

CHAPTER 8

Concrete Work



CONCRETE WORK

Foundations for walls and piers

All loadbearing walls and piers are required to stand on a concrete foundation, which must be able to receive and pass-on the load placed upon it to the natural foundations.

Natural Foundations

The subsoil (bottom of excavation) on which the concrete foundation rests is termed the natural foundations. This could be rock, clay, gravel, sand or even waterlogged and reclaimed ground. Where clay, loose sand or waterlogged soil is present, the advice of a geotechnical or soils engineer should be sought to avoid repairs arising from possible settlement of the foundations.

Purpose of Foundations

- To spread the load
- To prevent walls leaning over as a result of undue settlement.
- To bridge over any soft spots that may occur in the natural foundations.
- To form a level base on which to build.

Types of Foundations

- Pad foundations
- Raft or slab foundations
- Pile foundations
- Strip foundations
- Stepped strip foundations

In this publication the emphasis will be on strip and stepped strip foundations.

Pad Foundations

Pad foundations are isolated blocks of concrete supporting brick piers or concrete columns.

Raft Foundations

Raft foundations consist of concrete slabs formed at ground level, and covers the entire area to be enclosed by the eventual structure.

Pile Foundations

In cases where the natural foundation may subside (sink), when the weight of the building is applied, pile foundations are used. Pile foundations entail the drilling of a number of holes of various depths, and filling these with reinforced concrete. These concrete piers (piles) support the eventual structure.

Strip Foundations

This type of foundation is a continuous strip of concrete with a minimum thickness of 200mm. The depth and width are determined by SANS 10400 and illustrated in the following figures.

Stepped Strip Foundations

On sloping sites where the natural foundations run parallel with the ground surface, it is good building practice to construct a stepped foundation. This method reduces the depth and quantity of excavations.

Where a foundation is laid at more than one level, the higher foundation is to be extended over the lower level at a distance equating to the vertical thickness of the higher foundation, or alternatively the difference between adjacent levels, whichever is the greater. (See Figure 5.17)

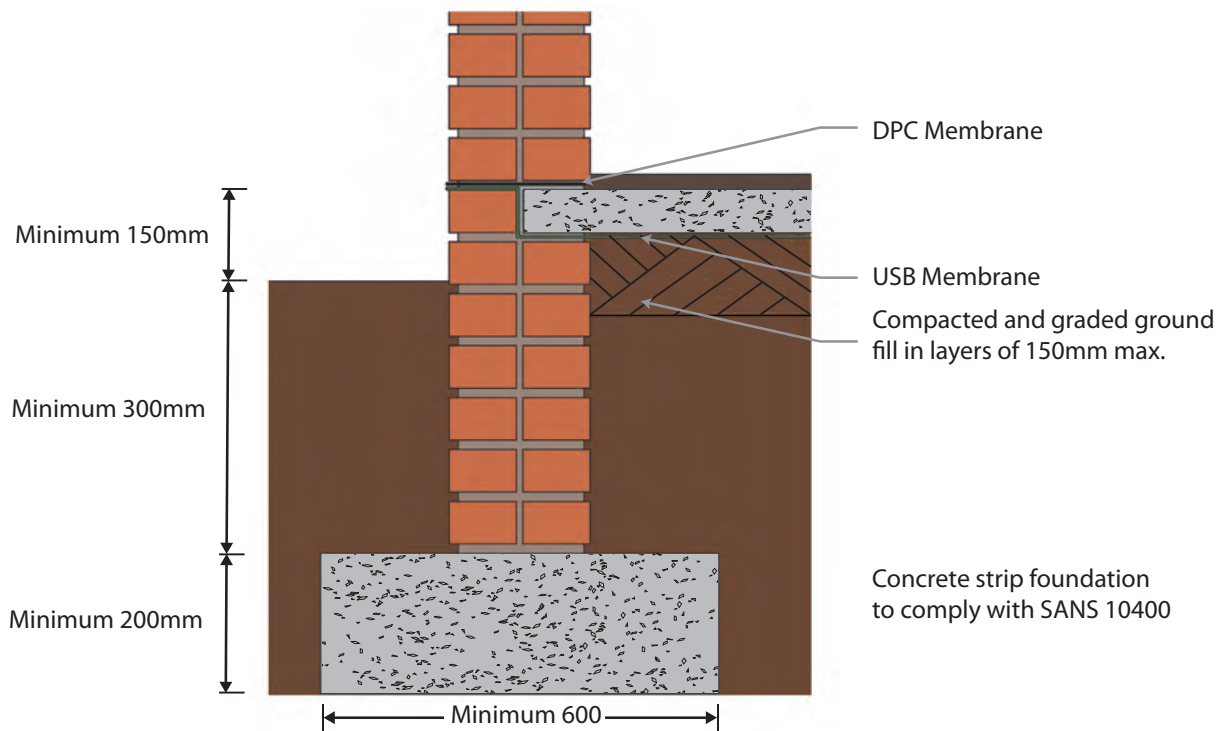
Overlap

The minimum overlap is not less than 400mm (See Figure 5.17) and no less than 200mm thick.

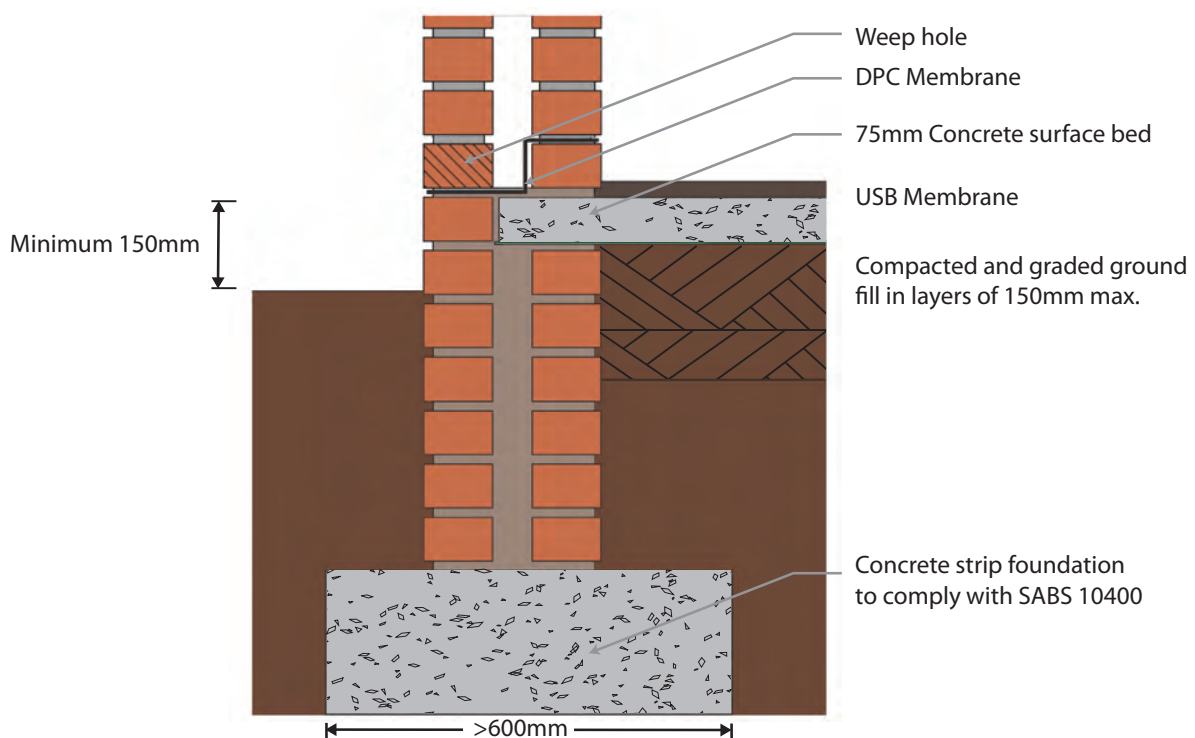


IMPORTANT NOTE:

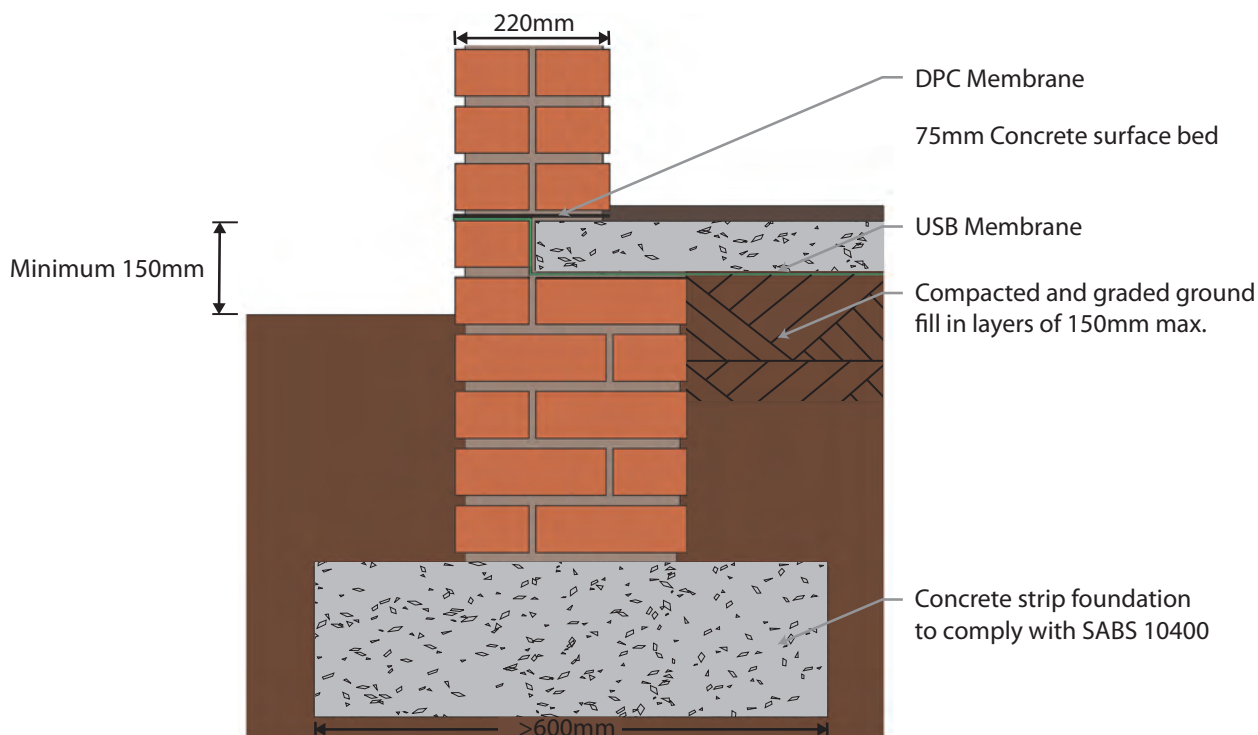
SANS 10400 specifies a minimum foundation width of 600 mm and a minimum foundation depth of 200 mm.



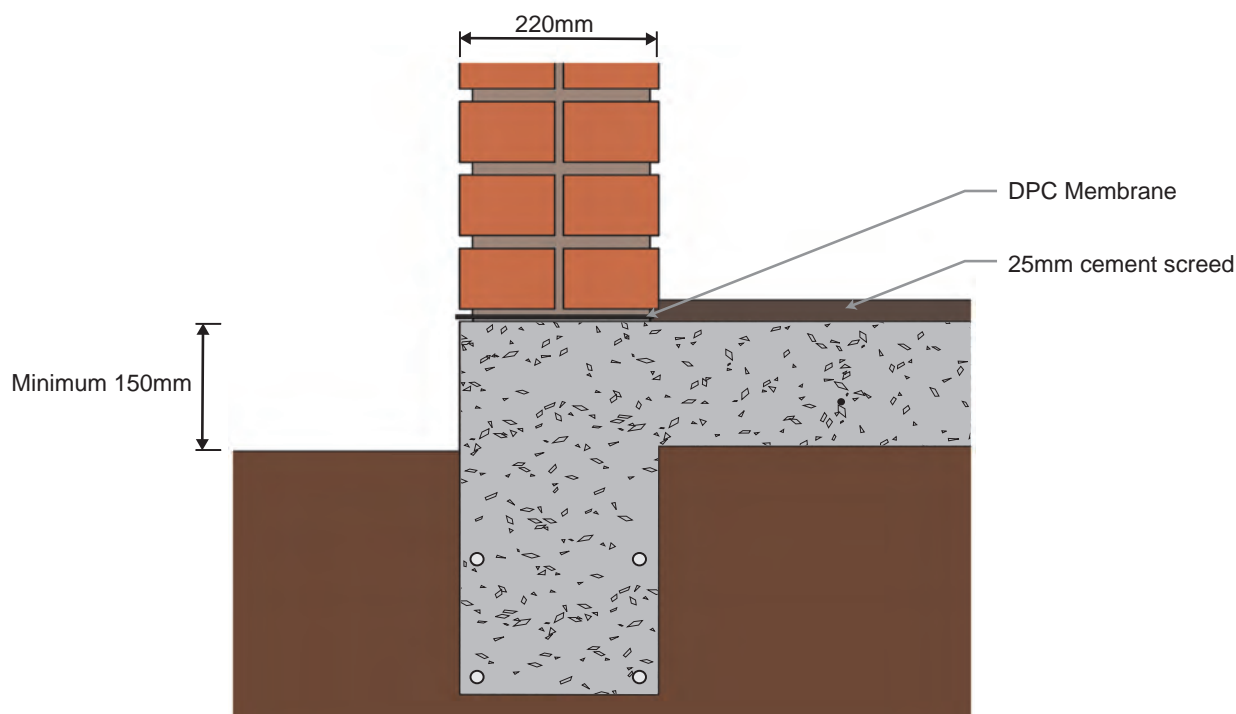
8.1.1 - One brick wall foundation



8.1.2 - Cavity wall foundation



8.1.3 - One and half brick wall foundation



8.1.4 - Raft foundation

Surface Beds

In normal domestic construction, the surface bed (floor slab) shall not be less than 75mm thick. The filling under the slab must be level and well compacted.

The filling required to bring the level of the ground up to the required underside of the slab level shall consist of broken bricks or well compacted inert fill material, and must be applied in layers not exceeding 150mm in thickness.

The use of ash is to be avoided, as the salts present in the ash will lead to excessive efflorescence on the foundation brickwork with possible deterioration of the brickwork or plaster.

Lintels

The simplest method of bridging an opening is to use one of the many types of lintels available, e.g. timber, steel, concrete and brick. As timber and steel are not generally used for lintels, we will consider only concrete and brick lintels.

Concrete Lintels

These may be either pre-cast or boxed and poured in position (in-situ).

Pre-Cast Lintels

These are cast away from the job and can be raised and placed into position when required without any holdup for the bricklayer. They are readily available from your local hardware store or any building supplier merchants.

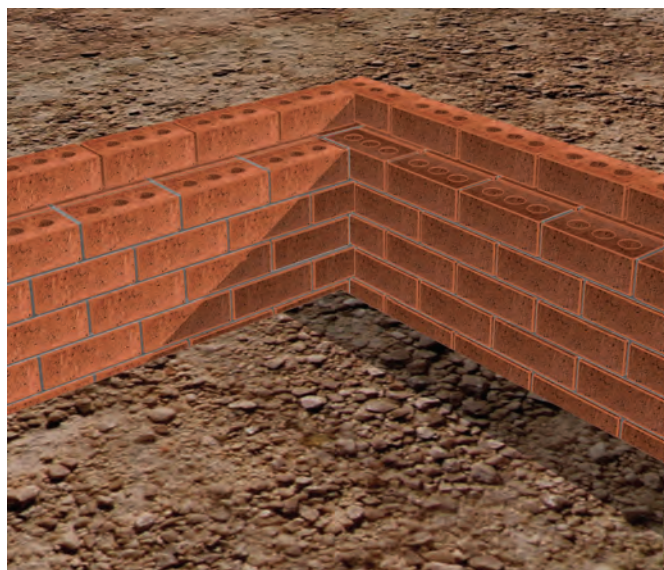
Description	Nominal size (w x h) mm
Standard 'one brick' lintel	110 x 75
6" (150mm) Lintel	150 x 75
Maxi brick lintel	90 x 110
Maxi brick/block lintel	140 x 110
Standard lengths	
900mm to 6000mm in 300mm increments	
900mm · 1300mm · 1900mm 2400mm · 3000mm	

Pre-stressed lintels require a minimum of 100mm of bearing on each side (See figure 8.6)

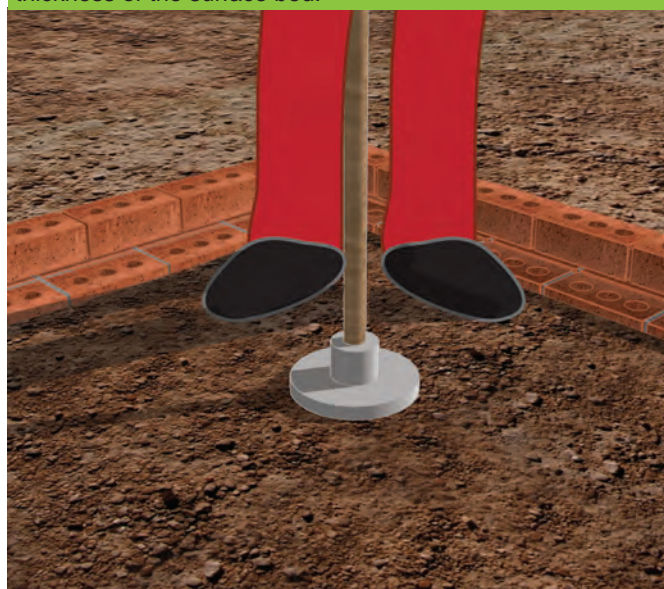
In cases where the outside of the construction is built of face brick, i.e. not plastered, the practice is to use a brick lintel on the face side, backed by a cast in-situ concrete lintel. When pre-cast lintels are not readily available, we use the in-situ concrete lintel method.

In-situ Concrete Lintel

The bricklayer builds the wall to the top of the lintel, leaving the required bearing at each end, as indicated in Figure 8.6.



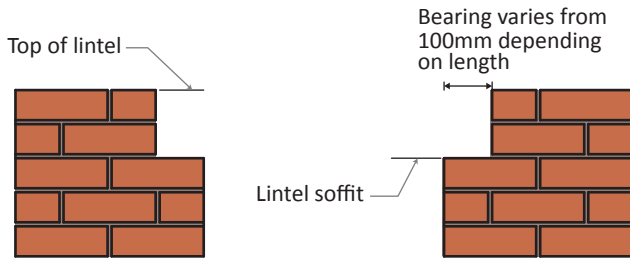
8.3 - Showing the complete foundation walling. Note the outer course is built one course higher to define the edge and thickness of the surface bed.



8.4 - The inside cavity between foundation walls is filled with rubble in layers not exceeding 150mm thick, which are well compacted.

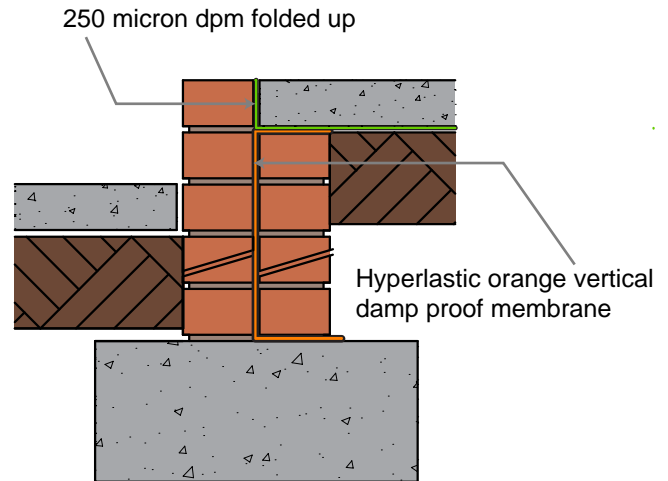


8.5 - Final layer is fully compacted. This layer needs to be poisoned by a specialist contractor. This prevents any infestations below the surface bed.

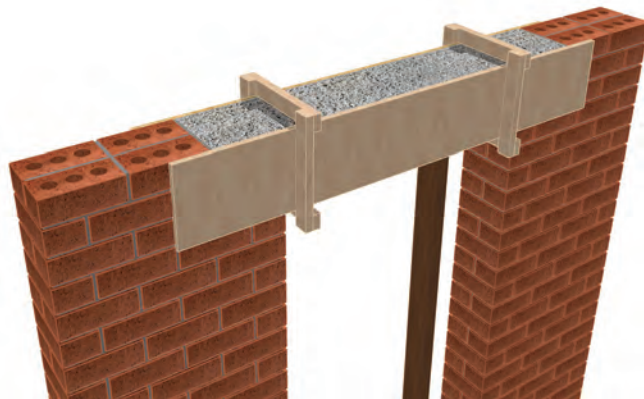


8.6 - Bearing

The form work (wooden box) as shown below consists of several upright supports, two sides and a bottom board which is fixed firmly in position.



8.9 - Tanking of a split level foundation



8.7 - Cast in-situ concrete lintel

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REQUIRED FROM CBA

Pre-cast lintels in position, air vent positioning, centre supports in large openings and wirea roof ties.

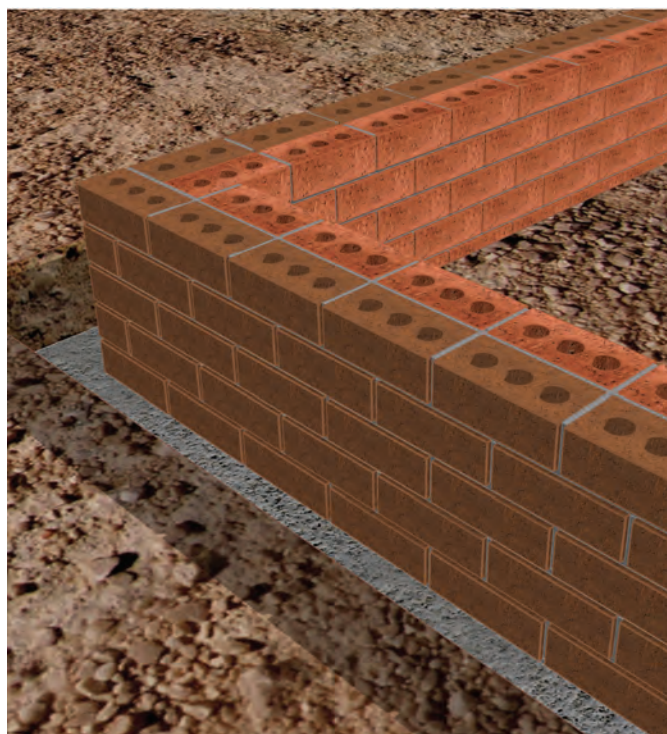
A simple method to determine the size of the in-situ lintel and reinforcement required is shown below:

Length	Depth	Bar Diameter
Up to 1200mm	2 courses	12mm
Up to 1600mm	3 courses	16 mm
Up to 2000mm	3 courses	20mm
Up to 2500mm	3 courses	20mm

One reinforcing bar is used per half brick thickness of walling, e.g.

$\frac{1}{2}$ brick wall = 1 bar
 1 brick wall = 2 bars

Before casting the concrete, ensure that the reinforcement is raised off the bottom of the box.



8.8 - Face bricks are used only where they are exposed in the finished structure

Advantages of in-situ Lintel

- They can be cast to any shape or size.
- They are useful for providing support for a brick lintel. (See Figure 8.7)

Disadvantages of in-situ Lintel

- The bricklayer must wait until the lintel is formed.
- Getting the wet concrete into the box can be difficult.



NOTE

The above is only a guideline, the recommendations of a structural engineer are recommended.

Brick lintels

This type of lintel is simply a flat arch and because of the nature of its structure, it is a weak form of construction. Brick lintels can be built in anyone of the following ways:

- Stretcher course
- Brick-on-edge
- Brick-on-end (Soldier course) (See figure 8.10)

Method

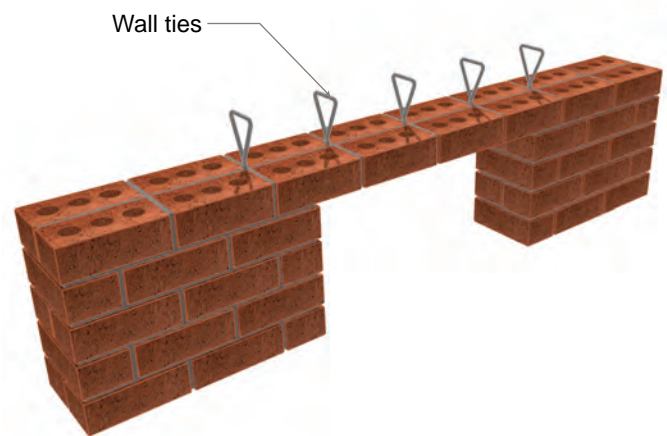
- Before an opening can be bridged with a brick lintel, a wooden support must be installed.
- Nail short lengths of timber (cleats) to the two sides of the opening (reveals).
- Cut another piece of timber equal to the span of the opening.
- Rest this piece of timber on the two side cleats. This turning piece must be level with the top of the window frame as brick lintels rest directly on the frame. (See figure 8.11)

Stretcher course lintel

This method is employed for small spans, e.g. bathroom or toilet windows, and where the walls are going to be plastered. Raise the line at the corners and build the stretcher course across the turning piece.

Precautions

- Add a small amount of neat cement to the mortar on the mortar board closest to the opening. This richer mix will add to the strength of the brickwork above the opening.
- Build in brick reinforcement in at least 3 courses above the brick lintel.
- Prepare butterfly wall ties and build these into the vertical joints as shown in Figure 8.10



8.10 - Stretcher course lintel. Butterfly wall ties built into vertical joint of the stretcher course lintel. This method is not recommended. Rather use a header brick-on-edge or precast lintel

Brick-on-edge lintel

This method is recommended if the opening exceeds 1 metre in length. If the outside of the building is of facebrick, then all the openings will be bridged by using either brick-on-edge or brick-on-end lintels. Prepare and bring on a turning piece (supports) for the brick lintels as described before.

Precautions

- Prepare a slightly richer mix for the brick lintel.
- Wall ties must be built in at every vertical joint.
- Brick reinforcement must be installed in at least 3 courses above the brick lintel.
- Bring on gauge marks to ensure full bricks across the opening.

Brick-on-end (soldier course) lintel

This method, like brick-on-edge is used mainly as an attractive feature in facebrick work. To increase the span of the brick lintel, wall ties are built in at every joint and left projecting behind. An in-situ reinforced concrete lintel is then cast in behind. (See figure 8.12).

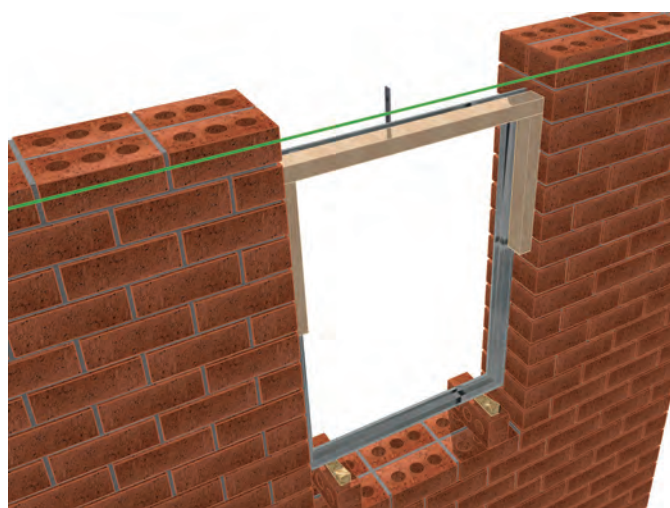
Method

Bring on temporary supports. Gauge off the bricks to ensure full bricks. Build the brick-on-edge course using a slightly richer mix. Do not forget the wall ties. At the completion of the brick lintel, bring on the framework as described under cast-in-situ concrete lintels. Install the required number of reinforcing bars and cast the concrete.



IMPORTANT NOTE:

If the span exceeds 1 metre in length, centre upright supports under the turning piece must be installed to avoid undue sagging during building operations.



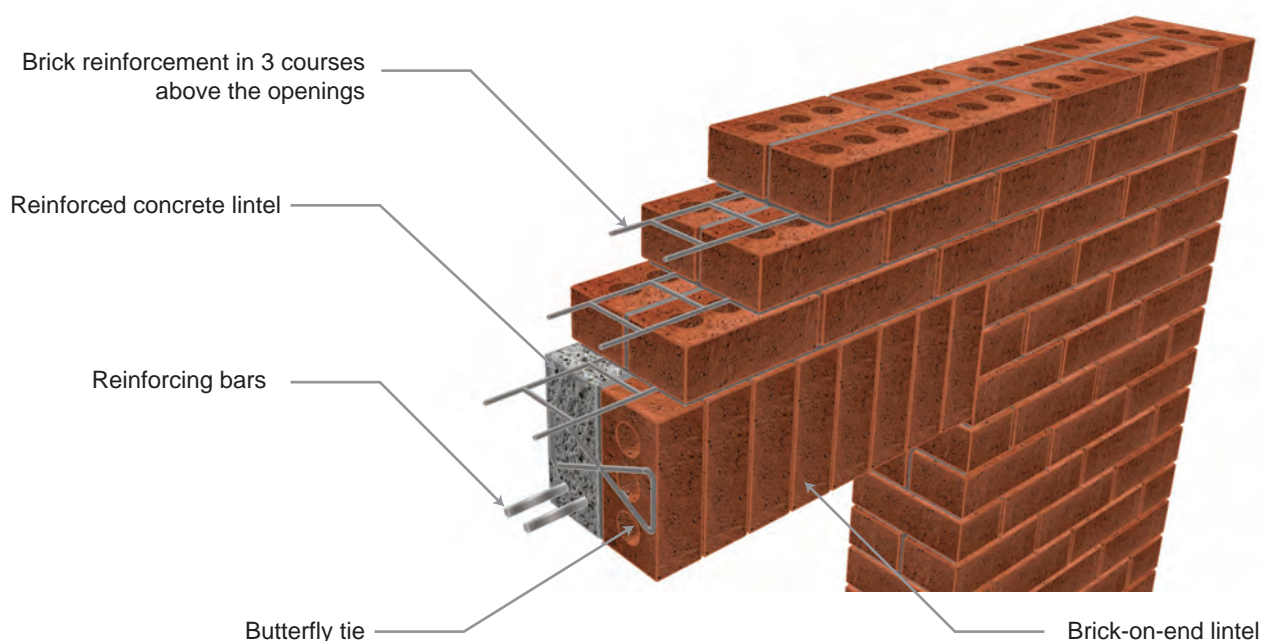
8.11 Showing wooden form work in position.

Brick reinforcement

There are various materials that can be used for brick reinforcement, e.g.

- Mild steel reinforcing rods
- Brickforce - 2 strands of mild steel wire with short pieces welded across
- Exempt (expanded metal).

These products and others suitable as brick reinforcement are obtainable in rolls of varying lengths and widths, from your local hardware shop or builders supplies merchants.



8.12 - Brick-on-end lintel with reinforced concrete backing.