MY REVISION NOTES

HODDER EDUCATION

City & Guilds

Level 2 Technical Certificate (8202-25)

PLUMBING

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

Stephen Lane

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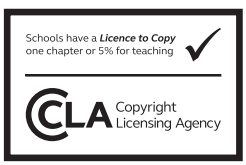


Get the most from this book

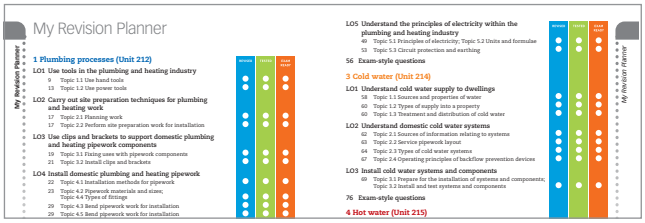
Everyone has to decide his or her own revision strategy, but it is essential to review your work, learn it and test your understanding. These Revision Notes will help you to do that in a planned way, topic by topic. Use this book as the cornerstone of your revision and don't hesitate to write in it –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

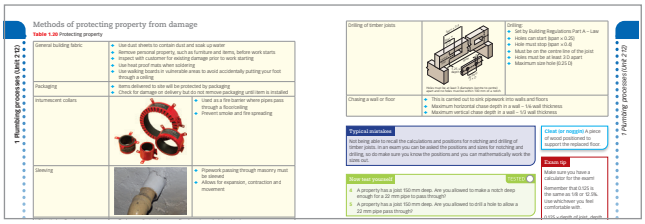
Tick to track your progress

Use the revision planner on pages 4–7 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.





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-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 162).

My Revision Planner

1 Plumbing processes (Unit 212)

LO1 Use tools in the plumbing and heating industry

LO2 Carry out site preparation techniques for plumbing and heating work

LO3 Use clips and brackets to support domestic plumbing and heating pipework components

LO4 Install domestic plumbing and heating pipework

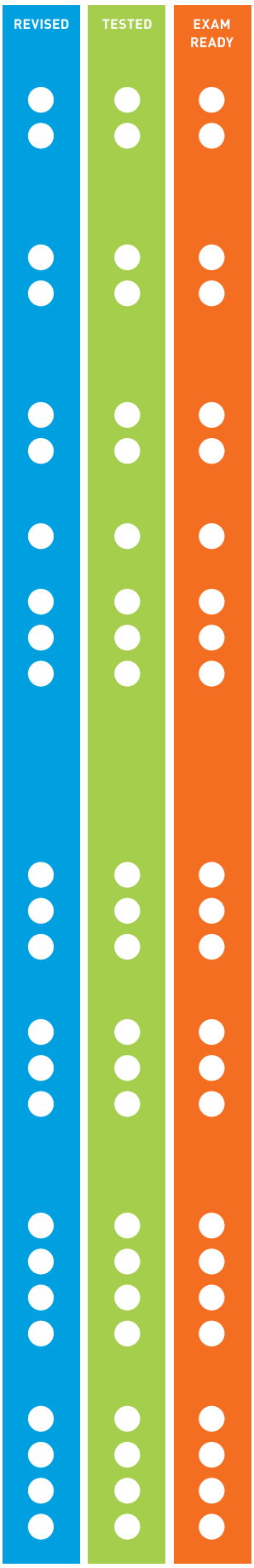
2 Electrical and scientific principles (Unit 213)

LO1 Understand materials used in the plumbing industry

LO2 Understand properties of water, liquids and gases

LO3 Understand density, force, pressure, flow rate and basic mechanics

LO4 Understand heat and power in the plumbing industry



Check your understanding and progress at **www.hoddereducation.co.uk/myrevisionnotes**

REVISED | TESTED | EXAM READY

7 Health and safety and industry practices (Unit 211)

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 4–7 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.

REVISED

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.

REVISED

My exams

825 Employer involvement

Hours completed..... (✔)

026 Synoptic test

Practical assessment

Date: .....

Time: .....

Location: .....

025/525 End of year exam

Multiple choice

Date: .....

Time: .....

Location: .....

1 Plumbing processes (Unit 212)

This unit is mainly about identification of tools and fittings, use and maintenance. So, ask yourself these questions as you go through this unit:

- What tools are used?
- What types of building fabrics are found in a property?
- Why is fitting selection important?

This unit holds a high weighting within the test specification, so you will need to get to grips with the content of this area.

LO1 Use tools in the plumbing and heating industry

Topic 1.1 Use hand tools

REVISED

There are many different hand tools used in the plumbing and heating industry. You need to know the function, safe use and maintenance of these hand tools.

Table 1.1 Screwdrivers

Pozi drive		Used for tightening and loosening screws
Philips		
Flat head		
Safety	Be careful of the pointed end; make sure handle is not damaged	
Maintenance	Check handle is secure and drive end is not damaged	

Table 1.2 Hammers

Claw		Driving in and removing nails
Club		Heavy hammering, used with chisels
Safety	Don't drop heavy items; wear eye protection	
Maintenance	Check handle and head are attached securely	

Exam tip

When looking at the tools, make sure you know:

- the name
- what it does (its function)
- safe use
- any maintenance required.

So, remember when you use tools in the workshop or on site and what you used them for, as this will prepare you for the questions in the exam.

Table 1.3 Chisels

Bolster		Cutting brickwork and lifting floorboards
Flat		Cutting, breaking and chasing brickwork
Safety	Remove any 'mushroom head' from the tool. Mind your hand when hitting the chisel with the hammer	
Wood		Shaping wood and notching floorboards
Safety	It has a very sharp cutting edge; wear eye protection	
Maintenance	Sharpen cutting edge when required	

Table 1.4 Grips and wrenches

Water pump pliers		General purpose grips
Pipe wrench – footprint type		General purpose **LCS** grips
Pipe wrench – stilson type		Installing LCS pipework
Basin wrench		Tightening or loosening hard to reach connections (e.g. basin and bath taps)
Mole grips		Sprung loaded grips
Safety	Don't catch fingers in the jaws; watch out for slipping off components	
Maintenance	Clean jaws and lubricate moving parts	

LCS (Low Carbon Steel)
Used for commercial pipework.

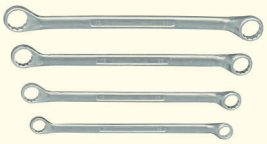
Typical mistake

Never use footprint- or stilson-type pipe wrenches on copper or brass items, because the teeth on these tools will damage softer materials.

Check your understanding

1 Which tool would you need to remove a mushroom head from?
2 When installing an LCS pipework system, what tool would you use to grip the pipe with to connect it to a fitting?

Table 1.5 Spanners

Adjustable		Tightening and loosening compression fittings and valves of various sizes
Open ended		Tightening and loosening set-sized fittings
Ring		Tightening and loosening set-sized fittings
Box		Tightening and loosening taps to sanitary ware
Immersion		Tightening and loosening immersion heater to a hot water cylinder
Safety	Adjust correctly or use the correct size to avoid slipping off or 'rounding-off' components	
Maintenance	Lubricate moving parts	

Exam tip

You might be asked how to size an adjustable spanner correctly. Always size an adjustable spanner correctly to avoid 'rounding off' the flat edges of a compression fitting and also to avoid hitting your hand if the tool slips off.

Table 1.6 Spirit levels

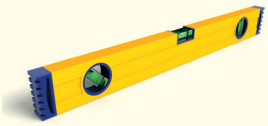
Torpedo or boat		Levelling smaller items, has magnetic strip which can help with radiators or boilers
Spirit level		Horizontal or vertical lines or leveling larger items like baths
Safety	Do not leave on the floor as this is a potential trip hazard	
Maintenance	Do not drop as that will affect the glass bubble	

Table 1.7 Manual pipe threader

Hand dies		Threading LCS pipework
Safety	Sharp cutting edge; swarf produced is sharp; lubricating oil used can cause a slip hazard or dermatitis	
Maintenance	Sharpen cutting edge or replace dies; lubricate rachet	

Table 1.8 Pipe cutters

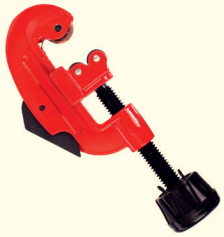
Pipe slice		Cutting copper pipe (single size only)
Adjustable pipe cutter		Cutting copper pipe (within a range)
Plastic pipe cutter		Cutting plastic pipe (within a range)
Safety	Sharp cutting wheels or edges	
Maintenance	Replace blade or replace tool; lubricate moving parts	

Table 1.9 Saws

Hacksaw		Used to cut various materials to length according to the blade of the saw
Junior hacksaw		
Universal hard point saw		
Floorboard saw		
Pad saw		
Safety	Sharp teeth on cutting edge	
Maintenance	Replace blade if possible – teeth facing forward	

Exam tip

In an exam you might be asked which stroke or movement of the saw cuts the material. The teeth of a saw face forward, so the cut is made on the **forward** stroke.

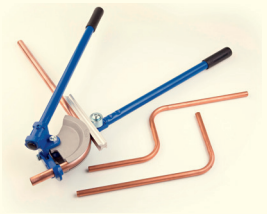
Check your understanding

3 You are using a copper pipe slice. It is not cutting a single groove but tram lining down the pipe. What needs to happen to the pipe slice to correct this?

Table 1.10 Pliers

General purpose pliers		Grip and tighten items
Long nose pliers		Grip small items or reach into small places
Circlip pliers		Internal and external types Removing and replacing circlips on maintenance jobs
Side cutters		Cutting wire or cable to length
Safety	Jaws can pinch fingers	
Maintenance	Lubricate hinge and clean jaws	

Table 1.11 Bending tools

Scissor type bender		Forming copper pipe (set sizes only)
Micro-bore bender		Forming copper pipe (within a range)
Safety	Take care not to trap fingers	
Maintenance	Lubricate moving parts	

Exam tip

In the exam, you might be asked about the scissor type bender and its component parts.

- The guide or slip prevents the copper pipe rippling.
- The copper pipe goes in between the former and the guide, then the roller goes on top of the guide (as seen in the picture).

Now test yourself TESTED

1 You are replacing a central heating circulator and you tighten up the electrical connections in the terminal strip. What is the main difference between the electrical screwdriver you are using and a conventional screwdriver?

Topic 1.2 Use power tools REVISED

Like with hand tools, there are many different power tools used in the industry, so you will need to know their function and how to use them safely.

Table 1.12 Power drills

Rotary hammer drill		Used to drill holes in building fabrics Has a standard self-centring chuck, variable speed, drilling and hammer drilling (Available in cordless)
SDS hammer drill		Powerful drill used to drill holes in building fabric, core drill and chase Has a bayonet-type (SDS) chuck, variable speed, drilling, hammer drilling and chuck lock (Available in cordless)
Safety	Electric shock, trip hazards, secure drill correctly Wear ear protection and other PPE as necessary	
Maintenance	PAT test, inspect, clean and lubricate chuck	
Cordless drill		Plumber's choice – flexible, fewer hazards Has a standard self-centring chuck, variable speed, drilling and hammer drilling Differing battery voltages and amp-hour charge (Available in SDS)
Safety	Inspection Wear eye protection and other PPE as necessary	
Maintenance	Inspect, clean and lubricate chuck. Re-charge battery	

Check your understanding

4 You need to drill an 8.0 mm hole in brickwork to install the support for a new boiler. Which power tool would you choose?

Table 1.13 Drill bits

Masonry drill bit		Tungsten tip to penetrate masonry
Wood drill bit		Point and two spurs to guide through wood
Metal drill bit		General purpose bit made of high-speed steel Can be used on wood, plastic and metal

Exam tip

Ask yourself why a cordless drill would be the tool of choice when drilling a hole in a customer's property.

Typical mistakes

Not being able to recall the basic maintenance considerations when using tools. Remember that tools can get dirty, blunt, damaged or loose after use so it's important to look after them appropriately.

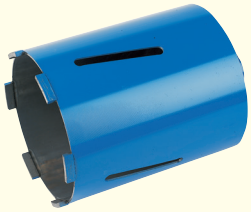
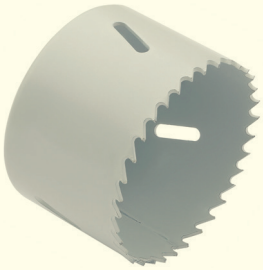
Spade bit		Also known as a flat bit; used to drill larger holes Point to guide through soft wood
Core drill		Drilling large holes through masonry (soil/waste pipes and flues) Diamond tipped Do not use hammer action with these
Hole saw		Teeth are hardened Used to drill into cisterns or acrylic sanitary ware
Safety	Adjust correctly or use the correct size. Wear PPE as dust and particles are produced.	
Maintenance	Lubricate moving parts	

Table 1.14 Power saws

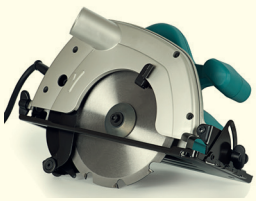
Circular saw		Used when lifting floorboards and notching joists
Jig saw		Used for cutting worktops for sinks and basins
Reciprocating saw		General purpose saw but not accurate
Safety	Inspection of tool, guard and triggers. Make sure blades are secure Wear eye protection and other PPE as necessary	
Maintenance	Clean, replace blades, check guard, PAT test and inspect	

Table 1.15 Portable pipe threading machines

Hand-held electric threader		Used to thread LCS pipework in situ
Pipe threading machine		Used to thread, cut and de-burr LCS pipework on site
Safety	PAT test, inspection, electric shock, swarf and oil Wear ear protection and other PPE as necessary	
Maintenance	PAT test, inspect, clean, sharpen dies and top up cutting oil	

Table 1.16 Hydraulic machine bender

Hydraulic machine bender		Used to form LCS pipework
Safety	High pressure oil used; care with hands and arms	
Maintenance	Check oil level	

Table 1.17 Hydraulic crimping tool

Hand-held crimping tool		Used to crimp or 'press fit' components in place Can be battery or mains powered
Safety	PAT test, inspection and electric shock Wear ear protection	
Maintenance	PAT test, inspect and clean jaws	

Table 1.18 Blow torch

Soldering torch		Used to solder copper pipe fittings
Safety	Flammable gas, burning customer's property and self Wear eye protection	
Maintenance	Clean jet and nozzle, replace gas cylinder when required	

Other specialised tools

- Fusion welder: Used by utility companies to connect mains water and gas pipework. Fittings have small electrical coils which heat up and melt items together.
- Freezing kit: Used to avoid full drain down of systems. Two sections of pipe are frozen and the pipework in-between is worked on.

Now test yourself TESTED

2 The blade in a power saw is blunt and requires replacing. What is the primary safety action to take before replacing the blade?

3 You are asked to assist in the installation of a new gas boiler in a customer's kitchen. A template identifies that a 100 mm hole is required to be put through the wall. What power tool and drill bit should be used?

Exam tip

In an exam it is important to remember that, when using a freezer kit, the water in the system pipework must not be allowed to flow to allow the water to freeze. Care must be taken because your hands can stick to the frozen clamps. So, a question could be associated with the use or health and safety when using a freezer kit.

LO2 Carry out site preparation techniques for plumbing and heating work

Topic 2.1 Planning work

REVISED

There are different methods that you can use for planning work for installation. For example:

Table 1.19 Planning methods

Job schedules	+ Works programme is a time against activity chart + Includes start and finish dates + Outlines the order for work to be completed in
Materials list	+ Important list of all components required for the installation + Saves extra trips to the suppliers + Enables the formulation of an **estimate** or **quotation**
Storing tools and equipment	+ Prevent damage or theft + Time saving as you know where items are

Estimate An approximate price that could vary slightly.

Quotation A fixed price that cannot vary.

Topic 2.2 Perform site preparation work for installation

REVISED

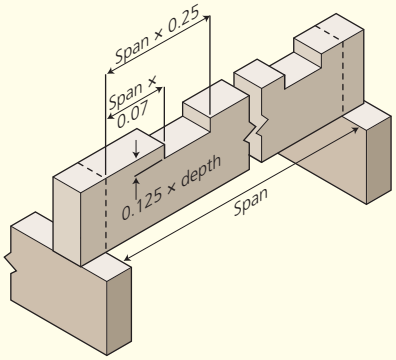
In order to prepare work for installation on site, there are many different factors that must be taken into account.

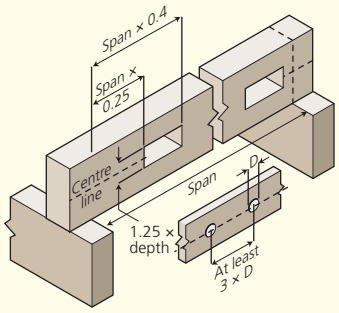
Types of work environments:

- new site for new build properties
- refurbishing and existing property (empty or occupied)
- industrial or commercial properties (non-domestic)
- domestic properties.

Methods of protecting property from damage

Table 1.20 Protecting property

General building fabric	✚ Use dust sheets to contain dust and soak up water ✚ Remove personal property, such as furniture and items, before work starts ✚ Inspect with customer for existing damage prior to work starting ✚ Use heat proof mats when soldering ✚ Use walking boards in vulnerable areas to avoid accidentally putting your foot through a ceiling	
Packaging	✚ Items delivered to site will be protected by packaging ✚ Check for damage on delivery but do not remove packaging until item is installed	
Intumescent collars		✚ Used as a fire barrier where pipes pass through a floor/ceiling ✚ Prevent smoke and fire spreading
Sleeving		✚ Pipework passing through masonry must be sleeved ✚ Allows for expansion, contraction and movement
Lifting timber floorboards	✚ Tools: pencil, circular saw or floorboard saw, bolster chisel ✚ Warn customer ✚ Mark floorboards ✚ Set circular saw to just under the depth of the floorboard ✚ Cut length and cross ✚ Lift using bolster chisel ✚ Remove nails ✚ A **cleat** (or **noggin**) may be required to support the floorboard or chipboard	
Notching of timber joists		✚ Notching: ✚ Set by Building Regulations Part A – Law ✚ Start of notch {span × 0.007} ✚ End of notch {span × 0.25} ✚ Depth of notch {0.125 × depth of joist} ✚ The span is the distance from supporting wall to supporting wall ✚ A nail guard or cover plate should be used over the joist before relaying the floorboard down

Drilling of timber joists	 Holes must be at least 3 diameters (centre to centre) apart and no holes must be within 100 mm of a notch	Drilling: ✚ Set by Building Regulations Part A – Law ✚ Holes can start {span × 0.25} ✚ Hole must stop {span × 0.4} ✚ Must be on the centre line of the joist ✚ Holes must be at least 3 D apart ✚ Maximum size hole {0.25 D}
Chasing a wall or floor	✚ This is carried out to sink pipework into walls and floors ✚ Maximum horizontal chase depth in a wall – 1/6 wall thickness ✚ Maximum vertical chase depth in a wall – 1/3 wall thickness	

Typical mistakes

Not being able to recall the calculations and positions for notching and drilling of timber joists. In an exam you can be asked the positions and sizes for notching and drilling, so do make sure you know the positions and you can mathematically work the sizes out.

Now test yourself TESTED

4 A property has a joist 150 mm deep. Are you allowed to make a notch deep enough for a 22 mm pipe to pass through?

5 A property has a joist 150 mm deep. Are you allowed to drill a hole to allow a 22 mm pipe pass through?

Cleat (or noggin) A piece of wood positioned to support the replaced floor.

Exam tip

Make sure you have a calculator for the exam!

Remember that 0.125 is the same as 1/8 or 12.5%. Use whichever you feel comfortable with.

0.125 × depth of joist, depth of joist / 8, depth of joist × 12.5/100

LO3 Use clips and brackets to support domestic plumbing and heating pipework components

Topic 3.1 Fixing uses with pipework components

REVISED

The different types of nails you may come across include:

- **masonry nail**. Hardened steel. Used to make fixings in brickwork
- **copper nail**. Used on sheet lead work to prevent corrosion
- **round bright wire nail**. Used for general purpose woodwork
- **oval bright wire nail**. Used for woodwork when appearance is important
- **floorboard nail** (floor brads). Used to secure floorboards down.

The different types of screws you may come across include:

- **countersunk screw**. Used for general purpose securing. Brass screws will have slotted head, steel will have pozi drive head. Can be coated to prevent corrosion. End up flush with surface
- **raised countersunk screw**. Used for decorative fittings, made to be on show
- **round head screw**. Used to secure copper saddles in place
- **mirror screw**. Aesthetic chrome or plastic cap used to secure mirrors and bath panels in place
- **coach screw**. Used to secure heavier items in place like boilers and larger radiators
- **chipboard screw**. Deeper course thread used to secure chip and fibreboard.

Don't forget the screw head types covered earlier in Topic 1.1 under 'Screwdrivers': slotted, Phillips and pozi drive. Pozi drive is the most commonly used head type now, but you will come across slotted head screws where the screw is made of brass.

Screw materials:

- brass – expensive and corrosion resistant
- steel – general purpose; cheap but could corrode
- coated – general purpose; cheap and corrosion resistant
- stainless steel – more expensive, long-life and corrosion resistant.

Check your understanding

5 You have to secure a toilet pan in position. What material would the screws be made of and why?

6 You are installing a run of guttering around a property. What type of screw head would you use to secure the fascia brackets? What material would the screws be made of and why?

Exam tip

In an exam you might be asked why a countersunk screw is preferred or which type of screw head protects the customer from cutting their hands or feet. Countersunk screws are used to resecure floorboards back. The head sinks into the wood to give a flush finish.

Plastic plugs (rawlplugs)

There are many different ones which are used in conjunction with screws. The colours denote the sizes of rawlplugs but the two most common used by plumbers are:

Screw gauge 6–12

Drill diameter: 6.0 mm

Screw gauge 10–14

Drill diameter: 7.0 mm

Check your understanding

7 Where and why are rawlplugs used?

Exam tip

The 'Check your understanding' questions are very similar but the basis of these is two-fold – corrosion resistance and cost. In the first question, only a few screws would be used, so the more expensive corrosion resistant screws are used. For gutter installation, many screws would be used, so more economical corrosion resistant screws are used.

Other fixings

Table 1.21 Fixings

Coach bolt		These are not generally used by plumbers but can be found in building structures, holding up cold water cisterns in lofts
Anchor bolt		These are not generally used by plumbers but can be found connecting structure and non-structure items together
Rawlbolt		Used for securing very large size pipework into masonry. Sometimes known as an 'anchor bolt'