

ENDORSED BY



**SAMPLE
MATERIAL**

Bricklaying

LEVEL 1 DIPLOMA (6705)

I Mike Jones

The City & Guilds textbook



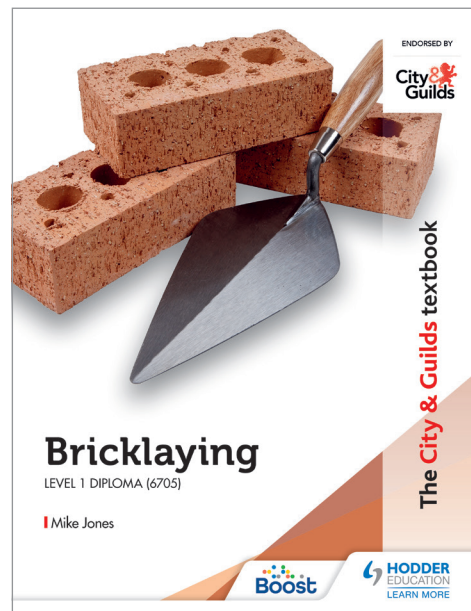
Hodder Education is working in association with City & Guilds to produce high-quality print and digital resources for City & Guilds' new suite of Technical qualifications as well as Apprenticeships across Levels 1, 2 and 3.

The City & Guilds textbook: Bricklaying

LEVEL 1 DIPLOMA (6705)

Ensure your learners have the knowledge and skills to start a successful career in the construction industry, with this comprehensive new textbook published in association with City & Guilds for the Level 1 Diploma (6705-13).

The City & Guilds Textbook: Bricklaying for the Level 1 Diploma (6705-13) Student Book	Mike Jones	9781398319363	May 2021	£25.99
The City & Guilds Textbook: Bricklaying for the Level 1 Diploma (6705-13) Boost eBook	Mike Jones	9781398318601	June 2021	Annual subscription: £8.75



To get eInspection copies or free no-obligation trials of digital resources, visit www.hoddereducation.co.uk/construction

Available as a Boost eBook. This allows you and your learners to:

- Give the eBook your own look and feel by creating toggleable annotations that can be shared
- Create revision study cards in an instant with the note-taking feature
- Locate artwork and diagrams quickly and easily using the image galleries
- Listen to passages using the text-to-speech function
- Cut out the hassle of managing passwords by synchronising with your Microsoft Teams or Google Classroom account.



Get in touch! Email us at cityandguilds@hoddereducation.co.uk and one of our dedicated consultants will contact you

Contents

Acknowledgements/picture credits

About the author

How to use this book

Introduction

1 Principles of construction, information and communication

Identifying information used in the workplace

How construction can affect the environment

The different parts of buildings

Calculating quantities of materials

Communicating in the workplace

2 Setting out masonry structures

Preparing the site for setting out

Tools and equipment used in setting out

Types of drawing used when setting out

Methods of setting out and transferring levels

3 Carrying out blocklaying activities

Preparation for blocklaying activities

Identifying and selecting the correct resources

Building straight walls, corners and junctions in block

4 Carrying out bricklaying activities

Preparation for bricklaying activities

Identifying and selecting the correct resources

Building straight walls, corners and junctions in brick

5 Building cavity walls

Why cavity walls are used

Selecting the correct tools and equipment

Identifying and selecting the correct materials

Methods of constructing cavity walls

6 Health and safety in the construction industry

Safety regulations, roles and responsibilities

Identifying and dealing with hazards and reporting accidents and emergencies

Handling materials and equipment safely

Welfare in the workplace and the use of personal protective equipment

The safe use of access equipment and working at height

Test your knowledge answers

Glossary

Index

© The City and Guilds of London Institute and Hodder & Stoughton Limited 2021

All rights reserved. Apart from any use permitted under UK copyright law, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or held within any information storage and retrieval system, without permission in writing from the publisher or under licence from the Copyright Licensing Agency Limited. Further details of such licences (for reprographic reproduction) may be obtained from the Copyright Licensing Agency Limited, www.cla.co.uk

Cover photo © PHILL THORNTON PHOTO - stock.adobe.com, p.2 top © Birgit Reitz-Hofmann/stock.adobe.com, p.2 left © Bijoy/stock.adobe.com, p.3 top © SeagullNady/stock.adobe.com, p.3 bottom © Luca pb/stock.adobe.com, p.5 top © Stanley Black & Decker, p.5 middle City & Guilds, p.5 bottom courtesy of Axminster Tool Centre Ltd., p.6 top © Faithfull Tools, p.6 middle © Faithfull Tools, p.6 bottom picture courtesy of Chestnut Products, p.12 left City & Guilds, p.12 right © Faithfull Tools, p.13 © York Survey Supply Centre Ltd, p.18 left © STABILA, p.18 right © 2020 Screwfix Direct Limited.

City & Guilds and the City & Guilds logo are trade marks of The City and Guilds of London Institute. City & Guilds Logo © City & Guilds 2021

Selected pages from Chapter 2

CHAPTER 2

SETTING OUT MASONRY STRUCTURES

INTRODUCTION

Setting out masonry structures requires great care in interpreting and applying the dimensions and measurements that form the design. Accuracy is vital at the setting-out stage of the construction process, to ensure the finished building is completed exactly as intended.

This chapter discusses:

- methods of preparing and clearing the site before starting the setting-out process
- equipment requirements
- methods used to set out and position a building on a site correctly
- processes used to set the height level of a structure in relation to specific reference points.

LEARNING OUTCOMES

After reading this chapter, you should:

- 1 Know how the site is prepared for setting out
- 2 Be able to identify tools and equipment used in setting out
- 3 Know about the types of drawing used when setting out
- 4 Know how to accurately set out a masonry structure to the set level.

1 PREPARING THE SITE FOR SETTING OUT

Good preparation at the setting-out stage is essential to prevent problems arising later in the project. Long before bricklayers arrive on site, a great deal of work will have been done to ensure the project proceeds safely and efficiently.

1.1 Services on site

Accidental damage to any existing services on site, such as electricity or gas, could pose a danger to workers, as well as causing delays and unexpected repair costs. Special equipment can be used to scan the ground to confirm the position of underground cables and pipe runs. It may be necessary to move the path of services.

Features in the book

The City & Guilds Textbook: Level 1 Bricklaying



▲ Figure 2.2 Natural drainage ditches must be protected

HEALTH AND SAFETY

Sometimes, a decision will be made not to remove or reroute services if they will not affect the positioning of buildings. If this is the case, control measures such as fences and signs must be put in place, to protect personnel from potential hazards.

KEY TERM

Topsoil: the upper, outermost layer of soil, usually the top 5–10 inches (13–25 cm)

Key terms provide concise definitions for learners to help them quickly pick up industry terms.



▲ Figure 2.1 Underground services

As well as underground services, there may be overhead cables that must be considered during the preparation of the site. Overhead electricity cables can be a hazard to operators of machines such as cranes and excavators as they move about the site. Telecoms cables running underground or overhead must also be considered.

Water and drainage systems must be located and protected or rerouted. Accidental damage to water mains can cause disruption through flooding and may result in contamination of the water supply to nearby properties. Damage to drainage systems could cause pollution of the environment surrounding the site, so it is important that water courses and natural drainage ditches are protected during construction operations.

1.2 Site clearance

To prepare the site, **topsoil** must be removed from the area where buildings will be constructed. Topsoil is unsuitable to build on since it cannot support the weight (or loadings) a building will place on it. It also contains a large amount of soft vegetable matter.

If the topsoil is clean and of suitable quality, it can be stored for later reuse in landscaping and levelling the site when construction is finished.

INDUSTRY TIP

If topsoil is stored on site, the storage location must be considered carefully. The soil must be stored so that it does not interfere with water courses or drainage ditches.

Stockpiling in a location that will not mean moving the material again later is also an important part of efficient preparation of the site. Surplus topsoil of good quality is a valuable material and can be sold on.



▲ Figure 2.3 Removing topsoil

The process of removing topsoil allows for the creation of a uniform, level area without obstacles, making it easier to set out a building accurately, even if the site has a slope.

There may be existing buildings on a site, which must be demolished and removed. Creating a level area on such land presents additional challenges. The buildings that must be removed may have design features such as basements, or there may be other underground elements such as storage tanks. If so, the site will need additional preparation before new construction work can begin.

ACTIVITY

Think about the problems that could arise when setting out a level building on a sloping site. Work with a partner to produce some simple sketches to show what the problems could be.



▲ Figure 2.4 Clearing a site of existing buildings

Features in the book

The City & Guilds Textbook: Level 1 Bricklaying

2 TOOLS AND EQUIPMENT USED IN SETTING OUT

KEY TERM

Profiles: (in the context of setting out) timber boards and pegs assembled at the corners and other wall locations of a building to allow string lines to be positioned accurately

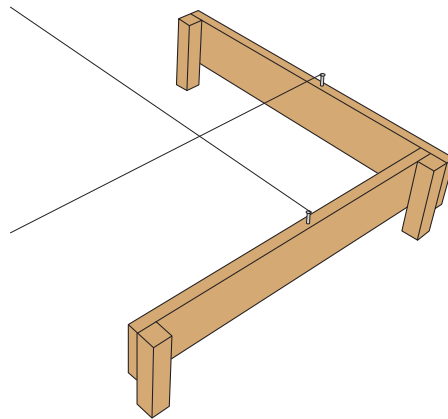
The equipment used to set out a building may be relatively simple. Accurate results can be achieved using string lines attached to timber **profiles** as guides for setting out wall positions on the ground, ready for excavation of the foundations. These profiles can be left in place for later use by bricklayers when establishing wall positions on the completed foundation concrete.

INDUSTRY TIP

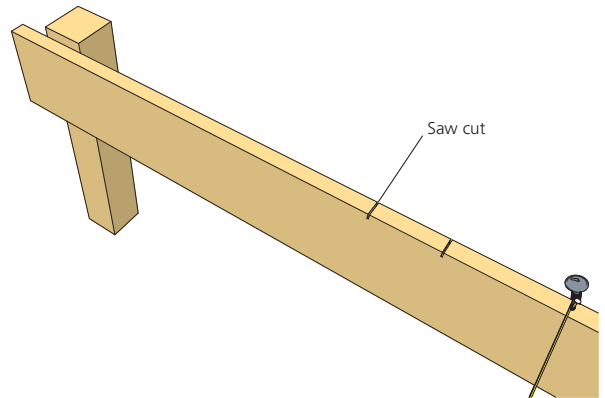
String lines used to set out a building are often referred to as ranging lines.

Profiles consist of timber rails (approximately 150 mm × 30 mm) attached to timber pegs (approximately 50 mm square) and are assembled on site to suit the requirements of the job. The pegs are securely driven into the ground and cross rails are fixed to them.

The positions of corner points and the lines of walls are indicated by nails driven into the top of the cross rails. An alternative method is to use saw cuts in the top of the rails to show the specified wall positions.



▲ Figure 2.5 String lines are attached to timber profiles



▲ Figure 2.6 Saw cuts can be used to mark wall positions on timber profiles

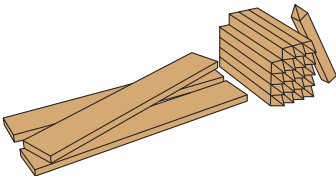



Industry tips provide practical pieces of advice for learners to use in their future careers.

INDUSTRY TIP

Using nails or saw cuts to mark wall positions on profiles is recommended, since the profiles could be in place for some time. Markings made in pen or pencil can wash away or fade, leading to mistakes in setting out.

Table 2.1 lists the tools and equipment used to set up the profiles and establish the building outline on the plot or construction site.

▼ Table 2.1 Tools and equipment for setting out wall positions

Tool/equipment	Description
<p>Timber pegs (or stakes) and rails</p> 	<p>These are used to construct profiles.</p>
<p>Lump (or club) hammer</p> 	<p>This is used to drive pointed pegs firmly into the ground when constructing profiles and marking specific setting-out locations.</p>
<p>Carpenter's saw (hand saw)</p> 	<p>This is used to cut profile rails to length. You may choose to use saw cuts on the top of the profile rails to indicate wall positions.</p>
<p>Tape measure/surveyor's tape measure</p> 	<p>This is an important tool that is used constantly for measuring and marking dimensional details with accuracy.</p> <p>For small to medium measuring tasks, there is a range of lengths, from 3 m to 10 m. Longer tape measures are available.</p>

Tables of information help learners identify the purpose of tools and equipment.

Features in the book

The City & Guilds Textbook: Level 1 Bricklaying

▼ Table 2.1 Tools and equipment for setting out wall positions (continued)

Tool/equipment	Description
Mason's line and pins 	These tools make it easy to attach string lines to reference points. They are effective over short to medium distances.
Ranging line 	Over longer distances, a more substantial ranging line can be used. It is often made from nylon for strength.
Spray paint 	This is used to mark guide lines on the ground, ready for excavation of the foundation trenches.

ACTIVITY

Search online for 'surveyor's tape measures' and make a list of all the different lengths of measuring tape you can find.

Additional items of equipment for creating right angles and transferring levels when setting out a building are discussed later in this chapter.

3 TYPES OF DRAWING USED WHEN SETTING OUT

INDUSTRY TIP

Surveyor's tape measures are made from steel or special fabric. Fabric tapes should be used with care to avoid stretching them and distorting the measurements.

In Chapter 1, we identified a range of drawings used to communicate information for a construction project. The use of **scale** was also considered, and Chapters 3 and 4 feature further application of scale when referring to working drawings. Drawing to scale means that the building being set out is represented with accurate proportions but reduced in size to fit onto a manageable size of paper.

In this chapter, we will concentrate on the drawings used to establish the position of a building on a plot or site, the building's outline and the position of internal walls.

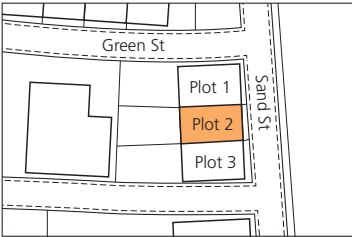
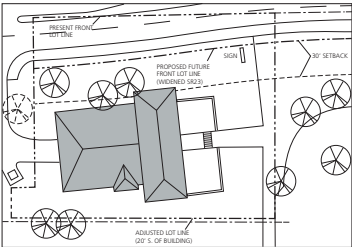
3.1 Location drawings

Location drawings give information about the position of the new building in relation to existing roads, buildings and other features that are reliable fixed reference points to measure from. The position of a new building must comply with planning laws, so location drawings are an important source of information to make sure a building is constructed in the right place.

KEY TERM

Scale: when accurate sizes of an object are reduced or enlarged by a stated amount

▼ Table 2.2 Types of location drawing

Type of drawing	Description
<p>Block plan</p> 	<p>This is a 'bird's eye' view of the whole site in relation to the area around it. It shows individual plots and road layouts on the site as a simple outline with few dimensions. It allows planning of access requirements and can assist in planning storage facilities and positioning of materials during preparation for construction. Usual scale: 1:1250 or 1:2500</p>
<p>Site plan</p> 	<p>This shows the proposed development in relation to the site boundary, giving details needed to position a building accurately in accordance with local authority planning permission. It may show the position of drains on the site and could include the position of trees and shrubs if they are part of the planning requirements. Usual scale: 1:200 or 1:500</p>

IMPROVE YOUR ENGLISH

Visit www.planningportal.co.uk. Go to the 'planning' section and write a short description of the purpose of the planning process.

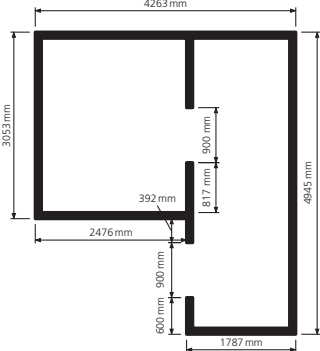


Improve your English activities help your learners hone their skills so that they can confidently set about tasks they will regularly need to perform in the workplace.

3.2 Construction drawings

Construction drawings are used to understand the structural details of a building design. The design will be drawn in accordance with building regulations.

▼ Table 2.3 Types of construction drawing

Type of drawing	Description
<p>Floor plan</p> 	<p>This provides dimensions for the outline of the building and the position of internal walls. Special-use rooms such as bathrooms and kitchens are identified, and the position of doors and windows can be shown. Usual scale: 1:50 or 1:100</p>



Features in the book

The City & Guilds Textbook: Level 1 Bricklaying

INDUSTRY TIP

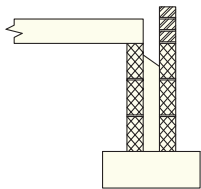
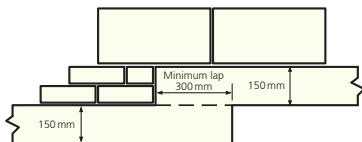
Notice the lines on the brickwork and blockwork in the section drawing. These lines are used to identify the materials within the 'slice' of the wall. A range of lines and symbols referred to as **hatchings** are used to show different materials.

KEY TERMS

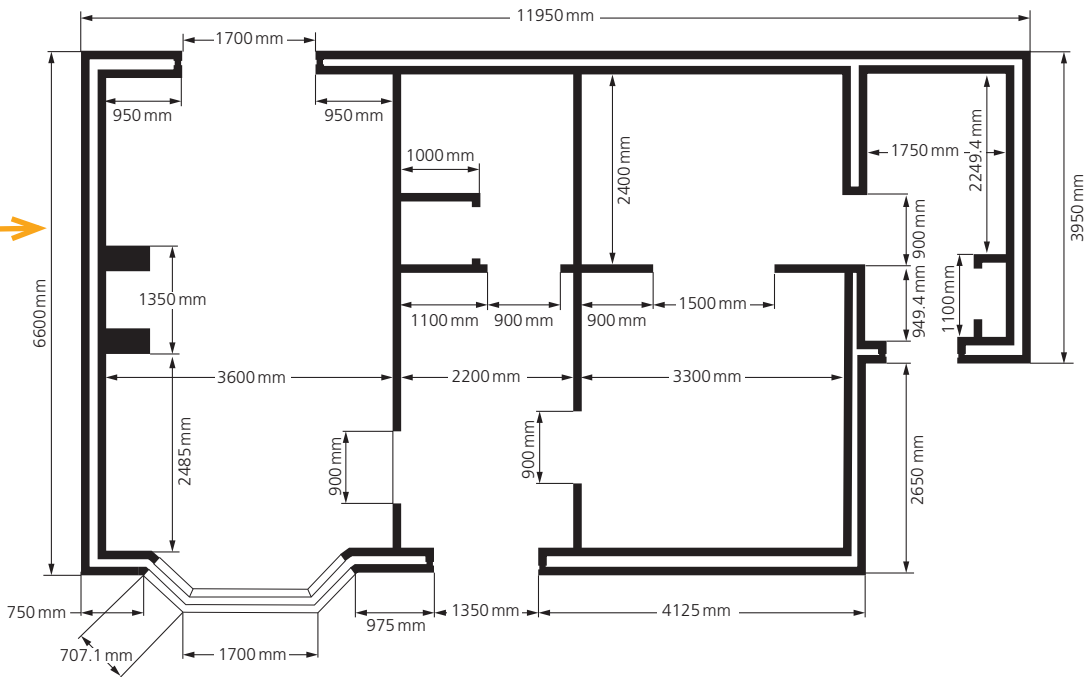
Substructure: the complete section of a building extending below ground-floor level

Hatchings: a standardised set of lines and symbols that allow easy identification of materials shown on a drawing

▼ Table 2.3 Types of construction drawing (continued)

Type of drawing	Description
Section (or sectional) drawing 	This is a slice through a structure which can show details that would otherwise be hidden. In the context of setting out a building, it could show the depth of a concrete foundation or other substructure details. Usual scale: 1:50 or 1:100
Detail drawing 	This is a larger-scale drawing used to show complex design features in greater detail. Usual scale: 1:5 and 1:10

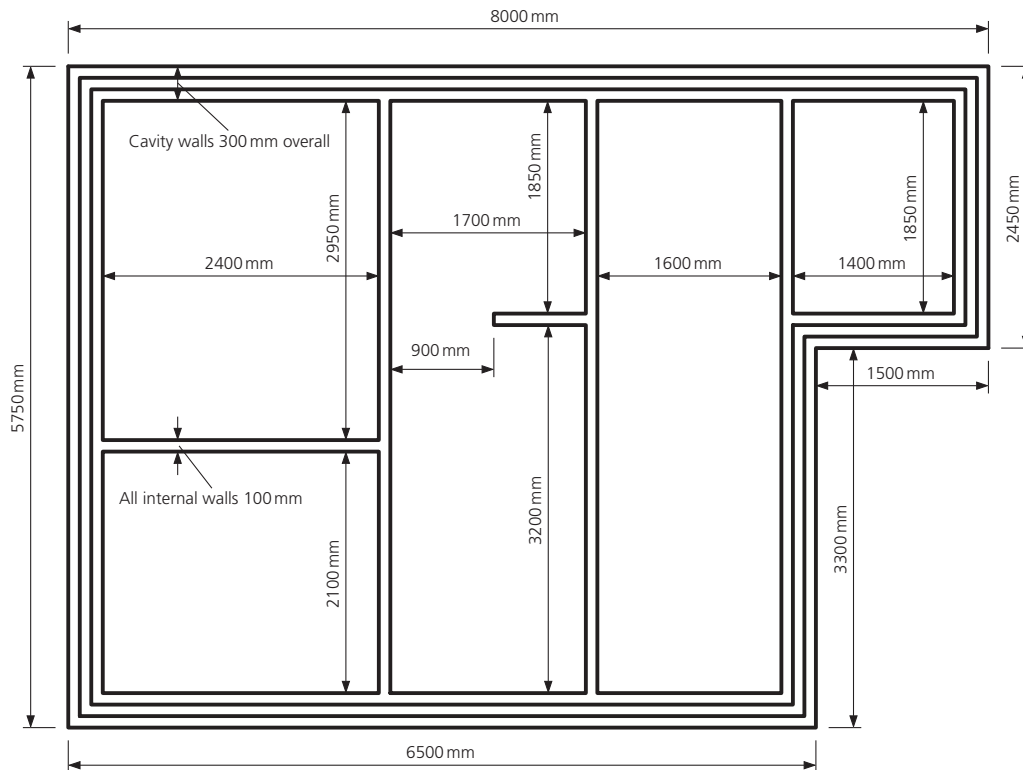
The main drawing that a bricklayer will use when setting out masonry for the substructure of a building is the floor plan. This view of the planned construction makes it relatively easy to interpret a range of information. It will show details such as internal wall positions, door and window positions, entry and exit of services, and other features that may have an impact on the way the substructure masonry is constructed.



▲ Figure 2.7 Floor plan

Diagrams and commentaries, such as floor plans, gently introduce and familiarise learners to processes and concepts.

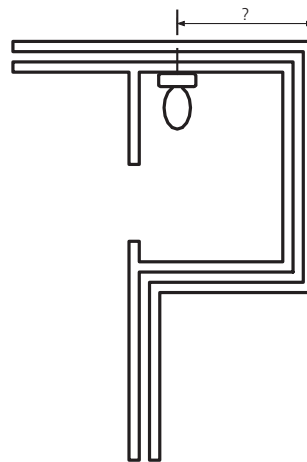
To simplify the setting out of the masonry below ground, an additional view of the floor plan (sometimes referred to as a setting-out drawing) can be prepared. This provides a simple outline of the building's external walls with overall dimensions and measurements for positioning internal walls.



▲ Figure 2.8 Setting-out drawing

Although plans are drawn to scale, accurate setting out can only be achieved by working to the written dimensions, not by taking dimensions from the drawing using a scale rule. A scale rule has a range of markings that allow the user to read dimensions directly from a drawing that is produced to a stated scale. Only approximate dimensions should be 'scaled' from a drawing.

An example might be where drainage pipes for a toilet pass through a wall below ground. If the approximate position of the toilet is shown on the floor plan using a symbol, a dimension for positioning an opening for the toilet drain connection can be scaled from the drawing. An opening can then be created in a suitable position that is large enough to allow for later adjustments.



▲ Figure 2.9 A symbol shows the position of a drain for a toilet without a specific dimension

Features in the book

The City & Guilds Textbook: Level 1 Bricklaying

Improve your maths activities give learners the opportunity to practise numeracy skills they will need to hardwire in the workplace.

IMPROVE YOUR MATHS

If you do not have a scale rule, you can use an ordinary tape measure to establish approximate dimensions from drawings using the two most common scales of 1:50 and 1:100.

Carefully measure the required detail on the drawing in millimetres and multiply by 50 or 100 depending on the scale of the drawing. For example, if a line shown on a drawing measures 53 mm, for a scale of 1:50 multiply 53 by 50, which equals 2650 mm or 2.65 m.

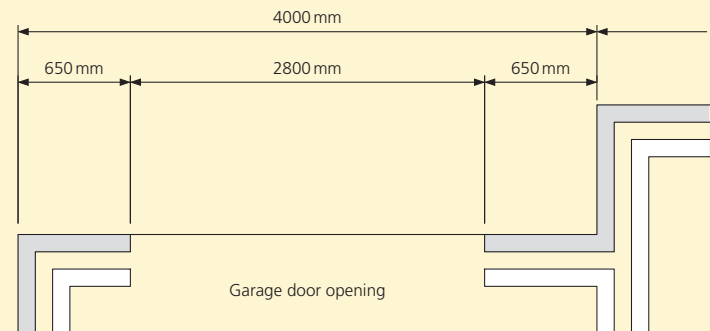
ACTIVITY

On a sheet of A4 paper, use a scale rule to draw a line to represent a length of 10 m for each of the scales in Tables 2.2 and 2.3. Is the paper big enough to draw a line at a scale of 1:5 or 1:10?

When setting out a structure using dimensions from a working drawing, the bricklayer must be alert to the possibility of mistakes in measurements occurring during the production of the drawing. Make it a habit to check that individual dimensions for wall positions along the line of a wall add up to the overall dimension. This will quickly reveal any errors.

IMPROVE YOUR MATHS

Look carefully at the dimensions in Figure 2.10. Can you see a discrepancy between the individual dimensions and the overall dimension?



▲ Figure 2.10 Check that the individual dimensions add up to the overall dimension

INDUSTRY TIP

In Chapter 1, it is explained that drawings are described as 'contract documents', which means they are legally binding. That is why if you discover an error on a drawing you must consult with someone who has the authority to decide how to solve the problem.

If errors are identified, talk to your supervisor who has the responsibility to decide on the solution to the problem. On large projects, the supervisor or line manager may request written confirmation of the correct details from a more senior manager; on a smaller project, they may consult directly with the architect.

In addition to extracting information from working drawings, a bricklayer may obtain important details about a work task from other written documents.

Risk assessments and method statements are used to identify potential hazards and to provide information on safe and efficient working practices. For example, when setting out buildings, the ranging lines set out across the work area can create trip hazards, and when foundation trenches are dug, there is a risk of falling into the excavation. These are risks that must be considered.

Job sheets can be used to give specific information about a work task, such as the:

- location on site
- materials to be used
- number of personnel required to accomplish the task.

Information specific to setting out masonry structures can be accessed from a range of documents, including schedules and specifications. These documents are discussed in Chapters 3 to 6 in different contexts.

4 METHODS OF SETTING OUT AND TRANSFERRING LEVELS

Most buildings are set out as squares or rectangles. This means that positioning the profiles to set out a building will involve creating right angles (90°) at the corner positions.

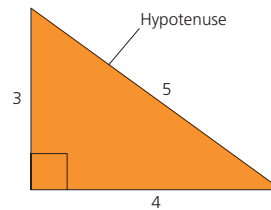
4.1 Setting out right angles

There are several methods to accurately set out right angles, employing different tools and equipment.

The 3:4:5 method

Using a simple ratio, it is possible to set out 90° corners quickly and accurately using tape measures and string lines. By applying the ratio 3:4:5 to a right-angled triangle, we establish 90° angles for the corner positions of a building.

The ratio 3:4:5 refers to units of measurement. You can use any unit of measurement (metres, centimetres, millimetres) that is easy to work with and suits the needs of the job, as long as the ratio stays the same.



▲ Figure 2.11 Right-angled triangle

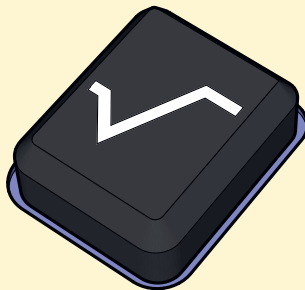
IMPROVE YOUR MATHS

Most smartphone calculators have a scientific calculator function. If you do not have a smartphone, borrow a scientific calculator, and try the following activity.

A small building is 2.5 m long and 1.5 m wide. Multiply 2.5 by 2.5 and write down the answer (this is called 'squaring' a number). Now multiply 1.5 by 1.5 and write down the answer. Add the two answers together.

Find the square root key on the scientific calculator. You might find it on an ordinary calculator; it will look something like this:

Enter the total of the two calculations and use the square root key. You should get the result 2.915. This is the measurement of the hypotenuse, the long side of a right-angled triangle, as shown in Figure 2.11 above.

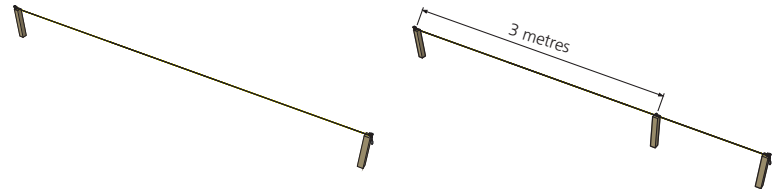


Setting out a building using the 3:4:5 method is straightforward if simple steps are followed. Study the following step-by-step guide to see how this works.

Features in the book

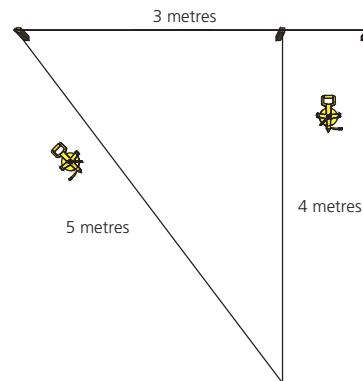
The City & Guilds Textbook: Level 1 Bricklaying

Step by step: Using the 3:4:5 method to set out a right angle

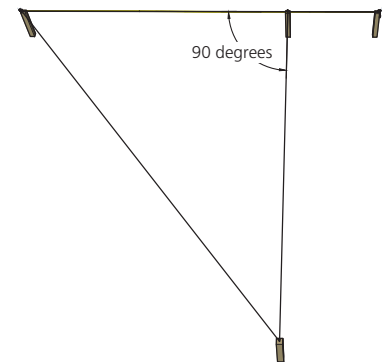


Step 1 Position two pegs to represent the front of a building. Drive nails into their tops and attach a string line.

Step 2 Measure 3 m along the string line from the first peg and position a third peg with a nail at the exact dimension directly under the line.



Step 3 Attach one tape measure (tape 1) to the nail on the first peg that was set up and attach the other tape measure (tape 2) to the nail on the third peg that was set up.



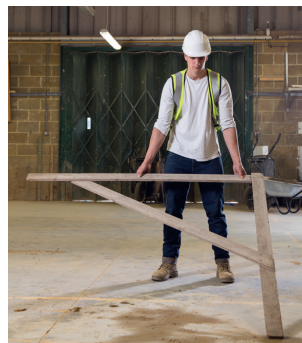
Step 4 Forming a triangle with the string line and the two tapes, read 4 m on tape 1 and 5 m on tape 2. Where these dimensions on the two tapes cross over each other, position a fourth peg, with a nail at the exact meeting point of the tapes.

INDUSTRY TIP

When setting out and positioning timber pegs, keep a carpenter's claw hammer in your tool kit. It will be easier to use than a club hammer to drive in nails. If you need to adjust the nail positions, you can use the claw hammer to pull out the nails to reposition them.

Builder's square

A builder's square can be used as a guide to set up two string lines at 90° angles to each other. You can make a builder's square on site using available timber, creating a right angle using the 3:4:5 method described in the step-by-step guide.



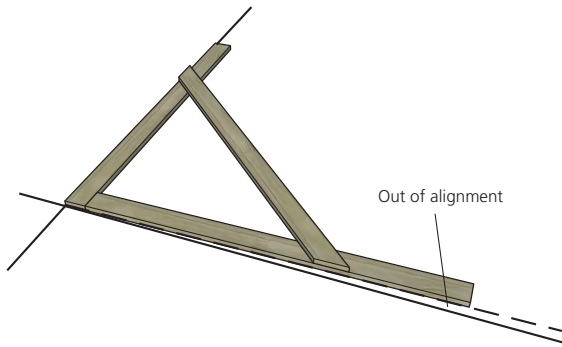
▲ Figure 2.12 Timber builder's square



▲ Figure 2.13 Metal folding builder's square

Alternatively, builder's squares are available that are manufactured from metal and foldable, which makes them more convenient to transport and store.

To produce accurate results when setting out walls at right angles using a builder's square, you must carefully align the string lines along the edges of the equipment. Slight inaccuracies in alignment will be magnified along the line of the walls, leading to construction of a building that is 'out of square'.



▲ Figure 2.14 Careful alignment of string lines with a builder's square is vital

Optical square

An optical square is a simple instrument which has either:

- two sighting views set at right angles to each other, or
- an optical device known as a prism, which allows the user to view two points at right angles to each other at the same time.

The instrument is mounted on a tripod when in use, to keep it steady and accurately positioned plumb over a corner reference point. An assistant is directed by the person sighting through the instrument to mark two positions at right angles to each other.

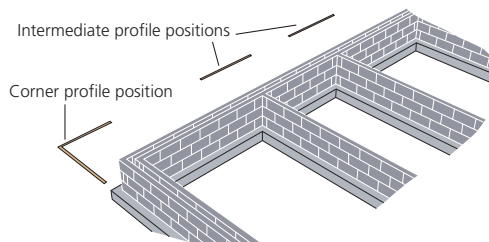
This instrument makes setting out right angles a simple and accurate process.



▲ Figure 2.15 Optical square

4.2 Positioning profiles

Timber profiles are positioned at the corners of the building to be constructed. Most buildings will have loadbearing internal partition walls, which require a foundation to be set out for them. This means profile boards must also be provided at suitable intermediate points corresponding to the floorplan of the structure.



▲ Figure 2.16 Intermediate profiles to set out internal walls

Features in the book

The City & Guilds Textbook: Level 1 Bricklaying

KEY TERMS

Frontage line: the front wall of a building

Building line: a boundary line set by the local authority beyond which the front of a building must not project

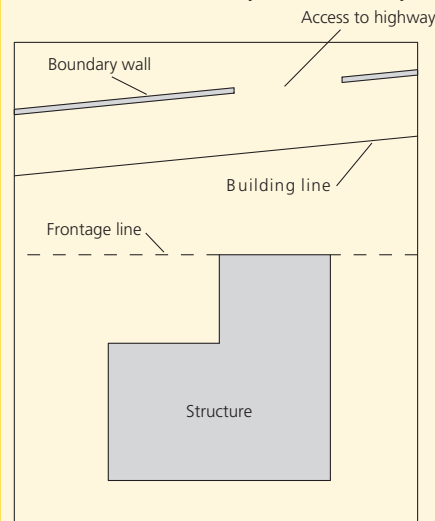
String lines are attached to the profiles to:

- guide the digging of trenches for the concrete foundation
- guide the bricklayer when positioning the walls of the building on the foundation concrete.

The front wall of the building (known as the **frontage line**) is set out first and must be located on or behind the **building line**. The side walls of the structure are set out at right angles to the frontage line, and the rear wall can then be set out parallel to the frontage line. These wall positions are established by positioning pegs at each corner.

INDUSTRY TIP

The frontage line is often confused with the building line. Keep in mind that the frontage line refers to the front wall of the building, which can be moved forwards or backwards. It could be positioned directly on, but never in front of, the building line. The building line cannot be moved – it is set by the local authority.



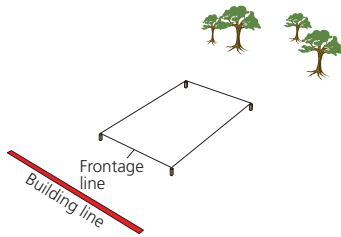
▲ Figure 2.17 Building line and frontage line

Profiles must be set out with care, to make sure that the finished building is positioned correctly on the site or building plot and that the outline and internal walls are located accurately.

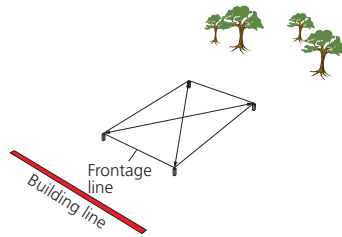
The first step is to confirm the position of the building line by checking the block plan and site plan. Then two pegs can be positioned along the frontage line, corresponding to the corner positions of the building. Remember, the frontage line must never project in front of the building line.

Study the step-by-step guide to see the remaining stages of setting out the profiles ready for work to continue.

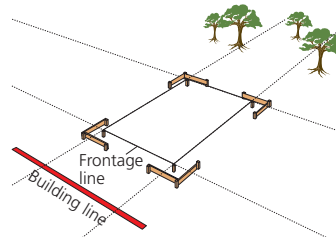
Step by step: Positioning profiles accurately



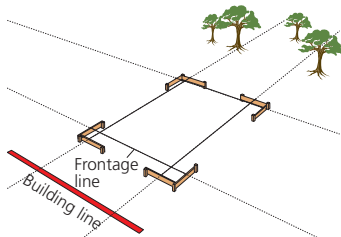
Step 1 Using one of the methods to create right angles previously discussed, set up pegs at the remaining two corners to create a rectangle.



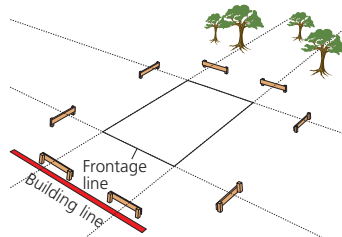
Step 2 Check the diagonal measurements are the same, to confirm the corners of the rectangle are 90° .



Step 3 Extend the lines of each side beyond the corner positions to set up corner profiles.



Step 4 Remove the corner pegs and attach lines to the wall positions on the profiles.



Step 4a Alternatively, if space is needed for a mechanical excavator to work, position profiles a short distance from the corner positions.

In step 2, checking that the diagonal measurements are the same gives confirmation that the corners are set at 90° angles. However, this will only be the case if the overall length and width dimensions of the rectangular (or square) building are accurate. Check these for accuracy first.

ACTIVITY

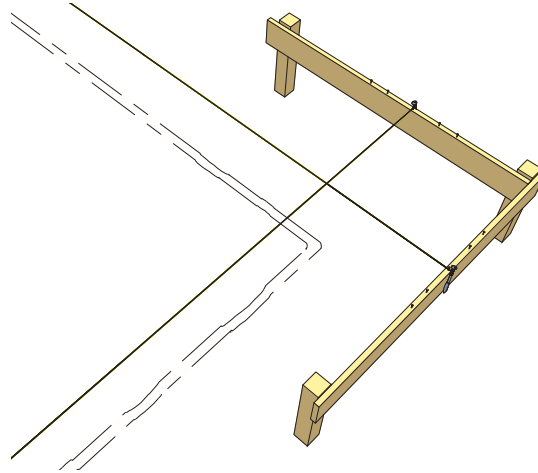
If the overall length and width dimensions of a structure are measured accurately, but the diagonal measurements are not the same, the outline of a building will become what is known as a parallelogram.

Search online for images of parallelograms and then draw one yourself to get the idea of what a building that is out of square might look like.

Features in the book

4.3 Excavation of the foundation trench

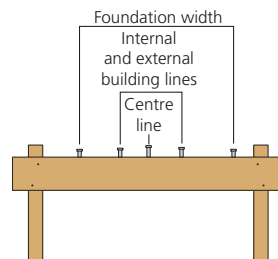
Once the ranging lines have been attached to the profiles, markings can be made to guide the excavation of the foundation trenches. Guide lines are marked directly below the ranging lines for all walls that are to be excavated.



▲ Figure 2.18 Ranging lines in position with guide lines marked in spray paint

INDUSTRY TIP

Lines for excavation are normally marked using spray paint. Traditionally, the marks were made using fine sand or white lime powder (which can be hazardous to health).



▲ Figure 2.19 Positions marked with nails on the top rail of a profile

A commonly used method is to mark the centre line of the wall position, so that the excavator operator can easily align the centre of the digging bucket when excavating the foundation trench.

The top of the profile rail may have several nails showing a range of positions, including the centre line.

When the excavation of the trenches is completed neatly and the bottom of the trench has been cleaned out, the concrete foundation can be poured and levelled.

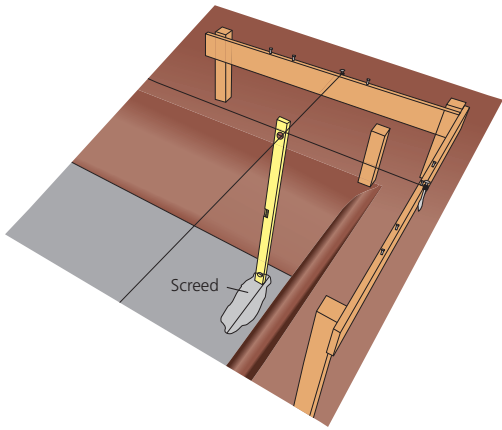
4.4 Establishing wall positions

When the foundation concrete has hardened, the bricklayer can set out wall positions ready to construct the **footing** masonry. This is done by reattaching the ranging lines to the profiles to show the face lines of the building. The bricklayer then plumbs down from these lines to mark the wall positions onto the foundation concrete.

The traditional method of marking the wall position on the foundation is to spread a thin layer of mortar (called a screed) on the surface of the concrete directly underneath the ranging lines. This can be marked with the tip of a trowel to follow the face line of the wall. Some bricklayers use a line of spray paint to provide a clean surface for marking with a permanent marker pen.

KEY TERM

Footing: the section of masonry from the concrete foundation to the ground-floor level; sometimes the whole foundation is referred to as 'footings'

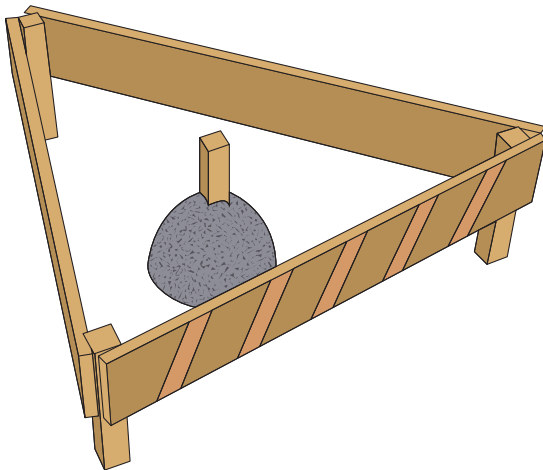


▲ Figure 2.20 Plumbing down from ranging lines to the foundation concrete

When the lines of wall positions at the corners of the building have been carefully marked on the foundation concrete, the bricklayer has a reference to build to which matches the string lines attached to the profiles. Be careful to lay the first bricks or blocks on the correct side of the marked lines. Develop the habit of continuously checking your work for accuracy.

4.5 Establishing the correct level of a building

To establish the correct level of a building, a reference point called a **datum** is set up on site. This is often referred to as a temporary bench mark (TBM). The TBM can take the form of a peg which is secured in concrete and protected from any disturbance that could be caused by vehicle or machinery movements or other construction activities.



▲ Figure 2.21 Datum point protected from disturbance

INDUSTRY TIP

Sometimes, the spirit level will not reach to the height of the ranging lines above the foundation concrete. When this is the case, use some adhesive tape to temporarily attach the spirit level to a longer straight edge to plumb down more easily.

KEY TERM

Datum: a reliable fixed point or height from which reference levels can be taken

ACTIVITY

If a TBM is a *temporary* reference point, where can you find a *permanent* reference point? Research 'Ordnance Survey bench marks' in the UK and write down what they are.

Additional activities encourage learners to actively build up skills and knowledge.

Features in the book

The City & Guilds Textbook: Level 1 Bricklaying

It is important that the datum is not disturbed, since all levels for buildings are transferred from it. Sometimes a fixed point, such as a marked point on a roadside kerb-stone or an inspection chamber cover in a road near to the site, may be used as a datum.

Usually, a level is transferred from the datum to the location of the building being constructed to establish the finished floor level (FFL) as the first reference point to build to. This usually corresponds to the damp proof course (DPC) level. Chapters 1 and 5 give more detail on these elements of the building.

4.6 Levelling equipment

A range of equipment can be used to transfer levels. Some equipment is quite basic, while other tools are technically advanced. Whichever type of equipment is used, care is needed to avoid errors and discrepancies in establishing levels.

Spirit level and straight edge

A traditional method of transferring levels makes use of relatively simple equipment; a spirit level and straight edge can be used together to transfer levels from one point to another.

INDUSTRY TIP

Straight edges manufactured from a lightweight metal such as aluminium are much more stable than timber straight edges. Timber is affected by changes in temperature and moisture levels, so a timber straight edge must be checked frequently to make sure it is not changing shape.



▲ Figure 2.22 Spirit level



▲ Figure 2.23 Straight edge

When transferring levels over distance on site, this method requires care and can be time consuming. Levelling over a long distance requires a series of pegs, spaced at a measurement that is slightly shorter than the length of the straight edge being used. The method is best suited to transferring levels over shorter distances.

When using a spirit level and straight edge together, it is important to 'reverse' them end to end between levelling pegs. This will largely cancel out any small inaccuracies in the spirit level or distortions in the straight edge. This is especially important if the straight edge is made from timber, which can warp or twist over time. Study the step-by-step guide to see how this is done.

Test your knowledge

End of chapter questions help learners to cement knowledge.

- 1 Which type of drawing shows the proposed development in relation to the site boundary?
 - a Block plan
 - b Detail drawing
 - c Site plan
 - d Section drawing
- 2 Which complete section of a building is called the substructure?
 - a Below ground-floor level
 - b Below first-floor level
 - c Above foundation level
 - d Above ground-floor level
- 3 What are the temporary timber guides called that are used for setting out a building?
 - a Positions
 - b Profiles
 - c Pointers
 - d Patterns
- 4 Which letters are used to indicate a central datum point on site?
 - a TBN
 - b TMB
 - c TBM
 - d TNB
- 5 Which angle is set out using an optical square?
 - a 30°
 - b 45°
 - c 60°
 - d 90°
- 6 To which scale is a detail drawing produced?
 - a 1:5 or 1:10
 - b 1:50 or 1:100
 - c 1:100 or 1:200
 - d 1:1250 or 1:2500
- 7 What is the boundary line set by the local authority beyond which a building must not project when setting out?
 - a Frontage line
 - b Ranging line
 - c Building line
 - d Guide line



Bricklaying

LEVEL 1 DIPLOMA (6705)

I Mike Jones

Lay the foundation for a career as a bricklayer. Published in association with City & Guilds and suitable for the 6705 Diploma, as well as other Level 1 Bricklaying qualifications, this highly illustrated and accessible book covers the principles of construction, setting out, block walls, brick walls, cavity walls and health and safety.

- Study with confidence, using the most up-to-date information available and industry standards
- Enhance understanding of tools and concepts in bricklaying with clear and accurate technical drawings and step-by-step photo sequences
- Test knowledge with practice questions and activities
- Develop core skills with expert author Mike Jones, who draws on his extensive teaching and industry experience

**SAMPLE
MATERIAL**



Boost

This title is also available
as an **eBook** with **learning
support**.

Visit hoddereducation.co.uk/boost
to find out more.

HODDER EDUCATION

t: 01235 827827

e: education@hachette.co.uk

w: hoddereducation.co.uk