# Contents

WJEC level 1 / 2 Award in Constructing the Built Environment

Teachers’ Guide

<table>
<thead>
<tr>
<th>Index</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
<td>3</td>
</tr>
<tr>
<td>2. Making Teaching Applied and Purposeful</td>
<td>3</td>
</tr>
<tr>
<td>3. Maximising Employer Links</td>
<td>4</td>
</tr>
<tr>
<td>4. Formative and Summative Assessment</td>
<td>4</td>
</tr>
<tr>
<td>5. Units and Learning Activities</td>
<td></td>
</tr>
<tr>
<td>5.1.1 Introduction to unit1 – Safety and Security</td>
<td>5</td>
</tr>
<tr>
<td>5.1.2 Suggested learning Activities</td>
<td>6</td>
</tr>
<tr>
<td>5.2.1 Introduction to unit 2 – Practical Construction Skills</td>
<td>20</td>
</tr>
<tr>
<td>5.2.2 Suggested Introductory activities</td>
<td>24</td>
</tr>
<tr>
<td>Focus on Brickwork</td>
<td>23</td>
</tr>
<tr>
<td>Focus on Plasterboarding</td>
<td>38</td>
</tr>
<tr>
<td>Focus on Wall Tiling</td>
<td>41</td>
</tr>
<tr>
<td>Focus on Painting</td>
<td>46</td>
</tr>
<tr>
<td>Focus on Plastering</td>
<td>53</td>
</tr>
<tr>
<td>5.3.1 Introduction to unit 3 – Planning Construction Projects</td>
<td>58</td>
</tr>
<tr>
<td>5.3.2 Suggested Learning Activities</td>
<td>59</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

Welcome to your WJEC teacher guide, which has been designed to assist you in the delivery of the Level 1/2 Award in Constructing the Built Environment.

It is the intention of this guide to be one of several ways in which WJEC provides assistance to teachers delivering the specification, sitting alongside the specimen papers and CPD. WJEC provides the following as part of its support for all specifications:

- Examiners’ reports on each examination series
- Free access to past question papers via the WJEC secure website
- Easy access to the specification and other key documents on the main website
- CPD
- Easy access to both the Subject Officer and to administrative sections.

Contact points for Level 1/2 Award in Constructing the Built Environment: Allan Perry (Subject Officer) 029 2026 5311

Sally Griffiths (Subject Support Officer) 029 2026 5332

2 MAKING TEACHING APPLIED AND PURPOSEFUL

Ofqual defines applied learning as ‘the acquisition and application of knowledge, skills and understanding through tasks set in sector contexts that have many of the characteristics of real work or are set within the workplace. Most importantly, the purpose of the task must be relevant to real work in the sector’. Source: http://www.ofqual.gov.uk/501.aspx

It is important that learners recognise that the knowledge, understanding and skills they develop are vocationally relevant. Applied learning can give learners ‘real-life’ purposeful experiences within and outside the school/college environment.

The activities within this teacher guide where possible adopt an applied and purposeful approach to learning.
3 MAXIMISING EMPLOYER LINKS

The suggested approaches and activities are designed to enable learners to work on ‘live’ projects. Links with construction organisations and construction projects are recommended to enhance the learning experience. Learning involving different aspects of the construction industry is highly desirable. Employers are fully aware of the responsibilities they have regarding health, safety and security and site visits will emphasise the amount of work they need to carry out to ensure these responsibilities are fully met. Learners experiences can be enhanced where the skills selected for unit 2 (Practical construction skills) can be seen either as completed work or if opportunities permit, live. Live construction projects may also benefit the learners in their understanding of budgeting, staffing and planning, especially where these projects are local or even on the site of the school or college.

The table below gives some examples of the benefits of working with employers for this qualification.

<table>
<thead>
<tr>
<th>Benefits to the learner</th>
<th>Benefits to the school/college</th>
<th>Benefits to the employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>• More enjoyable and purposeful</td>
<td>• More motivated learners</td>
<td>• Free research</td>
</tr>
<tr>
<td>• Improved and better informed aspirations</td>
<td>• Improved attainment and achievement</td>
<td>• Can improve the flow of young people into the Construction Industry</td>
</tr>
<tr>
<td>• Ability to apply skills, knowledge and understanding in future contexts and situations</td>
<td>• Better links with employers</td>
<td>• Cuts recruitment costs</td>
</tr>
<tr>
<td>• Prepared for future research</td>
<td>• Community involvement</td>
<td>• Become an employer of choice</td>
</tr>
<tr>
<td>• Better prepared for the assessment</td>
<td></td>
<td>• Brand awareness</td>
</tr>
<tr>
<td>• Develops employability skills</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4 FORMATIVE VERSUS SUMMATIVE ASSESSMENT

**Formative** – assessment for learning. This should be used throughout the learning process to analyse the learning and feedback progress to learners.

**Summative** – assessment of learning. This is used once learning of the unit is complete. This assessment certifies the individual achievement of learners. Each unit is assessed using one summative assignment.
UNIT 1: SAFETY AND SECURITY

5.1.1 Introduction to the unit

The purpose of this unit is to assist learners in gaining the knowledge and understanding that will enable them to plan how to minimise risk to their own and others' health and safety in a variety of construction contexts. Learners will need to familiarise themselves with the legal requirements of health and safety and how they impact upon the construction industry. They will need to consider the risks to health and safety in different situations and how these risks can be minimised. They will also need to be aware of the risks to security within the industry and how these risks can be minimised.

Centres will need to develop a Scheme of Work which ensures that learners gain an understanding of all of the content of the unit. This will include the current legislation relating to fire extinguishers and safety signs. It will also include key Laws and Regulations as outlined in the specification. Learners will also need to be able to identify risks and the associated hazards in different settings and suggest control measures which can be used to minimise risks to health and safety. Furthermore, they will need to identify risks to security in different situations and suggest measures which minimise those risks.

The following YouTube video by the CITB is an excellent overview of health and safety in the context of construction.

https://www.youtube.com/watch?v=gL14tWDNIEE
5.1.2 Suggested learning activities

**Activity 1 – AC 1.1**

Learners are requested to research a given act or regulation listed in the specification and produce a short summary highlighting:

<table>
<thead>
<tr>
<th>Name of the act or regulation.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What does the act or regulation cover?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What are the most important features?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Identify an activity on a construction site which would be covered by the act or regulation.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

This activity is to be given to a group with the intention of gaining coverage of the legislation listed in the specification, or at least as far as possible. The completed exercises could be checked and, subject to their appropriateness distributed to the class.
Activity 2 safety signs – AC 1.2

The following is an extract from the HSE website. It clearly shows the different safety sign shapes and their meanings.

(i) **prohibition sign** – a sign prohibiting behaviour likely to increase or cause danger (eg ‘no access for unauthorised persons’);

(ii) **warning sign** – a sign giving warning of a hazard or danger (eg ‘danger: electricity’);

(iii) **mandatory sign** – a sign prescribing specific behaviour (eg ‘eye protection must be worn’);

(iv) **emergency escape or first-aid sign** – a sign giving information on emergency exits, first aid, or rescue facilities (eg ‘emergency exit/escape route’);

(reference: hse.gov.uk)
Using the multiple safety sign from a construction site shown below, classify each of the three signs it includes by colour, shape and meaning.

[Image of multiple safety signs]

http://www.hse.gov.uk/pUbns/priced/l64.pdf - resource on safety signs from HSE website.
Activity 3 Fire extinguishers – AC 1.3

For this activity learners will need to watch the video ‘Types of fire extinguishers and their uses’. (2.45 minutes)

https://www.youtube.com/watch?v=GjSoxJF3RD4

Watch the video and then complete the following document – you may identify more than one extinguisher for each type of fire noted.

<table>
<thead>
<tr>
<th>Type of fire</th>
<th>Suitable extinguisher</th>
<th>Colour code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical appliance fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste paper bin fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solvent fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking fat fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Textiles fire</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fires and fire extinguishers on construction sites

Each year there are a number of serious fires on construction sites and buildings undergoing refurbishment.

Fire risk assessment

In most cases, conducting a risk assessment will be a relatively straightforward and simple task that may be carried out by the responsible person, or a person they nominate, such as a consultant.

There are five steps in carrying out a fire risk assessment:

1. **Identify hazards**: consider how a fire could start and what could burn;
2. **People at risk**: employees, contractors, visitors and anyone who is vulnerable, e.g. disabled people;
3. **Evaluation and action**: consider the hazards and people identified in 1 and 2 and act to remove and reduce risk to protect people and premises;
4. **Record, plan and train**: keep a record of the risks and action taken. Make a clear plan for fire safety and ensure that people understand what they need to do in the event of a fire; and
5. **Review**: your assessment regularly and check it takes account of any changes on site.

Means of escape

Key aspects to providing safe means of escape on construction sites include:

- **Routes**: your risk assessment should determine the escape routes required, which must be kept available and unobstructed;
- **Alternatives**: well-separated alternative ways to ground level should be provided where possible;
- **Protection**: routes can be protected by installing permanent fire separation and fire doors as soon as possible;
- **Assembly**: make sure escape routes give access to a safe place where people can assemble and be accounted for. On a small site the pavement outside may be adequate; and
- **Signs**: will be needed if people are not familiar with the escape routes. Lighting should
Means of giving warning

Set up a system to alert people on site. This may be temporary or permanent mains operated fire alarm (tested regularly), a klaxon, an air horn or a whistle, depending on the size and complexity of the site.

The warning needs to be distinctive, audible above other noise and recognisable by everyone.

Means of fighting fire

Fire extinguishers should be located at identified fire points around the site. The extinguishers should be appropriate to the nature of the potential fire:

- wood, paper and cloth – water extinguisher;
- flammable liquids – dry powder or foam extinguisher;
- electrical – carbon dioxide (C02) extinguisher.

Nominated people should be trained in how to use extinguishers.

Using the information provided in the shaded area (which can be copied and distributed to the class), learners will be asked to consider steps 1 – 5 of the fire risk assessment to a given accessible environment – this could be part, or all of, the school or college building.

Alternatively learners could be asked individually to consider 1 – 5 as applied to buildings visited in their own time such as supermarkets, leisure centres and catering establishments.

As a follow on exercise, learners can then note the means of escape, means of giving warning and means of fighting the fire. The means of fighting fire can be used as a focus and learners could note the likely causes of fires and whether the appropriate extinguishers are present.
Activity 5: The Health and Safety Executive - AC 1.4

Learners will be asked to access the HSE web site - [http://www.hse.gov.uk/](http://www.hse.gov.uk/)

The mission of the HSE is to prevent death, injury and ill health in Great Britain’s workplaces.

In order to do this they need to have the power to make sure organisations are acting within the law and according to regulations.

HSE’s emphasis is on prevention but, where appropriate, we will come down hard on those that put others at risk, particularly where we find deliberate flouting of the law.

Enforcement ensures that duty holders:

- deal immediately with serious risks;
- comply with the law; and
- are held to account if they fail in their responsibilities.

Case 1

Prosecution of a construction company following a fatal accident to an employee

An employee was killed when the auger drive unit of a piling rig he was attempting to dismantle flew off its stand and struck him. The defendant had been contracted to carry out piling around the perimeter of the site to form a retaining wall, enabling the area to be excavated for the construction of a new office block.

Outcome:

The company pleaded guilty, was fined £100,000 and ordered to pay costs of £76,128.68.

Activity 5(a)

Using case 1 and the resultant outcome as a basis, learners should access the HSE website and establish through research what the HSE do in order to help prevent similar occurrences taking place. Learners could then collate their thoughts and either hand into teaching staff and/or use these as the focus of a class discussion.
**Case 2**

**Worker crushed by a falling wall**

The defendant, a domestic client, was having an extension built on his house. One of his workers, a casual labourer, received severe injuries after being crushed by a falling wall. The injured person had been working from an improvised working platform consisting of two scaffold planks spanning a bay window opening at a height of 3.5 metres. Whilst using an electric drill and hammer to demolish a wall, part of the wall collapsed, knocking him to the ground and causing very severe injuries.

**Outcome:**

The defendant was charged with 2 breaches of Health and Safety legislation. After entering a not guilty plea the defendant was found guilty and fined £750 for each breach. As the employee was severely injured for the rest of his life the defendant was ordered to pay a very large 5 figure sum in compensation. The defendant was also found guilty of breaching one of the Prohibition Notices and sentenced to 6 months imprisonment.

**Activity 5(b)**

Using case 2 as a basis, learners should access the HSE website and establish through research how they think the HSE will have acted i.e. who do they think is responsible for the injury and what action, if any, did the HSE take. Learners could then collate their thoughts and either hand into teaching staff and/or use these as the focus of a class discussion. The outcome can be provided after the learners have arrived at their decisions.
Activity 6: Risks to health and safety in the workplace – AC 2.1, 2.2, 2.3 and 3.2

The following information can be show on screen or hard copies can be handed out to the class. The purpose of the article is to highlight the scale of health and safety issues within the UK construction industry.

Construction industry

Each year in the Construction sector around 3% of workers suffer from an illness they believe to be work-related...

...and 3% of workers sustain a work-related injury...

Main injury kinds as reported by employers

- 65,000 self-reported non-fatal workplace injuries
- Slips, Trips and Falls (23%)
- Lifting and Handling (22%)
- Falls from Height (19%)
- Struck by Object (11%)

There were 35 workers fatally injured in the Construction sector 2014/15
...leading to

**1.7 million working days lost**

<table>
<thead>
<tr>
<th>Work-related ill health</th>
<th>Workplace Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 million days</td>
<td>0.5 million days</td>
</tr>
</tbody>
</table>

**Activity 6(a)**

In light of the information from the HSE on work related illness in the Construction Industry, each learner (or small group of learners) will be asked to provide three suggested actions that construction organisations could carry out in order to reduce the level of work related illness.

**Activity 6(b)**

As Activity 6(a), but learners will be asked to suggest three actions which will reduce the level of work related injury.

**Activity 6(c)**

Learners will be asked to produce a poster for new construction workers which brings together the statistics provided by the HSE and one of their suggested actions for reducing work related illness or injury [from 6(a) or 6(b)]. For example, the poster could highlight the fact that over 6,500 construction workers were struck by objects in one year and that wearing a hard hat helps reduce potential injury.
Activity 6(d)

Learners will be asked to produce a fictitious case study for new construction workers. The case study should highlight selected potential hazards and risks on construction sites and how they can be minimised. The case study should highlight one or more hazards, identify the associated risks and outline possible control measures.

Activity 7: Risks in health and safety – AC 2.1, 2.2, 2.3, 3.1 and 3.2

Learners are asked to consider photo 1 and photo 2 then address the set tasks – both photos concern working at height.

Photo 1:
7(a) Identify the hazards to health and safety in this situation.
7(b) Describe the potential effects of the hazards identified.
7(c) Recommend health and safety control measures to minimise the risks.

Photo 2:
7(d) Identify the visible control measures in place.
7(e) Suggest other control measures that could be implemented that are not visible.
Photo 1 – working on commercial premises 10 metres above ground level.
Photo 2 – working at great height on the Shard, London.
Activity 8: Construction site security – 4.1 and 4.2

Learners will need to consider photo 1 – it depicts the concrete perimeter wall of a construction project which currently has the following items on site:

- storeroom containing 15 workers personal tools – mainly portable equipment
- Site office containing 3 laptops – 2 which are used for holding project details (including sub-contractor information) and the other for details about staff and costs
- 20,000 Engineering bricks on pallets
- 6 pallets of cement
- 2 mini excavators
- 2 dumper trucks
- Secondary store containing PPE for staff
- Flammable materials held in lockable storage

Activity 8(a)

Learners should consider the information above and identify the risks to security for both tools and equipment and sensitive information.

Activity 8(b)

Learners should consider the risks they have identified in 8(a) and note measures that could be taken to minimise them.
UNIT 2: PRACTICAL CONSTRUCTION SKILLS

5.2.1 Introduction to the unit

The purpose of this unit is to assist learners in acquiring practical construction skills within a realistic context. The unit provides a significant degree of flexibility, not only in relation to the breadth of practical skills they may develop, but equally in how these skills may be evidenced. The requirement for the contextualisation of skills means that learners will have to consider what needs to be completed from supplied technical sources, identify what materials, tools and other resources are required, plan for the completion of the given tasks and then evaluate their work. Three practical skills must be developed from the following list:

- Textiles
- Wood
- Brick
- Plaster
- Decorate
- Tiling
- Electrical
- Plumbing
- Heritage skills

Examples of the types of activity which can be used for evidence are listed below:

- Textiles e.g. pelmets, curtains, wall coverings
- Wood e.g. hang a door, make a frame, attach a skirting-board, create a timber stud wall
- Brick e.g. use wall connectors, cut bricks, create wall no higher than a metre, stretcher bond
- Plaster e.g. apply plasterboard, skim
- Decorate e.g. emulsion a surface, gloss a panel door, paper an internal corner or around a switch
- Tiling e.g. floor and wall, patch repair
- Electrical e.g. lighting, add a new socket
- Plumbing e.g. waste and taps to a sink
- Heritage skills e.g. dry stone wall, roofing (change material or patch)

Learners must develop three different skills and generate evidence accordingly.

The model assignment for this unit is based on a property called Sunny Cove Lodge. It is imperative that teachers read the model assignment alongside the specification. Centres may adapt this assignment, making acceptable changes (please see the ‘accepted changes’ information within the model assignment. It is anticipated that many centres will provide adapted assignments; however, teachers are strongly advised to use the model as a firm basis for any adapted versions created.

The model assignment contains three fundamental tasks – those being to plan, do and review. There are fourteen hours available for the assignment in its entirety, the split between the tasks is:
• Planning 2.5 hours
• Carrying out practical tasks 11 hours
• Evaluation 0.5 hours

Learners are expected to carry out work which replicates, as far as possible, construction tasks set in realistic context(s). This means that just carrying out practical tasks is not enough. Learners need to understand what is required, plan accordingly and then evaluate their performance.

The model assignment provides learners with three tasks:

1. Produce a plan showing how the work will be completed
2. Complete the specified renovation tasks
3. Prepare a report for your manager at J & J Design and Build Contractors, indicating the quality of the work carried out.

1. **Produce a plan showing how the work will be completed**

**AC 1.1**

This requires learners to interpret technical sources of information. The Sunny Cove Lodge model assignment contains a list of faults which need attention, a plan and an elevation.

Learners may be taught about the symbols and conventions used in the industry and how specifications, drawings and design briefs are used as the basis for work. These will vary considerably from context to context and from skill to skill. Certain skills may require different interpretations of what constitutes a 'technical source'. For most skills being assessed, there will be a written indication of what work needs to be carried out; this will generally be seen as one technical source. A drawing or plan can be another technical source which may be different for certain skills such as electrical, where symbols for components will readily be used. Other skills such as painting and decorating and tiling may (subject to any inbuilt design or complexity) have more straightforward means of communicating what is required.

It is envisaged there will be different technical sources for each skill under assessment, or that different aspects of the same technical source relate to different skills. A 'faults list' for example may indicate the entirety of the work required and may be considered a technical source of information for all three skills.

The use of technical sources of information for each of the three skills will be used in the assessment of this criterion.

**AC 1.2**

This is directly related to AC 1.1 as it represents the sequence of work deemed necessary to carry out the work communicated through the technical sources. There will be a separate sequence of work for each of the skills being assessed, unless a combined approach is adopted where one skill is dependent on another. This could be the case where wood skills have been assessed through the building of a stud partition wall which is subsequently plastered.
AC 2.1

Each of the pieces of work outlined in the technical sources of information will require resources. These will vary significantly from skill to skill, however, in general terms the learners will need to specify the tools, equipment and PPE needed to complete the work outlined.

This criterion goes to Merit level and states that to achieve a Merit a learner 'Accurately identifies and specifies in detail resources required to complete construction tasks'.

AC 2.2

Learners are required to calculate the materials needed to carry out the three pieces of work being assessed. The calculations will vary significantly from skill to skill. Calculations of area may be fundamental for tiling and painting, whereas ratios will be critical for mixing mortar. Each context and skill will have its own requirements.

Whilst costs are mentioned in the specification, there is no requirement to cost every aspect of the work to be undertaken. Costing every single aspect of the work to be undertaken is likely to be too time consuming given the two and a half hour allowance for the overall planning task. There is no expectation or requirement for centres to ask learners to create stores requisitions and activities linked to costs and stock.

AC 2.3

In setting the Success Criteria, learners are effectively considering what is required for the three pieces of work to be carried out successfully. It is anticipated that the teacher will have highlighted what outcomes should be aspired to and what criteria for success would usually be used. This will again vary from skill to skill, for brickwork for example, if a quoin is built then it is expected it will be to the dimensions set out in the technical source(s) and that all joints both vertical and horizontal are 10mm. All courses to be plumb and level, the face of the wall structure is clean and free of damaged bricks. The immediate environment should
be clean and debris free. Jointing is neat and follows requirements as provided by technical sources.

Learners are required to create a tangible piece of evidence to communicate the setting of success criteria for each of the three skills – the most likely format for this being a written document outlining what the criteria they have set.

The plan for the setting of success criteria for each of the three skills will be used in the assessment of this criterion.

2. **Complete the specified tasks**

AC 2.4, 3.1, 3.2

The work required to evidence this part of the assessment is purely a record of the candidate’s performance.

This criterion requires learners to carry out preparations for construction tasks. These will vary significantly from skill to skill. For many learners this will involve checking items for defects and to confirm they are appropriate and general 'setting out' considerations including measuring, cutting and marking out.

**Observation Record** – this document is located within the model assignment and provides a template for the assessment. It is to be completed by the teacher for each learner and for each of the three selected skills. The following headings are given and relate to AC 2.4, 3.1 and 3.2:

- Preparation
- Application of techniques
- Application of health and safety

When assessing a learner for AC 2.4, 3.1 and 3.2, their performance for all three skills needs to be taken into consideration.

3. **Prepare a report indicating the quality of the work carried out.**

AC 3.3

There is no set format for this report – it may be a written record provided by the candidate, but this is not the only way evidence can be recorded and submitted. Candidates may be interviewed or filmed by teaching staff and a record of their evaluation used for evidence. Other formats may also be appropriate; however, all approaches should focus on the requirements of the criterion.
Focus on Brickwork

Bricks are normally made from clay or calcium silicate, which is a mixture of lime and sand. Clay bricks are made by being pressed, wire cut or moulded and then fired in a kiln at very high temperatures. Their density, strength, colour and surface texture will depend on the variety of clay used and the firing temperature. Calcium silicate bricks are pressed into shape and then steamed at a high temperature. Pigment may be added during the manufacturing process to produce a range of colours.

There are three main classes of brick.

1. **Common bricks** are basic, cheaper bricks that are used mainly for internal walls, underground in foundations or external walls that will be rendered or clad.

2. **Facing bricks** are more expensive and are made from selected clays. The face of bricks can vary in texture to give an attractive finish to walls.

3. **Engineering bricks** are heavy, very strong and do not absorb water. They are used where there are heavy loads, e.g. bridges, and in damp conditions such as inspection chambers, basements and other kinds of work below ground.

![Pressed and Wire Cut common bricks](image1)

![Sand Faced and Rustic Facing bricks](image2)

![Typical Engineering brick](image3)
Bricks may be formed with an indent called a “frog” or with holes called “cores” before firing. Their purpose is to provide a better key for the mortar when laying the bricks.

**Exercise 1**

In the boxes on the drawing, write the description of what each arrow is pointing to. An example is given for “Stretcher”.

- 1. Stretcher
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
Bonding Brickwork

Bricks are laid so that they overlap each other to spread the load. This makes the wall much stronger and less likely to crack and distort. This is called bonding.

The illustration shows what is called stretcher bond. All the bricks are laid header to header and the stretcher side of the brick is what is seen. A brick is twice as long as it is wide and the illustration shows a “half brick” wall. A “one brick” wall from front to back is the length of one brick.

Half brick walls are often used for internal walls and the external skin of cavity walls. Bricks cut in half across the width are used to complete the bond at the ends of walls. These are called “bats”.

[Diagram showing stretcher bond and dimensions of a brick]
One brick walls are bonded so that some bricks go from front to back. Two common bonds are:

- English bond
- Flemish bond

English bond is very strong and is built with alternate rows of headers and stretchers. Flemish bond is more common and each row is built with alternate headers and stretchers.

At queen and perpendicular ends of these walls a cut brick called a “closer” is half the width of the header and is cut the full length of the brick.
Exercise 2

Complete the following by ticking the appropriate true or false box.

<table>
<thead>
<tr>
<th></th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The long face of a brick is called a stretcher.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. “Bats” are full sized bricks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. A quoin is a brick cut in half.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Flemish bond has alternate rows of headers and stretchers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Half brick walls are built in stretcher bond.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The vertical ends of walls built in English bond need queen closers to complete the bond.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Bonding the bricks makes the wall stronger and less likely to crack or distort.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cutting Bricks

Exercise 3

Complete the sentences by filling in the blank spaces with the correct words from the following list.

around, bolster, bonding, cutting, flat, lump, masonry, size,

Bricks are always manufactured full _____________ and are cut on site to suit the wall sizes and _____________. The most common tools used for cutting bricks are the _______________ chisel made from steel and with a cutting blade about 75 mm wide and the _______________ hammer.

An alternative tool is the brick hammer.

To cut a brick the _______________ line is marked on the brick with a pencil or scratch mark. The brick is placed on a _______________ firm surface with the blade along the line. The chisel is hit sharply with the lump hammer. This is done all _______________ the brick until it breaks apart.
Laying Bricks to Line

TOOLS AND EQUIPMENT USED FOR LAYING BRICKS

The common tools and equipment used when laying bricks and blocks are as follows:

Gauge Rods

A gauge rod is usually a planed piece of wood, about 2 metres long, marked to show the exact height of each course of bricks or blocks. Different makes of bricks vary in thickness and the gauge rod will be marked out to suit the brick size.
Corner blocks

Corner blocks are used to hold the line taut and at the correct height so that the bricks or blocks can be laid to the level. They are made from wood and are used in pairs to stretch the line from corners or ends of the walling. The blocks have sawn slots in them for locking the line.

Brick trowels

Brick trowels are made in varying sizes ranging from 225 to 350 mm long. They are used for spreading mortar along the rows and on the bricks and also for tapping the brick down to its required position.

Pointing trowels

Pointing trowels generally range in size from 75 to 150 mm. They are used to fill any small holes in the mortar between the bricks and to smooth the mortar joints on the face of the brickwork. This is called pointing.
**Straight edges**

A straight edge is used for checking levels and marking straight lines. They are usually about 2 metres long and made from planed, parallel pieces of wood about 100 mm x 30 mm, or H section metal.

**Spirit levels**

Two kinds of spirit level are used. One is long, usually 1200 mm, and the other is a short boat level. Both have horizontal and vertical bubbles. Long levels are used for checking courses and facework for level and the boat level for across the width of the bricks.

**Mortarboard (or spot)**

A mortarboard is usually made of smooth boards or plywood, about 600 mm square and is used for holding about a bucket full of mortar which the bricklayer can use when laying bricks and blocks. There will be a number of mortarboards on a site so that the bricklayer can reach the mortar easily to load the trowel. The mortarboard is usually placed on a wooden stand or a stack of bricks or blocks to save a lot of bending.
Jointing tool

One way to point up brickwork/blockwork is to use a jointing tool for pressing the mortar in the joint into a concave shape.

BUILDING A BRICK WALL

Stage 1   Sweep the floor and mark a chalk line using a straight edge. Lay the bricks dry (no mortar) along the line leaving gaps for the joints. Place an end stand at each end of the bricks level with and touching the end brick.
Stage 2

Move the bricks to one side. Lay an end brick on mortar up to the end stand. Check height with gauge rod and the level with a spirit level.

Repeat at other end. Fix corner blocks at each end and pull the line so that it is taut. Lay the rest of the bricks on mortar along the line. Each brick should have mortar at the end for the perpendicular joint and should be tapped down to the line with the bricklaying trowel. Check each brick for level.
Stage 3  Move the end blocks and line up to the next mark on the gauge rod. Lay bricks on a bed of mortar, with ends “buttered” with mortar for the perpendicular joints. Both end bricks will be half bricks to bond the brickwork.

Stage 4  Repeat, moving the end blocks and line and lay each course. Use the gauge rod to check each height. End bricks will be full bricks and half bricks on alternate rows to keep the correct bond. Remove surplus mortar that has squeezed out from the joints.

Stage 5  Check that the face of the brickwork is flat with the straight edge and that the perpends are in line.
Stage 6  Fill any gaps in the joints with mortar, using a pointing trowel to press the mortar into the joint.

Stage 7  When the mortar has dried out sufficiently point up the brickwork with a jointing tool.
Exercise 4

List the tools you would use to cut and lay bricks in mortar to gauge and line. Brickwork to be pointed with a jointing tool.

Tool list:
Focus on Plasterboarding

Plasterboards are flat sheets made from gypsum plaster, covered on both sides with strong paper. The most common sizes are 2240 mm x 1220 mm although smaller sheets are available. They are normally either 9.5 mm or 12.5 mm in thickness. Plasterboards are used to cover the surfaces of internal walls and ceilings and can be decorated directly on to the board with paint or wallpaper. Some boards have a coating of aluminium foil on one side and this is fixed facing the wall or ceiling joists to add insulation.

Plasterboards are easily damaged and must be handled and stored very carefully. They are porous and are easily damaged by water. For this reason they are not used externally or in damp conditions internally.

Cutting plasterboard

Plasterboard can be cut with a sharp bladed knife or with a fine-toothed saw. When cutting with a knife the blade is drawn along the line, usually at the side of a straight edge to cut through the paper cover. A batten is placed under the score mark and a slight pressure on the board will snap the gypsum plaster core. The board is turned over and the paper cover cut to part the board.
Fixing plasterboard

When fixing plasterboard to wood framing galvanised nails are used. These have a large, flat head and are between 30 mm – 40 mm long. The nails are spaced at a maximum of 400 mm and there are nails at all corners. Care must be taken to drive the nail so that the head is below the surface of the board but does not break through the paper covering.

Some frames are made from thin galvanised metal channels. To fix plasterboard to these it is necessary to use special self-tapping screws. These are hammered through the plasterboard into the metal channel and then screwed into position with the head of the screw sunk into the paper cover.
Exercise 1

List the tasks you would need to carry out, in the order you would do them, to cut a 2240 mm x 1220 mm plasterboard sheet into two 1220 mm x 1120 mm panels. The first task has been listed as an example.

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
<td>Carefully lay a piece of plasterboard 2240 mm x 1220 mm flat onto a previously cleaned, clear area of floor, with the face upwards.</td>
</tr>
<tr>
<td>Task 2</td>
<td></td>
</tr>
<tr>
<td>Task 3</td>
<td></td>
</tr>
<tr>
<td>Task 4</td>
<td></td>
</tr>
<tr>
<td>Task 5</td>
<td></td>
</tr>
<tr>
<td>Task 6</td>
<td></td>
</tr>
<tr>
<td>Task 7</td>
<td></td>
</tr>
</tbody>
</table>
Focus on Wall Tiling

Exercise 1

Complete the sentences by filling in the blank spaces with the correct words from the following list:

adhesive, bathrooms, batten, colours, comb, corner, cutting, edges, finishes, flat, gauge, glazed, grout, horizontally, joints, kiln, kitchens, line, nibbler, nibs, pencil, plumb, polished, powder, rod, saw, showers, sizes, spacers, sponge, spreader, surface, tile, tungsten, vertically.

Wall tiles

Wall tiles are normally made from clay with one surface glazed. The tiles are fired in a _______________. They can be bought in a range of ________________, ________________ and surface _________________. The glazed surface is waterproof and can be easily cleaned. For this reason they are used in houses in ________________, ________________ and ________________.

Cutting tiles

Wall tiles can be cut by scoring the ________________ surface with a tile cutter. This usually has a ________________ tip or wheel. The ________________ is placed on two matchsticks under the score mark and pressure on the tile will break it at the score line.

Scoring a tile using a tile cutter and straight edge
When only a small edge needs to be removed a tile _______________ is used.

Curves and awkward shapes can be cut with a tile ________________.

**Setting out the tiles**

Wall tiles do not need to be bonded for strength. Most are laid with straight joints both horizontally and ________________ to true ________________ and plumb. Care needs to be taken on how the tiles are spaced so that the ________________ of the tiles gives a symmetrical look to the tiled areas.

A gauge ________________ is made from a straight, planed wooden batten about 2 metres long by 50 mm x 25 mm. The size of the tile is marked along it allowing spaces for the _________________. This can be used for planning rows both ________________ and vertically.

A base line is marked on the wall and a temporary batten fixed up to the underside of the line to act as a guide for the tiles.
A vertical ________________ is plumbed and fixed at a point marked by the ________________ rod about centre along the base line.

Fixing the tiles

Tiles are normally fixed using a ready mixed tile _________________. The adhesive is spread on the wall using a tile comb (often supplied with the adhesive) or a notched spreader trowel.

The ridges left by the notches in the ________________ or ________________ allow the tile to be positioned and pressed into the adhesive. No more than 1 metre square of adhesive is applied at a time when bedding tiles because of it drying out.

Tiling is started at the ________________ where the two battens meet and the tiles are added on that side of the vertical batten, first along the bottom row and then upwards row by row using cut tiles where needed. Plastic ________________ are used between the tiles unless the tiles have spacer ________________ on their ________________.
Surplus adhesive is wiped off the surface of the tiles with a damp sponge or cloth. Checks are made that the joints are level, ________________ and in line and that the surface of the tiles is perfectly __________________.

On completion of the one side, the vertical batten is removed and the remaining wall area is tiled. Finally, after the adhesive is set (about 12 hours) the bottom batten is removed. If required, cut tiles are fixed to complete the wall.

**Grouting the tiles**

A grout is used to fill the joints. This can be ready mixed or a ________________ that is mixed with water to make the grout. The grout is applied at least 24 hours after tiling, when the adhesive has set. ________________ is spread across the tiles using a damp cloth or sponge and worked into the joints to fill them completely. The surplus grout on the ________________ of the tiles is wiped off with a damp sponge or cloth.

A rounded end of a ________________ or piece of dowel is run along the joints to press the grout in and to give an even finish.
Finally, when the grout is dry the tiled area is ________________ with a dry, soft cloth.
Exercise 2

Describe briefly the meaning of each of the following terms:

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Score</td>
<td></td>
</tr>
<tr>
<td>2. Dowel</td>
<td></td>
</tr>
<tr>
<td>3. Brick kiln</td>
<td></td>
</tr>
<tr>
<td>4. To key</td>
<td></td>
</tr>
<tr>
<td>5. Firing</td>
<td></td>
</tr>
<tr>
<td>6. Dense</td>
<td></td>
</tr>
<tr>
<td>7. Insulation</td>
<td></td>
</tr>
<tr>
<td>8. Brick bonding</td>
<td></td>
</tr>
<tr>
<td>9. Parallel lines</td>
<td></td>
</tr>
<tr>
<td>10. Glazed</td>
<td></td>
</tr>
</tbody>
</table>
Focus on Painting

Exercise 1

Types and preparation of paints

Complete the sentences by filling in the blank spaces with the correct words from the following list:

acrylic, additives, airtight, barrier, base, bottom, chisels, cleansing, colour, damage, decanting, disposed, external, gloss, hazards, latex, lids, peel, pigment, plastic, prepared, priming, ready-mixed, rubbed, sealed, skin, solvent, spillage, splashing, strainer, thinning, undercoats, white.

TYPES OF PAINT

Paint is supplied ________________in a range of sizes of metal or ________________ containers. The containers have ________________ lids and once opened, the paint will gradually harden if it is not used. There is a whole range of different types of paint to suit different kinds of surfaces and situations. For normal, internal and external paintwork the most commonly used paints are:

1. spirit-based paint
2. water-based ________________ paint
3. emulsion paint

Spirit-based and water-based acrylic paints consist of:

a) primers
b) ________________
c) top coats

Spirit-based paints dry slowly and need twenty four hours between coats. Water-based acrylic paints dry faster, in two to three hours and two coats can be applied on the same day.

Priming coats are used to cover surfaces not previously painted (or when paint has been removed). It provides a ________________ on which other coats can be applied. Without it other coats of paint would not stick properly and would ________________ off.
Undercoats are applied over ________________ coats and previously painted surfaces that have been rubbed down with sandpaper or similar. It is important that each coat when dry is ________________ smooth to remove any bits or bristles that have set into the paint. The undercoat must match the ________________of the next coat or a true colour will not be obtained on the final coat.

Top coats are applied over the undercoats and they provide the finished colour and surface. They can be in spirit or water-based acrylic paints and are available in ________________, matt or eggshell finishes.

**Emulsion paint** is water-based with a ________________ mixed in the water. The pigment is the colour that is left when the water dries out. They are available in matt, satin or silk finishes. Emulsion paint is commonly used for internal walls and ceilings. Some have special ________________ such as acrylic or vinyl and this makes them very hard wearing.

New surfaces, such as plastered walls, should be ________________ before painting with emulsion. The paint dries within a few hours and further coats can be applied on the same day. It normally takes two to three coats to obtain the required colour and density.

Special emulsion paints are available to paint ________________ surfaces. Alternatively, masonry paints can be used. These are water-based but have additives to make the paint more hard wearing.

**PREPARING PAINT**

Although paints are ready mixed when purchased, they must be ________________ correctly before using them, to obtain the best results. Care must be taken when opening the paint containers to avoid ________________ . The lids are prised off using a screwdriver or similar lever. ________________ must not be used. Personal protective equipment should include overalls and ________________ gloves.

A ________________ is likely to form on paint that has been part used and it is possible that dust or other debris has fallen into the paint. The skin should be cut out and disposed of in the correct bin.

The paint can then be mixed thoroughly using a whisk or spatula or similar, long enough to reach the ________________ of the container.

To make sure the paint is free from lumps or other debris it is poured through a ________________ into another clean container. The old container can be cleaned out or disposed of. When paint is poured from one container to another it is called ________________ .

Sometimes the paint needs ________________ to make it easier to apply. A ________________ is added to the paint, a little at a time, and stirred in until the right consistency of the paint has been obtained. For spirit-based paints the solvent is ________________ spirit or similar and for water-based paint clean, drinking water is used as the solvent.

All equipment used for the preparation should be thoroughly cleaned using the correct solvent to loosen the paint. All waste cloths and papers used for cleaning must be ________________ of in the correct bin. Container ________________ should be pressed firmly into place and the containers stored on shelves or racks where very cold or very hot temperatures can be avoided.
HEALTH AND SAFETY

The aim is to work as cleanly as possible and to avoid ________________ paint onto surrounding areas. Avoid getting paint on the skin but if it does happen it should be removed using a proprietary ________________ agent. On no account must white spirit or other spirit solvents be used to remove paint from the skin as this could cause serious skin ________________. ________________ creams can be applied before preparing or using paint. Latex gloves should be worn as a protection. Care should be taken when using spirit-based paints and solvents to avoid fire or fume ________________.

Exercise 2

Complete the following:

You are instructed to paint a door with gloss paint using a brush. The door has not been painted before and it will need a priming coat, undercoat and finish top coat. The paint is ready to use.

Write down the different tasks you would do, in the order you would do them, from preparing the door to the cleaning of the paint tools. The first task has been listed as an example.

<table>
<thead>
<tr>
<th>Task 1</th>
<th>Smooth the surface of the wood with sandpaper and remove dust with a cloth.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 2</td>
<td></td>
</tr>
<tr>
<td>Task 3</td>
<td></td>
</tr>
<tr>
<td>Task 4</td>
<td></td>
</tr>
<tr>
<td>Task 5</td>
<td></td>
</tr>
<tr>
<td>Task 6</td>
<td></td>
</tr>
<tr>
<td>Task 7</td>
<td></td>
</tr>
</tbody>
</table>
Applying paints

TOOLS AND EQUIPMENT USED FOR PAINTING

Brushes

Paint brushes are commonly between 12 mm to 150 mm in width. They are made in four parts – a handle made from wood or plastic, the bristles, a metal ferrule to hold the bristles and filler pieces that are in the ferrule to give the bristles their thickness. Good brushes have more bristles than the poorer, less expensive brushes.

The majority of paint brushes are straight ended and these are used on most surfaces with the smaller brushes used on architraves and other narrow work. Medium sized brushes – 38mm – 50mm are used for wider work such as skirtings, door frames and windows. A 75mm brush is used for larger areas, such as flush doors and the 150mm brush for walls and ceilings. A brush with the bristles cut at an angle is called a fitch and this is used for cutting in to edges and lines. Right angle, or crevice, brushes are used for painting behind radiators and other awkward places.

Radiator, fitch, small and large square ended brushes
Paint Pads
These are used for similar painting work to the brushes. They are available in a range of sizes and shapes. Each pad is made from mohair or synthetic fibre, bonded to a foam back that is attached to a flat plastic pad and handle. A paint tray is needed to load the pads with paint. Extension handles are available to give extra reach.

Paint Rollers
Rollers roll the paint onto the surface. The roller is made from wood or plastic and spins on a metal frame that has a wooden or plastic handle. A paint sleeve, which is removable for cleaning or replacement, fits over the roller. Sleeves vary from 180mm to 350mm and are available in various materials. Felt is cheap but not as good as mohair, which is more expensive.

Paint is loaded from a paint tray. These can be metal or plastic. The metal is stronger but needs to be cleaned and dried carefully between uses to avoid rusting. Rust will stain the paint. Extension handles are available to give extra reach.
APPLYING PAINTS

Brushes

Because paint containers can be large and heavy it is usual to pour (decant) a small amount of the prepared paint into a paint kettle. This is a small container with a carrying handle.

Small brushes should be held by the ferrule with the thumb on one side and four fingers on the other. This allows the wrist to be moved easily. Make sure the bristles are soft by pressing the bristles against your hand.

The brush is dipped about a third up the bristles to load it with paint and any surplus paint is removed by tapping or scraping the bristles against the inside of the kettle.

On larger areas the paint is applied first in one direction, then at right angles, making sure that the whole surface is covered. Final brush strokes should be gentle with the bristles only slightly loaded with paint.

When working up to an edge or a line, such as with a glazing bar, the loaded brush is worked close to the edge. By pressing on the brush the paint will ooze out and reach the line. The paint can be finished off with unloaded brush strokes.

When painting walls or other large areas the brush can be held further up the handle and the paint applied in wide, sweeping movements, in horizontal bands. Margins can be painted with the brush held sideways or by using a smaller brush.

Applying paint by pads

Pads are loaded by using paint trays part filled with paint. The pad is dipped in the paint and the surplus squeezed off onto the uncovered area of the tray. Only the pile of the pad needs to be loaded, not the foam backing.

The paint is applied first in one direction, then at right angles, finishing off with gentle strokes in one direction only. Margins should be finished off using a brush or specially shaped pad.
Applying paint by rollers

Paint is loaded onto the sleeve by dipping the roller into the paint tray and rolling off the surplus on the uncovered area of the tray. Paint is applied by rolling with upward strokes with gentle pressure. Areas should be criss-crossed and then finished off in one direction only. Margins can be painted with a brush and then rolled as close to the edge as possible in order to obtain a uniform finish.

Cleaning up

All brushes, pads, rollers, kettles and paint trays should be cleaned thoroughly with the correct solvent and then stored in their correct places. Brushes should not be stored in jars filled with solvent because the bristles will bend up under the weight of the brush. Paint splashes should be cleaned off using a solvent and all waste materials disposed of in the correct bins.

Exercise 3

Complete the following by ticking the appropriate true or false box.

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A felt sleeve for a paint roller is more expensive than a mohair sleeve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. A fitch is used for painting close to lines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. A metal ferrule holds the bristles in a brush</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 150 mm brushes are used for painting narrow widths such as architraves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Brushes should be stored in jars filled with solvent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Focus on Plastering

Prepare for and apply plaster to vertical surfaces

PREPARING BACKGROUNDS

Plaster relies on direct contact with the background surface to bond to it. Dust or loose debris can cause a barrier between the plaster and the background and the plaster will not adhere correctly. Any loose materials and dust must be swept off the surface of the background with a stiff hand or yard brush and disposed of in a skip. It is sometimes necessary to use a wire brush to remove flaky materials or other substances such as grease spots.

FIXING GUIDES

Plaster is usually about 10 – 20 mm thick and to help to obtain a flat surface flatness guides are put into place before the main plastering is carried out.

Guides are set at about 900 mm or less apart and are fixed vertically. They can be wood, metal or simply plaster and are fixed to give the required thickness of plaster. Wood battens are fixed with masonry nails and are removed when the plaster is firm enough for the next bay to be plastered. Metal guides are “T” shaped and rust proof and are fixed with dabs of mortar. These are left in as part of the plastering. Plaster guides are runs of plaster carefully trowelled flat to the required thickness and level. All guides are plumbed vertically with a spirit level and lined through horizontally with a straight edge.
Angle beads are used to protect external corners and they project the same distance as the flatness guides. The angle beads are fixed with plaster dabs and galvanised plasterboard nails.

**TOOLS AND EQUIPMENT USED FOR APPLYING PLASTER**

**Spot Board**

A spot board is a flat board, about 600 mm square and is used to hold a supply of plaster previously mixed in a bucket. To make it easier to reach the board is placed on a purpose made, wooden stand.

**Hawk**

A hawk is a flat board or plate, about 30 – 40 mm square, with a handle on the underside. It is used to carry plaster to the surface of the wall being plastered. They are made from wood or metal.
Gauging Trowel

This is used for remixing the plaster on the spot board and for loading the hawk with plaster.

Plastering Trowel And Wood Float

Plastering trowels are used for “laying on” the plaster from the hawk and for finishing the surface of the plaster. It is a rectangular, steel blade and a handle parallel to the blade.

Wood floats are used for flattening the surface of the plaster, mainly on the first layer but can also be used on the finishing surface.
Straight Edge For “Ruling Off”

Straight edges are usually made from straight, planed wood about 100 mm x 30 mm in section. They are used to level the plaster between the guides and to check the flatness vertically.

Sponges

A wet sponge is used when the plaster has been ruled off prior to finishing the surface with a plastering trowel.

APPLYING PLASTER TO VERTICAL SURFACES

Plaster is applied to wall surfaces by the plastering trowel, from the hawk. The plaster is spread by using upward sweeping strokes of the trowel, working from the ground level upwards. It is applied in two layers to the required thickness between the guides. It is then “ruled off” using the straight edge pressed against the guides. The straight edge is used to check the flatness of the plaster. Any hollows are filled and ruled off. The sponge is used when the plaster has firmed a little and the surface is then finished smooth using the plastering trowel.

All tools and equipment must be cleaned thoroughly during and on completion of the plastering process to avoid the plaster setting on them.
Exercise 1

Complete the following by ticking the appropriate true or false box.

<table>
<thead>
<tr>
<th></th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A gauging trowel is used to load the plaster into the hawk from the spot board.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Plaster remains workable up to 3 hours after mixing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. A hawk is used to “rule off” the plaster.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. One coat plaster is laid on in two layers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Plaster dropped onto the floor can be collected and remixed with the other plaster on the spot board.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT 3: PLANNING CONSTRUCTION PROJECTS

5.3.1 Introduction to the unit

The purpose of this unit is to assist learners in gaining the knowledge and understanding required to plan straightforward built environment development projects.

The Learning objectives for this unit are:

- Know job roles involved in realising construction and built environment projects (LO1)
- Understand how built environment development projects are realised (LO2)
- Be able to plan built environment development projects (LO3)

The three tasks given in the model assignment for this unit require candidates to:

1. Calculate a total amount of money that has to be raised to build the dormitory.
2. E-mail details of the roles of the three specialist trades people that should go to Africa to support the construction of the dormitory.
3. Plan the construction of the dormitory.

In general terms and for those looking to adapt the model assignment or wish to replace the given scenario the three tasks will be:

1. Calculate a budget (AC 2.2 and 2.4)
2. Provide details of three specialist roles required in the completion of the construction project under consideration (AC 1.1, 1.2 and 1.3)
3. Plan the construction of the project (AC 2.1, 2.3, 3.1, 3.2, 3.3 and 3.4)
5.3.2 Suggested learning activities

Activity 1 – AC 1.1, 1.2 and 1.3

Access the following pages of the go construct web site:

https://www.goconstruct.org/roles-in-construction/

This section of the website will provide information about careers in the construction industry laid out diagrammatically under the following headings:

- Design and Planning
- Demolition and Deconstruction
- Foundations
- Superstructure
- 1st and 2nd Fixing
- 3rd Fixing and Finish
- Repair, Maintenance and Management

Job roles can be accessed by clicking onto the icons shown – this then provides a level of detail for any roles considered.

Activity 1(a)

Candidates, under the guidance of the teacher, could access the site and find out information about roles which may be of particular interest to them.

This activity may be used as a general exercise to raise awareness of the diverse range of roles which exist within the industry. It will also help prepare candidates in meeting criteria AC 1.1, 1.2 and 1.3.

The following are definitions as to the meaning of the words Activities, Responsibilities and Outputs:

**Activities (AC1.1)** Work undertaken to achieve an aim – for example a brick layer will lay bricks.

**Responsibilities (AC1.2)** What is required to be dealt with – depends on the project – for example there may be more than one bricklayer, it may be necessary to report to a site manager, a foreman a team leader, or they may be working in isolation. What will they do on arrival at the site? Who will they report to and possibly who reports to them? What are the parameters of the work they are expected to undertake? These are all considerations in gauging the responsibilities.

**Output (AC 1.3)** What is produced— for example a brick layer will create a brick structure.
**Activity 1(b)**

*Use the following extracts from the go construct web site and complete the table below:*

<table>
<thead>
<tr>
<th>Job Role</th>
<th>Activities</th>
<th>Responsibilities</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roofing Operative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrician</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plumber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Manager</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Roofing Operative (extract) (Ref. go construct)**

Roofing Operatives work on the protective layers of a building which separate the inside from the elements using a range of materials, methods and structures.

The work is mostly outdoors, and at heights. There are a wide range of areas to specialise in, depending on the type of building being worked on and the amount of experience the roofer has. All Roofers, however, must be willing to work outdoors in all weather, at height, be able to read plans and cut and shape raw materials.

As with any career in construction a Roofing Operative is very aware of health and safety rules and building regulations. He or she works at height with materials that can be hazardous if they aren’t handled properly.

**Electrician (extract)**

Electricians install, inspect and test electrical equipment making sure everything in a building works properly and – above all – safely. They are in demand because everyone needs an electrician at some time or other.

It’s a responsible job because an electrician’s work must meet very strict safety regulations. He or she must keep up to date with the different types of legislation covering electrical equipment.
This career brings all kinds of work on all kinds of projects. Electricians could be needed to bring power safely into people’s homes or be on the team of a major engineering project. They are highly skilled in inspecting electrical systems, equipment and components so they can identify and repair anything that doesn’t work properly. They test every kind of electrical equipment and repair or replace wiring, equipment and fixtures, using hand tools and power tools.

**Plumber (extract)**

A plumber is in charge of anything that involves pipework on a construction site or in people’s homes.

Plumbers are always in demand and are needed on a huge variety of projects to install systems in new buildings and fix or maintain existing ones.

Domestic plumbers install basic cold water, hot water, sanitation (toilets), rainwater harvesters, central heating systems and sheet lead systems. Some receive extra training to install domestic fuel-burning appliances using gas, oil or solid fuel.

A plumber’s many skills are also needed to fit weatherproof materials, joints and flashings to roofs, chimneys and walls. Some plumbers design systems, plan work activities and have some responsibility for improving business products and supervising other people.

Work on industrial or a commercial building (such as factories, hospitals and shopping centres) usually brings a wider range of duties than domestic plumbers face. On big projects plumbers also install heating and fuel supplies, specialist appliances and fire protection systems.

**Site Manager (extract)**

Site Managers in the Construction Industry are (often referred to as Construction Managers, Site agents or Building Managers), responsible for day to day running of a Construction Project.

They are employed to prepare sites prior to the commencement of construction work (to set out the site and organise facilities), to plan projects and ensure that they meet agreed specifications, budgets and timescales and to oversee building work.

On site responsibilities include:

- liaising with clients and reporting progress, professional staff (such as architects and surveyors) and the public
- supervising contracted staff
- meeting subcontractors
- making safety inspections and ensuring construction and site safety
- checking and preparing site reports, designs and drawings
- maintaining quality control checks
- motivating the workforce throughout the project
- day to day problem solving
- using specialist construction management computer applications

The following websites are excellent sources of information about job roles and careers in the construction industry:
Activity 2 Processes in built environment development projects - AC 2.1

The key processes identified in the specification are:

- Planning (design, project planning, procurement)
- Construction (secure site, site clearance, substructure, superstructure)
- Handover to client (commissioning, handover)
- Maintenance

The expectation is that learners will be able to describe these processes. Access to an expert and/or a visit to a construction site would be highly beneficial for learners to comprehend what each of the processes involves. It is also likely that such an undertaking would assist in enhancing learners understanding of the interconnection between each of the processes and that each involves a variety of stakeholders.

The following link (CITB) gives access to the page focused on the Construction (Design and Management) Regulations 2015: Industry Guidance


By clicking onto the above link the teacher can access individual stakeholder documents for:

- Clients
- Principal Designers
- Designers
- Principal Contractors
- Contractors
- Workers

These relate to the Planning, Constructing and Handover stages. These could act as stimuli material for a wide range of tasks, even though; it may be deemed appropriate to paraphrase some or all aspects of the documents.
Activity 3 Calculate resources for built environment development projects - AC 2.2

Activity 3(a) Area and general calculations (Ref. Clip art)

The wall shown above has just been completed in the back garden of a house. The lower level of the wall has 11 courses of bricks with 10 mm mortar mix being used between each course. It has a coping stone on top which is 10 cm longer than the brick part of the wall.

How high will the wall be up to the top of the bricks?

The brick part of the wall is 9 and a half bricks long, with 10mm mortar mix between each course.

How long is the wall?

The customer has asked if the brick part of the wall can be rendered to match the rear of the house. In order to do this it will be necessary to calculate the area of the brick part of the wall.

What is the area of the brick part of the wall (one face only)?

Activity 3(b) Area and Volume

A customer is considering having a rectangular swimming pool built. The pool will be 10 metres long and 5 metres wide. The pool will not have a deep or shallow end, it will simply be 1.2 metres deep at all points.

The customer has asked if the bottom of the pool can be finished in mosaic tiles. In order to do this it will be necessary to calculate the area of the bottom of the pool.

(Ref. clip art)
What is the area of the bottom of the pool?

In addition to having the bottom of the pool in mosaic, they would like the inner sides of the pool tiled as well. This will also require a calculation of area.

What is the area of the four inner sides of the pool?

What is the total area of the bottom and sides of the pool?

The customer has also asked you about the volume of the pool when it is full of water (it is a deck level pool so this will be calculated by considering the length, width and the height of 1.2 metres).

What is the volume of the pool?
Activity 3(c) - Extension activity

The customer has also considered an alternative design which incorporates a semi circular recess. The pool has the exact same dimensions of the rectangular one (10M x 5M) with the exception of the recess which is a perfect half circle with a diameter of 1.5 meters. The recess runs to a depth of 1.2 metres as does the rest of the pool.

(Ref. clip art)

The calculations completed for the standard pool will now need revisiting in the light of the recess.

What is the area of the bottom of the recessed pool?

........................................................................................................................................................................

What is the area of the sides of the recessed pool?

........................................................................................................................................................................

What is the total area of the bottom and sides of the recessed pool?

........................................................................................................................................................................

What is the volume of the recessed pool?

........................................................................................................................................................................
Activity 4 Percentages and VAT

Design Pools LTD have been recommended to carry out the mosaic work on whichever pool is selected.

The following invoice is one which has been completed for a different job (the VAT figure and total are missing).

Design Pools LTD
Invoice

For the completion of mosaic works

<table>
<thead>
<tr>
<th>Supply of: Olympic origins mosaic</th>
<th>£4,050.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitting (including adhesive)</td>
<td>£3,375.00</td>
</tr>
<tr>
<td>Sub total</td>
<td>£7,425.00</td>
</tr>
<tr>
<td>VAT @ 20%</td>
<td>£</td>
</tr>
<tr>
<td>Total</td>
<td>£</td>
</tr>
</tbody>
</table>

The cost of the mosaics is £30.00 per square metre (not including VAT).

What is the area of the pool which requires mosaic?

Having established the area of the pool which requires mosaic, what is the price per square meter (not including VAT) of fitting and adhesive?

Calculate the cost of VAT.
Calculate the total cost for the job.

You have been advised by staff at Design Pools LTD that they will provide building contractors with a 10% discount on the price of labour and materials.

Calculate the price per metre they would charge a building contractor for Labour and adhesive (without VAT).

Calculate the price per metre they would charge a building contractor for the same type of mosaic noted in their invoice (Olympic origins).
Activity 5 – Scaling and Area

A two bedroomed bungalow has been built using the following plan. Unfortunately the original plan has been mislaid. Using the drawing supplied, create a plan on a 1:50 or 1:100 scale. There are certain rooms where you will not be able to draw accurately as some information is missing. This will not be critical in the calculations which follow:

(Ref. – plan provided by Chief Examiner)

Activity 5(a) Scaling and area

The customer is considering having woodblock flooring fitted throughout the bungalow (except for the pantry and utilities room).

What is the total area of woodblock required?

The second bedroom is to be decorated for a young child and requires wall paper on all walls. The room is 4 x 4.3 metres with a ceiling height of 2.4 Metres. The window is 2 metres wide by 2 metres high (floor level up) and is effectively flush with the wall (it has a small surround that can be wallpapered directly up to). There is also one standard door with no fitted cupboards or Wardrobes.
How many rolls of paper will be required assuming an added 10% waste factor (standard roll of paper = 0.52m width x 10.05m length)?

Activity 5(b) - Extension Activity

The paper the customer has chosen is the penguin print shown below:

This type of wall paper has a pattern and therefore calculations need to consider the pattern repeat. The pattern repeat for this paper is 0.2 metres.

How many rolls of paper are required given the pattern repeat of 0.2 metres (0.52m width x 10.05m length)?
Activity 6 - Sequence of work - AC 2.1, 2.3, 2.4, 3.1, 3.2, 3.3 and 3.4.

Activity 6(a)

The following is a list of 15 stages of a construction project which are ordered randomly. The learners are required to re-order the stages from start to completion under the 'Correct Sequence' heading.

<table>
<thead>
<tr>
<th>Random Sequence</th>
<th>Correct Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor slab</td>
<td></td>
</tr>
<tr>
<td>External walls</td>
<td></td>
</tr>
<tr>
<td>Foundations</td>
<td></td>
</tr>
<tr>
<td>Footings</td>
<td></td>
</tr>
<tr>
<td>Doors</td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td></td>
</tr>
<tr>
<td>Roof</td>
<td></td>
</tr>
<tr>
<td>Landscaping</td>
<td></td>
</tr>
<tr>
<td>Internal finishes</td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td></td>
</tr>
<tr>
<td>Hand over</td>
<td></td>
</tr>
<tr>
<td>External finishes</td>
<td></td>
</tr>
<tr>
<td>Internal walls</td>
<td></td>
</tr>
<tr>
<td>Windows</td>
<td></td>
</tr>
<tr>
<td>Groundwork (excavations)</td>
<td></td>
</tr>
</tbody>
</table>

Activity 6(a) gives the opportunity to introduce a number of key concepts in terms of the ordering of a built environment development project. It will need to be highlighted that the stages being referred to follow the design and planning stages.

Whilst these are a valid indicator of sequence, the factor of time is also critical and will need to be introduced.

Activity 6(b)

The following sequence is similar to 6(a); however, an indication of timing has been introduced. The learners should be asked to correctly order the sequence and then provide an overall time for the project in weeks.

<table>
<thead>
<tr>
<th>Random Sequence</th>
<th>Planned time for completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor slab</td>
<td>1 week</td>
</tr>
<tr>
<td>External and internal walls</td>
<td>14 weeks</td>
</tr>
<tr>
<td>Foundations</td>
<td>1 week</td>
</tr>
<tr>
<td>Footings</td>
<td>1 week</td>
</tr>
<tr>
<td>Doors and windows</td>
<td>6 weeks</td>
</tr>
<tr>
<td>Services</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Roof</td>
<td>1 week</td>
</tr>
<tr>
<td>Landscaping and hand over</td>
<td>1 week</td>
</tr>
<tr>
<td>Internal finishes</td>
<td>4 weeks</td>
</tr>
<tr>
<td>External finishes</td>
<td>3 weeks</td>
</tr>
<tr>
<td>Groundwork and drainage</td>
<td>8 weeks</td>
</tr>
</tbody>
</table>

Activity 6(b) can be completed simplistically by assuming that each of the stages cannot be started until the previous stage is completed.
Extension activity

Consider the stages noted in 6(b) and discuss if there are any areas where work could be taking place simultaneously. This will provide a lead into more complex project planning concepts.

Activity 6(c)


View video on 2 of 9 – Assistant quantity Surveyor then answer the following questions:

What is a project proposal?

…………………………………………………………………………………………………………
…………………………………………………………………………………………………………

Why is the client sign off very important?

…………………………………………………………………………………………………………
…………………………………………………………………………………………………………

What are the 4 key stages of a project noted?

…………………………………………………………………………………………………………
…………………………………………………………………………………………………………

What does project planning software allow anyone managing a project do?

…………………………………………………………………………………………………………
…………………………………………………………………………………………………………
Activity 6(d)

Whilst these are all important, it would be useful to emphasise that (for the last question) project planning software facilitates planning but also provides a snapshot of progress at any given time.


View video on 6 of 9 – Project Site Manage (Civil Engineer) then answer the following question(s):

What software does the Project Site Manager use in project planning and project management?

..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................

Extension question

The collaborative use of software is noted by the Project Site Manager. How can sharing all information in a collaborative way help the progress of the project?

..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................
..........................................................................................................................................................

It is anticipated that in consideration of 6(c) and 6(d) the use of software for planning built environment development projects will be acknowledged and reinforced through the words of the two speakers.
Activity 7 focus on AC 3.3

<table>
<thead>
<tr>
<th>Task</th>
<th>Duration(days)</th>
<th>notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of existing flooring in main area</td>
<td>1</td>
<td>Access available from the 28 September</td>
</tr>
<tr>
<td>Floor preparations to main area</td>
<td>1</td>
<td>Can be started when existing flooring is removed</td>
</tr>
<tr>
<td>Delivery of woodblock flooring</td>
<td>1</td>
<td>Separate storage available so can be delivered at any time before fitting takes place</td>
</tr>
<tr>
<td>Preparation of staircase</td>
<td>1</td>
<td>Can be started any time from the 28 September</td>
</tr>
<tr>
<td>Fitting nosings to staircase</td>
<td>1</td>
<td>Can be started after staircase preparations are completed</td>
</tr>
<tr>
<td>Vinyl floor fitting to staircase</td>
<td>1</td>
<td>Can be started after nosings have been fitted</td>
</tr>
<tr>
<td>Laying of woodblock flooring to main area</td>
<td>3</td>
<td>Can be started after all other main area work has been completed</td>
</tr>
</tbody>
</table>

There are many tools that can be used to help plan projects, for example spreadsheets. Many centres may already have project management software available, and even if that is not the case, then such software can be downloaded for free. One free tool is Gantt Project which can be downloaded from:

http://www.ganttproject.biz/

There are a number of videos on YouTube which provide tutorials in order to gain a good understanding of how to use this software, and indeed other similar applications.

The simple plan below shows a small flooring project which ran from the 28 September to the 2 October.

Learners could be given the following information:

Work to commence on RGB Offices on the 28 September. Existing flooring to main area is to be removed and replaced with woodblock. Staircase is to be prepared for new vinyl floor and nosings and is not impacted upon by the work to the main area.
The learners should produce a plan which looks similar to the chart shown (using software as preferred or that which is available).

This is a very basic project but further activities could be used to extend the use of the project planning tools by:

- increasing the number and complexity of the tasks
- introducing the concept of predecessors
- introducing the use of resources alongside tasks
- contingency planning