Design Manual 3

The Full Brick Manual

Acrobat Edition

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For many years clay bricks have been central to our definition of housing. Today more and more Australians are rediscovering full brick construction.

The external walls of a full brick house are built with two leaves of clay brick masonry separated by a narrow cavity. This method of construction is also known as cavity brick, solid brick or double brick.

Single thickness brick walls may be used between rooms eliminating any requirement for steel or timber wall frames. Some or all of the inner walls of a full brick house may be left as face (or exposed) brick or finished with render, plasterboard, timber or paint.

Full brick houses are:

- Cooler in summer and warmer in winter.
- Quiet.
- Low maintenance.
- Affordable.

This manual sets out design and construction details for detached full brick housing and uses ample illustrations to show that building in full brick is as simple and economical as the familiar brick veneer.

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INTRODUCTION

For many years Australia has had a love affair with clay brick. For most of us the ubiquitous brick veneer has defined the great Australian dream of home ownership. Today there is a new player in the market with full brick construction taking the high ground in quality residential construction.

What is full brick? The external walls of a full brick house are built with two leaves of clay brick masonry separated by a cavity. All or most of the internal dividing walls are built in single-leaf clay brick masonry. This is also known as cavity brick, solid brick or double brick construction. Figure 1 shows a typical section of full brick walling.

Full brick is much more than a revival of an 'old' form of construction. The internal walls of a full brick house may be displayed as face brick or given a conventional finish. Modern construction materials and techniques have also been adopted.

The purpose of this technical manual is to assist designers, builders, specifiers and others involved in housing construction and to demonstrate that building in full brick is as simple and economical as the familiar brick veneer.

"... building in full brick is as simple and economical as the familiar brick veneer."

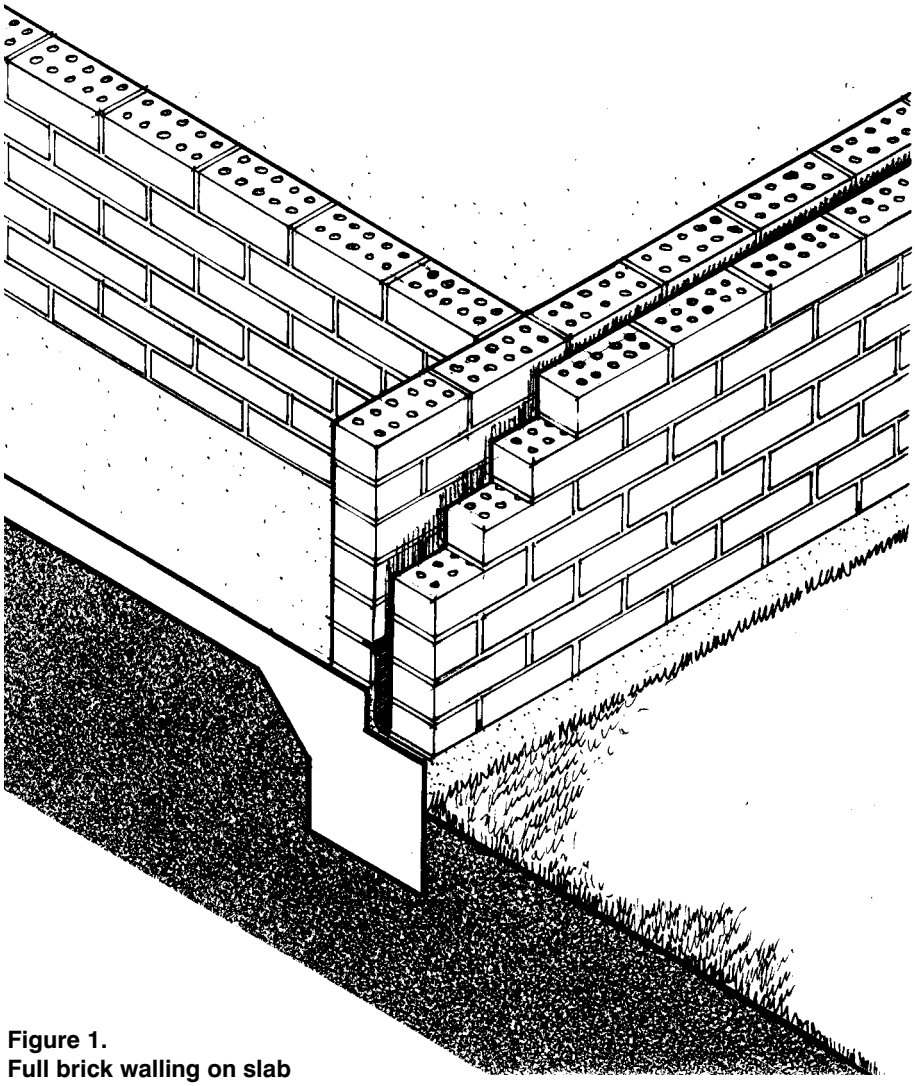


Figure 1.
Full brick walling on slab

WHAT ARE THE ADVANTAGES OF FULL BRICK CONSTRUCTION?

• *Full brick houses are cooler in summer and warmer in winter.* The high mass of a full brick house absorbs the worst of the Australian summer and retains winter warmth. In conjunction with passive solar design principles, full brick construction ensures a comfortable, energy-efficient house.

• *Full brick houses are quiet.* The two leaves of dense clay bricks on the outside of a full brick house reduce noise entry. Single leaf internal clay brick masonry reduces noise transfer between rooms.

• *Full brick houses are low maintenance.* Bricks are extremely durable, immune to vermin and termite attack and do not require any finish to maintain their appearance or performance. Depending on the design, the full brick house may not require skirtings or architraves, reducing the amount of timber needing repainting.

• *Full brick houses are affordable.* As well as being more economical to run and maintain, the full brick house should cost little, if any, more to build than a conventional brick veneer. Full brick houses also command a premium when it comes time to sell.

REGULATORY REQUIREMENTS

All buildings are required to comply with the *Building Code of Australia* (BCA), which in turn requires clay brick masonry to comply with AS 3700-1988, *The SAA Masonry Code.*

At the time of writing this manual the Australian Building Control Board was preparing the *ABCB Housing Code* (a simplified version of the BCA, specific to house construction) and Standards Australia was preparing a code for masonry housing. As far as possible these preliminary documents have been considered in the preparation of this manual.

MATERIALS

BRICKS

Clay bricks are required to comply with AS 1225-1984, *Clay Building Bricks.* This is expected to be superseded in mid-1996 by a new standard covering all masonry materials. The requirements for bricks for full brick construction are identical to those for brick veneer.

Brick selection is a matter of personal choice but light-coloured units with a smooth or slightly-textured face will often be preferred for internal face clay brick masonry.

Like all manufactured products, clay bricks vary slightly in size even within the same batch. However in the majority of cases the standard brick gauge tables can be applied. The bricklayer will need to adjust the gauge if these tables are used for bricks of smaller or larger average size (work size). The alternative of adjusting mortar joint thickness will often be visually unsatisfactory.

MORTAR

The requirements for mortar are given in AS 3700 and are identical for full brick and brick veneer construction. In both cases accurate mortar batching is important.

ACCESSORIES

One of the great qualities of full brick houses is their endurance. Clay brick masonry can last a thousand years and then some, so it is natural that the accessories built into it must be selected for fitness of purpose and durability.

Damp-proof courses and flashings

Currently AS 3700 requires materials for DPCs and flashings to comply with AS 2904-1986, *Damp-proof courses and flashings*. A new standard with the same title was issued as AS/NZS 2904:1995 and this was used in preparing this manual.

The most commonly used DPC materials are bitumen- or polyethylene-coated aluminium or heavily-embossed polyethylene. Uncoated lead or copper are also approved. Polyethylene is preferred in corrosive or saline environments.

Vents

The vents for full brick construction are identical to those used in brick veneer.

Wall ties

Wall ties are required to comply with AS 2699-1984, *Wall ties for masonry construction,* but a new Standard, AS/NZS 2699.1, *Connectors and accessories for masonry construction Part 1: Wall ties* is in preparation. Wall ties for full brick construction differ from those used in brick veneer but are readily available.

Flexible anchors or connectors

These are used to connect clay brick masonry across articulation joints or control gaps. Anchors or connectors are currently required to comply with AS 2975-1987, *Accessories for masonry construction,* but AS/NZS 2699.2, *Part 2, Anchors and accessories* is in preparation.

Lintels

Lintels are usually standard or proprietary steel sections. They may also be reinforced clay brick masonry, prefabricated or constructed on site.

The following lintel span table is suitable for walls carrying a roof load provided there are not widely-spaced rafters or trusses located near the mid span of wide openings. If they occur, the given span should be reduced by 15 per cent. Engineering advice is needed for lintels in walls carrying floor loads or otherwise outside the limits of this table. Manufacturers also provide load/span tables for proprietary lintels.

CHECK LIST

MATERIALS FOR FULL BRICK CONSTRUCTION

- ✓ ***Bricks:*** identical to those used in brick veneer.
- ✓ ***Mortar:*** identical to that used in brick veneer.
- ✓ ***DPCs and flashings:*** identical to those used in brick veneer.
- ✓ ***Wall ties:*** full brick wall ties are readily available.
- ✓ ***Flexible anchors or connectors:*** identical to those used in brick veneer.
- ✓ ***Lintels:*** identical to those used in brick veneer, but needed also on the inner leaf.
- ✓ ***Vents:*** identical to those used in brick veneer.

Table 1.
Lintels for 110 & 90 mm single-storey clay brick masonry (mm)

Span	Standard steel sections	Minimum end support
Up to 1200	75 x 10 flat	100
1200 to 2100	100 x 100 x 6 angle	120
2100 to 3600	150 x 100 x 8 angle	150

Note: *Unequal angle lintels should have their long leg vertical.*

PASSIVE SOLAR DESIGN

This term is widely used but little understood. The basis of passive solar design is heavyweight construction that has the ability to store heat and moderate internal temperatures.

A full brick house with internal (partition) brick walls provides this mass, particularly when combined with a concrete slab floor. Studies have shown that the temperature range in a full brick house is close to the preferred human comfort zone in both the coolest and hottest months. The other principles of good solar design, such as providing large areas of appropriately shaded north-facing glass, particularly apply.

This design technique works equally well in the temperate zones of Australia that includes Adelaide, Brisbane, Hobart, Melbourne, Perth and Sydney, and the cool temperate zones that take in Canberra, Snowy Mountains, NSW Central Tablelands and Victoria's High Country.

Some designers favour the use of a relatively light-weight and light-coloured brick in the outer leaf (for maximum insulation and heat reflection) and a dark, heavyweight brick in the inner leaf (for maximum sound and heat absorption and heat storage). This is feasible but not necessarily practical. However it does reinforce the point that different types and colours of brick can be used inside and out.

"... the temperature range in a full brick house is close to the preferred human comfort zone"

DIMENSIONING DRAWINGS

Plan the house so that dimensions are exact brick or brick-and-a-half lengths. Where interior walls are to be face brick, dimension wall lengths from corners to openings in brick unit sizes. This is critical because these walls will be regularly seen at close quarters. In the same way, vertical dimensions to window sills, heads and wall heights should be taken from the brick height gauge.

A further advantage of full brick construction is that all walls are constructed by the one trade thereby reducing the possibility of dimensional errors and set-out difficulties.

"Dimension wall lengths from corners to openings in brick unit sizes"

CHECK LIST

PLANNING THE FULL BRICK HOUSE

- ✓ The high mass of full brick houses is ideal for passive solar design.
- ✓ The passive solar benefits of full brick apply in most areas of Australia
- ✓ Different bricks can be selected for the internal and external clay brick masonry.
- ✓ Dimension in brick and brick-and-a-half lengths.
- ✓ Fewer trades equals fewer errors.

FOOTINGS & SLABS

Footings for brick walls must be designed in accordance with AS 2870-1996 *Residential slabs and footings.* Slabs for full brick are little more complicated than those for brick veneer. The principles for footing and slab design for full brick on sloping sites are identical to those for brick veneer.

Local experience on known stable sites (around Perth, for example) may permit thinner slabs and less reinforcing than shown here. In other places, a variation of the slab-on-ground known as a waffle-raft may be used.

In areas with very reactive, deep-seated soil movements (such as Adelaide) local experience indicates that stiffer slab footings than those shown here are required. In such cases AS 2870 gives guidance under the additional site classifications of M-D and H-D. It is also recommended that an experienced local engineer design the slab or check the proposed design when building on such sites.

Sizes and reinforcing for strip footings, slabs-on-ground and footing slabs for full brick construction are shown in figures 2 to 4 and 5 to 7.

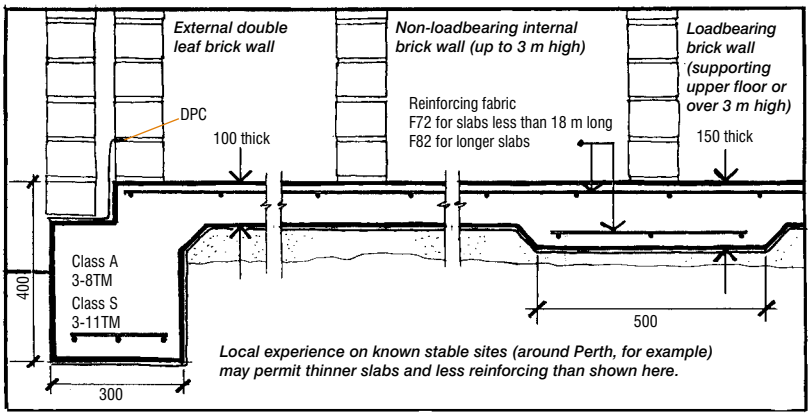


Figure 2.
Slab-on-ground for class A & S sites

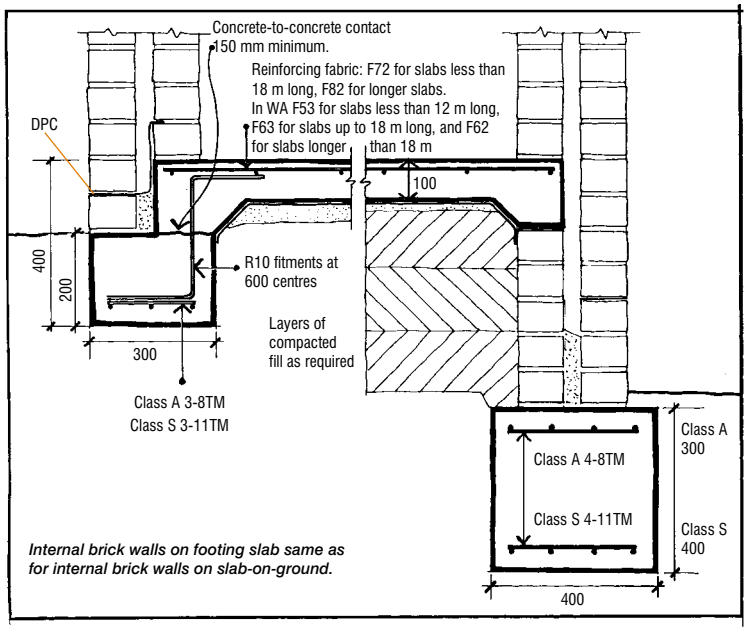
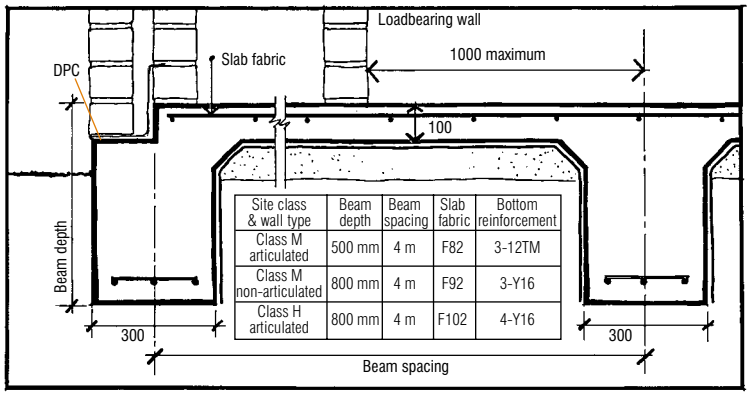


Figure 3.
Footing slab for class A & S sites



Site class & wall type	Beam depth	Beam spacing	Slab fabric	Bottom reinforcement
Class M articulated	500 mm	4 m	F82	3-12TM
Class M non-articulated	800 mm	4 m	F92	3-Y16
Class H articulated	800 mm	4 m	F102	4-Y16

Figure 4.
Slab-on-ground on class M & H sites

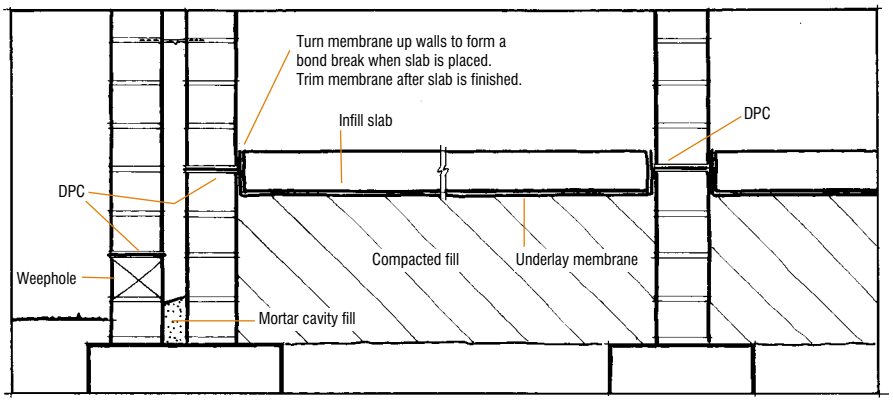


Figure 5.
Strip footings with infill slab floors

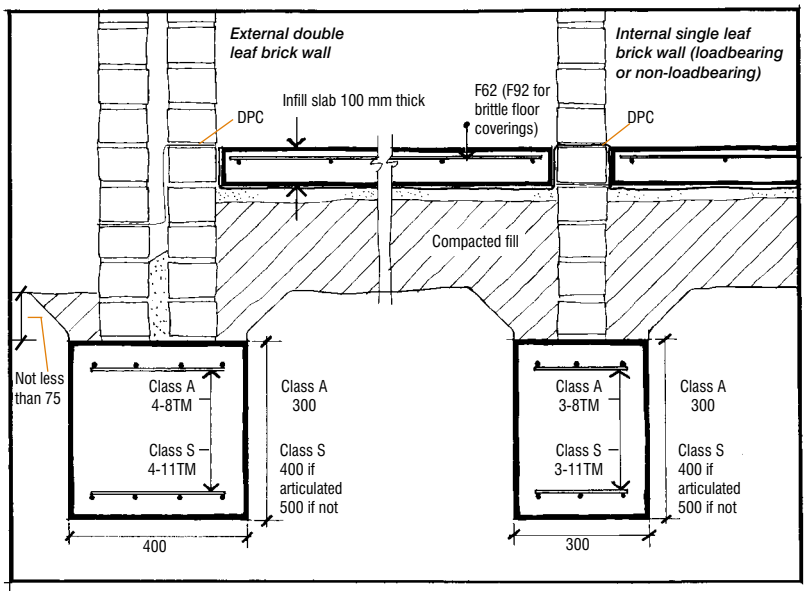


Figure 6.
Strip footings for class A & S sites

> **"Local experience on known stable sites may permit thinner slabs and less reinforcing"**

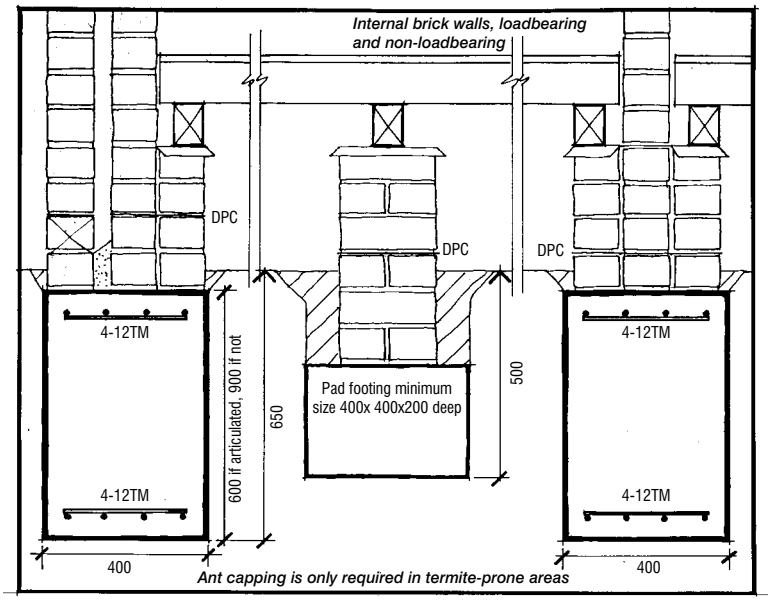


Figure 7.
Strip footings for articulated full brick construction on class M site

BRICK PIERS

Pier construction for full brick is similar to that in brick veneer and is illustrated in figures 8 and 9.

TERMITE CONTROL

In termite risk areas the BCA requires attack to be controlled in accordance with AS 3660.1-1995 *Protection of buildings from subterranean termites Part 1: New buildings.* That standard requires any structural material vulnerable to termite attack to be protected. Therefore in a full brick house with a concrete floor and a timber framed roof, that frame must be protected, but no protection is needed for the walls or floors.

Under AS 3660.1 termite protection for full brick is identical to that for brick veneer even though the material requiring protection is at least 2400 mm above the termite barrier. This suggests that full brick houses are over-protected by the standard and are therefore super-safe from termite attack.

FIRE RESISTANCE

Any external wall closer to a boundary than 900 mm is required to have an FRL of not less than 60/60/60 when tested from the outside. The material with that resistance must extend to the underside of a non-combustible roof. Full brick construction easily satisfies this requirement.

A garage needs a similar FRL 60/60/60 separation from the residence to which it is attached. This means that a full brick house with a garage separated from it by a single leaf of clay brick masonry satisfies the BCA requirements for fire resistance.

For more information on this topic refer to Design Manual 5, *Fire Resistance Levels for Clay Brick Walls,* published by the Clay Brick and Paver Institute.

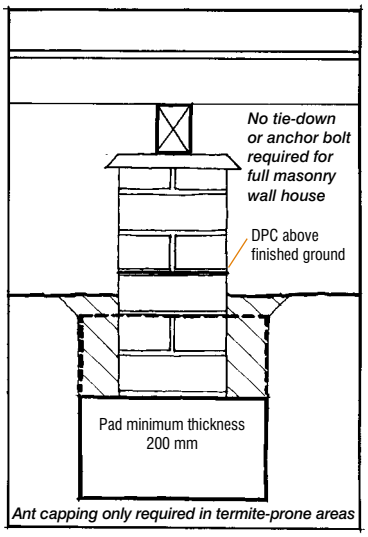


Figure 8.
Isolated brick pier with concrete footing

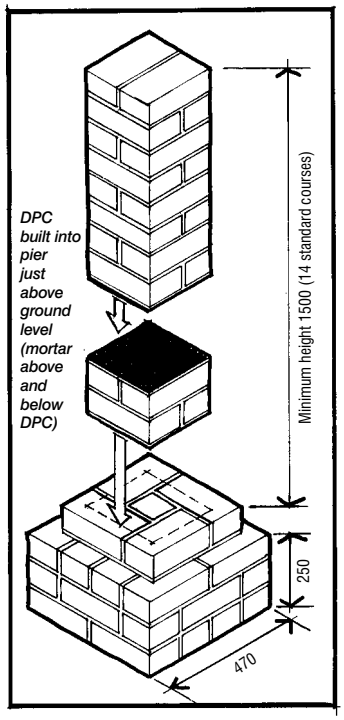


Figure 9.
Isolated brick pier with brick footing

CHECK LIST

FOOTINGS, SLABS, PIERS, TERMITE CONTROL AND FRLs

- ✓ Footing and slab design for full brick is very similar to that for brick veneer.
- ✓ Brick piers are virtually identical for full brick and brick veneer.
- ✓ Termite control measures are identical for full brick and brick veneer.
- ✓ Full brick construction easily satisfies regulation fire resistance requirements.

BRICK WALLS

Sub-floor clay brick masonry

The construction of sub-floor clay brick masonry (figures 7, 8 and 10) is substantially similar to that in brick veneer. Masonry units used below the DPC shall be at least General Purpose class but must be Exposure class in a known aggressive environment. The provision of vents under suspended floors is shown in figure 10. It is also important to provide for good air circulation by leaving openings in internal base walls, large enough to also allow access to internal sub-floor spaces.

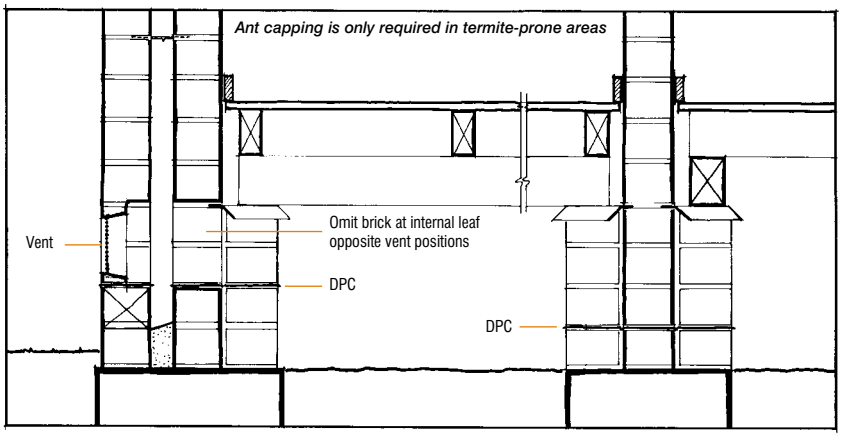
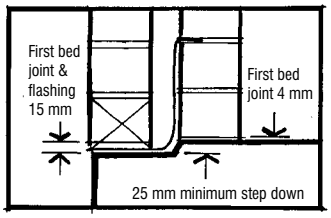


Figure 10.
Cavity walls on strip footing with framed flooring and sub-floor vent

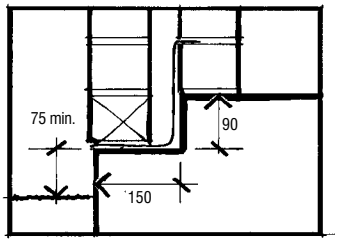
DPCs and cavity flashings

The various forms of DPCs and cavity flashings are illustrated in figures 11, 12 and 13. These membranes should project beyond the wall face during construction but may be cut off flush after the mortar has set.

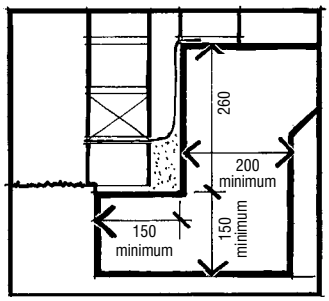
Figure 11.
Slab edge rebates for cavity walls showing DPCs and cavity flashings



MINIMUM EDGE STEP



ONE BRICK EDGE STEP



THREE BRICK EDGE STEP

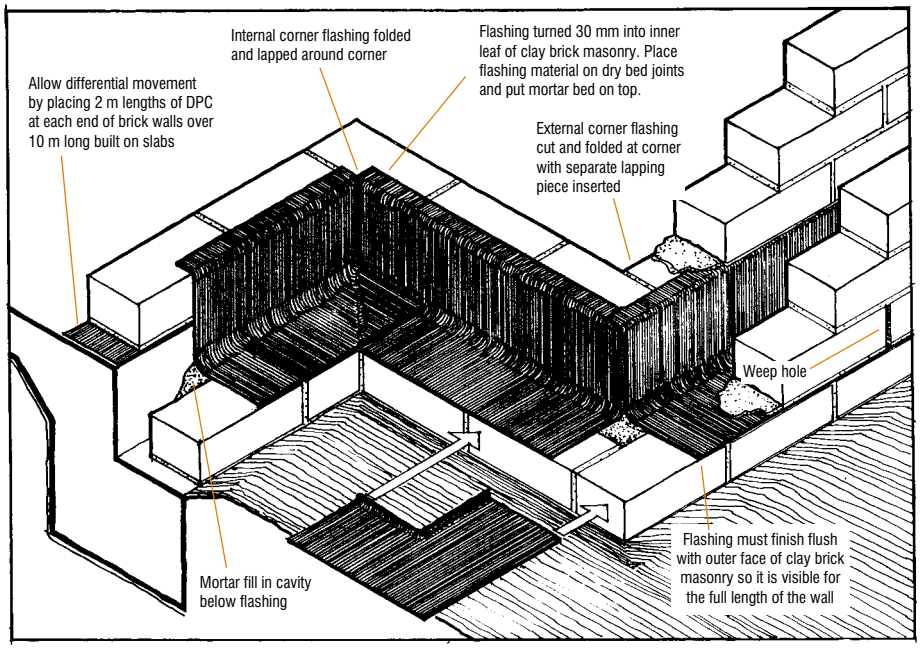


Figure 12.
DPC and cavity flashings for full brick walls

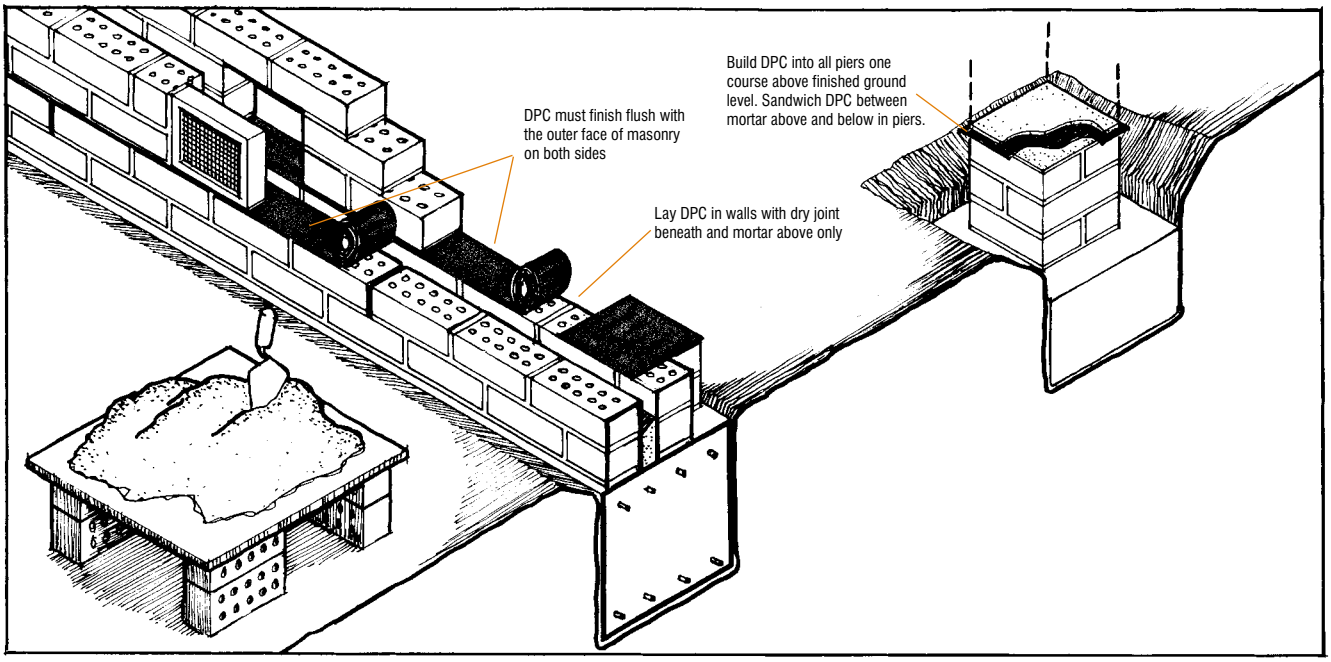


Figure 13.
DPCs for full brick walls on strip footings

Walling above the DPC

The bricklaying process for full brick varies little from that used in brick veneer. Flush mortar joints are usually preferred internally for aesthetic reasons and because they eliminate dust-collecting ledges and harsh shadow lines.

Where render or sheeting finishes are to be applied, internal clay brick masonry is sometimes laid without filling the perpend joints. This is common practice in Western Australia.

To reduce efflorescence and staining it is good practice to cover the top of incomplete clay brick masonry during breaks in construction until the roof is in place.

Bonding of clay brick masonry above the DPC is the straightforward process of building everything in bond, including all intersecting walls. Building up to toothings does not provide adequate bond strength. Where it is not possible to build connecting walls in bond by raking back they must be tied with the equivalent of a light-duty tie in every second course.

Window and external door frames can be fixed after the masonry is constructed but are usually built in as bricklaying proceeds with ties and flashings as illustrated in figures 14 and 15. Temporary protection of frames against damage or scratching of finishes may be needed.

Wall ties must be included at the centres illustrated in figure 16 to provide stability to the outer leaf. Particular attention must be given to the building in of extra ties at unbonded cross-wall intersections and at discontinuities such as window jambs and articulation joints or control gaps.

“Flush mortar joints are usually preferred internally for aesthetic reasons”

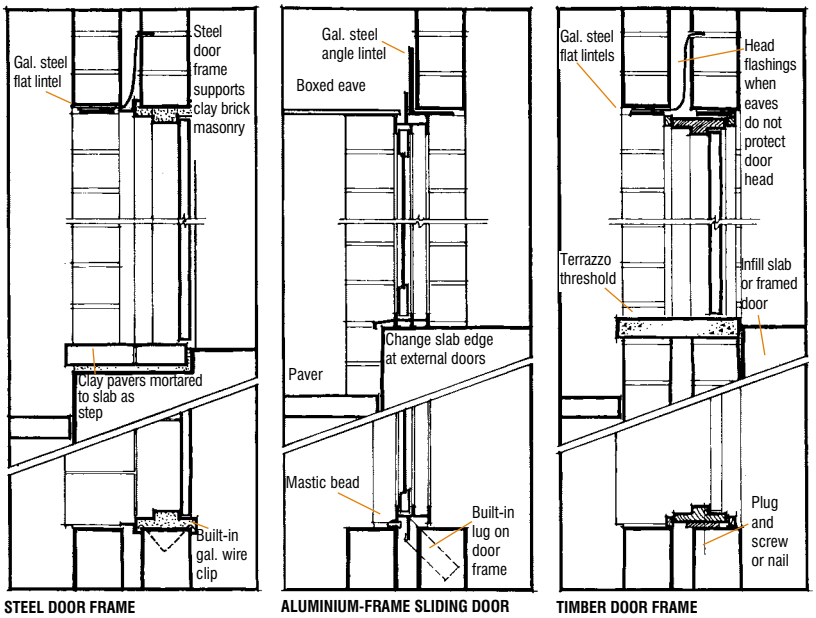


Figure 14.
External doors showing lintel and flashing details and fixing of frames

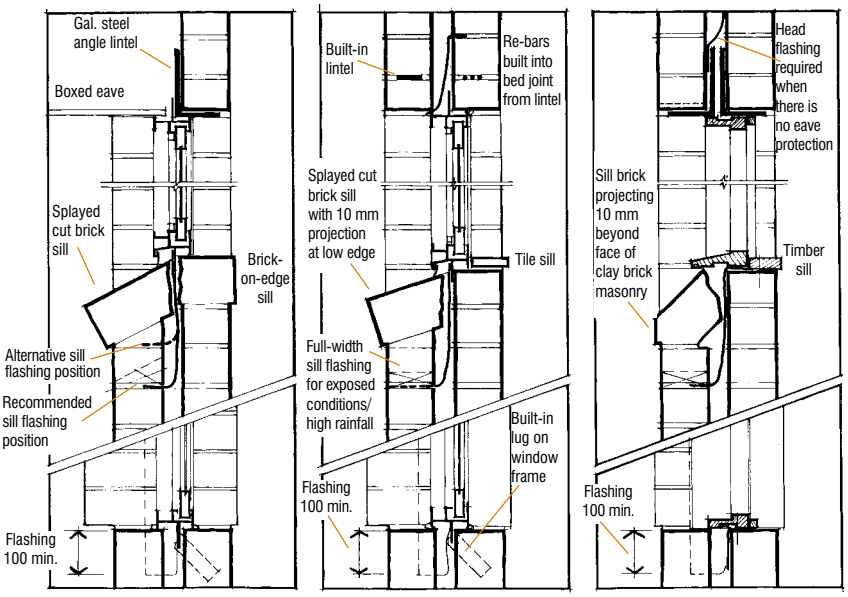


Figure 15.
Lintel and flashing details and fixing of window frames

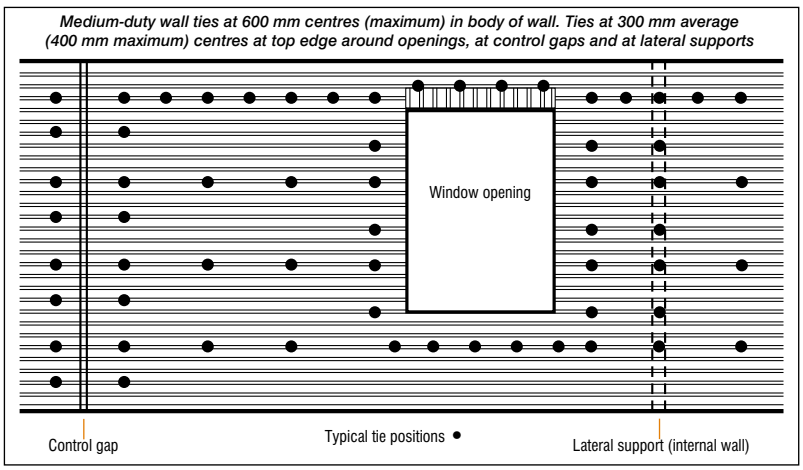


Figure 16.
Cavity wall tie positioning and spacing

Walls subject to high winds

In those areas with design wind speeds of 28 m/s and above it is necessary to provide anchorage for the roof. Details are provided in figures 17, 18 and 19.

Where the design wind speed is above 41 m/s it may be necessary to reinforce the clay brick masonry. This is commonly done with external walls made from hollow units. (See figure 17.)

Lintels

It is common practice to leave a gap in the mortar of about 10 mm at both ends of a steel lintel to allow it to expand without cracking the clay brick masonry. Reinforced clay brick masonry lintels can be used.

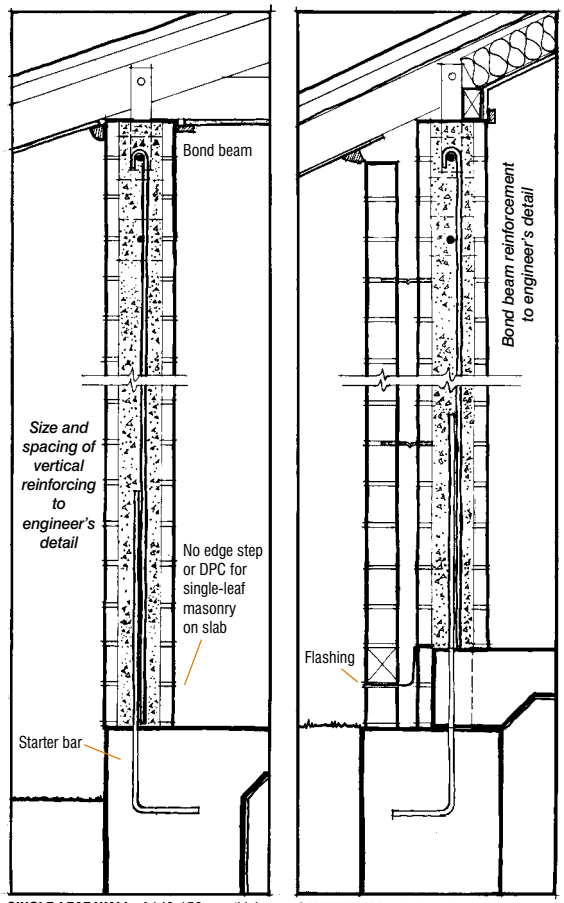


Figure 17. Reinforced hollow clay units in high wind areas

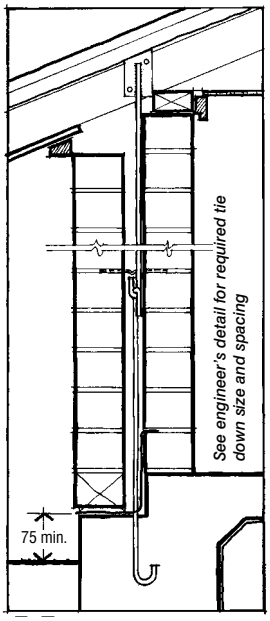


Figure 18. Roof tie down for high wind areas

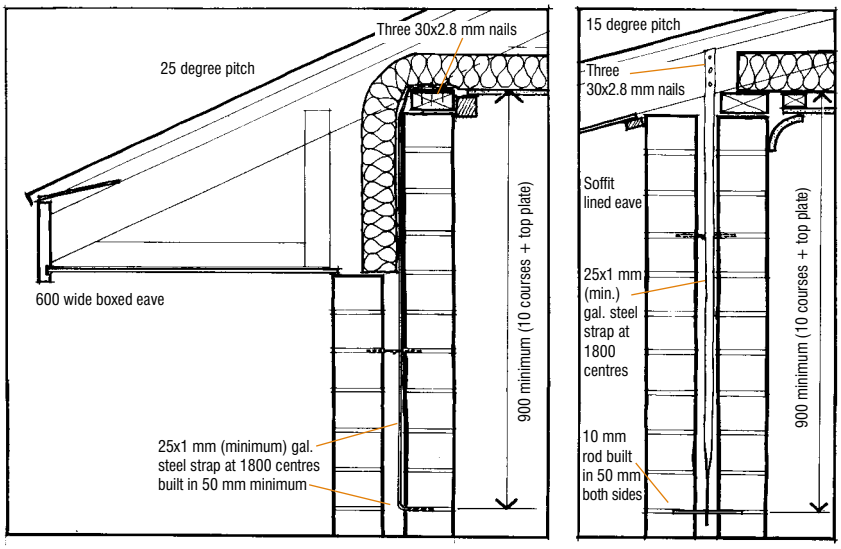


Figure 19. Tie down to clay brick masonry for tile or sheet roof in wind classification areas W28 and W33

CHECK LIST

BRICKLAYING BELOW AND ABOVE DPC

- ✓ Sub-floor clay brick masonry is very similar for full brick & brick veneer.
- ✓ DPC and cavity flashings follow the same principles as brick veneer construction.
- ✓ Bricklaying above the DPC varies little from brick veneer.
- ✓ Flush joints are preferred for internal face clay brick masonry.
- ✓ Bond or tie intersecting walls.
- ✓ Window and external door frames are usually built in during bricklaying and may need temporary protection.
- ✓ Tie across cavities with extra ties at openings, joints or gaps and at cross walls providing lateral support.
- ✓ Roof anchorage is necessary in high wind areas. Reinforcement is required above 41 m/s.
- ✓ Steel or reinforced brick lintels may be used.

Articulation joints

Articulation joints are vertical gaps in brick walls, or between clay brick masonry and windows or doors, that allow for minor footing movements without causing distress or significant wall cracking.

Articulation joints provide the flexibility needed when building on reactive clay soils. Articulation is not required for clay brick masonry on stable sites.

The basic design and construction of articulation joints in the outer leaf of a full brick house is similar to that in a brick veneer. The principles are illustrated in figure 20.

Where it is not possible to provide ties to the other leaf on either side of an articulation joint, it is necessary to provide a structural connection across the joint. This is made with masonry flexible anchors (MFAs) mortared into bed joints of clay brick masonry. See figure 21.

Where MFAs are used in walls over 3 m high or exposed to high winds, they must be built into the clay brick masonry at half-height then at every seventh course (600 mm) above. See figure 22. Articulation joints can usually be placed so that they function also as control gaps.

Control gaps

Control gaps are also called expansion gaps or joints and their purpose is to control differential and thermal movement of materials. They are essential in long runs of clay brick masonry.

The design and construction of control gaps in the external leaf of a full brick house is identical to that in a brick veneer. Except at re-entrant angles in long walls, control gaps are not usually required in internal clay brick masonry. Where an internal gap is required it can usually be located at a full-height opening such as a door or window.

“Control gaps are not usually required in internal clay brick masonry”

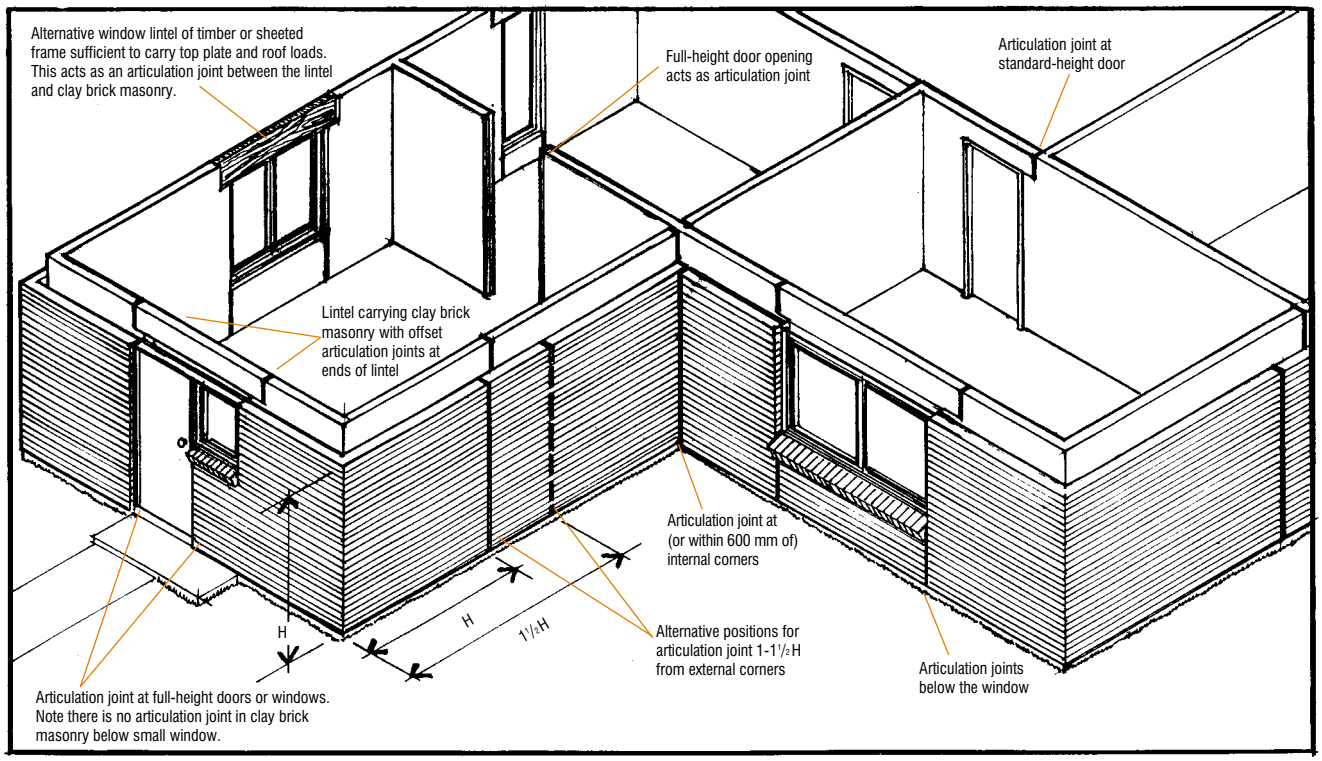


Figure 20.
Typical articulation joint locations

"Articulation is not required for clay brick masonry on stable sites"

Figure 21.
Control and articulation joint detailing

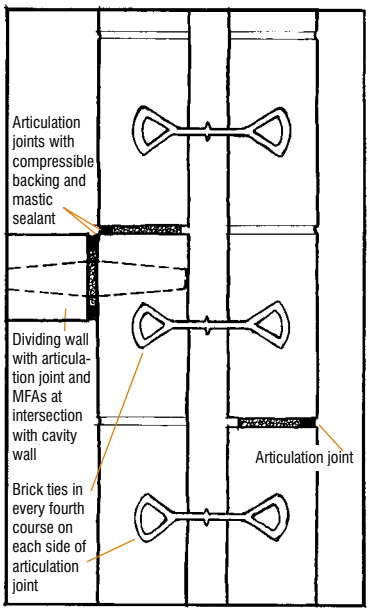
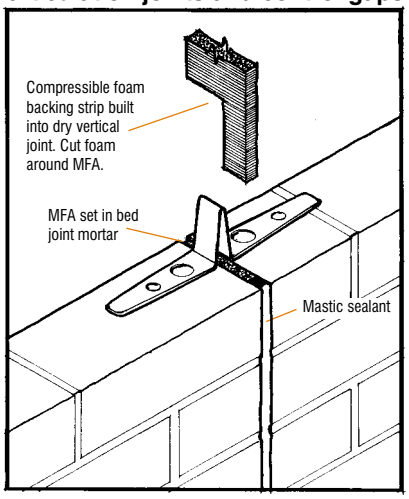


Figure 22.
Masonry flexible anchor in articulation joints and control gaps



Doors

Full height doors have many advantages in full brick construction:

- They are simple, neat and economical to build.
- They act as articulation joints.
- They allow for simple reticulation of electrical switch cabling.

The door itself can be full height or alternatively of normal height and have a fixed panel of matching thickness over it or the frame can be made with a transom and fixed glass above the door leaf.

With full height doors there is no need to match opening widths to brick sizes, but if they are to be of normal height with brickwork above it is important that both heights and widths be compatible with brick sizes.

Standard door height is 2040 mm so 24 courses of traditional bricks or 21 courses of modular bricks give the required door opening height while allowing for the frame thickness.

Door widths that match brick openings are given in table 2 and the concepts are illustrated in figure 23.

"With full height doors there is no need to match opening widths to brick sizes ..."

Table 2.
Optimum door width for standard-height doors

Brick length (mm)	Frame type	Door width (mm)	Brick width opening (mm)	Brick width opening (bricks)
Standard (230)	Steel	720	730	3
	Steel	820	850	3½
	Timber	770	850	3½
	Timber	870	970	4
Modular (290)	Steel	770	810	2⅔
	Steel	870	910	3
	Timber	720	810	2⅔
	Timber	820	910	2

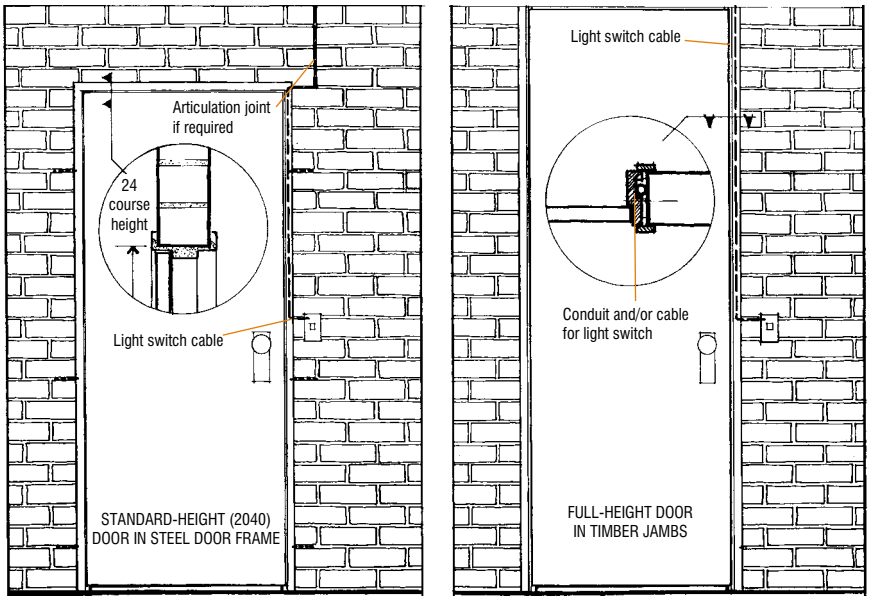


Figure 23.
Internal doors showing switch wiring

Steel door frames have been popular in commercial buildings and home units and are increasingly used in houses. They are readily available with hinges fitted and can be prepainted to match powder-coated aluminium window frames.

Steel frames form a guide for bricklayers to build to and they increase the sense of a strong, solid building. They do not require architraves, saving finishing time and cost.

Basic steel frame sizes allow building into 110 mm or 90 mm thick clay brick masonry with head heights to match 24 courses of standard bricks or 21 courses of modular bricks. Full-height steel frames are also available to order.

Timber door frames are best with full-height, floor-to-ceiling doors. When full-height timber frames are used it is best to finish the ceiling flush through the door opening without a frame at the top of the door. This way the timber door jambs are simply two straight lengths fixed to the clay brick masonry. The architraves covering the gap between frame and bricks are four straight pieces from floor to ceiling, eliminating mitre cuts in frames or architraves.

Timber frames for standard 2040 mm high doors are widely available and require a flat steel arch bar to support the clay brick masonry above.

Articulation joints at standard-height doors When there is a potential for footing movement, stresses in the wall are concentrated at door heads and may cause cracking at corners. An articulation joint above selected internal doors will help to solve this problem.

The articulation joint should run from the door head to the ceiling and be a half-brick length away from the side of the door frame. This gives a seat for the arch bar or clay brick masonry spanning the opening. See figure 23.

External doors in cavity walls

Steel door frames in a cavity wall are illustrated in figure 24.

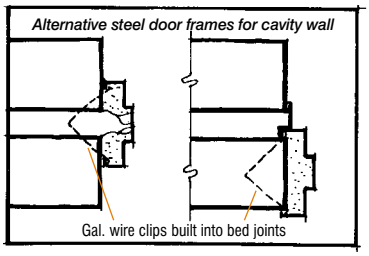


Figure 24. Steel door frames in cavity walls

"Steel door frames ... do not require architraves, saving finishing time and cost"

CHECK LIST

ARTICULATION JOINTS, CONTROL GAPS, INTERNAL DOORS

- ✓ Articulation joints will usually be required on reactive sites.
- ✓ Articulation joints can also act as control gaps.
- ✓ Control gaps may be required in long runs of external clay brick masonry but rarely in internal clay masonry
- ✓ Full height door openings have many advantages.
- ✓ Standard door sizes suit brick dimensions.
- ✓ Door openings can act as articulation joints.
- ✓ Steel door frames are inexpensive and solid.
- ✓ Timber door frames are best if full height.

Brick cleaning

The cleaning of external clay brick masonry in a full brick house is identical to that of a brick veneer.

Internal face clay brick masonry may be acid cleaned. Neutralise after acid cleaning and provide adequate ventilation to ensure thorough drying otherwise acid vapour may corrode unprotected metallic and other susceptible objects. Follow local health and safety regulations. Prewetting the clay brick masonry is recommended but do not saturate the bricks — a light spray just ahead of the work in progress should be sufficient.

If internal walls are to be painted, mortar dags should be removed and the walls hosed down with plain water and allowed to dry prior to painting. The advice of the paint supplier should be sought if walls have been washed with a chemical rather than water.

"Neutralise (internal face clay brick masonry) after acid cleaning and provide adequate ventilation"

Internal wall finishes

Clay brick external walls do not require any finish to preserve their function or appearance.

In full brick construction all or some of the internal walls may be displayed as face brick. Clay bricks are naturally durable and attractive and do not require the initial and ongoing cost of additional treatment. Face brick is also economical as skirtings (and in many instances architraves) are not required, reducing the amount of timber to be purchased, fitted, finished and maintained.

Where other than internal face brick is desired a number of finishes are available: renders, board sheeting and paints. These can be applied to full or dado height to selected areas (for example specific walls or rooms) during construction or at a later stage, for instance during renovations.

Where render, sheeting or wallpaper is used, service conduits or pipes may be chased into walls. (Some states permit electrical cable to be buried in the render.)

Renders include:

- Float and set
- Exposed aggregate render
- Stucco/rustic
- Bagging
- Lime wash

These are applied to the completed clay brick masonry by separate trades (except bagging that is usually done by the bricklayer). Render finishes are generally more expensive and, except for exposed aggregate renders and lime wash, also require painting. Bagging mortar may be coloured to eliminate painting.

These finishes require more building time as they must dry thoroughly prior to any final paint application.

Render finishes usually eliminate the brick outline, the exceptions being lime wash and, in some cases, bagging.

Sheeting requires fixing by trades-persons. There are four basic sheeting methods:

- Plasterboard is fixed by proprietary adhesives directly to the clay brick masonry. Alternatively it can be fixed onto plasterboard packing pieces, battens or furring channels. Plasterboard requires painting.
- Fibre-cement board must be fixed to battens and also requires painting.
- Timber, either sheeting or board, can be fixed to battens to full or dado height and can be painted or stained.
- Wallpaper may be hung on backing paper glued directly to the clay brick masonry providing flush mortar joints have been used.

Paints Brick walls can be painted with any one of the many paints available for masonry walls. These include standard acrylic or oil-based paints or thick (filler) paints designed to smooth uneven surfaces. Almost all paints require a sealer coat.

- Standard paints are suitable for clay brick masonry laid to face standard.
- Standard paints may also be used on non-face clay brick masonry with filled, flush mortar joints. ‘Sponged’ or ‘rubbed’ joints are also suitable.
- Thicker paints are more suitable for clay brick masonry that has not been laid to face standard.
- The paint manufacturer’s instructions must be followed.

Skirtings

Skirtings are not required on face brick walls or walls that have been bagged or lime washed. Otherwise secure skirtings with wall plugs.

Wall/ceiling junction

A typical wall/ceiling junction using a standard cornice is shown in figure 25.

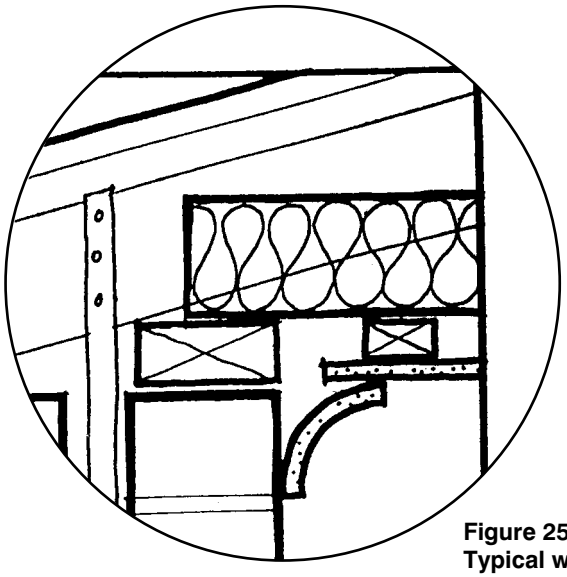


Figure 25.
Typical wall/ceiling junction

CHECK LIST

BRICK CLEANING AND INTERNAL FINISHES

- ✓ Neutralise after acid cleaning internal clay brick masonry and provide good ventilation
- ✓ No special finish is required for external clay brick walls.
- ✓ Some or all internal full brick walls may be displayed as face or finished.
- ✓ Finishes include render, sheeting, paint or wallpaper.

Services

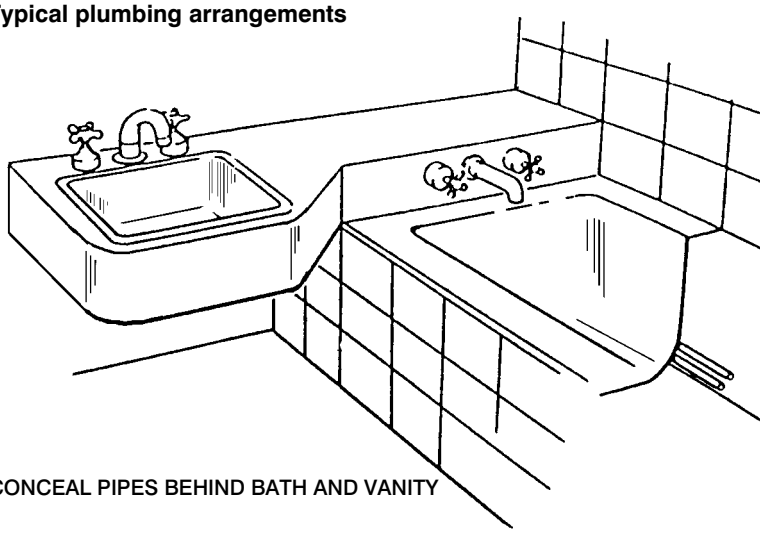
Plumbing

Designing and installing plumbing in a full brick house requires more consideration than in a framed structure and minor changes in procedure. Here are some guidelines:

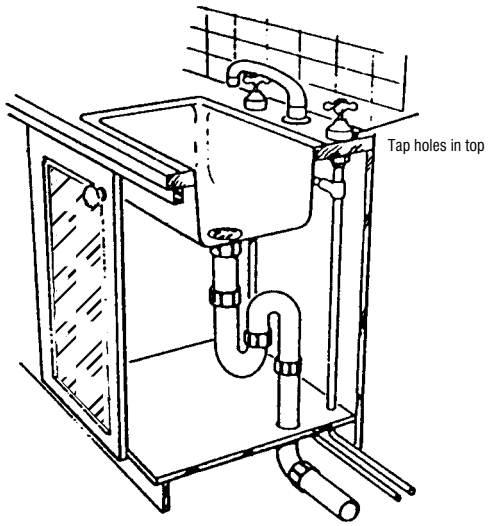
- Position baths, sinks, basins and showers on external walls so that pipe runs to the outside are short and can, where practicable, be run directly through the wall.
- Reduce chasing by hiding pipes behind or under sinks, baths, vanities and basins.
- Choose baths, basins and sinks that allow taps to be mounted on the fitting rather than on the wall.
- Provide maintenance access to junctions, traps and connection points.
- Where chasing is necessary use a twin-blade masonry saw and render or tile the area. Avoid inhaling dust containing silica.

Some typical plumbing options are illustrated in figure 26.

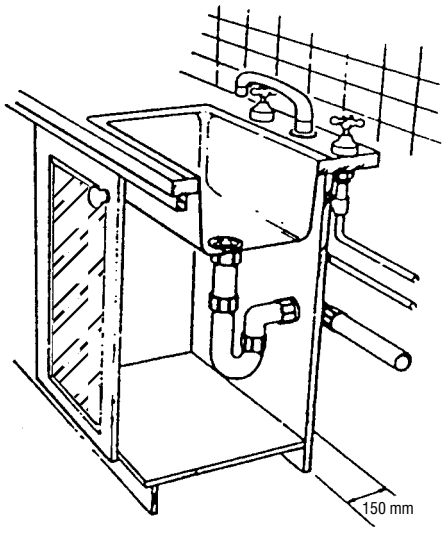
Figure 26.
Typical plumbing arrangements



CONCEAL PIPES BEHIND BATH AND VANITY



CONCEAL PIPES UNDER CUPBOARDS



PROVIDE SPACE BEHIND CUPBOARDS

Electrical

As with plumbing, electrical wiring requires more consideration in a full brick design. With a little planning it is possible to wire a full brick house without chasing. Practices vary from state to state but here are some guidelines:

- Position as many GPOs as possible on external walls.
- Where possible position GPOs in adjacent rooms back-to-back.
- Use full-height door frames to route cables from the ceiling space to the switch location. (See figures 23 and 24.)
- Use architrave-mounted switches where possible. Alternatively use surface-mounted switches located within 150 mm of the door frame. (See figures 23 and 24.)
- Route cable (through surface-mounted conduit if required by regulations) in cupboards and wardrobes.
- Have the bricklayer place flat plastic conduit in the bed joints from door openings to the GPO or switch location.
- Flat conduit can also be used in a rendered wall although some states still permit the cable to be buried in the render thickness.
- Conduit can sometimes be routed through the cavities in bricks or blocks.

Some of the electrical installation must be carried out during bricklaying and the electrician may also need to coordinate some aspects with the bricklayer.

"With a little planning it is possible to wire a full brick house without chasing"

CHECK LIST

PLUMBING AND ELECTRICAL SERVICES

- ✓ Plumbing design and installation requires more consideration and minor changes in procedure.
- ✓ Reduce chasing by hiding pipes behind cabinets etc.
- ✓ When chasing, avoid inhaling dust containing silica.
- ✓ Choose fittings that allow taps to be mounted on them.
- ✓ Position GPOs on external walls or back-to-back where possible.
- ✓ Route switch cables through full height door frames.
- ✓ Route cable in cupboards and wardrobes or bury in render using flat conduit if required.
- ✓ Coordination between bricklayer and electrician is usually required.

SCHEDULING TRADES

The scheduling of trades for full brick construction will be different from that for brick veneer. A typical schedule is shown in table 3.

Table 3.
Typical trades schedule for full brick house construction

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Clear block														
Set out														
Cut & fill														
Formwork														
Drain rough-in														
Termite/level up piers														
Reinforcement														
Concrete slab														
Drains						MAY BE CARRIED OUT AT ANY TIME DURING THIS PERIOD									
Bricklaying														
Roof framing														
Fascia, gutter, valleys														
Roofing														
Chasing						MAY BE CARRIED OUT AT ANY TIME DURING THIS PERIOD									
Eaves														
Electrical rough-in														
Plumbing														
Rendering														
Brick cleaning														
Plastering														
Kitchen														
Ceramic tiling														
Joinery														
Painting														
Electrical fit-out														
Plumbing fit-out														
Clean up														

Note: This schedule is indicative only. Shading shows the period during which the activity is carried out.