This chapter discusses the skills and knowledge required to carry out basic bricklaying tasks. Mastering the task of assembling bricks and mortar to produce a wall or other structure requires patience and practice. Persevere in developing your skills and knowledge and you will have an ability that will provide you with great job satisfaction as well as a good living. Become an expert in your trade and you will gain the respect of those who value a good job.

By reading this chapter you will know how to:

1. Prepare for bricklaying activities in accordance with work specifications.
2. Build brick walling, returns and junctions in half-brick Stretcher bond.
3. Use bricks to build walling.
With most activities in life, the key to success is preparation. Laying bricks is no different: success depends on good preparation. That’s why becoming a good bricklayer depends on more than learning just the trade skills. You also need to develop skills in planning and organising as well as learning to work efficiently with others.

Most importantly, good preparation means getting the right mind-set about health and safety. There are materials used in construction that must be treated with care. Make it a habit to consult the relevant Control of Substances Hazardous to Health (COSHH) statements. This is a protection to you and those around you.

Building sites and construction workshops can be dangerous places with many potential hazards. Chapter 1 provides lots of important detail about the many laws and regulations.

When preparing for your brickwork tasks in the workshop or the workplace, the first step is to get familiar with exactly what it is that you are building. To ensure you know all the relevant details of the job, you will need to refer to a working drawing and a specification. (For more on drawings including scale, hatchings and symbols, refer back to pages 47–48.)

The drawing and specification will tell you what types of materials are to be used and may tell you something about the methods of work to be used. They will also help you to select the right tools and equipment for the task in hand.

**TOOLS**

Let’s look at the range of tools needed for basic bricklaying. You will recognise some of these from Chapter 3. We can split the tools into three main groups. Tools for:

- **Laying and finishing.** To build any wall you will need a trowel to lay the bricks, a pointing trowel and a jointer to provide a finish to the joints.
- **Checking.** A spirit level is needed to make sure the work is level and plumb, a set of line and pins to align the bricks accurately and a tape measure to set out and check dimensions.

- **Cutting.** To cut the bricks you will need a club (or lump) hammer and a brick bolster. There are additional tools to cut bricks for different purposes such as a brick hammer and a **scutch hammer** (sometimes called a comb hammer).

  - **Scutch hammer**
    
    A bricklayer’s hammer with interchangeable finishing heads for trimming and tidying bricks and blocks.

The correct way to use all of these tools will be discussed later.
MATERIALS

BRICKS

Bricks are manufactured in a vast range of colours and textures. They also vary in hardness or compressive strength and resistance to moisture penetration according to the materials used in manufacture. Choosing the right brick for a particular location or type of structure is therefore very important. The architect and his or her design team are responsible for specifying the right brick.

It’s good to develop the habit of checking that the bricks and other materials you intend to use are actually the ones specified. If you find that the materials are the wrong type, size or colour, never just ‘carry on regardless’. Always check the specification with your supervisor or line manager and talk to them about any problems.

It’s also good to develop the habit of thinking ahead about protecting the bricks and other materials. Having polythene sheeting or other protection to hand is good practice at the preparation stage. The materials should be protected from adverse weather at all times. Bricks are difficult to lay accurately and neatly when wet.

**ACTIVITY**

Check out some websites of brick manufacturers. They will usually have a section on the materials they use for manufacture and their sustainability. List the names of the manufacturers you’ve found and what materials they use.

**INDUSTRY TIP**

When you start work on a new site, you should have an ‘induction’ talk from a supervisor. Remember who it is you need to talk to about problems or difficulties.

**ACTIVITY**

Write down why you think bricks would be difficult to lay if they’re wet. What would happen to the mortar joints?

**ACTIVITY**

Think about the other trade activities that are carried out on a building site (by carpenters, electricians, scaffolders etc). Make a list of possible damage that you think they could cause to newly completed brickwork.

**Efflorescence**

A white deposit which may form on the surface of new bricks if the latter contain a high proportion of mineral salts.
Once work is completed, it will still need to be protected from adverse weather and other construction operations.

Everyone in the workplace must contribute to safety and efficiency by:

- taking care to minimise damage to work
- keeping the work area clean and tidy
- disposing of waste properly.

Waste is often segregated to support recycling and contribute to sustainability.

Since bricks can be a heavy building material, it is very important to give careful consideration to health and safety matters when moving them. Always use proper handling techniques and wear suitable PPE. A basic set of PPE items for a bricklayer handling materials would include: safety boots, safety glasses or goggles and gloves. Chapter 1, pages 20–23, covers these points in more detail but, when preparing and placing materials prior to building brickwork, remember that bricks are heavy and often sharp.
Cutting bricks

Sharp edges are also produced when we need to cut bricks. We may need to cut bricks for a number of reasons which we will discuss later. For now, let’s look at the tools needed and the methods we should use to cut bricks by hand (cutting by machine is often preferred on site but requires extensive training in safe practices).

Cutting bricks is an operation that can only be mastered with experience, so be prepared to have disappointments at first! The main cutting tools have been listed previously. The primary tools are a club (or lump) hammer and a brick bolster. Another useful tool not mentioned above, which aids in producing accurate and consistent cuts, is a brick gauge. This is made from timber and can be easily made on site. The different parts of the cutting gauge allow you to easily and accurately mark the measurements for a half-bat, three-quarter bat and a Queen Closer.

Whether we use a brick gauge or a tape measure and pencil to mark the brick, always aim for accuracy. This will make producing a quality piece of brickwork a much easier task.

Many bricks have good compressive strength but are brittle and shatter easily. To improve the chances of success in cutting, therefore, it’s good practice to place the brick to be cut on a small mound of sand which will act as a cushion. Alternatives such as sacking or old carpet could also be used. Make sure the whole surface area of whichever face is on the cushion is supported. Let’s look at the process.
The aim is to produce clean sharp edges especially on the face side of the cut brick. This will ensure a good appearance in the finished wall. If there are rough projections or edges, then a scutch hammer can be used to trim the cut brick and to make precise adjustments. The other cutting tool mentioned in our previous list is a brick hammer. This can also be used for trimming bricks but it is less precise and is usually used to quickly produce rougher cuts where appearance is not so important.

High standards in selecting, moving, cutting or laying bricks depends on skill, care and attention and the use of the correct tools and techniques. This is no less true with the other important material used by the bricklayer: mortar.

MORTAR

Whilst it is usually the case that mortar is mixed and brought to the bricklayer by semi-skilled operatives, it is the bricklayer’s responsibility to make sure that the material is fit for purpose and is used in accordance with the specification.

Mortar is the material we use to **bed** and **joint** the bricks together. It is mainly composed of **well graded** sand (either ‘pit sand’ or ‘sea-dredged sand’) and Ordinary Portland Cement (often referred to as OPC) mixed to a specified ratio. There are other types of cement which you will learn about later in your studies. Mixing these two component materials together with water will produce a mix that is difficult to use, so a plasticiser is added to improve workability. This usually comes in the form of a chemical additive that traps tiny bubbles of air in the mix, which allows the grains of sand to move over each other more freely.

Traditionally, hydrated lime in powder form was added as a plasticiser. As there are some safety hazards to consider in using

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**STEP 4** Now do the same on the opposite side of the brick.

**STEP 5** Turn the brick so that the face is uppermost again and strike the last blow. If the strength of the blow is adjusted correctly, this should complete the operation (remember – experience counts).

**STEP 6** If the brick doesn’t break as desired, repeat from Step 3 until a clean break is achieved.

---

**INDUSTRY TIP**

Since different types of brick can vary in hardness, it’s sometimes better to make the final cutting stroke on the bed of the brick. With experience you will learn the best approach.

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**ACTIVITY**

What items of PPE do you think you might need to use when cutting bricks? Make a list, starting with ‘Safety glasses or goggles’.
lime and it is not used so often since the introduction of safer, easier to use chemical additives.

On site, mortar can be mixed as required in a drum mixer. A more modern approach is to use a dry silo mixer. Both these methods minimise waste since they produce mortar as it is needed. The silo mixer has the advantage of producing mortar of dependable quality and consistency which is particularly important if coloured mortar is specified. An alternative is to have mortar delivered to site in a ready-mixed form. This method of production requires a chemical additive to slow down the setting time so that the material remains workable throughout a working day.

There will still be occasions when there will be a need to mix mortar by hand for smaller jobs. For example, a small garden wall may be difficult to access with machinery such as a mixer, so mixing by hand will be the only option. Whatever method is used to mix mortar, always keep in mind the hazards associated with the materials used. These are covered in more detail in Chapter 1, but when preparing...
and placing mixing materials prior to building brickwork, remember that cement and lime powders can irritate your skin and aggregates are heavy to move especially when wet.

**QUANTITIES**

This section on preparation for bricklaying tasks would not be complete without considering the subject of quantities. Many construction workers shy away from carrying out calculations of quantities, perhaps thinking that it’s too complex for them to deal with. Whether we work in the workshop or out on site, being able to calculate the amount of materials for the job is very important.

Think about it: if we can’t calculate the correct amount of materials for a task, we might run out of materials before we finish it. On site, losing time means losing money. At the end of a working week, we will need to know how much money we have earned. If we can’t calculate the quantity of work completed, we won’t know how much we should be paid. To see how simple it can be to work things out, look at the examples below. The examples focus on two aspects of calculating quantities: area and linear measurements.

When you are calculating quantities, the area of a wall is the size of its surface, so when you look at the face of a brick wall you are looking at the area you need to calculate. For more general information on area, refer to Chapter 2, page 62.

Although measurements on a working drawing are normally stated in millimetres, we calculate the surface area in square metres. Each square metre contains 60 bricks so by multiplying the number of square metres by 60, we can work out the number of bricks we need for a wall. Always add an amount to cover wastage (eg 5%).

If our wall dimensions are in whole metres the job is very easy – we can just count up the square metre ‘boxes’.

<table>
<thead>
<tr>
<th>1 sq. m</th>
<th>1 sq. m</th>
<th>1 sq. m</th>
<th>1 sq. m</th>
<th>1 sq. m</th>
</tr>
</thead>
<tbody>
<tr>
<td>2m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 sq. m</td>
<td>1 sq. m</td>
<td>1 sq. m</td>
<td>1 sq. m</td>
<td>1 sq. m</td>
</tr>
<tr>
<td>5m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This example has an area of 10m².

**ACTIVITY**

Research the health effects of irritation from cement and lime dust. Find out what diseases can be caused.

[Image of a quantity surveyor at work]
However, it’s rarely the case that we build walls like this, so we need to remember the simple formula to work out areas for walls that are not whole metres from Chapter 2: \( \text{Area} = \text{length multiplied by height} \). Using a calculator makes it very easy to work things out.

**Example 1**

Using our formula we simply multiply the length (4.75m) by the height (1.8m) to produce our area in \( \text{m}^2 \) (or square metres). So our calculation to work out the area of our wall would look like this:

\[
4.75 \times 1.8 = 8.55 \text{m}^2
\]

The total wall area is 8.55\( \text{m}^2 \).

**Example 2**

Adding these together produces the overall linear measurement:

\[
2100 + 900 + 1950 = 4950\text{mm}
\]

The overall linear measurement is 4950mm.
Notice these dimensions are written as millimetres. This is usual practice in construction working drawings. To convert millimetres to metres we simply move the decimal point three places to the left.

**Example 3**

With 4950mm the decimal point is here: 4950.

Move it three places to the left and it ends up here: 4.950, which now reads as 4 metres and 950 millimetres.

Calculating quantities for mortar is more difficult, but there are many free calculating tools online that are specifically designed for the purpose and are easy to use.

Preparation of resources is all about thinking ahead and planning carefully. If you make good preparation a habit, your work will be more enjoyable and productive and you will be able to build brickwork to high standards that will be valued by employers and customers throughout your career.

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**SET OUT TO BUILD BRICK WALLING TO GIVEN INSTRUCTIONS**

After preparing our tools, checking our materials, and having calculated our quantities, we can arrange our work area and set up our work task. Once again careful preparation is important to success. The main consideration from the outset is to set up our work area safely. The safety and welfare of construction personnel and members of the public who may be affected by construction operations is protected by many laws and regulations. They are detailed in Chapter 1. Review them frequently.

Remember that, as an individual in the workshop or on site, you are responsible for your own health, safety and welfare and for that of the people including those around you. There are serious consequences for being **negligent**.

Moving heavy materials like bricks is best done by mechanical means if possible. On site, it’s likely that a forklift will be the main piece of machinery used for moving heavy materials. The driver of the forklift is trained to work in a safe manner. Cooperate with his or her instructions when setting up the work area. If bricks have to be moved by hand, use **kinetic lifting** techniques, see pages 18–19 of Chapter 1.
Bricks are usually delivered to site in packs of several hundreds. The number in each pack will vary depending on the weight of the brick – heavier bricks will have fewer in the pack. The packs are ‘banded’ together using steel or heavy-duty nylon bands to prevent the bricks spilling out. Removing these bands needs to be done with care. Use a proper cutting tool such as metal snips, and wear the correct PPE. Gloves, safety goggles and safety boots should be worn whilst opening packs of bricks. *Never leave the bands lying around* – they will be a dangerous trip hazard.

**INDUSTRY TIP**
Get to know the forklift driver. Since it’s likely he/she will be moving most of your heavy materials for you, it’s a good idea to build a positive relationship.

**ACTIVITY**
Write a simple risk assessment detailing the potential hazards associated with moving and handling bricks on site. Include moving materials by machine and by hand. You will need to list the risks, who could be affected and what you can do to minimise the risks you have identified.
Once the materials are near the work area, they will need to be arranged so that the bricklayer can work efficiently. It’s often the case that bricklayers work in teams of two bricklayers and a general operative (often referred to as a ‘2 and 1 gang’). During the early stages of setting up the job, it’s a good idea if the loading out is shared by the whole team, in order to get the actual bricklaying started as soon as possible. The bricks should be arranged in neat stacks.

Some tradespersons set out stacks with 12 bricks to each layer in the stack. Whatever pattern is preferred, the stacks should be as stable as possible, so it may be necessary to spend some time levelling the area when stacking at ground level. Stacking out on scaffolding is simpler since the deck of the scaffold is level and even. However, preparing the work area and the actual process of building requires greater care and awareness when working at height. There may be personnel working in the area below the scaffold who could be severely injured if materials were to fall on them from above. Wherever the stacking takes place, at ground level or on scaffold, never stack too high!

An important point to keep in mind when stacking out is to make sure that the bricks are mixed or **blended**. This is because the colour of bricks can vary from batch to batch, due to variations in the manufacturing conditions and the materials used. Mixing bricks by selecting them from a minimum of three packs whilst loading out will help to avoid bands of colour showing in the completed work.

An operative levelling ground prior to stacking bricks

Blended
Having gone through a process that disperses variations in colour and size of bricks to avoid unwanted patterns emerging

**ACTIVITY**

When you travel around, see if you can spot some examples of **banding** in brickwork in your area. If you have one, use your mobile phone to take a photograph and show your tutor and fellow students.

Banding
Whole sections of brickwork that differ in colour and stand out from the main body of work

Operatives working with stacks of bricks on a level scaffold

So that the bricklayer can work efficiently, the stacks of bricks should be positioned about 600mm from the face line of the wall to be built.
This allows enough space to work and move without the bricklayer having to stretch too far to pick up a brick. Think about it – if a bricklayer has to take two steps to reach a stack of bricks for every brick laid, and he or she lays 500 bricks in a day, how much time and energy has been wasted? A lot!

The same principle applies to positioning the mortar. The mortar mix is placed on a **spot board**, which is raised up from ground level by supporting it on blocks. Along the line of the wall there should be alternate stacks of bricks and spot boards to allow continuous laying along the full length of the wall with the same pattern of materials continuing around corners.

Once the materials are safely moved to the work area and positioned for efficient working, we can begin the job of setting out the wall ready for building.

### SETTING OUT

Bricks are manufactured to dimensions and tolerances decided by official institutes. In the UK, the British Standards Institute (see Chapter 2, page 47) has in the past been the agency that produced official standards and gave numbers to components so that the details about them could be easily checked. Now the European Union has more control and the numbers have changed. For example, clay bricks used to have the number BS 3921. This has now changed to BS EN 771–1.

Look at the illustration of a brick. It shows the names of the various parts of a brick and its dimensions. **In time you should know these off by heart.**

Due to variations in the quality of materials and the manufacturing processes, bricks can vary slightly in overall size. By varying the size of the mortar joint between bricks, we can accommodate these differences, but the size of the joint should not vary by more than 3mm. This means that the maximum joint size should be 13mm and...
the minimum joint size should be 7mm. You will learn more about these and BS testing at Level 2.

It’s good practice to set out a wall dry before laying the bricks in mortar, especially if the wall has to be built to specific linear dimensions. (Note: Setting out wall dimensions is different to setting out a building. Setting out a complete building is done before excavation of the foundation trenches can take place.) Setting out the first course dry means we can check whether the joint sizes will be suitable and either tighten or open up the perp joints so that the wall will fit within the specified dimensions. This is often referred to as setting out the bond.

Dry
Spacing bricks without mortar to sort out potential problems with the bond

Perp joints
Small vertical joints which join two bricks together

Dimensions and parts of a brick

Stretcher Face
The long face of a brick when laid

Frog
The indentation of a brick

Arris
Any straight sharp edge of a brick formed by the junction of two faces

Header Face
The end face of a brick

Setting out dry: notice there is no mortar between the bricks
TYPES OF BOND

HALF-BOND

The most common bond is Stretcher bond. The name refers to the long face of the brick, which is called the ‘stretcher’ face, see the illustration on the previous page. In Stretcher bond the bricks are arranged with an overlap the width of a brick (102.5mm). This means that the perp joints are exactly halfway along the face of the stretchers in the course below, so Stretcher bond is often called half-bond. Since the width of the wall is almost the same as half a brick, we refer to Stretcher bond as half-brick walling.

A good building design will be arranged so that the overall dimensions work to full brick sizes. But this is not always possible and, if varying the joint sizes doesn’t make things fit, the bricklayer will have to use other methods. One method is to ‘reverse’ the bond. This means that rather than the wall having matching headers (or stretchers) at either end, the bonding arrangement is reversed so that there will be a header at one end and a stretcher at the other end.

If this doesn’t produce a wall with uniform joints within the overall measurements, then the only choice is to cut the bricks to suitable dimensions. Placing cut bricks within a course of brickwork is called broken bond. The smallest cut allowed is known as a half-bat and measures 102.5mm, the same as the header face of a full brick.

Cut bricks in broken bond should be placed as near to the centre of the wall as possible. If there are doors or windows in the wall, the broken bond can be placed underneath one of them. When a half-bat is built into a course of brickwork, the course above and below it will contain two three-quarter cuts (or bats) to maintain the bond.

If the decision is to cut the bricks to establish proper bonding, then we need to use the methods and tools already discussed in the previous section.

Since it is important to maintain accuracy in building our wall, we need to ensure that the first course that we lay is level and...
accurately aligned, as required by the working drawing. The next section will discuss in detail the methods and sequence we use to achieve this.

QUARTER BOND

Whilst Stretcher bond can be termed half-bond, there are other bonds which can be termed Quarter bond. The most common of these are Flemish bond and English bond. These are used where a thicker wall is needed for greater strength. Using these bonds results in a wall that has a width equal to the length of the stretcher face of a brick (215mm) and are therefore referred to as ‘one-brick’ walling.

BONDING ARRANGEMENTS

The bonding arrangement in Stretcher bond is quite straightforward, but a bricklayer needs to understand how all of these different kinds of bond are laid out, in order to set out walls effectively. An old saying states ‘Bricklayer can't bond – Bricklayer can't build’, so we need to examine bonding in more detail. We'll concentrate on one-brick walling or Quarter bond for a moment.

Take note of the width of a brick: 102.5mm. Why bother with 0.5 (half) of a millimetre? It’s important because bricks are designed to be assembled together in modular patterns.

In a modular arrangement, two header faces with a 10mm joint between them will add up exactly to the length of the stretcher face of a brick (102.5 + 10 + 102.5 = 215m). This is useful when we want to create the first course of the end of a wall in one-brick walling.

However, when we want to set out a corner, we will find it difficult to achieve the correct bonding arrangement without adding a specially cut component to maintain Quarter bond. This component is called a...
Queen Closer. Take some time to study the illustrations of English bond and Flemish bond (covered later in this chapter) and note where the Queen Closer is placed in each course.

IndustriY Tip
Older bricklayers will often refer to one-brick walling as ‘9-inch work’. This goes back to the time when imperial measurements were used before metric measurements were introduced. For more information on measurements see Chapter 2, page 57.

HEIGHT OF WORK
Of course, limits must be applied to the height of any brick wall during the construction process since the mortar must be given time to set to its working strength. Masonry is relatively fragile until the mortar is completely set and the wall is integrated into a building or complete structure. A wall built from heavy components, like bricks laid in a soft material like mortar, can be vulnerable to strong winds blowing into the face. For this reason care must be exercised by the bricklayer not to build too high in one working day.

The optimum height to which a wall can be built in one work period will be determined by the type of brick, the consistency of the mortar, and the weather conditions, both at the time of building and expected in the near future. As a rule of thumb, be cautious about building unsupported brickwork higher than 12 courses at one time (especially for half-brick walling). Whilst it’s possible to build higher than this, the specification for a particular job may actually direct the bricklayer to build to fewer than 12 courses at one time, sometimes as few as six courses. If in doubt, ask your supervisor or line manager.
Carefully setting out the work area and the brickwork task prior to actually commencing laying bricks achieves a number of things:

- supports safe practice both in the workshop and on site
- increases efficiency and productivity
- highlights potential problems and difficulties before they become expensive to rectify
- assists in producing good-quality work.

**BUILD STRAIGHT BRICK WALLING AND RETURN CORNERS IN HALF-BRICK STRETCHER BOND TO THE GIVEN INSTRUCTIONS**

We now come to the actual laying of bricks to produce a wall or structure that conforms to a working drawing and a specification. Having taken care in preparation, we need to extend this standard of care into our bricklaying activity. Skilled bricklayers with years of experience behind them are a pleasure to watch as they carefully produce a high-quality piece of work.

Experience is obviously not something that can be gained overnight, so be patient. Practice, perseverance and developing the habit of scrutinising your own work is the only way to become more proficient and skilled. The techniques required to manage and manipulate the materials used in bricklaying will be repeated over and over throughout your career. Let’s examine them.
ROLLING MORTAR

Rolling mortar on the spot board is the traditional way of preparing the material to lay a bed joint. A portion of mortar is cut from the heap on the board and, with the **blade** of the trowel held vertically, a roll is formed by a back-and-forth horizontal movement across the board. Keep in mind that the rolling action takes a great deal of practice to master. Eventually a suitable roll can be formed which can be placed on the wall with a swift action that controls the flow of mortar into the desired position.

Once the mortar is in position it can be distributed as necessary along the length of the wall by a spreading action with the back and tip of the trowel blade. With practice the thickness of the mortar can be accurately judged so that, when a brick is placed, it will not need to be hammered into position and there will be no excessive mortar squeezed from the joint.

The following step by steps show spreading a bed joint.

**STEP 1** Place the brick in the wall.

**STEP 2** Remove the excess mortar from the joint.
Remember, this is a real skill that requires much practice and repetition. Surplus mortar squeezed from the bed joint must be removed with care. The final appearance of the work can be spoiled if mortar is smudged over the face of the wall and not cut off carefully.

**PERP JOINTS**

Forming a perp or cross joint is also something that requires continuous practice. With the brick held almost vertically in one hand and the trowel in the other, a suitable amount of mortar is picked up and spread on the header face of the brick. There are a number of techniques to achieve this, but it should always be remembered that the practice of ‘wiping’ a small amount of mortar on the front and back edges of the header face will not produce a weatherproof joint. Good standards of workmanship demand that perp joints and bed joints should be full.

The following series of steps show one method of forming a full perp joint.

**STEP 1** Apply a small amount of mortar to the header face of the brick.

**STEP 2** Use the trowel to make a smooth joint.

**STEP 3** Apply mortar to the next brick.

**STEP 4** Insert and remove mortar from the header face.

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**ACTIVITY**

If your house or your friend’s house is built of brick, do you notice mortar smudged on the face of the wall? Look around for examples of ‘clean’ walls and note how much better they appear.
GETTING STARTED

Building brickwork in the workshop is obviously different from producing a piece of work on site. The workshop is an indoor environment and therefore has none of the weather considerations that working outdoors brings with it.

In addition, in the training workshop we build on a reasonably level surface – the floor. On a building site, however, it’s probably true to say that we will never find a perfectly level surface to build on.

On site the bricklayer is often called upon to build on uneven concrete foundations. This calls for particular skills to build his or her work up to specified levels above ground level. In Chapter 2 you will learn how the bricklayer uses datum points and bench marks to achieve this, see page 47.

For now we’ll concentrate on dealing with how to build straight walling and corners in half-brick or Stretcher bond in the training workshop. We will assume that our wall is designed to whole brick dimensions, so there will be no need to reverse the bond or to cut bricks to produce broken bond, as described in the previous section.

ACTIVITY

Make a list of different weather conditions (rain, snow, sun, etc) and write down how you think they could affect a bricklayer’s work.

1 Mark the two end points of the wall in accordance with instructions. The marks could be in chalk or a thin spread of mortar marked with a line made with the point of the trowel to indicate the required dimension. (Note: You may decide to set out the first course dry to ensure uniform joint sizes will be achieved, as already discussed.)

STEP 3 Angle the brick to smooth each side of the joint.

STEP 4 Make sure that the joint is full.
2 Lay a brick on a mortar bed at both ends of the wall to correspond with the marks. Try to line them up with each other by eye for now. The beds should be 10mm, but may need to be adjusted as we’ll see in a moment.

3 Since the wall is likely to be longer than the length of a spirit level, we will need to use a straight edge to ‘transfer’ a level reference from one end of the wall to the other. Our spirit level is placed on top of the straight edge so that we can now level over a greater distance.

4 We will now probably need to make adjustments to one of the bedded bricks. Checking the spirit level will tell us whether we need to raise or lower one brick to make it level with the other. We could also place our straight edge against the face of the bricks to line them up more accurately with each other.

5 When we are satisfied that the laid bricks are level with each other, we can attach a string line (line and pins) to the top face arris at each end. We now have an accurate level reference to lay the rest of the first course to.

The following step by steps show the key points in the method for laying out a level first course.

**STEP 1** Mark the two ends of the wall.

**STEP 2** Lay a brick on a mortar bed at both ends.

**STEP 3** Use a straight edge to check the bricks are level.

**STEP 4** Use the spirit level to confirm a level wall.

**STEP 5** Attach using a string and line.
Attaching a line to the two isolated bricks can pose problems. A string line needs to be as tight as possible. We don’t want it to sag in the middle since our course of brickwork would follow the sag and would look unacceptable. However, if we pull the line too tight, it could dislodge our carefully positioned bricks. Getting the tension right is something that comes with experience. A little later, we will look at attaching our line and pins to the brickwork we build at each end of a wall.

Here is one method of attaching the string line to our two isolated bricks:

Another method is to use temporary ‘profiles’ such as a concrete block placed on end to which we attach our line. Because the block is heavier than a brick, we can pull the attached line much tighter. Some bricklayers refer to a temporary brick or block used in this way as a ‘dead man’.

If our design of wall is simply a straight run of bricks without corners, our next step is to build a rack either end. _Racking back_ is the term used to describe the process of stepping each course laid at the ends of a wall to produce a plumb reference point that guides accurate laying of the rest of the wall. Since the wall doesn’t return around a corner but has a straight end, we will need to introduce a half-bat in alternate courses to maintain Stretcher bond (or half-bond).
The thickness of each bed joint in the rack is kept uniform and accurate to make sure that the final height of the wall is kept to specification. This is known as keeping to gauge and requires frequent checking with a tape measure. Sometimes it will be easier to use a gauge rod. This is a timber rod with shallow gauge markings made on it with a saw. On site it has the advantage of including markings to show heights of specified levels such as window sills.

Let’s say that you are laying the first course of your rack four bricks long. Having laid and prepared your bed of mortar, you might at first lay one brick at a time and level it before laying the next brick. This is fine to begin with, but over time you will develop the confidence to lay all four of the bricks (or however many are in that course) and level them in one operation.

As you improve your skills, building a rack is faster and more accurate if you follow a simple sequence:

- gauge
- level
- plumb
- line.

**ACTIVITY**

If the gauge measurement for one course of brickwork is 75mm, work out what the gauge measurement will be for

1. 9 courses
2. 15 courses

Answers: 1) 675mm, 2) 1125mm.
Note: Checking the *gauge* measurement can be done when the first brick is laid and levelled at the corner point, or when the whole course is completed and levelled.

So, first *level* the four bricks we have laid, then *plumb* each end of the course, and finally *line* in the face of the four bricks between the points you have just plumbed.

These three procedures are accomplished with the spirit level in hand, which speeds up production. Once we have accurately built our brick racks at each end of our wall we are ready to fill in the masonry between them. We need to use our line and pins again but now we add another simple but effective tool to our toolkit — a corner block.

**CORNER BLOCKS**

Corner blocks are made of plastic or wood and use the tension of the string line stretched from end to end to keep them in position. They are easy to make from timber available on site. They make it quick and easy to adjust the string line up the wall for each course of brickwork to be laid.

**INDUSTRY TIP**

A gauge rod is sometimes referred to on site as a storey rod.

**OUR HOUSE**

Look online at a building tool supplier website (start with Buck & Hickman.) Check out the types of corner blocks that they sell. Look at the corner blocks in ‘Our House’ too, as an additional guide to how the blocks should appear.
Having considered how we set out and build a straight wall, let’s look at how we set out a wall that has corners specified for the design. In brickwork, a corner has an unusual name: a quoin. A corner or quoin, is usually set out as a right-angle; in other words it is set out at 90°. (There are quoins set out to other angles that you will learn about as you progress to higher levels.) In Chapter 3 you will find more details about setting out squares and rectangles using a number of methods.

In the training workshop we are most likely to use a steel square to set out our brickwork. Care and accuracy are once again the main requirements. Having set out and laid our first course as already described, we place one leg of the steel square against the face of the first course to create an accurate angle for our return to follow. After we have laid our return bricks we need to ensure that they are level. Always level from the corner point to the end of the course you are laying.

This applies to each course we lay as we build our quoin to the intended height. Laying and levelling from the corner point maintains accuracy. If we keep in mind the sequence already mentioned for building a brick rack, we can speed up our work rate and add to our efficiency. Remember:

- gauge
- level
- plumb
- line.

Let’s review some techniques that help us maintain quality and standards.

**BRICKLAYING TECHNIQUES**

**LEVELLING**

Keep in mind that the spirit level is a precision instrument. *Never strike the spirit level to align bricks horizontally.*

Place the spirit level on the top of the course of bricks to be levelled, and gently tap the bricks, *not* the level as shown in the illustration.

If we need to make excessive adjustments, it could be that we will need to remove bricks in that course and adjust the thickness of the bed joint. Think of the quoin (or corner) brick as a ‘control point’ to which we refer for the rest of each course.
PLUMBING

When only one course is laid, it is virtually impossible to plumb it accurately. Start careful plumbing from the second course. To keep the spirit level stable, place your foot against the bottom of the level whilst holding the top of the level with your free hand. Carefully adjust the bricks at either end of a course and look down the face of the wall to make sure it lines up with the spirit level. When making adjustments, once again, *never strike the spirit level to plumb a quoin.*
LINING IN
Lining the face of bricks between the plumbed ends of each course will help to produce a wall that has an accurate face plane. Rest the edge of the spirit level against the face of the bricks in each course. (We don’t refer to any of the bubbles in the level – we just use the level as a straight edge.) Gently tap the bricks into line. Never strike the spirit level to line up a course.

Face plane
The alignment of all the bricks in the face of a wall to give a uniform flat appearance

RANGING
An accurate face plane will also be achieved if we range our work. This again means using our spirit level as a straight edge, but this time we place it in line with the stepped brickwork as it racks back. (This applies to a straight rack as well as a quoin.) Gently tap the bricks to align them with the edge of the spirit level. Never strike the spirit level to range a quoin.
With any of these operations, if we have to strike the brickwork with force to bring it accurately into line, then we may need to pay more attention to how we place and spread mortar and how we lay the bricks. Remember – we are brick laying not brick bashing!

LAYING TO THE LINE
When we are satisfied that our quoins are completed accurately, we can use them as a guide to ‘run in’ the walling between the corners or racks. Laying to the line is another aspect of bricklaying that needs time to develop speed and accuracy. The main points to keep in mind are:

- Make sure the top arris of the brick is level with the line along the full length of the brick.
- Never lay the bricks touching the line. Doing this will cause the line to move away from the face of the wall and will result in a curved face plane. Keep the top arris of the brick about the thickness of the line away from the line.
- ‘Eye’ down the wall to ensure the face plane is smooth and the perps are lined up vertically.

FINISHING THE WALL
Finally we need to consider the finishing of the wall. The bed and perp joints need to be tooled or ironed in order to satisfy two requirements:

- to produce the desired appearance that is specified
- to weatherproof the joint in order to prevent the entry of moisture.

The most commonly used joint is called a half-round joint. A specific tool called a jointer is used to produce a concave finish to the mortar just before it begins to harden. The timing of the operation is very important since if it’s performed too soon it will lead to a rough finish and if it’s performed too late a black deposit will sometimes form due to what is known as lime burn.

Because the profile of the half-round joint is concave, the procedure of jointing pushes the mortar tight against the arris of the brick and seals it against moisture penetration.

It’s good practice to joint all the perps first, followed by the bed joints. This reduces the number of small projections where the perp joint and the bed joint intersect.
A good bricklayer is constantly observant, looking for flaws in the bricks he or she is laying and discarding materials that may affect the quality of finish. Brickwork can be knocked and nudged by other workers nearby, so check the work frequently to maintain plumb and level. Be critical of your own work and aim to constantly improve your own standards, and employers and customers will always be happy to give you work.

As previously mentioned, one-brick walling is brickwork built to produce walling with a width of 215mm – the length of one brick. This means that bricks can be laid across the wall as well as in line with the wall. The bricks laid across the wall are called headers, and the bricks in line with the wall are called stretchers, because of the relevant faces of the brick showing in the finished wall.
A wall built to this thickness is obviously stronger than a half-brick wall and will usually be used in situations that require greater strength, such as:

- walls carrying steelwork
- inspection chambers
- fire walls
- free-standing walls used as garden or boundary walls.

The two main bonds that are built as one-brick walling have been referred to already — Flemish bond and English bond. These bonding arrangement provide a lap of a quarter of a brick.

When building a quoin in one-brick walling, if the course starts with a header, then immediately next to it will be a Queen Closer. In Flemish bond the Queen Closer will be followed by a stretcher, whereas in English bond the Queen Closer will be followed by a header. Study the illustrations earlier in the chapter to remind yourself of the bonding arrangements.

Although the wall is thicker than half-brick walling, the techniques used in forming bed and perp joints are similar. We still need to prepare the mortar by rolling it ready for spreading but, we need to be aware that we will produce a shorter bed joint in one movement of the trowel, owing to the increased width of the wall. With practice a larger amount of mortar can be rolled and picked up from the spot board to speed up the work rate, but remember this takes lots of practice.
When perping the stretcher face of a brick (to lay a brick in a course of headers), our perps will obviously be longer. The temptation may be to ‘top and tail’ the perp by just placing mortar on the ends of the stretcher face. The skilled bricklayer aims to produce a full joint with mortar placed along the full length of the face of the brick. This will ensure a weatherproof joint to contribute to a long-lasting and durable wall.

**TYPES OF ONE-BRICK BONDS**

Let’s look at the differences in these one-brick bonds.

**FLEMISH BOND**

The bonding arrangement of Flemish bond basically consists of alternating headers and stretchers within a course. The headers in a course are centred above the stretchers in the course below to give a strong Quarter bond and also to produce an interesting pattern.

Flemish bond is often specified because it has a decorative pattern that is acceptable on both sides of the wall. Think about it – we’ve already talked about the fact that bricks can vary slightly in size. That being the case, if we lay a header brick to the line (as described for stretchers in the previous section), whilst the face of the brick will be accurate, the other end of the brick will vary in the amount it projects compared to other headers in the wall.
Since Flemish bond has fewer headers in the bonding arrangement, our wall is more likely to have a better appearance on both sides. The back of this type of wall is often referred to as ‘fair-faced’.

**ENGLISH BOND**

This bond is set out with alternating courses of headers and stretchers. Since English bond has more headers showing in an elevation, it is not so suitable for use where good appearance is desired on both sides of the wall. However, the bonding arrangement makes English bond the strongest bonding arrangement possible.

That's why it is often specified for situations where the brickwork may have to withstand a lot of lateral pressure, for example in an inspection chamber where the weight of the surrounding subsoil presses in on the masonry.
LAYING TO THE LINE

With one-brick walling, we could say that the width of the wall is the same as two half-brick walls laid back to back with a 10mm joint between them. If we are building the equivalent of two walls, do we need two string lines to produce accurate work?

To produce high-quality work, some bricklayers will decide to use two lines; one on the face and the other on the fair-face (or back line of the wall). The face side line is used as described already, but the fair-face line can only be used to establish level and not line. This is because the header bricks will vary slightly in length and so can't be laid accurately to both lines.

The usual practice is to lay the header with its rear arris very slightly below the line, so as not to push the rear line out of alignment with the run of the wall.

Building one-brick walling uses greater quantities of materials and places greater demands on operatives in preparation of the work area. It requires the bricklayer to use similar techniques to those needed to produce half-brick walling, but with a few modifications to allow for increased proportions.

INDUSTRY TIP
If you use the blade of your trowel to tap the back edge of the bricks into place, take care not to tap the line by mistake. It’s annoying when you accidentally cut the line!
FORM JUNCTIONS IN BRICK WALLS TO THE GIVEN INSTRUCTIONS

There are many points in a building or other structure where one wall intersects with another to form a **junction**. One example would be where the partition walls in a house (walls between rooms) meet the outside walls. The junction is formed by bonding the masonry to form a stable and strong feature.

**CHOOSING THE METHOD**

There are a number of ways that the masonry could be bonded for stability. The choice of method will depend on factors such as access requirements and the planned sequence of work. If building a wall that joins another wall would block off easy access to a part of the building, then the method chosen could be to leave **indents** in the main wall.

These are holes or pockets accurately formed in the wall at each course or block of courses as building proceeds. The indents are the width of the wall that will be built later, with allowance for a mortar joint either side of the added wall, to make sure that the junction is solid and stable.

A simpler way of providing for a junction wall at a later stage is to use reinforcing mesh. This is carefully built into the bed joints on the vertical line of the wall that will be added later. The mesh is built in as work on the main wall proceeds, in accordance with site instructions and specifications.

If there are no issues related to access and no other problems are foreseen, then the junction wall can be built along with the main wall course for course. The overlap or bond of the junction should follow the overlap of the walls being built. In other words, if the walls are one brick thick, then the lap or bond should be a quarter of a brick and if they are half-brick walls, then the lap should be half-bond.
Sometimes a junction wall may be added at a later date after the main wall has been completed, perhaps owing to a change in design. In this case indents may need to be cut out carefully to allow the new wall to be attached. When cutting holes in masonry, use the right tools that have been maintained in a safe condition, and remember the importance of using the correct PPE.

A more modern approach to forming a stable junction between walls is to use proprietary connectors or wall starter kits.

**Proprietary**
Manufactured and sold under a brand name or trademark

**ACTIVITY**
Check out the CATNIC website and look for 'stronghold wall starter kits'. Find out what the benefits of using this type of system are.
Case Study: Josh and Sid

Josh had been working for a small building company for about six months as an apprentice bricklayer. He had been partnered with Sid, an older, more experienced bricklayer who knew the trade inside out.

Sid was good at explaining things and Josh felt he was making good progress in developing the skills he had learned at college. Sid kept emphasising the need to think carefully about each task and plan ahead. That way, you can help to avoid problems later on.

The company had a contract to produce decorative brickwork in solid walling for a new retail park. The work required special bricks to be ordered. Josh was keen to try his hand at some of the fancy brickwork, but Sid said he should be patient and ‘get the basics right first’.

When the special bricks for the job arrived on site, Sid was in the manager’s office. Josh decided to supervise the delivery and picked a good storage location, somewhere the bricks wouldn’t be damaged. He told Sid that the delivery was sorted and gave the site manager the paperwork.

After wet weather held the job up, the time came to start the feature work using the special bricks that Josh had previously taken delivery of. He arranged with the forklift driver to transport the first pack of bricks to the work area.

When they arrived, Sid was upset. ‘You didn’t cover them when you took delivery — we can’t lay wet bricks!’

Josh remembered what Sid kept saying: ‘get the basics right first’.
Work through the following questions to check your learning.

1. When building even levelled courses, the wall is
   a. Gauged
   b. Staged
   c. Caged
   d. Coursed

2. Which of the following is a recognised bond?
   a. Full bond
   b. Stop bond
   c. Turned bond
   d. Reverse bond

3. If a wall does not work full bricks, the bond is called a
   a. Damaged bond
   b. Broken bond
   c. Full bond
   d. Half bond

4. A bricklayer will bond the bricks for
   a. Decoration
   b. Colour
   c. Cost
   d. Strength

5. The wastage allowance for brickwork is
   a. 5%
   b. 10%
   c. 15%
   d. 30%

6. Communicating with the line manager is best carried out
   a. By letter
   b. By phone
   c. Using text
   d. Verbally

7. The action to take upon an incorrect delivery of bricks is to contact the
   a. Supplier
   b. Architect
   c. Line manager
   d. Client

8. Technical details on a working drawing can be located in the
   a. Specification
   b. Bill of quantities
   c. Contract
   d. Email

9. When is a bricklayer required to wear PPE?
   a. Never
   b. Always
   c. Important events
   d. Sometimes

10. Bricklayers use dry bonding to establish the
    a. Joints
    b. Face
    c. Correct bond
    d. Ranging
11 The total number of bricks to build a wall 3.0 high by 3.0m in length, with a thickness of 102.5mm is
   a 510
   b 520
   c 530
   d 540

12 Four pallets of bricks each containing 390 bricks are delivered to site, 10% are damaged. How many bricks are being returned?
   a 102
   b 120
   c 130
   d 156

13 What is the name of the smallest cut brick inserted into the middle of a wall?
   a Quarter brick
   b Half-bat
   c Three quarter bat
   d Bevelled brick

14 The rules of bonding requires the quoin header to be followed by a
   a Header
   b stretcher
   c Queen Closer
   d Three quarter

15 Perp and bed joint should be
   a 5mm
   b 10mm
   c 15mm
   d 20mm

16 What procedure will ensure a flat surface?
   a Range the wall
   b Plumb the wall
   c Level the wall
   d Gauge the wall

17 The term ‘perps’ relate to the
   a Long bed joints
   b Short vertical joint between bricks
   c Ends of a bed joint
   d Cross joint of the wall

18 The term ‘header’ relates to the
   a Length of the brick
   b Width of the brick
   c End face of a brick
   d Arris of a brick

19 The term ‘bucket handle’ relates to the
   a Bucket with no handle
   b Type of brick
   c Form of joint finish
   d Tool used for jointing

20 The term ‘indents’ refers to
   a An apprentice's qualification papers
   b The dips in a rough concrete foundation
   c Pockets left in a wall to allow another wall to be joined
   d Marks on the surface of a metal tool