

INTRODUCTION TO MUD BRICK LAYING NOTES

These notes form the basis of Mud Brick Skills Workshops run by TMC to prepare clients for building. The topics covered are:

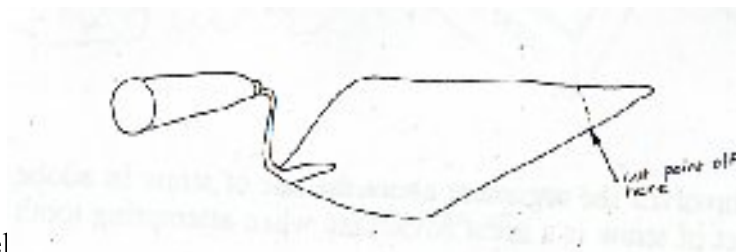
- **Brick Laying and Rendering Equipment**
- **Equipment**
- **Hardware and Materials**
- **Mixing Mortar by Hand**
- **Bricklaying**
- **Mortar Mix**
- **The Gauge**
- **How to Determine the Common Height of your Bricks**
- **Calculating your Vertical Gauge**
- **Horizontal Gauge**
- **Starting**
- **Frame Ties**
- **Weather Strip**
- **Corner Bond for Standard Mud Bricks**
- **Cutting Bricks**
- **Pointing up**
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BRICKLAYING AND RENDERING EQUIPMENT

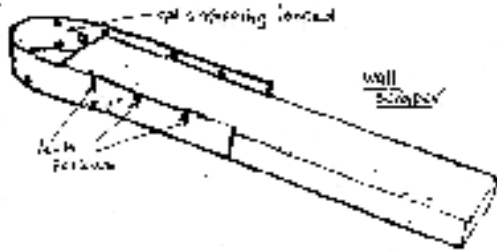
Most of the equipment described here is self explanatory. To make a mud brick trowel cut the point off an ordinary brick laying trowel (see illustration below). A brick trowel is best purchased from the bargain table at your local hardware. Better not to butcher an expensive one. Choose from large, medium or small size depending on the wrist strength of your helpers. Once the point has been removed, though, even a large trowel, which was previously difficult to use, can become comfortable. If want to proceed without a cement mixer read our notes on **MIXING MORTAR by HAND**. A miners shovel is short, small and has a “D” shaped handle. Gauntlet gloves are especially useful for rendering when you want to get your hands well into the brew. A wall scraper (see illustration below) is made from a piece of four b’ two pine with a loop of gal strapping ‘tech screwed’ to the edges at one end. You hold the scraper tool at the opposite end.

EQUIPMENT

Cement Mixer
Wheelbarrow
Level
Plumb Bob
Line blocks
Small shovel (miners shovel is ideal)
Plastic buckets 2 x 10 litre 1 x 20 litre
Measuring tape
Foam sponges
Nylon broom head or white washing brush
Side cutters, Pliers or bolt cutters (to cut reinforcing)
Hammer
Carpenters pencil
Tomahawk



Cut down mud brick trowel
Hose with a spray nozzle
Open 44 gallon drum
Gauntlet gloves



Wall scraper

HARDWARE AND MATERIALS

9-inch frame ties. Use 4 inch frame ties to attach splits to a stud wall.

Limil

Clouts

Staples

Damp Proof Course

Silastic

Soil for mortar (150=200 bricks laid per m3 of soil)

Half-inch speed brace, eight strand brick weld, barbed wire or lengths of masonry reinforcing

MIXING MORTAR BY HAND

Mixing mortar in a wheelbarrow can be successful if the water is given the opportunity to reduce the effort of mixing. Time must be allowed for water to soak through the soil before any hand mixing is attempted.

- Tip about 100lmm of water into the wheelbarrow
- Add soil until the water disappears
- Repeat this process until the barrow is full.

Leave the mix in the barrow as long as is practical. Overnight soaking is the most effective. The amount of time for soaking can be increased by using more than one barrow at a time, and making sure that each one is filled to stand soaking as soon as it has been emptied.

- Using shovel or a Chinese hoe* heap the mix to the front of the barrow and then to the back.
- At the same time, add water to the mix to achieve ultimate creaminess. This method can also be used to mix a mudbrick or a wattle and daub brew by adding straw and/or lime to each layer.

*Chinese Hoes usually have larger blades than more common garden hoes. They are very effective for mixing mud and are well worth tracking down.

BRICKLAYING

The bricklaying technique you will be taught at our workshop is only one approach to finishing mud brick work. We have used this method over a long period of contracting and have found it to have a high acceptance amongst our clients. Please consult our check list for the *EQUIPMENT AND MATERIALS* you may need to lay mud bricks.

MORTAR MIX

Some of the best mortar mixes are river silts or the pale subsoil which overlays yellow clay in "bush" soils. Often these are not available so we recommend a mortar which has only enough clay in it to make it workable. It needs to be 'fatty' enough to fit any holes and crevices in the brickwork. You just need enough clay to make the mortar workable but not so

much as to produce shrinkage cracks over 3 mm. Our experience has shown the great advantage of minimum shrinkage or cracking in mudbrick mortar. Loam free of humus often has enough clay in it. Add sand to reduce the clay content of mortar. You can test mortar material for shrinkage and durability using tests described elsewhere.

Shrinkage in mudbrick walls can create serious problems. An extreme example that I have observed resulted in window frames twisting and contorting as the shrinking mortar pulled at them via the wall ties, with tremendous force. Another example is a diagonal crack which can appear between a high section of brickwork and a low section of brickwork (especially in load bearing construction).

It is also useful to obtain material which will mix in a cement mixer and is free of lumps and stones. When laying bricks it is extremely frustrating when one places a brick on the mortar bed and it will not push down to the stringline. 17 kgs of block has to be lifted out of the mortar, the lump or stone removed and the brick placed in the mortar again. Sieving materials is also slow, tedious work so if you find a source of good lump free soil which does not need that attention, grab it! By adding a small quantity of lime to your mortar (say 8:1) you will enhance its durability against weathering. This practice is important when you have durable bricks and wish to leave the outside of your wall unrendered. Lime mortar has an uncomfortable affect on bare skin so gloves are recommended for pointing up.

When laying bricks, it is essential to have no lumps and the right consistencies (think of toothpaste or whipped cream). Mudbrick laying becomes easy with good mortar placed on the wall in the correct way.

THE GAUGE

The gauge is made from a straight, light, piece of timber (2" by 1" is ideal) and has the height of your brick courses marked on all four sides. Mark one side and then use a square to transfer the gauge to the other four sides. Cut the gauge to the height of your brickwork. To mark your gauge you will need to know

- The height of your brickwork
- The common height of your bricks.

HOW TO DETERMINE THE COMMON HEIGHT OF YOUR BRICKS

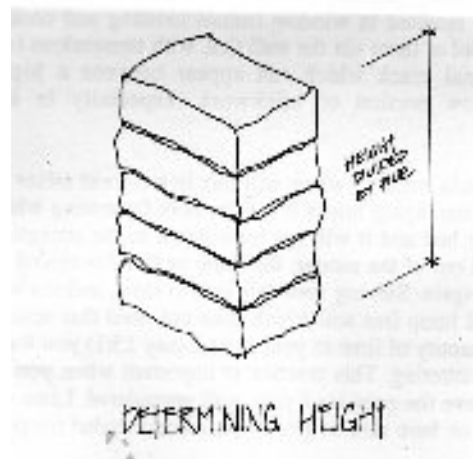
The thickness of handmade bricks varies, so decide on a height common to most of the bricks. Don't include suitcases in your assessment. Suitcase is a mudbrick term for handmade bricks which are much thicker than the norm and, which may, need to be trimmed before they are laid. One way to arrive at a common height is to put 5 bricks on top of one another, divide the height by 5 to arrive at a brick height.

Add between 10mm - 20mm to your common height and this gives you a range of course heights to calculate your gauge.

Example:-

Common height = 125mm

Range for your gauge 135 - 145mm i.e. the common height of your bricks plus ten to twenty mm.



CALCULATING YOUR VERTICAL GAUGE

When you have measured the height of your brickwork and the common height of your bricks you can calculate your gauge.

Example:-

Common height of bricks 125mm

Height of wall 2320mm

Divide the wall height by 140mm (140mm is 15mm < brick height)

2320mm (wall height) divided by 140 = 16.571428

16 courses of brickwork give a gauge of 145mm

17 courses give a gauge of 136.47058mm

Choose the gauge which will accommodate variations in brick height. If the bricks are uniform in height you would choose 17 courses i.e the leaner gauge. If the bricks vary in height a 16 courses gauge may be better, i.e. a fuller brick course.

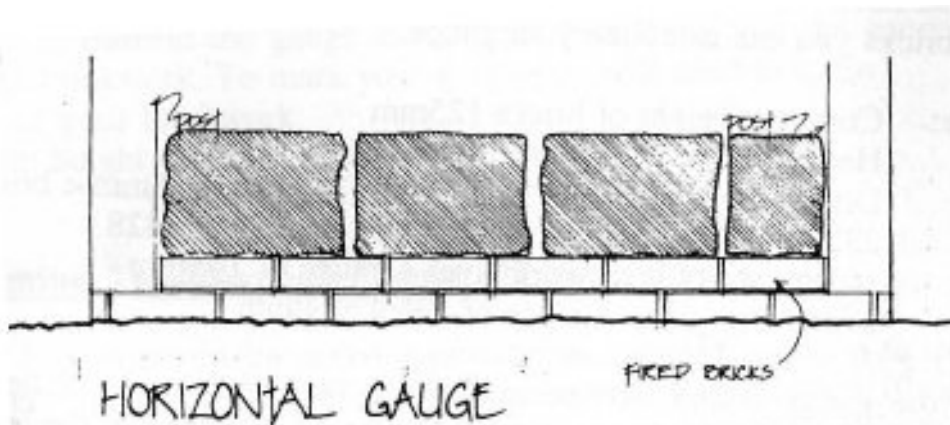
Some pointers for choosing a gauge:-

- 1.. Always choose the leanest course which will accommodate the variations in brick height (but not suitcases!).
2. You will soon discover if your gauge is too lean because when you begin to lay bricks it will be difficult to push them down to the stringline.

A mortar course which is too full must also be avoided because:-

- (i) shrinkage problems are exacerbated by this situation (see ref to shrinkage in section on mortar mix);
- (ii) good mortar material is often expensive both in dollar terms and in terms of labour required to prepare it, and transport, it to the wall;
- (iii) mudbrick work does not rely on hydration to dry the mortar as in cement mortar. A wall laid quickly with very thick mortar can slump and move in the lower portions after it has been finished.

THE HORIZONTAL GAUGE

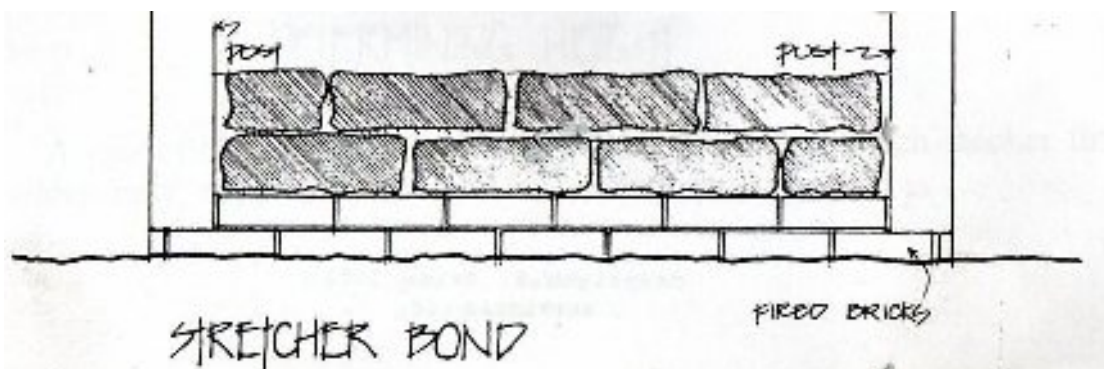


Place bricks on edge, end for end along the footing of the section you are working on.

Use your fingers as a gauge to judge the distance between bricks. Use the tips of your fingers to gauge uniformly a minimum perpendicular (perpendicular joint). By pushing your fingers further down between the bricks, you are able to uniformly increase the size of perpendicular. By manipulating the gap in this way you can fit the bricks into a section of

brickwork to the nearest halfbrick. Before removing the bricks from the footing, mark their position. The horizontal gauge in a load bearing house can continue right around the building if there is brickwork above the doors and windows are built to the roof. You can gauge the job section by section as in "post and beam" construction. The "finger" method can be used to determine maximum and minimum widths of doors and windows so they will fit into the brickwork easily. The longer a run of brickwork, the easier to manipulate the gauge. Small sections can create plenty of cutting and subsequent brick wastage if they are out of step with the horizontal gauge.

For stretcher bond place every other course of brickwork so the perpendiculars line up with the middle of the brick below.



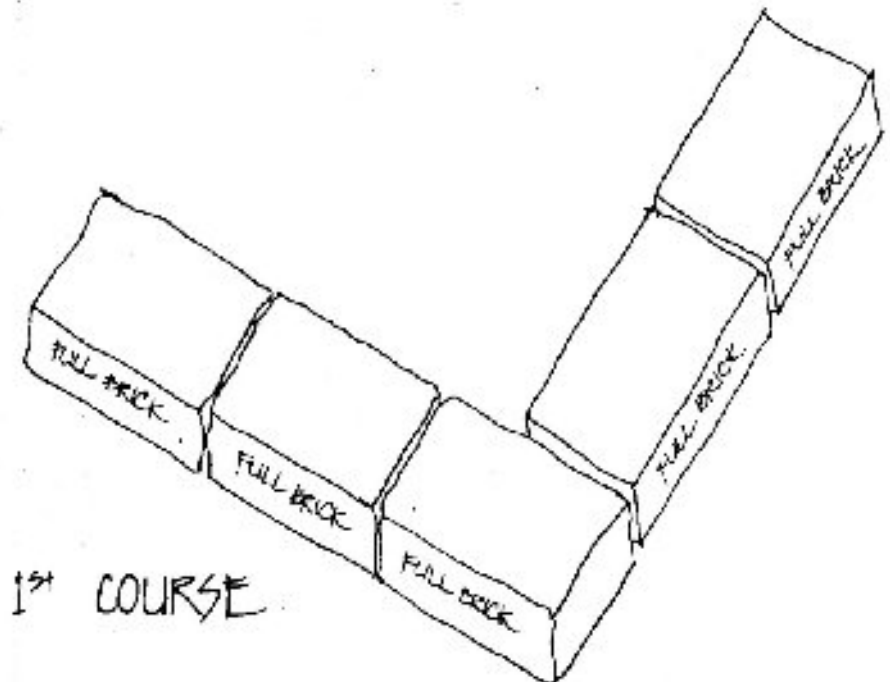
STARTING

- roll out your damp course and place this on top of your footing.

- Set up your stringline on your vertical gauge marks (refer section on gauge). It is absolutely essential in loadbearing construction to set up substantial profile boards (they should be firm enough to remain plumb even when occasionally bumped). Its worth using steel or perhaps 4" by 2" Oregon – the timber has to be straight and securely erected. As your brickwork progresses, they become less fragile. Window and door frames can be plumbed using two strings (top and bottom) from the profiles. Once again substantial bracing is essential to hold the frames until you brick up more than half way.
- (take a shovel and place a uniform amount of mortar along the wall).
- With practise you will learn to put just enough mud on the wall so that a small amount oozes out of the joints when you push the brick down to the line. It is important that the mortar bed remains aerated (in other words don't fiddle around with it too much). The idea is that the bed is kept high so that the brick pushes down easily into position. Any excess mud which oozes from the joints can be stuck off with your mudbrick towel (see illustration) and spread onto the end of the brick to fill the next preprend. Push each brick flat down on the mortar course to the stringline. Position yourself comfortably so that your nose is vertically above the centre of each brick. Avoid touching or moving the stringline. Initially many beginners lay their bricks tilted towards the line. Check the diagonals of you first few bricks with a level until you get the hang of pushing them down flat. If the horizontal gauge is marked on the face of the footing brick, you will have no trouble locating the position of each brick along the bed on your initial coarse. With subsequent coarses make sure the preprends of each alternate layer of brickwork line up vertically.

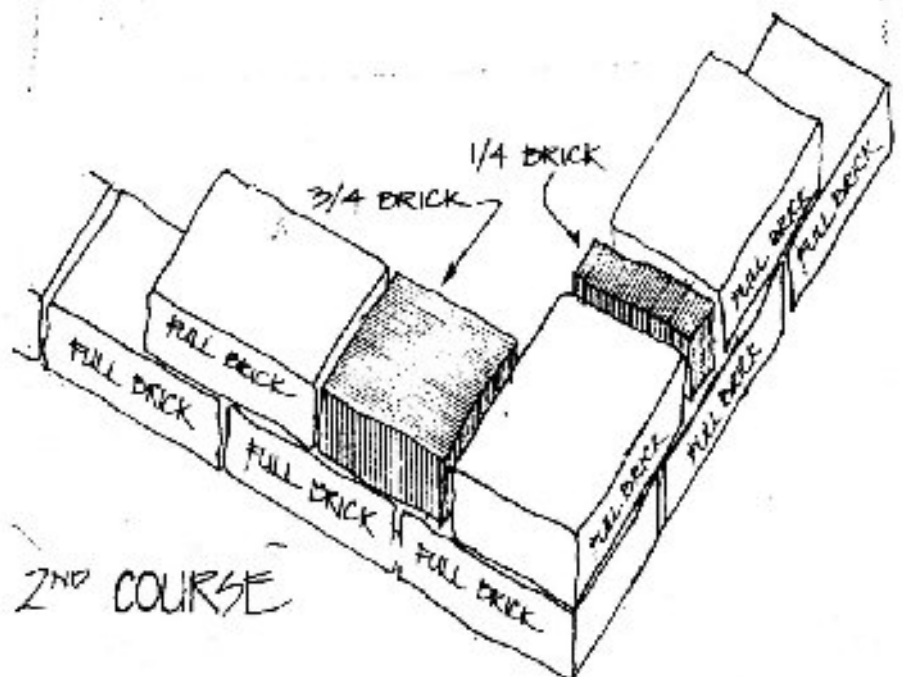
FRAME TIES

Attach 9" frame ties (see hardware list) to window and door frames as the brick work progresses. My suggestion is to place them every second course of brickwork. Most councils require some form of reinforcement along the length of the wall also. Many publications malign the use of barbed wire for this purpose. If you can overcome laceration it is much cheaper than the products like brick tor. If you have light frames it is much more gentle process to fix reinforcement with tek screws rather than screw clouts, clouts or staples.



WEATHER STRIP (also called daylight strip, wind mould or sight barrier)

A small strip of timber (2' by 1' ripped down the centre) or speed brace is usually attached to frames and posts. Its main purpose is to ensure a seal, even in circumstances where timber shrinks away from the brick work or vica versa. Attach the strip with skew nail or teks, with Silastic between the two pieces of timber. Squeeze some Silastic down the frame or post before you attach the strip.



CORNER BOND FOR STANDARD MUD BRICKS

To maintain bond on a corner, place the first course down as illustrated. In a standard 10" by 15" by 5" brick, you will need to cut slightly less than $\frac{1}{4}$ off a brick to create stretcher bond in the next course. The large piece ($\frac{3}{4}$) is placed on one wall, and the small piece you cut off is placed on the other wall.

CUTTING BRICKS.

1. Simple cut

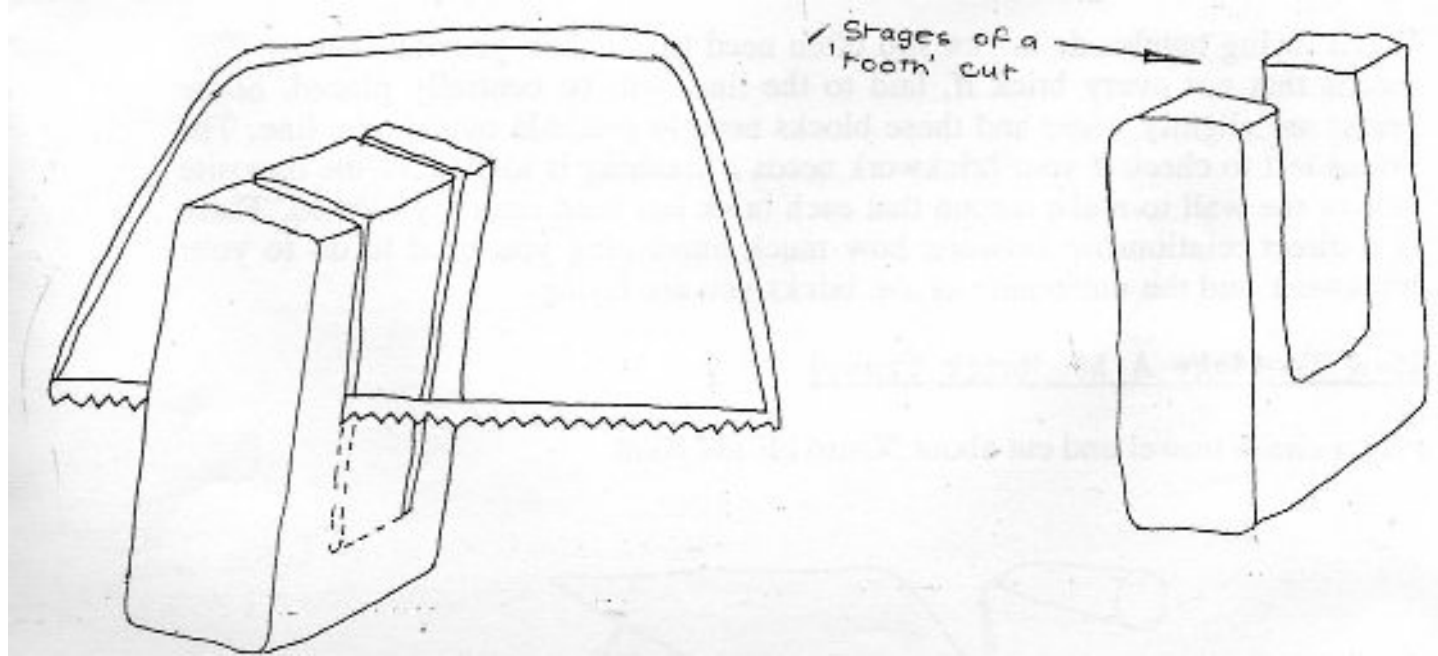
To cut a brick in half, for instance, chip around the whole four sides of the block with your towel or tomahawk. When you have weakened the brick sufficiently, make a hard chop, (in the karate tradition) and the brick will break along the rut. Use this method to also

- a) Cut along the length of your block,
- b) Cut the end off a block in load bearing construction to maintain your bond

2. Complicated cut

An example of the necessity for a complicated cut is when a brick needs to be shaped to allow for the intrusion or holding down bolts. From a bricklaying point of view, it is easier to cut the block in shape of a tooth rather than drill a hole in it. The latter method involves lifting the brick to the full height of the obstruction to feed it down onto the mortar bed. With the 'tooth' cut the brick is fed from the side. The tooth cut is also a better method than cutting two face bricks and leaving a cavity for the conduit. The laying of face bricks is quite difficult because of their narrow base.

Select a brick which is crack free for a '**tooth cut**'. Using a ceramic disc in an angle grinder, or a bushman's saw, cut two slits right through the brick but only about three quarters of the length of the brick.. Join these slits with the chipping action you used in 'simple cuts'. The middle section can then be removed.



An aside to all this involves the argument about the use of straw in adobe bricks, the reinforcing effect of straw is a great advantage when attempting tooth cuts.

POINTING UP

After you have completed six courses, you must point up your brickwork. It is important to point up all brickwork before it starts to dry out. I have found that a trowel is inappropriate for this task. Use rubber gloves and the heel of your hand. The subtle texture of handmade bricks is complemented by the soft curve of your palm. The idea is to go along all the mortar beds and prebends, filling where there are holes and removing excess mud. You may also need to gently scrape the brickwork with a frame tie, to remove any mud, which may have stuck to the bricks. Using plenty of water, brush the wall down vigorously with nylon broom head. This washing process will fill any remaining small holes or cracks. Take particular care to fill around window and door frames. Use another bucket of clean water plus two sponges to thoroughly clean all timber. It is a good idea to oil timber frames before bricklaying.

There are 2 important advantages which flow from this method of pointing up:-

- it gives a workmanlike finish complements the texture of hand made bricks.
- when you come to rendering your wall the job is made much easier. A dried out wall which has not been pointed up properly can take many breaking hours of work to prepare for rendering.

HUMOURING YOUR BRICKWORK

When laying handmade bricks you often need to 'humour' your brickwork. This means that not every brick if, laid to the line, will be centrally placed. Some bricks are slightly wider, and these blocks need to protrude outside the line. The litmus test to check if your brickwork needs humouring, is to observe the opposite side of the wall to make certain that each brick has been centrally located. There is a direct relationship between how much humouring you need to do to your brickwork and the uniformity of the bricks you are laying. Perhaps the last word in all this is to maintain your own sense of humour, whatever strange or unexplained is happening with your brickwork!

