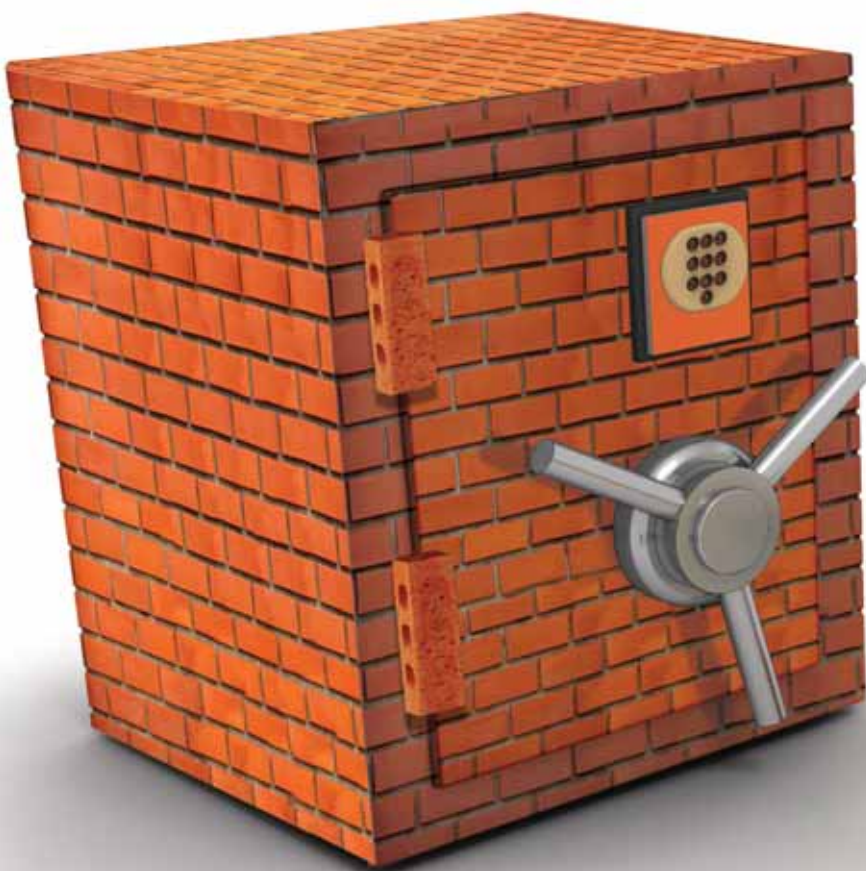


# CLAY BRICK ASSOCIATION

BUILDING CONTRACTORS HANDBOOK



THE SAFEST CHOICE  
YOU WILL EVER MAKE



# CLAY BRICK ASSOCIATION

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The Clay Brick Association is unable to warrant the suitability of the details, materials and performance of any building in a particular environment nor accept responsibility for any claims from this information



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# INTRODUCTION

The Clay Brick Association has pleasure in providing this builder's pocket manual which has been designed to provide a handy quick reference to most of the basic principles required when planning, setting out, and constructing new buildings. The data and illustrations cover the basic requirements for constructing a well designed and durable structure. Reference has been made to SABS standards and Codes of Practice and the new National HOME Builders Registration Council's Standards and Guidelines. It remains the responsibility of the designer and building contractor to ensure that the building conforms to the architectural plans and appropriate standards for the building and site conditions of the project.

The NHBRC's Standards and Guidelines are not intended to replace or overrule existing National Building Regulations and/ or SABS Codes of Practice. They are rather directed at providing a simple reference document to ensure that builders adhere to accepted building practice.



# SITE MANAGEMENT, KEY TO MORE PROFITS

Control of wastage and breakage on this site is the key to more profits from building construction. Here are a few simple ways to cut wastage and increase productivity on your site.

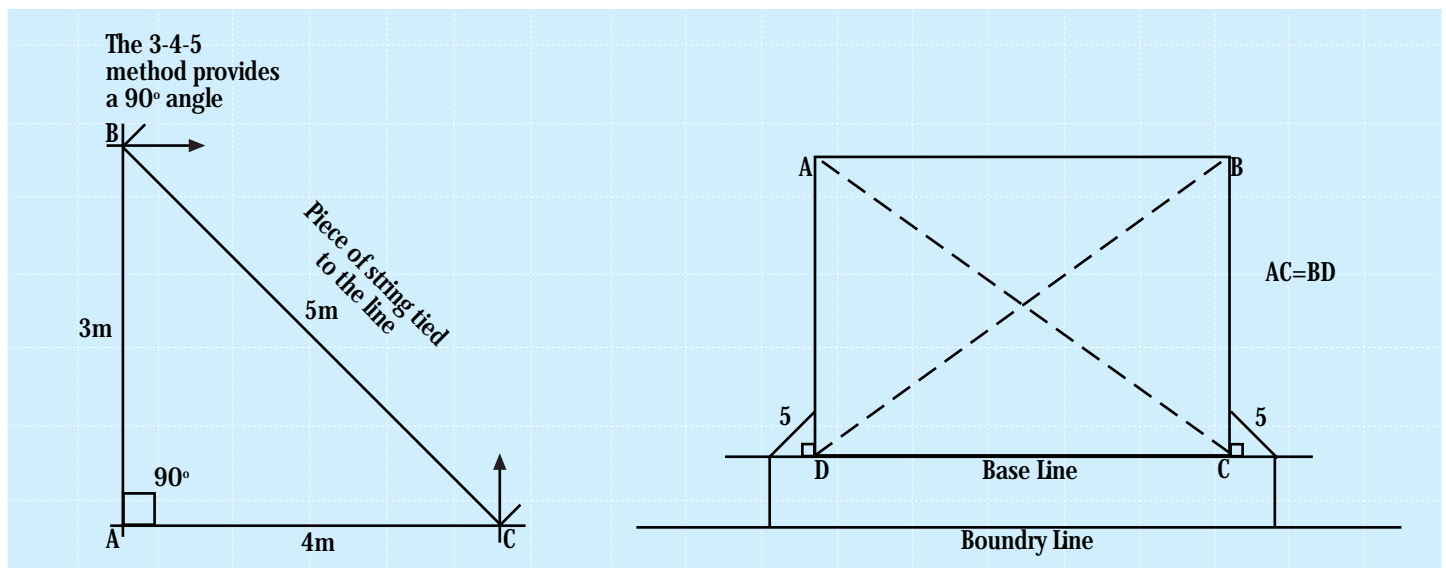
1. Store sands for concrete, mortar and plaster separately as near to the structure and mixing area as possible. They should be placed on well compacted clean ground or a platform constructed of broken bricks, aggregate or even a weak concrete mixture for larger projects to prevent contamination.
2. Preferably store bagged cement in a lockable hut on a raised floor protection from rain and rising damp. If outdoors, store on elevated wooden pallets, well covered with plastic sheeting or a tarpaulin suitably weighed down for windy conditions.
3. Stack bricks on firm hard ground as close to the structure as possible, protected from storm water and splashing with mud. Contamination of building materials results in an inferior end product. Pre-planning the layout of material storage areas will result in lower costs.
4. Hand-mixing of concrete and mortar should only be done on small projects or for small quantities of material. Hiring a concrete mixer at the foundation and floor slab stage could save money.
5. Draw up a simple bar chart showing the construction stages of each component of the house and plan your delivery schedule with your supplier in advance with high value window frame, etc arriving on the day of installation to reduce the chance of the theft and the need for storage. Use this planning principle for all materials and trades.
6. Mark out an area on site for all rubbish and waste. A tidy building site means a more profitable contract. At the end of each day ensure that that all building rubble and unused dagha is moved on to the rubbish heap before it sets. The smaller the site the more important rubble control and removal becomes.
7. Protect wooden or aluminium door and window frames from damage by wheelbarrows, scaffolding etc.



# BUILDING LINES, SURVEY PEGS, SETTING OUT

## Property and Boundary Peg

1. The onus of locating and marking the correct boundaries of the site or stand is that of the seller of the property. The buyer or his representative must then satisfy himself that these pegs correctly mark the stand he has purchased. The builder likewise must check these boundary pegs and be certain that they represent the stand as marked on the construction drawing. The boundary pegs should be well protected for future use or any further setting out. If these pegs are likely to be lost with the building of boundary walls, or fences, offset pegs should be provided. Protection can be provided by three posts planted around the peg with brightly painted horizontal planks nailed to the posts.
2. The setting out of the building to the drawing should always be checked by a second person to ensure it is correctly positioned in terms of the building plan and regulations. The drawings should be studied, the boundary pegs identified and the building corner pegs set out on the site.
3. Having set out the corner pegs of the building they should be checked for squareness using the diagonal method shown below viz with the 3,4,5 string length method.

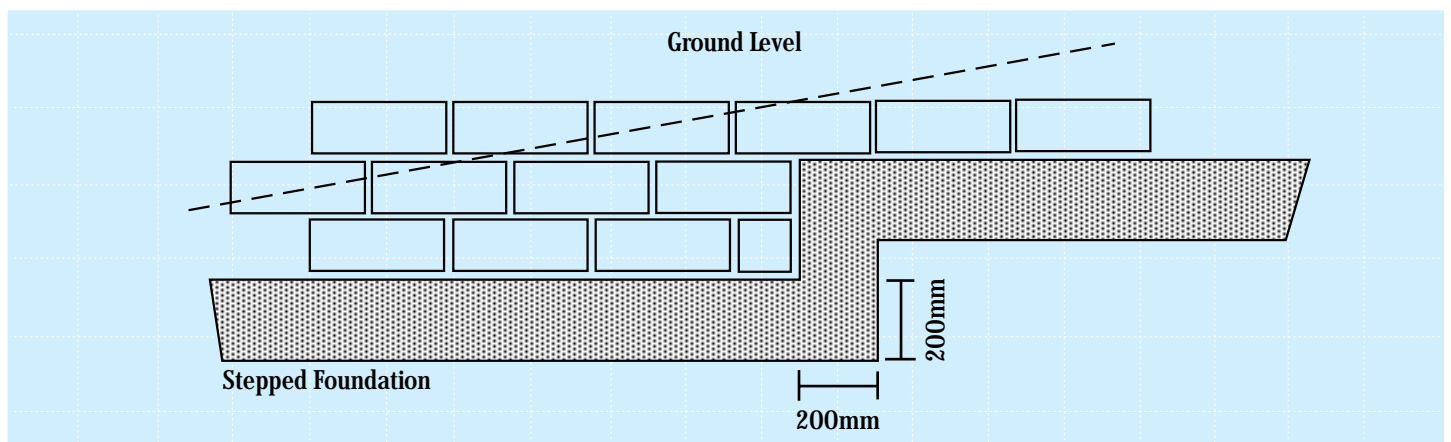


4. Building profiles should be kept at least one metre away from the temporary located outside corner pegs. This will allow for enough room for workers and wheelbarrows to pass between the edges of the trenches. (The profile must remain in position till after the foundation walls have been constructed.)



# FOUNDATIONS, FOOTINGS AND SURFACE BEDS

1. The purpose of foundations is to support the walls by spreading their load uniformly over soft and hard soil and for providing a level base for the laying of bricks. Various types are used being predominately strip footings that can be stepped on a sloping site (others – pad, raft, slab or piled foundations). Eccentrically loaded foundations to be avoided unless designed by a competent person.
2. Foundation trenches or excavations must be dug out so that the foundation will rest on hard ground with the trench width and depth that conforms to the drawings and dimensions of the local authority or the National Home Builders Registration Council.
3. The trench sides must be straight and plumb and the bottom of the trench level, except in exceptional circumstances.
4. To ensure that the foundation is level and uniform thickness, level pegs are to be placed in the trenches to indicate the concrete thickness. These levels are very important as they represent the start of brickwork. When the ground slopes, the trench bottoms must be stepped so that the foundation itself does not slope. The step should be equal to one or more course of brickwork (i.e. thickness of brick plus one mortar joint).






## Notes:

1. The amount of water added to mix must be enough to make the mix workable and plastic.
2. Use cement that complies with SABS ENV 197-1; strength class CEM1 325,5 or higher
3. Stone for concrete should be 19mm or 26mm maximum size.
4. If you use a wheelbarrow for measuring, it should be a builder's wheelbarrow which has capacity of 65 litres.






## CONCRETE MIXES - Basic recommendations of the Cement and Concrete Institute.

Low-strength concrete suitable for : house foundations		
CEMENT	CONCRETE SAND	STONE
		
1 BAG	2 WHEELBARROWS	2 WHEELBARROWS

To make 1 cubic metre of concrete you will need :

**5½ bags cement + 0.75 cubic metres of sand + 0.75 cubic metres of stone**

Medium-strength concrete suitable for : house floors, footpaths and driveways		
CEMENT	CONCRETE SAND	STONE
		
1 BAG	1½ WHEELBARROWS	1½ WHEELBARROWS

To make 1 cubic metre of concrete you will need :

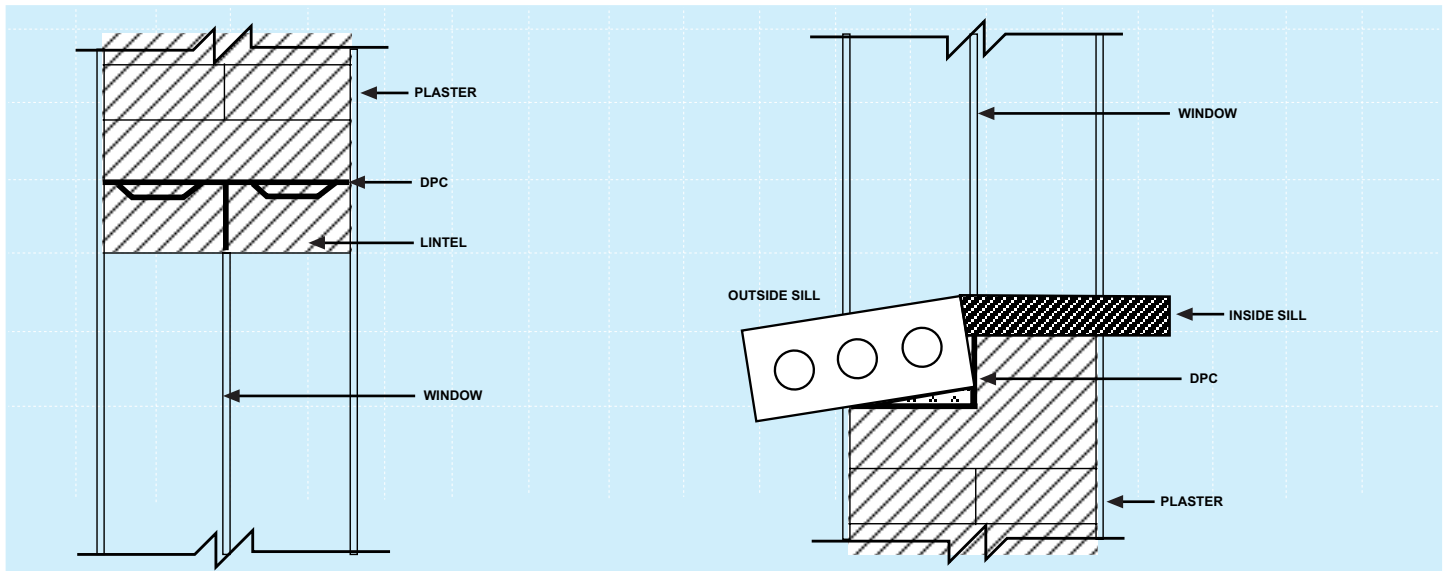
**7 bags cement + 0.70 cubic metres of sand + 0.70 cubic metres of stone**

### Surface Beds

- Generally a minimum of 75mm thick 15MPa concrete cast on a layer of compacted fill (or hard core). In wet climates or low lying situation surface bed should be cast on a polyethylene sheet at least 0,25mm thick.
- Top level to at least 150 or 2 brick courses above external ground level.







## Cavity Wall Construction

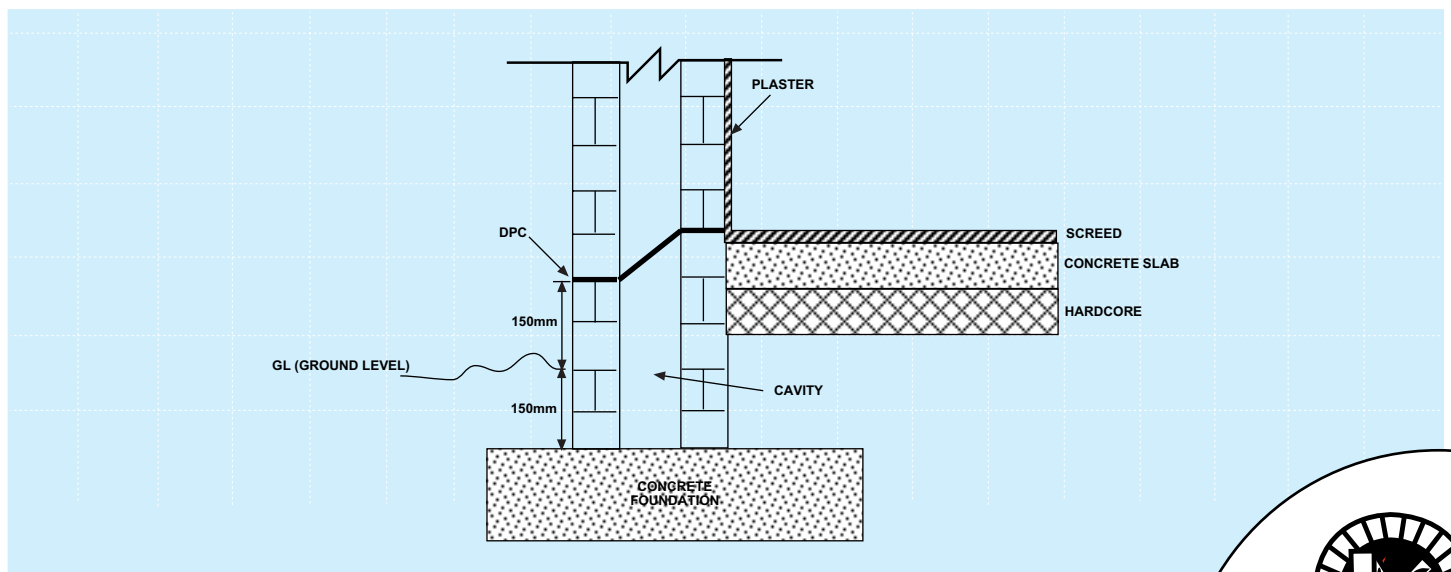
The recommended method for preventing moisture penetration through walls is to have walls in the cavity wall construction.

- The cavity wall consists of 2 bricks leaves (or skins) with a 50-110mm cavity.
- The two brick leaves must be tied together with wire walls ties, Butterfly and modified PWD.

### Note:

There must be at least 2.5 ties per  $m^2$  set level or with a slight slope to the outside leaf.

- In certain areas of the country, the cavity has been replaced effectively by a bitumen layer painted on the outside face of the inner leaf.
- In coastal areas the wall ties shall be galvanised



## BRICK TYPES AND PROPERTIES

Clay bricks are defined as “burnt clay masonry units” in the SABS 227.

Clay bricks are available in 4 categories:

(a) Face Bricks; available in classifications:

**FBS (Face Bricks Standards)** units that are selected or produced for their durability and uniformity of size and shape.

**FBX (Face Brick Extra)** units that are selected or produced for their durability and high degree of uniformity of size, shape and colour.

**FBA (Face Brick Aesthetic)** units that are selected or produced for their durability and aesthetic effect deriving from non-uniform of size, shape and colour.

(b) **NFP (Non-Face Plaster Bricks)** – suitable for building work which is then plastered and painted.

(c) **NFX (Non-Face Extra Bricks)** – used in general building work for extra durability in such areas as below ground and in damp situations like retaining walls where looks are not important.

(d) **Engineering Bricks** – for special structural or load bearing purposes. Available as Face Brick and Non-Face Plaster, they are supplied to pre-agreed average strength.

When ordering or specifying clay bricks, ensure the following points are discussed and made known to the supplier.

- The degree of exposure to weather conditions, closeness to the sea, etc.
- Track record of the preferred brick in the area where you are building.
- An undertaking or warranty from the brick supplier that the bricks delivered will be fit for purposes.
- Colour expectations in the case of face bricks.
- The acceptable levels of breakage during delivery to site.

**Note:**

To avoid colour banding, it is highly recommended that face bricks are taken from a number of different packs and carefully blended during the building operation.



## Brick Sizes

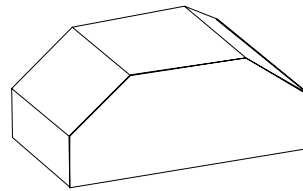
The most commonly used brick size has similar dimensions to that used by the Ancient Egyptians which provides the ideal width for the human hand to lift and place with the minimum of strain as well as allowing the bricks to be bonded in any direction.

There is a rough arithmetical relationship of length to width of 2 : 1 and length to height of 3 : 1 in the standard or Imperial brick of 222mm long \* 106mm wide \*73mm high.

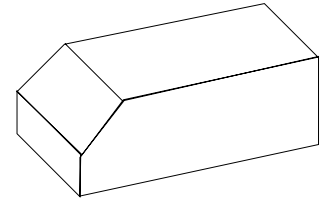
### Other sizes include:

Length	Width	Height
222	90	73
222	40	73
222	90	114
222	140	114
190	90	90
290	90	90

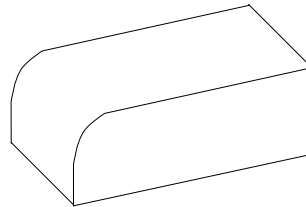
DOUBLE CANT



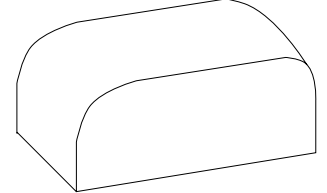
SINGLE CANT



SINGLE BULLNOSE



DOUBLE BULLNOSE



A range of special shapes are available from certain suppliers to enhance to aesthetic detailing of buildings. The common specials available are the cants and the bull-nose bricks.

### NB Discuss availability of specials with your supplier.

Other clay brick properties that required consideration in larger more complex structure are:

- Compressive stress (varies form 7MPa to 50MPa)
- Water absorption (face brick up to 10% - NFP up to 16%)
- Modules of rupture – strength in bending.
- Moisture expansion – important when detailing longer structures.

**Irreversible moisture expansion takes place with all clay product predominantly during the first 24months after manufacture. This expansion is dependent on the clay minerals present in the product and firing temperature of the process. The movement takes place in both the vertical and horizontal directions.**



**NB Expansion or control joint centres should not exceed the following:**

	<b>Walls,m</b>	<b>Parapets,m</b>
<b>Category 1</b>	16,0	11,0
11	10,0	8,0
111	6,0	4,0

Category 111 products are the ones that require careful detailing.

-Initial rate of absorption – affects the development of bond between the mortar and the brick, Bricks with high rates of absorption may require pre-wetting well before laying to prevent absorbing excessive water from the mortal mix. Trial and experiments when bricks arrive on site will determine the need to pre-wet bricks.

The individual leaves of cavity walls may be constructed of dissimilar (i.e. clay and concrete bricks) materials provided, however, that the interconnecting walls ties are flexible and reveals and wall ends are not in direct contact with each other.

**It is not recommended that dissimilar materials be used in the same leaf.**

**Particular attention must be paid in loadbearing walls of cavity construction with dissimilar materials. Failures have occurred where cavity walls with clay outer skin and concrete inner skin support concrete floors. In time, the clay leaf may expand whilst the concrete leaf may shrink leading to a situation where all the load might be carried by the leaf. This may lead to structural failure.**

Control joints in concrete and calcium silicate materials are placed to follow for shrinkage not expansion. Recommended spacing of 10mm joints are:

	<b>Wall,m</b>	<b>Parapets,m</b>
Concrete	6,0	5,0
Calcium silicate 8,0	6,0	6,0



## BONDS, JOINTING AND MORTAR MIXES

**Bonding of Brickwork**

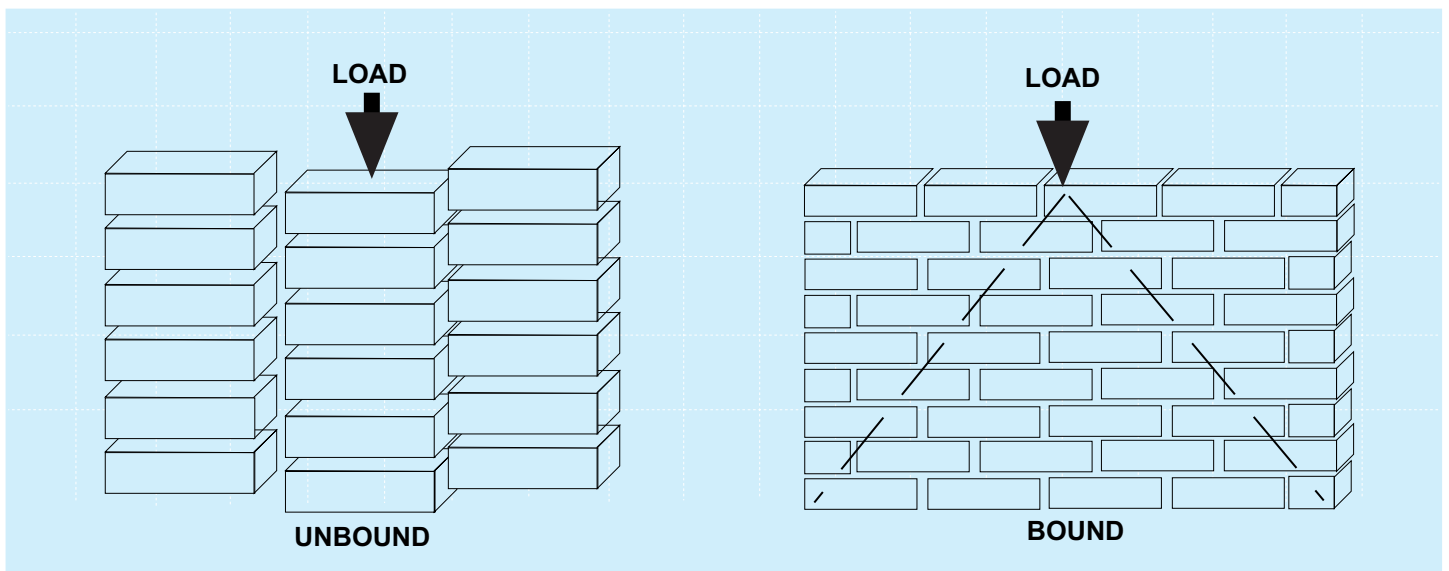
There are basically three different bonds that are used in the modern building construction (see sketch below).

- Stretcher bond
- English bond (alternative stretchers and headers in the same course).

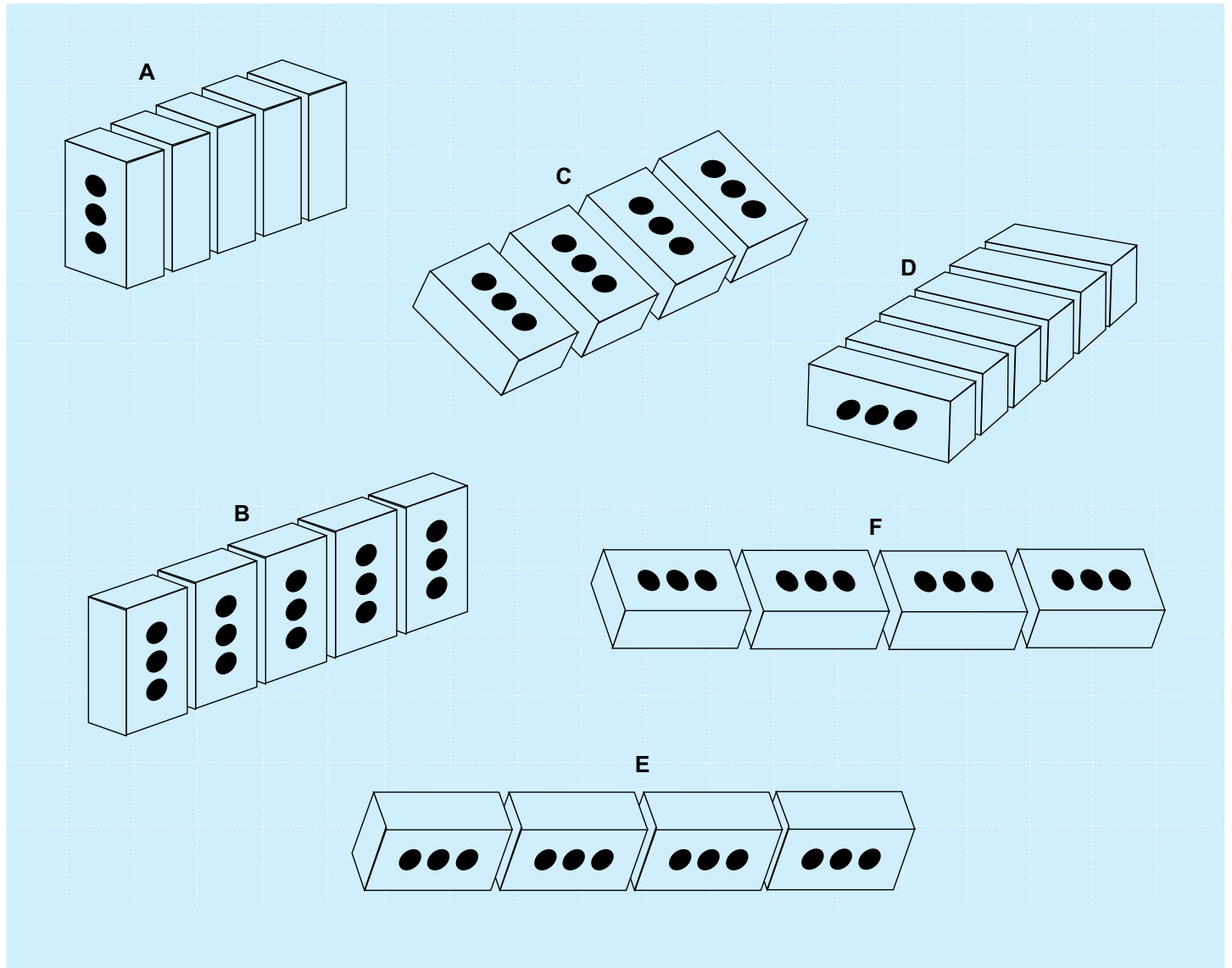
Bonding is required to strengthen and stabilize a brick wall and enable it to carry vertical and horizontal loads.

**Broken Bonding**

This occurs where the length of a brick wall is not equal to brick format sizes, which means that a cut brick must be inserted. The cut brick should not be less than a half brick.



## Different ways of laying bricks.



**A - Soldier course**

**B - Sailor course**

**C - Header course**

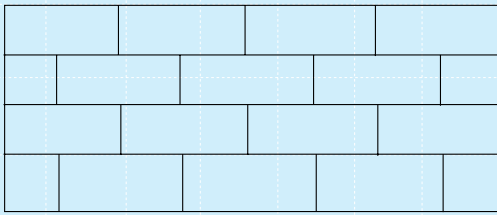
**D - Brick-on-edge header course**

**E - Brick-on-edge stretcher course**

**F - Stretcher course**

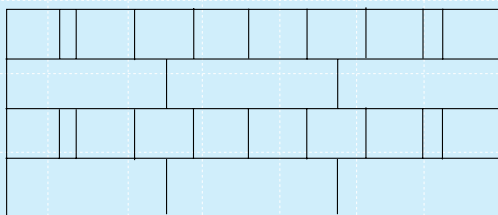


## Strecher Bond ( $\frac{1}{2}$ Overlap)

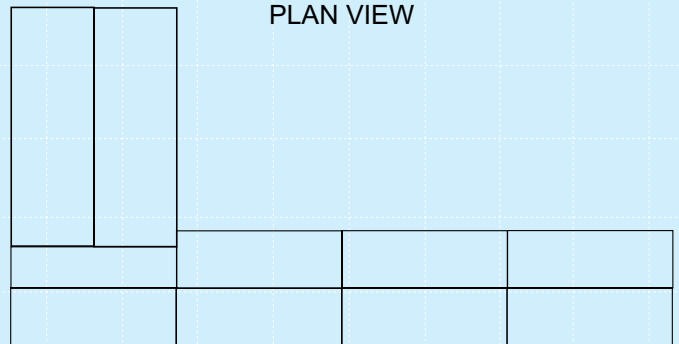


## English Bond

ELEVATION

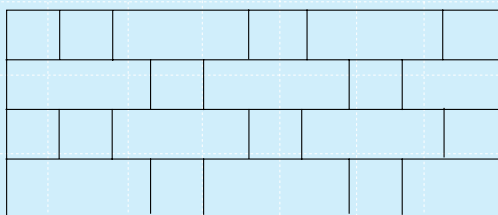


PLAN VIEW

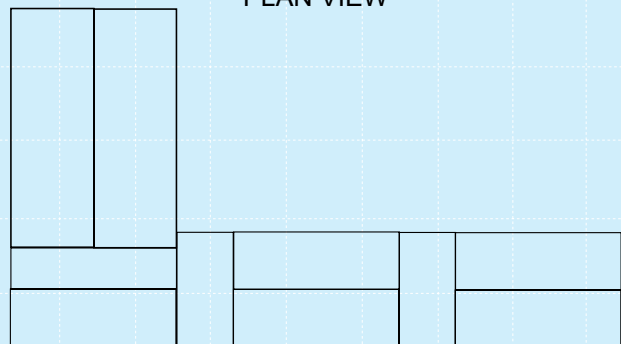


## Flemish Bond

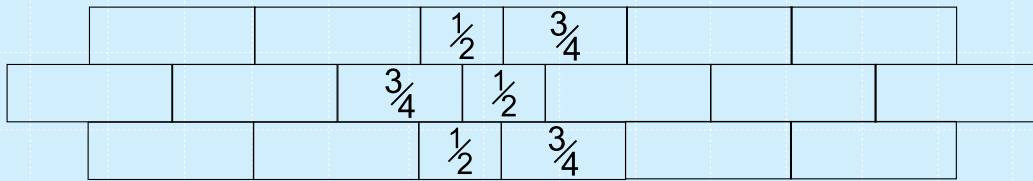
ELEVATION



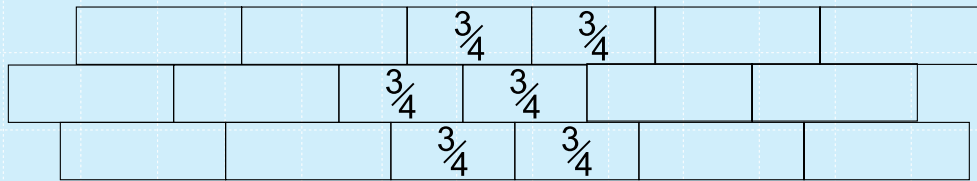
PLAN VIEW



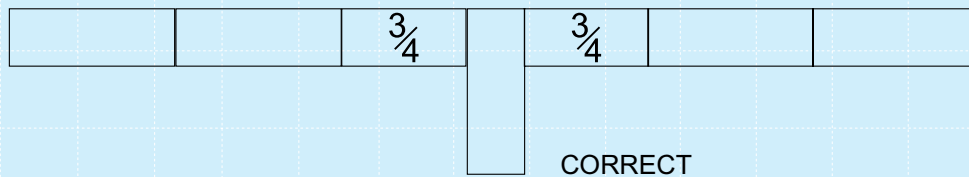
## Half/Three Quarter



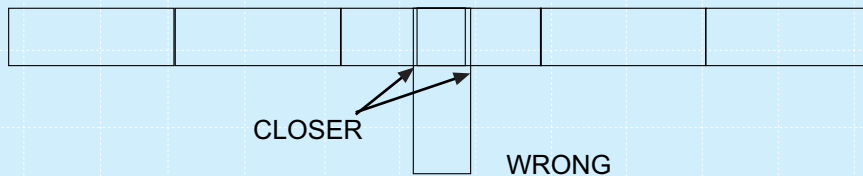
## Three Quarter



## Two Three Quarter



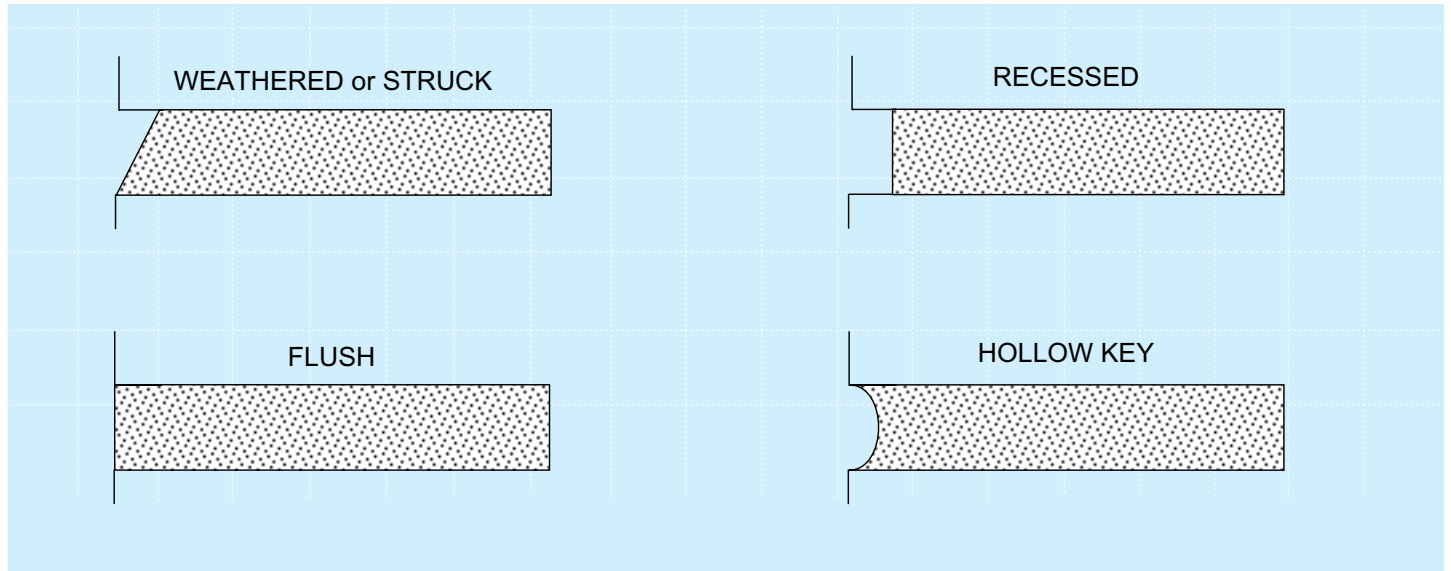
## Two Three Quarter



### Joint Profiles

The main purpose of jointing brickwork is to bond the unit together, enhance the appearance of brickwork and to consolidate the joint surface to prevent water penetration.

Jointing is the process of finishing the face of joints as the work progresses. The joints can be raked out for square recessed and then finished properly using the correct long and short jointers.



#### Note:

Square recessed jointing is prone to water penetration and is not recommended in high rain fall or high wind areas unless a full cavity wall has been detailed.

Pointing is the process of raking out the joints as the work proceeds and, at a later stage, filling and finishing them with specially prepared mortar.



## Setting Out of Jointing

### a) Horizontal positioning

The order to set out the bonding and avoid unsightly thick perpendicular joints, the bricklayer should set out dry the bricks for the first course in short panes. For longer panels, the brickwork must be started from the two outside corners maintaining a 10-12mm mortar joint. The broken bond can be worked out in the middle of the wall. Broken bonds can also be positioned below windows.

### b) Vertical coursing

Take a random sample of 6 bricks from different areas in the brick stacks.

Place the bricks on the edge close together on a flat surface. Measure the distance across the six bricks. Divide the answer by the number of bricks in the sample. The answer is the average thickness of the type of bricks being used. In order to mark off the brick courses we need to add a mortar joint to the average brick thickness.

Guide to mortar joint size.

Hollow key joint, a 10-12mm joint recommended.

Square recess – a 12-15mm joint is recommended.

Example: Hollow key (brick size say) 72 mm + mortar joint 12mm=87mm

### c) Typical dimensions and general setting out comments

Burnt clay bricks are generally manufactured to a size of 222 x 106 x 73mm and we recommend the use of 12mm mortar joints. Therefore:

- The format size becomes 234 x 118 x 85mm.
- The format length (234) is the spacing of stretcher perpendes.
- The format width (118) is the spacing of header perpendes
- The format height (85) is the coursing height.

### It should also be noted that:

- The actual length of a brickwork panel is less by one 12mm joint that the overall distance between format lines.
- The actual widths of openings between brick reveals are greater by one 12mm joint that the width between format lines.
- The height of brickwork measured conveniently between the tops of the courses, is equal to the format height multiplied by the number of courses, and the clear height of an opening measured to the brickwork is therefore greater by one bed joint than the coursing height of the opening.



## Planing and Setting Out Guides

No.	Vertical	Horizontal	No.	Vertical	Horizontal	No.	Vertical	Horizontal
1	85	234	34	2890	2956	67	5695	15678
2	170	468	35	2975	8190	68	5780	15912
3	255	702	36	3060	8424	69	5865	16146
4	340	936	37	3145	8658	70	5950	16380
5	425	1170	38	3230	8892	71	6035	16614
6	510	1404	39	3315	9126	72	6120	16848
7	595	1638	40	3400	9360	73	6205	17082
8	680	1872	41	3485	9594	74	6290	17316
9	765	2106	42	3570	9828	75	6375	17550
10	850	2430	43	3655	10062	76	6460	17784
11	935	2574	44	3740	10296	77	6545	18018
12	1020	2808	45	3825	10530	78	6630	18252
13	1105	3042	46	3910	10764	79	6715	18486
14	1190	3276	47	3995	10998	80	6800	18720
15	1275	3510	48	4080	11232	81	6885	18954
16	1360	3744	49	4165	11466	82	6970	19188
17	1445	3978	50	4250	11700	83	7055	19422
18	1530	4212	51	4335	11934	84	7140	19656
19	1615	4446	52	4420	12168	85	7225	19890
20	1700	4680	53	4505	12402	86	7310	20124
21	1785	4914	54	4590	12636	87	7395	20358
22	1870	5148	55	4675	12870	88	7480	20592
23	1955	5382	56	4760	13104	89	7565	20826
24	2040	5616	57	4845	13338	90	7650	21060
25	2125	5850	58	4930	13572	91	7735	21294
26	2210	6084	59	5010	13806	92	7820	21528
27	2295	6318	60	5100	14040	93	7905	21762
28	2380	6552	61	5185	14274	94	7990	21996
29	2465	6756	62	5270	14508	95	8075	22230
30	2550	7020	63	5355	14742	96	8160	22464
31	2635	7254	64	5440	14976	97	8245	22698
32	2720	7488	65	5525	15210	98	8330	22932
33	2805	7722	66	5640	15444	99	8415	23166
The above dimensions are in mm						100	8500	23400



## Mortars (and plaster)

The cost and quality of masonry work is significantly affected by the mortar used. Mortars may account for as little as 7% of the volume of the walls, but the role it plays and the influence it has on performance are greater than the proportion indicates.

Mortar provides a bed for laying; bonds units together to give compressive and flexural strength and seals joints against rain penetration.

Four types of building mortar detailed in SABS 0164.

Common cement : sand

Common cement : lime : sand

Common cement : sand plus mortar plasticizer.

Masonry cement : sand (common = Portland)

### Approximate proportions for mortar

MORTER CLASS	COMMON CEMENT	LIME	SAND MEASURED LOOSE & DAMP LITRES MIX	MASONRY CEMENT SAND	
	<i>IT</i>	<i>IT</i>		KG	LITRES
II	50	0-40	200	50	170
III	50	0-80	300	50	200

**Class 11:** Normal loadbearing applications, as well as parapets, balustrades, retaining structures, free-standing and garden walls and other walls and other walls potentially exposed to severe damp conditions.

**Class 111:** Lightly stressed (e.g. single storey) bearing walls where exposure to dampness is not severe but check NBR and NHBRC.

The comprehensive strength requirements for mortar and given in table 2.

MORTER CLASS	COMPRESSIVE STRENGTH AT 28 DAY, MPa, min	
	PRELIMINARY (LAB) TESTS	WORK TESTS
II	7	5
III	2	1,5



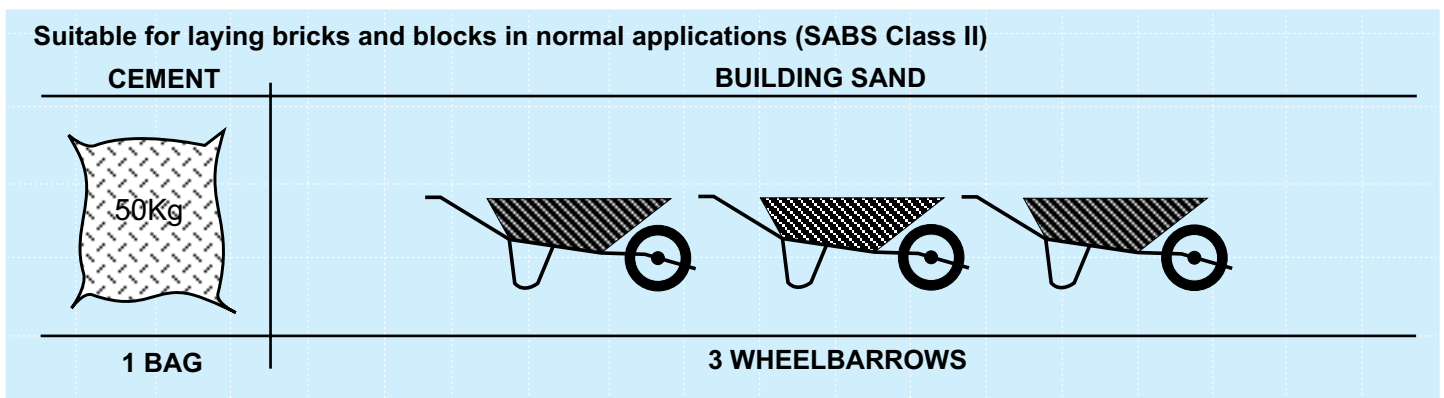
## Cementitious Materials

CEM 1 325.5 (Ordinary Portland cement) and CEM 11/A (S,V or W) 32.5 (Portland cement 15) may be used in mortar. It is not advisable to use CEM 111/A 32.5 (PBFC). Unless the mortar sands are good quality, mortar with common cement lacks plasticity, may bleed, and will be harsh to work with. This deficiency in properties may be overcome by using masonry cement. The use of lime in mortar mixed is beneficial but is difficult to obtain. Masonry cement are readily available.

## Sand

Sand for mortar should comply with SABS 1090 and be well graded from 5mm downwards. Sand be evenly graded and should not contain an excess of dust or other fine material. The use of fine sands of more or less uniform particle size, though contributing to workability, frequently leads to excessive shrinkage and cracking of the joints. Sands containing high percentage of clay tend to give a conveniently plastic mix, but also lead to undue shrinkage.

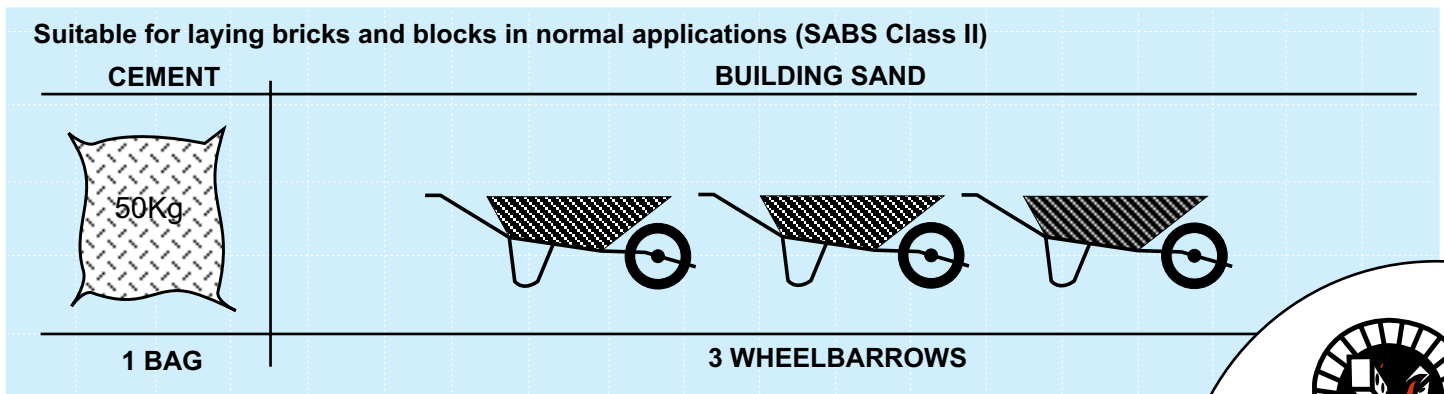
## Mortar



To lay 1 000 bricks you will need :

**3 bags cement + 0.6 cubic metres of sand**

## Plaster



To lay 100 square metres (15 mm thick) you will need :

**10 bags cement + 2 cubic metres of sand**



## GOOD BRICKLAYING

### Preparation

- Store and protect all materials to minimize saturation and contamination.
- Control the wetting of bricks in hot windy weather. Do not lay surface saturated bricks.
- Set out at ground level to locate all openings before commencing bricklaying. Lay out dry and minimize broken bonds
- Prepare and take care of gauge rods – they are important quality control equipment.
- Work all levels from one datum.
- Plumb perpend regularly – every fifth course.

### Protection of brickwork

- The best treatment is to protect it from getting dirty in the first place – so protect the walls as from work progresses from mortar droppings.
- After the first course of bricks has been laid – protect the base of the wall by laying sand, straw, sawdust or plastic sheeting along the ground : this minimises mud splashes and damage from mortar droppings.
- As clay brickwork should be kept as dry as possible during construction, cover the walls at each day's work and during rain in order to prevent mortar droppings to fall to the ground and away from brickwork.
- Set scaffolding far enough away from the wall to allow mortar droppings to fall to the ground and away from the brickwork,.
- At the end of each working day clean the toe boards closest to the wall and turn the boards back to prevent rain fall from splashing mortar and dirt on to the brickwork.

### Process and Technique

- Mix small batches of mortar to suit building rate and 20 minute initial set timing.
- Bed all DPC's on fresh mortar.
- Blend face bricks from a number of packs to minimize colour bonding.
- Fill all mortar joints solidly to minimize water penetration.
- Clean mortar dropping from cavities regularly.
- Pay attention to DPC details.
- Incline brick ties downwards to the outer leaf.



## Non-Face brickwork finishes

### a) Plaster and paint

- The most common finish applied to non-face plaster brick is plaster and paint.
- When applied correctly, it provides highly durable finish for this type of brickwork.
- Plaster finishes vary considerably and paint supplier recommendations should be carefully adhered to.

**NB. Do not apply directly onto NFP's**

### b) Bagwash and paint

- It is often assumed that brick masonry walls that are to be painted can be built with less durable materials and, in some instances, with less care in workmanship than would normally be used for unpainted brick walls. This is not the case. When a brick wall is to be painted, the selection of materials, both brick units and mortar, and the workmanship used in constructing the wall should all be of highest quality.
- Although popular because of relatively low initial outlay, this application is not recommended for exterior or interior leaves of external walls as it does not always give durable finish.
- Bagwashing usually has a lifespan of 3-5 years on external walls, generally failing because of flaking and peeling.
- Bagwash and paint is more durable as an interior wall finish for partition walls .
- When applying bagwash, it is important to consider the application of the bagwash, its strength and durability will be greatly reduced.

### c) PVA paint

- PVA paint applied directly on to clay is not recommended as the two materials are incompatible. Moisture movement through the brickwork causes the paint to peel.

## Face brickwork finishes

### a) Varnishes and brick dressing

- Most varnishes and brick dressings show unevenly on the wall, and deteriorate due to sunlight and moisture. As these finishes are difficult to remove from brickwork, walls can rarely be restored to their original condition.
- The best “look” a face brick wall offers is the original clean brick and mortar joint approach. Brickmakers all over the world do not recommend the use of any other finish especially the “clean engine oil & paraffin approach”



## Cleaning New Face Brickwork

### Mortar smear and deposits

It is best to clean brickwork by hand with a hard scrubbing brush using water and possibly a commercial mortar cleaner as work progresses.

### Check List

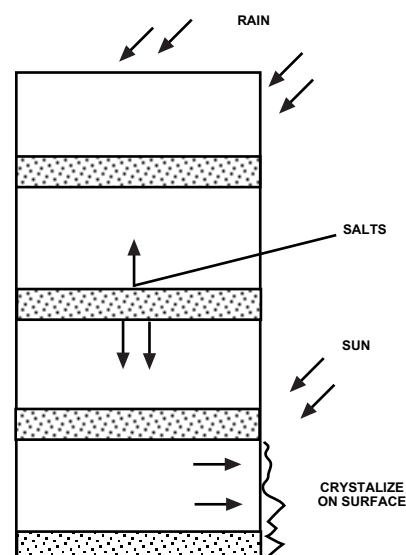
- For light coloured bricks which are likely to contain vanadium salts, do not use hydrochloric or muriatic acid for cleaning as they will fix the salts, make them insoluble and difficult to clean..
- Do early trials to ensure chemical compatibility with materials being used.
- Ensure that all proper safety precautions are taken when using chemicals.
- When diluting concentrated acid, always pour acid to water and not vice-versa
- Identify the nature of masonry to be cleaned and the type of stain to be removed before deciding on the cleaning method. Try method on a small area of wall.
- Protect metalwork, building materials and plants from chemical liquids, spray and fumes.
- Do not clean brickwork exposed to hot sunlight.
- Do not use wire brushes or other abrasives on brick faces.
- If in doubt, contact a specialist for advice.

### Lime bloom staining

Lime bloom staining originates from common cement in mortar and concrete structures. It is released into solution in the early life of a wall and dries out on the surface of the brick as an insoluble salt that is difficult and expensive to remove.

Solution: Prevent saturation in the first 24 hours. Clean in accordance with recommendations and then protect from rain for the next week.

Unprotected newly built green brickwork becomes saturated. Common cement sets and release lime into solution. Brickwork dries out calcium hydroxide precipitated on surface. Calcium hydroxide converts to insoluble calcium carbonate – a white deposit.



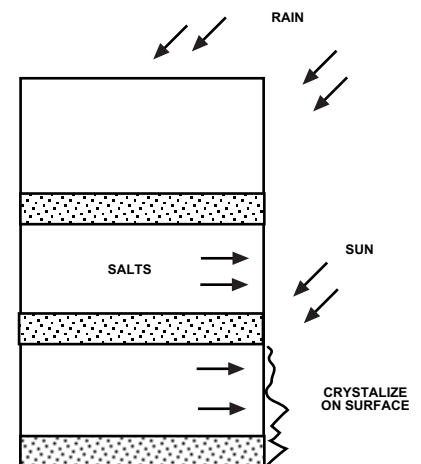
## c) Cleaning guide for older brickwork

- While stains can spoil the attractiveness of clay brickwork, incorrect cleaning techniques can cause permanent damage.
- Specialists should be contracted to clean prestige buildings.
- As cleaning techniques differ for different types of masonry and stain, identify the kind of brick and the nature of stain before commencing any cleaning.
- Thoroughly saturate brickwork before and wash after application of chemical cleaners.
- When using chemicals such as acid-based solvent for removing mortar, allow the chemical to clear for 5-10 minutes, then wash down thoroughly with clean water.
- Protect adjacent feature such as metal windows and the area at the foot of the wall from splashing, spraying and fumes from chemicals.
- When the stain is very localised, most cleaning liquids can be applied as a poultice by thickening with inert filler such as talc or powder chalk.
- As many recommended chemicals are either caustic or poisonous handle them with great care and wear protective clothing, gloves and goggles.
- When using volatile solvents indoors, ensure there is good ventilation.

## Removing effloresce

Efflorescence is caused by salts present in the brick, sand or cement, or sometimes in either ground water or rain water, which is ultimately deposited on the surface of the brickwork in a dry crystallised form.

1. Brickwork contains soluble salts
2. Brickwork saturated – dissolves salts.
3. Brickwork dries out – solution migrates to surface.
4. Water evaporates – soluble salts, salts crystallise on surface.



## **Preventative Solutions:**

- Good detailing that minimises the ingress of water into the brickwork is the most important step to minimise efflorescence.
- Careful stacking of materials on site so as to eliminate salt contamination.
- Protection from ground water with membrane. Attending to the above still does not totally eliminate the occurrence and the brick work may require cleaning as addressed below.

Our recommendation, however, is to allow the efflorescence to form and dry out over, say, six months and try and brush off dry or wash off with water with a hard bristle brush. If unsuccessful, refer the problem to a cleaning specialist. Vanadium (yellow, green and brown) efflorescence can present problems.

**Do not use hydrochloric acid, rather refer to a specialist.**

## **e) Moss & plant growth**

Occasionally an exterior masonry surface, not exposed to sunlight, remains in a constantly damp condition, thus permitting plant growth. Application of ammonium sulphate or weed killer, in accordance with directions results in the removal of such growth.



Estimates should always include a certain percentage for waste. We suggest for

- Brick units 5 to 10% depending on unloading method.
- Mortar 25 to 50% ( maybe higher if joints excessively thick)
- Concrete foundation 10% (depends on accuracy of excavation and thickness of footings)

## Concrete and Excavation

Vol = L x B x H Builders wheelbarrow - 65litres or  $\pm 0.375m^2$  sand and stone.

**10MPa** concrete 5 bags cement

0.75m<sup>2</sup> concrete and sand

0.75m<sup>2</sup> stone

**15MPa** concrete 7 bags cement

0.70m<sup>2</sup> concrete and sand

0.70m<sup>2</sup> stone

**Mortar Class 11** 3 bags cement

9 barrow building sand

Will lay  $\pm 1000$  bricks.

**Bricks** (Imperial) Approximately 52 -56 bricks/m<sup>2</sup> single leaf

**Plaster** 1 bag cement plus 3 wheelbarrows plaster sand will approximately 10m<sup>2</sup>



# SECTION I

**AGGREGATE:** Any hard inert materials (sand, gravel or stone) used for mixing with cementitious materials to form mortar or concrete.

**ARCH:** An arrangement of bricks over an opening.

**ARRIS:** The sharp edges of a brick.

**BEAM FILLING:** A filling of brick between the roof timber, from wall plate to roof covering, to prevent the entry of birds and vermin and to render the wall weather tight.

**BED JOINT:** The horizontal layer of mortar on which a masonry unit is set

**BOND 1:** The arrangement of bricks in brickwork, usually interlocking to distribute the load and attain a pleasant appearance.

**BOND 2:** The resistance to displacement of individual bricks in wall provided by the adhesive property of mortar.

**BROKEN BOND:** The use of part bricks to make a good bonding pattern where dimensions do not allow regularised bond patterns of full bricks.

**BUTTERING:** Applying mortar to the end of a brick when laying bricks.

**CAVITY WALL:** Wall of two leaves effectively tied together with a space between them, usually at least 50mm wide.

**CHASES:** Recesses cut in walls to accommodate service cables or pipes.

**COPING:** The materials or masonry units used to form a cap or finish on top of wall, pier, or chimney, to protect the masonry below from water penetration. Commonly extended beyond the wall face and incorporating a drip.

**COMPRESSIVE STRENGTH:** The average value of the crushing strengths of a sample of bricks tested to assess load bearing capability.

**CONCRETE:** A mixture of sand, stone, cement and water that sets and hardens.

**CORBEL:** A feature, or course, or courses of brick projecting from the face of the wall.

**COURSE:** One complete level row of bricks in brickwork.



## SECTION I

**DAMP-PROOF COURSE (DPC):** A course or layer of impervious material which prevents vertical movement of water.

**DATUM:** a fixed reference point from which levels are set out.

**DURABILITY:** The ability of materials to withstand the potentially destructive action of natural conditions and chemical reactions.

**EFFLORESCENCE:** The unsightly chalk-like appearance on a building due to the crystallisation of soluble salts contained in the bricks or mortar.

**FACE WORK:** Brickwork built neatly and evenly without applied finish.

**FLASHING:** Waterproof sheet materials, usually galvanised sheet iron shaped to prevent entry of rain

**FOUNDATION:** A structure to carry brickwork onto soil or earth.

**FROST DAMAGE:** The destructive action of freezing water and thawing ice in saturated materials.

**FOOTING:** The broadened concrete base of a foundation wall or pier.

**GABLES:** Portion of wall above eaves level that enclosed the end of a pitched roof.

**GAUGE ROD:** Batten marked at intervals for vertical setting-out of brick courses.

**GAUGE BOXES:** Boxes of specific volumes to accurately measure the proportions of cement, lime and sand when preparing mortar.

**HEADER:** The end face of a standard brick.

**HEAD COURSE:** A continuous course of header brick.

**INITIAL SET:** The first setting action of mortar, the beginning of the set.

**JOINT ENFORCEMENT:** Steel reinforcement placed in mortar bed joint.



# SECTION I

**JOINTING:** The finishing off of joints between courses of masonry units before the mortar has hardened.

**LEAF:** One or two parallel walls that are tied together as a cavity wall.

**LIME STAINS (BLEED OR BLOOM):** White insoluble calcareous deposits on the face of brickwork derived from common cement mortars which have been subjected to severe wetting during setting and hardening.

**LINTEL:** A beam placed or constructed over an opening in a wall to carry the superimposed load.

**MORTAR:** A mixture of sand (lime), cement and water.

**MOVEMENT JOINT:** A continuous horizontal or vertical joint in brickwork filled with compressible material to accommodate movement due to moisture, thermal or structural effects.

**PARAPET:** A low wall around the perimeter of a building at roof level or around balconies.

**PIER:** A vertical block of brickwork which may either be isolated or attached to the face of a wall.

**PERPENDS (PERPS):** Vertical lines controlling the verticality of cross joints appearing in the face wall.

**DRAWING OR PLANS:** A construction drawing showing a view of a building or object in a horizontal plane. A floor plan shows the floor area of the building or object in a horizontal plane.

**PLUMB:** The verticality of brickwork.

**COMMON (FORMERLY PORTLAND) CEMENT:** A fine powdered material which, when mixed with water, sets and binds together to form a hard, solid material. It is used as a component of mortar and concrete.

**REINFORCED BRICKWORK:** Brickwork incorporating steel wire or rods to enhance its resistance to loads.

**REINFORCING:** Metal that is built into brickwork, e.g. reinforcing bars, brickforce.

**RETAINING WALL:** A wall that provides lateral support to higher ground at a change of level.



## SECTION I

**RETEMPERING:** To moisten mortar and re-mix, after original mixing, to proper consistency for use.

**ROOF TILES:** Lengths of hoop-iron or double strands of wire built into the wall to secure the roof to the superstructure.

**SCAFFOLDING:** A temporary framework, usually of tubular steel or aluminium, and timber boards to give access for construction work.

**SEALANT:** A stiff fluid material which set but does not harden. Used to exclude wind driven rain from movement joints and around door and window frames.

**SOFFIT:** The exposed lower surface of any overhead component of a building such as a slab lintel, vault or cornice, or an arch.

**SOFT-BURNED:** Clay products that have been fired at low temperature ranges, producing units of relatively high absorptions and low compressive strengths

**STRETHER:** The longer face of a brick showing in the surface of a wall.

**SUCTION RATE:** The tendency of a brick or block to absorb water from the mortar used for its bedding and jointing. Dense vitrified bricks have a low suction rate, porous bricks have a higher suction rate (IRA – Initial Rate of Absorption – affects bonding properties).

**WALL TIE:** A metal piece that connects leaves of masonry to each other or to other materials.

**WATER ABSORPTION:** The amount of water that a unit absorbs, when immersed in either cold or boiling water for a stated length of time; expressed as a percentage of the weight of the dry unit.

**WATERPROOFING:** Prevention of moisture flow through masonry.

**WEEPHOLE:** An opening placed in mortar joints of facing materials at the level of flashing, to permit the escape of moisture.



# STANDARD SPECIFICATION CODES OF PRACTICE AND REFERENCE ON THE USE OF BRICKS

## MATERIALS

### Bricks:

SABS 227- 1986 Amended

Burnt Clay Masonry Units

### Cement

SABS Env 197 – 1: 1996

Part 1. Common Cement

Part 1. Cement – composition, specification and conformity criteria.

SABS ENV 413 – 1: 1996 Masonry cements

Part 1. Specification.

### Aggregates

SABS 1090 – 1996: Aggregates from natural sources

### Lime

SABS 523 – 1972: Limes for use in building

### Sand

SABS 1090 – 1996: Aggregates from natural sources – Fine aggregate for plaster and mortar.

### Wall ties

SABS 28 – 1986: Metal ties for cavity walls.

### Damp Proof Courses

SABS 248 – 1973: Bituminous damp proof course

SABS 298 – 1975 Mastic asphalt for damp proofing courses and tanking.

## REFERENCE AND RECOMMENDED READING

### Fw Kraukamp:

1. Bricklaying & Plastering Theory (N1)
2. Bricklaying is easy.

### BDA UK:

The BDA Guide to Successful Brickwork.

### Brick Institute of America:

Pocket Guide to Brick Construction.

### Cement & Concrete Institute (RSA)

Various pamphlets on concrete, mortar, plaster and construction detailing.

### National Home Builders Registration Council:

Standards and Guidelines.

### BDRI – Australia:

Technical Guide on Clay Bricks.

