a clearer picture of how the risk can be controlled.
3 Evaluate the risk	+ What is the level of risk? + How likely is it to occur? + How can it be removed or reduced? Consider methods of risk reduction, such as: + trying a less risky option + preventing access by others to the hazardous area + consulting others + working timings around others. PPE should always be the last resort as a method of risk reduction.
4 Record your findings	Record all the above on a risk assessment document. Keep it as simple as possible, focusing on control methods. Written records are a good way to reassess so once the risk has been recorded, look at it again – ensure there is nothing missed and that the risk is low after measures are in place.
5 Regularly review	Few sites remain the same. Changes in location will change the level of risk, so always review a completed risk assessment to ensure the following: + There are no major changes. + Can you make further improvements? + What did you learn from the last time the assessment was made? Did something happen that wasn't thought of last time?

Now test yourself TESTED

3 Go to the HSE website and download a risk assessment template (free to use). Complete the risk assessment based on a simple everyday task, such as making toast.

Young person's risk assessment

Risk assessments should assess the risk for all involved in a task, whether they are actively doing the task or are close by to it.

However, young persons can introduce additional risks because of inexperience of the workplace, being unaware of the risks and a potential lack of maturity.

Young person Someone aged between 16 and 18, but may include 15 if they turn 16 in that academic year. A young person under the age of 16 is considered a child.

As a result, employers must consider further factors that impact on the risk that may be a challenge for a young person, such as:

- workplace layout
- any hazardous materials
- handling work equipment
- methods or processes.

Exam tip

The procedure for producing a risk assessment and method statement can often be referred to as RAMS.

Topic 3.2 Types of accident reporting

REVISED

Even when all risk reduction methods have been put into place, accidents still happen!

Accidents can be minor, needing little or no attention. But they could be major or cause long-term effects. The severity of the accident will affect the further actions required.

RIDDOR

Under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR), certain workplace accident situations need to be reported to the HSE.

Specified injuries or situations include:

- fractures (other than to toes, thumbs and fingers)
- amputations
- loss or partial loss of sight
- crush to brain or internal organs
- serious burns
- loss of consciousness caused by head injury or breathing difficulty
- injuries arising from working in confined location
- injuries resulting in absence from work for over seven days
- accidents to non-workers, such as members of the public
- occupational diseases
- dangerous occurrences and specified near-misses, such as scaffold collapse.

Note: if somebody is off work for more than three days, but less than seven, this must be recorded – but does not need reporting to HSE. This could be reported in an accident book. Other injuries which result in seven or more days off work require reporting to the HSE.

Check your understanding

9 How soon after an accident should the following incidents be reported to the HSE?

a) An accident resulting in death.

b) An accident resulting in bad bruising, but the person was off work for nine days.

Reporting accidents to the emergency services

When accidents or incidents occur at work, an immediate reaction is to ring the emergency services for help. When you dial 999 or 112, the person on the other end of the phone will need some information. Before you call, think about the following:

- Address and location of the incident.
- Nature of the incident (e.g. fire, accident).
- Any difficulties that the emergency services may have getting to the incident.
- Any immediate dangers, such as leaking gas or fuel, or persons trapped.

If you need to contact the emergency services, make sure you are clear and concise with your information.

Check your understanding

10 What emergency services could you contact by calling 999 or 112?