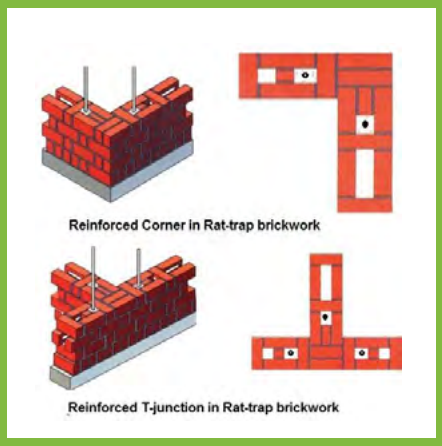
SALES TRAINING

Clay Brick Specification & Benefits



THE VOICE OF THE CLAY BRICK INDUSTRY

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SECURE SAVE SUSTAIN STYLE

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INDEX

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THE BENEFITS OF CLAY BRICKS

Clay brick is the most reliable and enduring of all building materials. Few other fabricated building units have enjoyed such widespread and continuous popularity.

The benefits of clay brick include the following:

1. Acoustic Insulation

Apart from its natural thermal qualities, clay brick has highly sought after acoustic properties that facilitate the reduction of external noise. Acoustic insulation is the ability of a wall to resist the transmission of airborne sound. The density of clay brick provides maximum insulation against noise.

2. Aesthetic Appeal

In colour, form and texture, clay brick is a harmonious building material with an ageless ability to blend in with any structural and building design. It is also a natural complement to the functional and aesthetic needs of the area. Clay brick buildings retain their original beauty even after long-term exposure to weather and other environmental elements.

3. Comfort

The nature of clay brick has a number of benefits in terms of breathability, thermal insulation and sound insulation. This ensures that the inside of a building is a place where people can feel truly comfortable.

4. Consistency

Clay bricks are made to the same formula that has been used in the construction of many prominent landmarks. It has proved itself as a durable and aesthetically pleasing building material that performs consistently over long periods of time. Clay brick owes its unique properties such as strength, durability, dimensional stability, longevity, fire- and weather-resistance to the final composition of raw materials as well as a time trusted process that is as rich in tradition as it is in performance.

5. Compatibility

Clay brick is a natural complement to other organic building materials like stone and timber.

6. Cost Effective

Buildings should be built to last and as such the life cycle value of a building derived from long-term durability, low maintenance and energy savings should be the key determining factor to be taken into account. Clay bricks fulfil all these requirements in ensuring solid quality constructions, and offer the most efficient and cost-effective solutions in the long-term.

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7. Dimensional Accuracy and Symmetry

Clay bricks have the highest dimensional stability and compressive strength. Deformations in buildings can lead to creep and shrinkage of mortar, which in turn can lead to surface cracking due to compressive strains and temperature fluctuations, thus jeopardising the safety of the entire building. These cracks can be avoided by adapting the structural design to the properties of the building material, using a building material with extremely low deformation values, like clay brick.

8. Durability

Durability is as an important factor in sustainable building design - the longer the building lasts the fewer materials and less energy it will consume over the long term. Clay brick is a durable and timeless building material that complements the aesthetic and functional needs of any building. Structures that were built from clay brick, and still remain standing, even after centuries of exposure have proved the durability of clay brick many times over. Thus, with very little maintenance, buildings made from clay brick can outlast many generations.

9. Ease of Use

Seldom do clay brick become too wet to work with, which means builders and developers benefit from significant savings on time and labour too.

10. Energy Efficiency

Clay brick's are renowned for their thermal attributes that provide warmth in winter and cooler conditions in summer, thus ensuring that energy is not squandered on artificial heating and cooling mechanisms.

11. Environmentally Friendly

Clay brick is a product of 'mother earth' and after use, can be crushed and returned to earth, or recycled. Not only do recycled clay bricks contribute towards embodied energy savings, they also extend the life cycle of this material.

12. Fire Resistance

Since clay brick is incombustible it cannot contribute to the start or rapid spread of fires, nor can it add fuel to make a fire more intense. Tests have proven that clay brick walls obtain maximum fire ratings, which means that they can withstand fully developed fires longer than any other standard building material.

13. Strength

Clay bricks vary in compressive strength due to the differing qualities of raw materials and the method of firing. The compressive strengths of clay bricks can vary from 7MPa for NFP, to greater than 50MPa for face brick extra. Clay brick products for load-bearing designs can be provided according to tolerances and strength.

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14. Symmetry

The majority of clay bricks in South Africa are regular in size and shape. Although clay bricks are fashioned from a very forgiving material that does not require perfect symmetry, all clay brick products conform to stringent SABS industry codes that define the parameters of product manufacture, building design and materials application, and are deemed fit for purpose.

15. Value Retention

Buildings constructed form clay bricks are built for generations to enjoy due to the nature of the product to resist the harsh and varied attacks of this country's weather. Clay brick is renowned as a long lasting material. Clay brick buildings require little maintenance to preserve their elegant looks and this enhances their desirability to future owners.

16. Versatility

Clay bricks are available in a variety of colours, shapes, and textures to suit any building application. A key characteristic is the way clay brick walls and pavers remain solid and pleasing even after long term weather exposure.

17. Weatherproof

Clay bricks are rendered water resistant making them impervious to all forms of weather conditions. They comprise of a fine capillary pore system, which has the ability to absorb moisture from rain or water vapour and then release it back into the atmosphere again as quickly. This is a property specific to clay brick. Other building materials can certainly absorb moisture, but lacking a capillary system, they remain moist for a much longer period or have relatively high permanent moisture content.

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PRODUCT TYPES
AND
CLASSES

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PART 2
PRODUCT TYPES AND CLASSES (NOMENCLATURE)

Brick making and selling were until fairly recently, largely area bound and local architects and builders soon became aware of the qualities, performance and names of the various bricks and brick types available in their regions.

Over the past 10 years, there has been a noticeable trend for bricks to cross the old boundaries and specification and design is often done hundreds of kilometres from site. In addition, both central and local/provincial government departments define the product types and classes in their building materials specifications regardless of parochial nomenclature so the need for standard nomenclature and performance criteria has become essential.

Examples of the old style ‘regional names’ include:
- Commons in KwaZulu-Natal
- Stock Bricks in Gauteng
- Fair Face Commons in KwaZulu-Natal
- Hard Burnt Stocks in Gauteng

ROK's (run of kiln) often requiring sorting on site to find bricks deemed to be fit for face and those for stocks or even semi-face are some of the terms and descriptions used by the older and more resistant to change operators even to this day.

Terms such as "semi-face" are misleading in both aesthetics and durability aspects.

The SABS adopted a South African developed system of Clay Brick classification to provide national definitions of bricks, which are detailed in this section - SABS specification 227.

2.1. Basic Clay Brick Types

There are three basic types of Clay Bricks produced in South Africa:

2.1.1. Bricks for rendered or plastered use - whether for both internal and external leaves of a full brick wall, or as the backing leaf to an external face brick leaf, or as a single leaf or half brick internal wall - rendering/plastering is essential to protect the brick from the weather, or to provide a suitable finish for painting/ceramic cladding. These are called **NFP's (Non Face Plaster)** known in some quarters as ‘stock bricks’, ‘Commons’ or ‘common bricks’.

2.1.2. Bricks which are produced to face the environment without rendering and whose appearance provides an aesthetic value through colour, texture, accuracy of size and size uniformity, or the purposefully produced lack of size uniformity. This class is divided into three types or grades:

- **Face Brick Aesthetic (FBA)** - Durable Clay Face Bricks produced or especially selected/sorted for a highly individual aesthetic look derived from deliberate non-uniformity of size, shape and colour. Brickwork using these products is lively and full of character in respect of colour and texture at close to medium viewing. Products include the heavy ‘leaf rustics’, all rock face bricks, blackhearts and clinkered bricks, which are sometimes known (quite erroneously) as ‘semi-face’.

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- **Face Brick Standard (FBS)** - Clay Bricks that are durable, uniform in size and shape and require no further rendering or aesthetic treatment. Standard Facings are ideally suited to the creation of horizontal and vertical brickwork, medium to long viewing distances. Travertine and smooth satin textures are the most widely produced finishes in FBS products.

- **Face Brick Extra (FBX)** - Durable Face Bricks possessing the highest degree of size, shape and colour uniformity. FBX's are ideally suited to the creation of detailed, disciplined brickwork and may be used for close viewing distances through to the creation of dramatic and visually large design elements thus providing opportunities for long viewing distances.

2.1.3. **Non Face Extra (NFX)** bricks produced for building work below damp proof course (DPC), under damp conditions or below ground level where aesthetics are unimportant. NFX bricks may be plastered or left unrendered. Bricks of this class are sometimes referred to as ‘hard burnt commons’, ‘footing bricks’ or ‘foundation bricks’.

2.1.4. **Engineering Units (E)** are any class of masonry unit produced for structural or load-bearing purposes in face or non-face work, where the manufacturer supplies clay bricks to an agreed compressive strength. An engineering unit is designated by the addition of the letter E followed by a number equal to the nominal compressive strength in Mega Pascals (MPa), e.g. FBSE21.

2.2 Surface Finish – Texture and colour

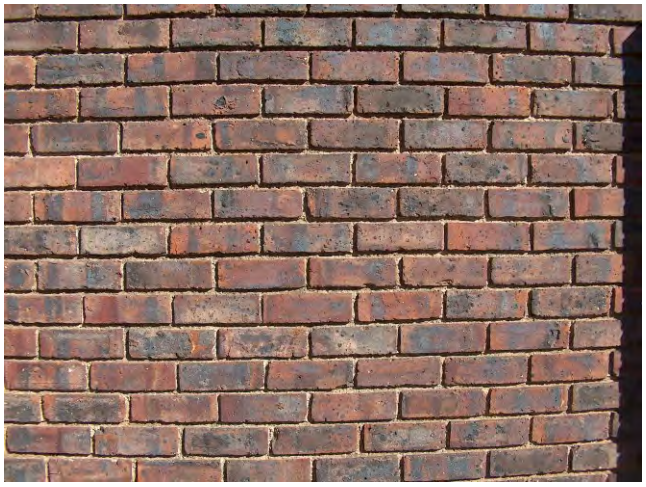
SABS 227 requires that unless otherwise specified, the texture and colour of masonry units shall be uniform.

For the purpose of assessing uniformity of colour and texture, the manufacturer shall, by agreement with the purchaser, submit for the purchaser's approval a sample of 20 units, 10 of which are to be retained by the purchaser and 10 by the manufacturer.

The following textures are possible:

2.2.1 Clinker:

At the heart of these gnarled, bloated, multi-coloured bricks is a distinctive blue or black carbon core.



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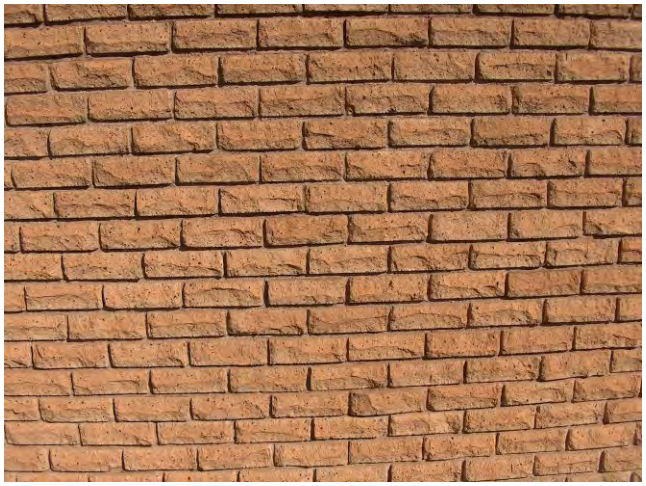
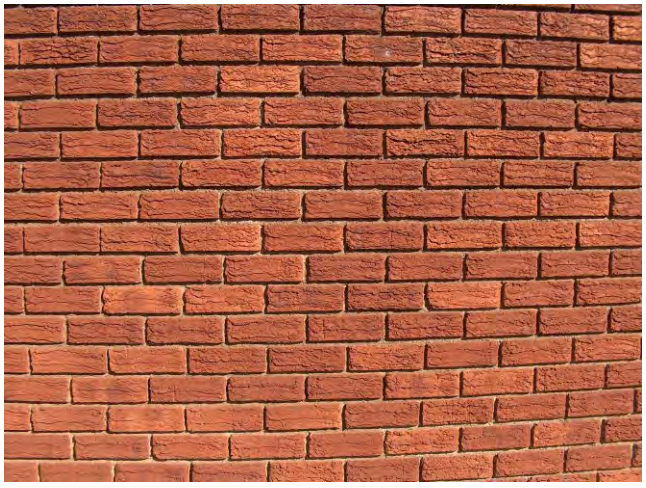
2.2.2 Rockface:

A completely irregular rock-like finish to the stretcher face achieved by chiselling the brick surface. The resulting brick is craggy and raw with a natural appearance.



2.2.3 Rustic:

A crusty finish resembling the bark of a pine or oak tree, with a textured surface, accentuating differences of light and shadow



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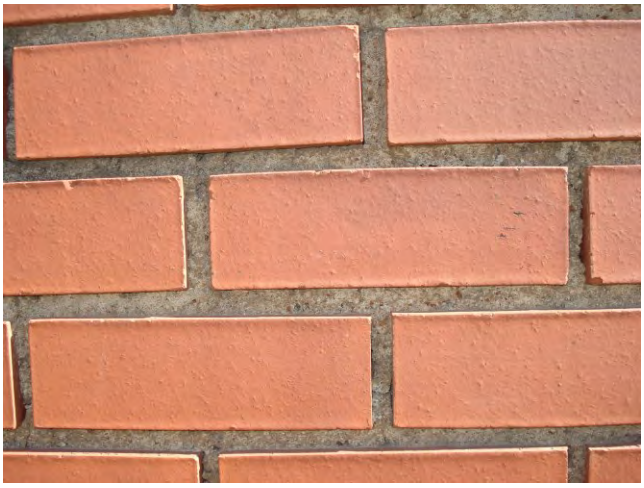
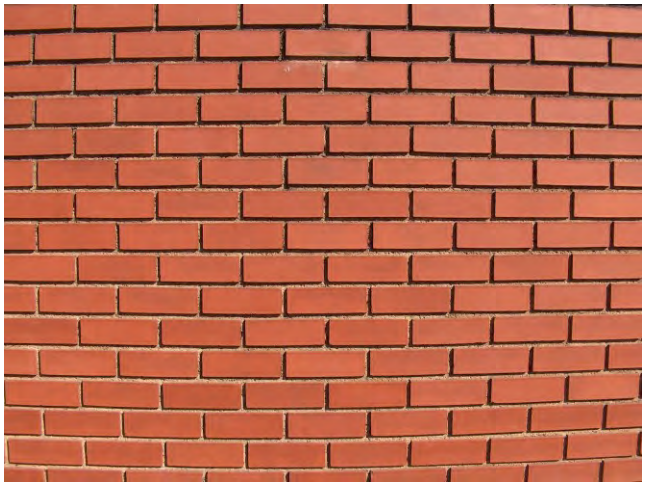
2.2.4 Coral: A horizontal texture, the 'regular' uneven finish resembles coarse woven cloth.

2.2.5 Satin: A smooth, non-grainy face finish with no texture.





2.2.6 Travertine: Almost smooth, but with a natural 'clay grain' appearance.

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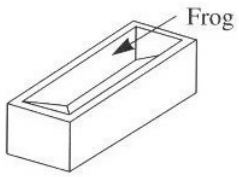
2.3 Shape and Appearance

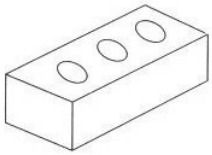
2.3.1 Shape

All units may be with or without frogs, perforations or cavities and (except FBA) shall be true to the appropriate acceptable pattern. They shall have rectangular faces, and units to be used in facing and structural applications shall have uniform arises.

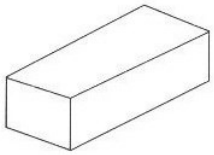
Brick Units by Method of Manufacture:



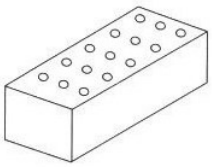
Frogged (Pressed)



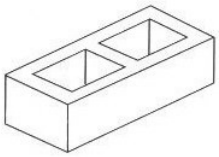
Standard Perforated (Extruded)



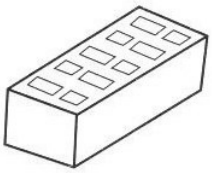
Solid (Pressed or Extruded)



Highly Perforated (Extruded)



Cellular (Pressed, Moulded or Extruded)



Medium Perforated (Extruded)

2.3.2 Appearance

All units shall be well burnt and shall be acceptably free from deep or extensive cracks, damage to edges and corners, and pebbles and expansive particles of lime. When a cut surface of a unit is examined, it shall show an acceptably uniform texture.

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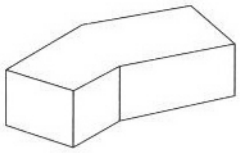
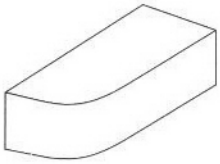
2.3.3 Specials

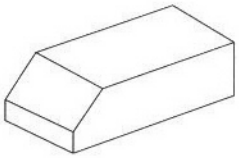
Standard bricks are shaped as rectangular prisms, but a variety of other shaped bricks are commonly made. These include bricks with splayed or rounded edges. Those shapes which are commonly made are described as 'standard specials' to distinguish them from other forms which might be made to order only.



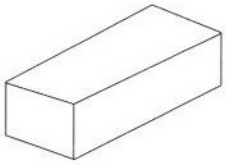
External Angle



Single Bullnose



Single Cant



Solid

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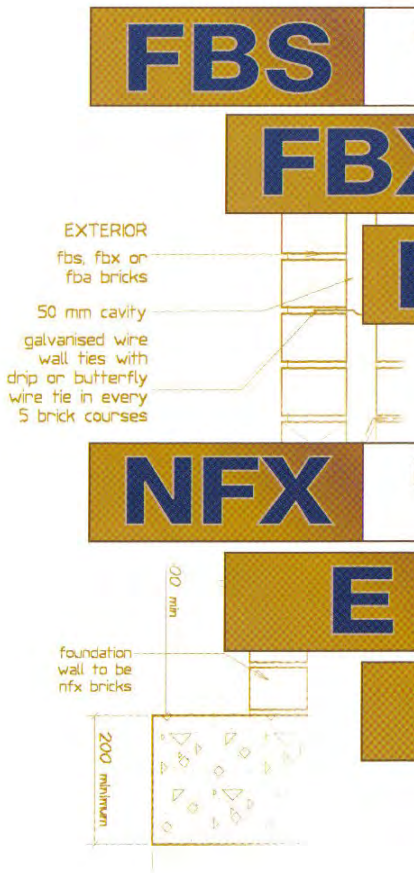
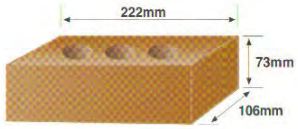
THE LANGUAGE OF CLAY BRICKS

FBS	**Face Brick Standard**	Clay bricks that are selected or produced for their **durability** and **uniformity** of **size** and **shape.**	
FBX	**Face Brick Extra**	Clay bricks that are selected or produced for their **durability** and **high degree** of **uniformity** of **size, shape** and **colour.**	
FBA	**Face Brick Aesthetic**	Clay bricks that are selected or produced for their **durability** and **aesthetic** effect deriving from non-uniformity of **size, shape** and **colour.**	
NFP	**Non-Facing Plastered**	Clay bricks suitable for **general building work** that is to be **plastered.**	
NFX	**Non-Facing Extra**	Clay bricks suitable for use, **plastered** or **un-plastered**, for **general building work below damp-proof course** or under	**damp conditions** or **below** ground level where **durability** rather than aesthetics is the criterion for selection.
E	**Engineering Units**	Any class masonry unit produced for structural or load-bearing purposes in face or non-face work, where the manufacturer supplies clay bricks to an agreed	compressive strength. An engineering unit is designated by the addition of the letter E followed by a number equal to the nominal compressive strength in megapascals, e.g. FBSE21
PA	**PA Clay Pavers**	Clay pavers that are selected or produced for their durability and for a high degree of uniformity in size and shape, and that have	dimensions such that the ratio of work size length to work size width is approximately 1:1; 2:1 or 3:1.
PB	**PB Clay Pavers**	Clay pavers that are selected or produced for their durability and for their uniformity in size and shape.	





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PRODUCT SPECIFICATION AND PHYSICAL PROPERTIES

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PART 3
PRODUCT SPECIFICATION AND PHYSICAL PROPERTIES
(SABS 227: Burnt Clay Masonry Units)

3.1 Overall Dimensions and Tolerances (refer SABS 227:4.2)

The most commonly used and manufactured brick size is the 'Imperial Brick'. It measures 222mm long x 106mm wide x 73mm high with a mass between 3.0kg and 3.5kg, depending on the materials used, the degree of vitrification and the perforations provided (see Table 3.1 for tolerances).

Two important criteria determine this size. First, it is the ideal width for the human hand to lift and place in position with a minimum of strain and secondly, it satisfies the need for bricks to be modular in terms of BOND patterns. Thus there is an approximate arithmetic relationship of length to width of 2:1 and in length to height of 3:1, which allows bonding in any direction.

Figure 3.1: Imperial Brick Dimensions

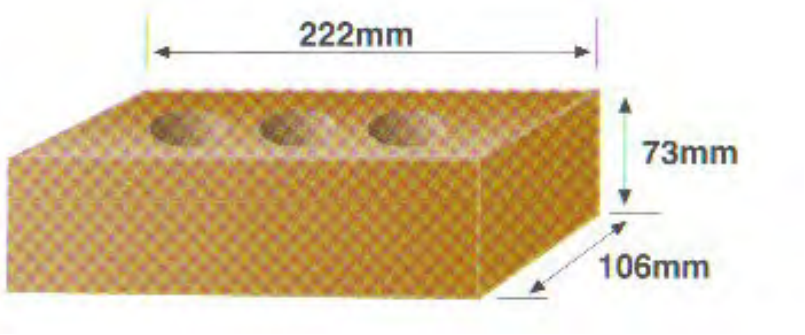

TABLE 3.1: TOLERANCES ON WORK SIZES			
Class of unit	**Tolerances (mm)**		
	Length	**Width**	**Height**
	Individual units		
FBX **FBS** **FBA and non-face**	±5 ±7 -	±3 ±4 -	±3 ±4 -
	Average 32 units		
FBX **FBS** **FBA** **NFP, NFX**	±2.5 ±3.5 - ±3,5	±1,5 ±2 - ±2	±1,5 ±2 - ±2

Individual manufacturers may offer tighter tolerances than the above.

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Other sizes of bricks and blocks are made by individual manufacturers. Various combinations of dimensions in millimetres are:

Length:	222	222	222	222	220	190	190	290	290	390
Width:	90	40	90	140	110	90	106	90	150	190
Height:	73	73	114	114	73	90	90	90	190	90

3.2 Warpage and Tolerance (refer SABS 227: 4.3)

FBX Products:	Individual 5mm; average of 3 bricks not more than 3mm
FBS & Engineering:	Individual not to exceed 5mm
FBA & NFP:	No requirement

3.3 Brick Strength (refer SABS 227:4.4)

A wide range of bricks are available in this country. Bricks vary in compressive strength due to the differing qualities of raw material and the method of firing. The compressive strengths range from 3.5MPa for NFP to greater than 50MPa for face brick extra and engineering products.

Standard testing is carried out on a sample of twelve, to prescribed procedures. Local manufacturers should be able to meet specific needs.

Modern methods of manufacture produce bricks with consistent qualities, but bricks are made from naturally occurring materials and the compressive strength of individual bricks in a given batch inevitably varies.

Note: The compressive strength of clay bricks is not always indicative of their durability. Clay products for load-bearing designs can be provided to suitable close tolerances and strength.

Table3.2: Compressive Strength

Class of Unit	Nominal Compressive Strength (MPa)	Individual Compressive Strength MPa (min.)
FBS) **FBX)** **FBA)**	***12,0** **17,0**	***9,0** **12,5**
NFP) **NFX)**	**3,5** **7,0** **10.5** **14,0**	**3,0** **5,5** **7,5** **10,5**

❖ For hand-moulded units

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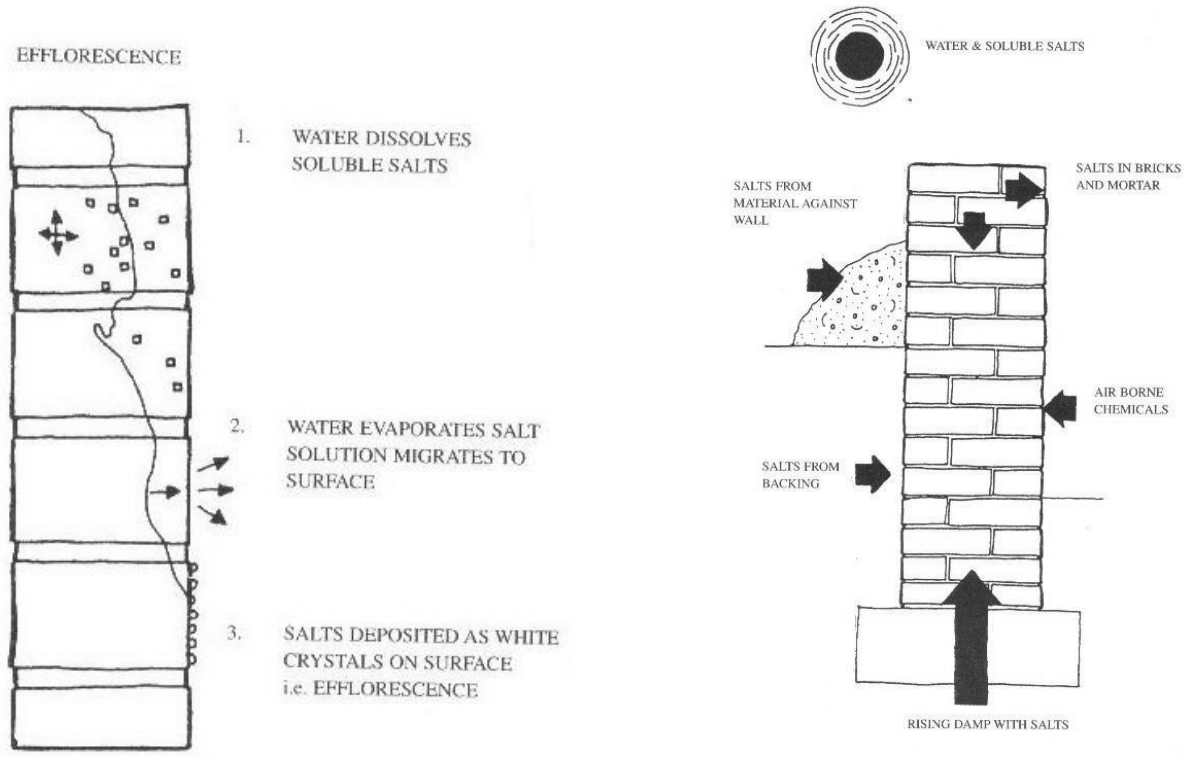
3.4 Efflorescence (refer SABS 227:4.5)

Efflorescence is the crystallisation of soluble salts on or near the surface of brickwork that results from the evaporation of water carrying salts through or from the brickwork. Efflorescence can be no more than an unsightly deposit on newly laid brickwork that soon disappears or it can be serious, causing unsightly permanent discolouration or even the failure of plaster, paintwork or face finishes.

Figure 3.2: Formation of Efflorescence



This is often caused by poor waterproofing or detailing. SABS 227 describes degrees of efflorescence and the limits of efflorescence caused by salts in the clay bricks during manufacturing.

The degrees of efflorescence:

Nil	:	no perceptible deposit of salts
Slight	:	a very thin deposit of salts, just perceptible, or a small quantity of salts occurring only on the edges of a unit
Moderate	:	a deposit heavier than "slight", but that has not caused powdering or flaking of the surface
Heavy	:	a thick deposit of salts covering a large area of the unit, but that has not caused powdering or flaking of the surface
Serious	:	a deposit of salts that has caused powdering or flaking of the surface.

When units are tested in accordance with SABS 227, the numbers that exhibit efflorescence shall not exceed the limits given in Table 3.3, for special or normal grade, appropriate to the class of the units, namely:

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Special Grade: When tested in accordance with SABS 227, no facing unit is to exhibit more than slight efflorescence and non-facing (plastering) units, no unit is to show heavy efflorescence and not more than 10 out of 20 units tested to exhibit moderate efflorescence.

Normal Grade: No facing unit is to exhibit heavy efflorescence and not more than 10 out of 20 units tested to exhibit moderate efflorescence. For non-facing units not more than 10 out of the 20 units tested to exhibit heavy efflorescence.

Table 3.3: Degree of Efflorescence

Grade	Class Of unit	Number of units that exhibit Efflorescence		
		Degree of efflorescence		
		Slight	Moderate	Heavy
Special	FBS	20	-	-
	FBX	20	-	-
	FBA	20	-	-
	NFP	10	10	-
	NFX	10	10	-
Normal	FBS	10	10	-
	FBX	10	10	-
	FBA	10	10	-
	NFP	-	10	1 0
	NFX	-	10	10

3.5 Irreversible Moisture Expansion (refer SABS 227: 4.7)

Burnt clay masonry units, in general, shall have an irreversible moisture expansion of not more than 0.20% and in faced applications, a demonstrated satisfactory performance with respect to durability unless it can be reasonably demonstrated by other means that the units are fit for purpose.

Burnt clay masonry units undergo an irreversible moisture expansion, which occurs as a result of the absorption of moisture from the atmosphere after firing. This expansion, which is characteristic of all porous ceramic products, commences once the unit starts absorbing moisture from the atmosphere - hence the term moisture expansion. Moisture expansion must be considered when designing and constructing a brick structure *(see Figure 3.3).*

Clay bricks are normally classified into three groups of moisture expansion ranges:

Category I: For bricks exhibiting irreversible expansions of 0,00% - 0,05%
Category II: For bricks exhibiting irreversible expansions >0,05% ≤ 0,10%
Category III: For bricks exhibiting irreversible expansions >0,10% ≤ 0,20%

The curves below show the irreversible moisture expansion for :

1. Individual Bricks
2. Horizontal Brickwork or length of a wall
3. Vertical brickwork or the height of a wall.

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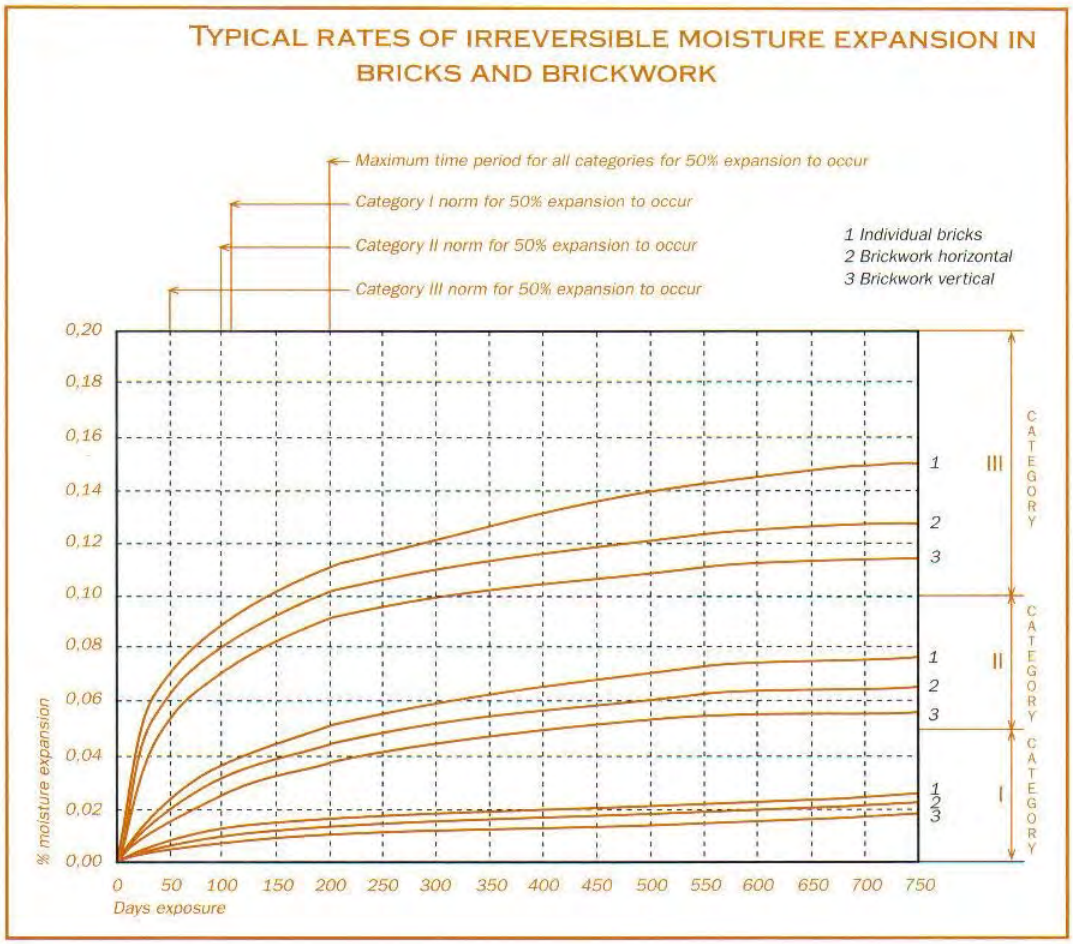
Figure 3.3: Irreversible Moisture Expansion



Notes on irreversible moisture expansion:
There is no difference in the expansion of perforated and solid bricks. Bricks stored in air expand in the same manner as bricks cooled from the kiln in a drier.

There are no cost-effective ways of accelerating the irreversible moisture expansion of clay bricks. For ceramic materials the rate of expansion decreases steadily with the passage of time.

3.6 Durability: Selection Criteria

The best indicator of a product's durability performance in any application is at least 5 years of satisfactory performance in the application concerned.

A single global value of compressive strength is not an adequate criterion for a product's likely durability in an exposed application. The present minimum requirement for facing of 17MPa average compressive strength fails to cater for the requirements of varying exposure zones.

Currently, a direct determination of durability does not exist in the form of a proven accelerated weathering test or any other performance-based evaluation, although a programme of research and of measuring the performance of products is ongoing.

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Durability is the ability of a material to withstand the combined effects of the weathering agents of moisture, soluble salts, frost and thermal changes.

Exposure is the severity of these weathering actions, varying from mild to severe, and depending on both regional geographic and micro-climatic conditions with regard to the building's height and the material's position within the building.

Figure 3.4: Regional Geographic Exposure

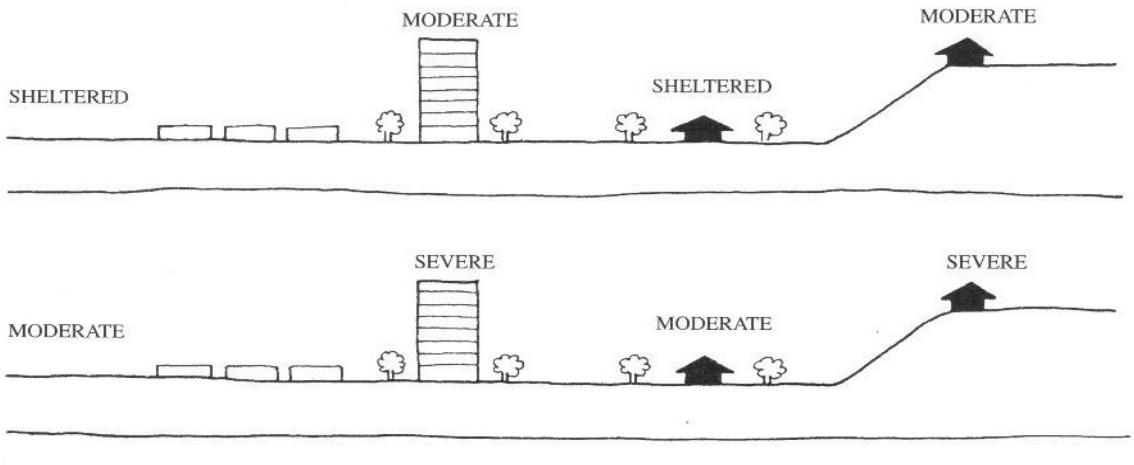
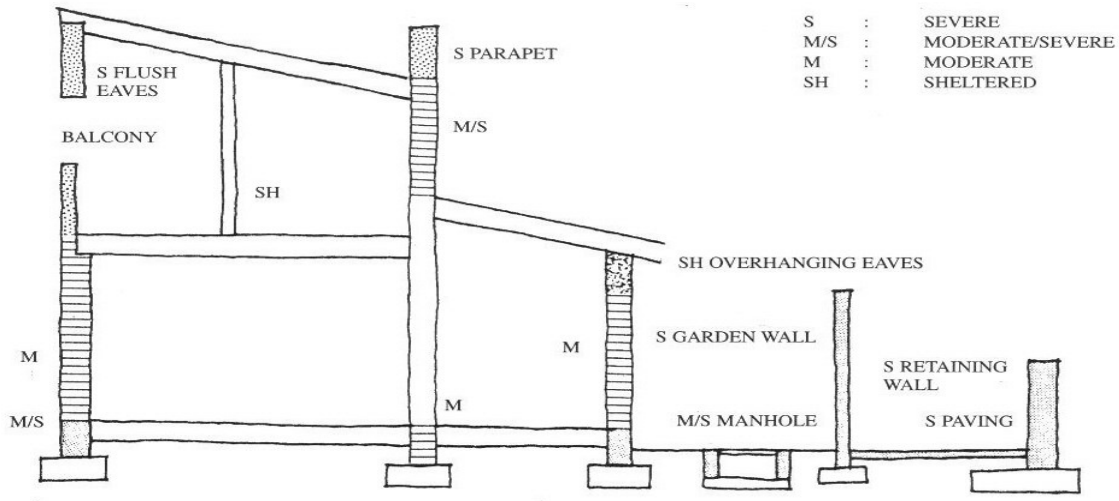


Figure 3.5: Micro Climatic Exposure



Parapets and copings, for example, are clearly subject to more severe exposure conditions than face brickwork protected by overhanging eaves. Internal face brickwork is not subject to the same degree of exposure as external unrendered brickwork. This section is primarily concerned with the selection of bricks for external face brick applications.

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The use of facings and non-facings selected for durability in an area geographically close to the factory manufacturing the bricks poses few problems. The local knowledge of the exposure conditions and of the performance of the bricks concerned, which is generally available from the brick manufacturer, specifiers and building contractors will ensure that only products suited for their intended purpose will be used.

It is when bricks are specified by an architect or client far from the location of the manufacturer, with the building undertaken by a contractor who is not familiar with the properties and performance of the particular brick, that the risk of a brick being used that is not suited to a particular application is increased.

The durability of bricks in the wall, or brickwork, is dependent on a number of factors:

- Orientation of the structure in terms of prevailing weather
- Design detailing in terms of protection of the exposed walling by adequate eaves, overhangs, guttering, flashing etc
- Macro and Micro climatic conditions
- Good building practice with special emphasis on mortars, joints and pointing, sealants and damp proofing materials
- The assurance/certification from the brickmaker/supplier that the bricks are fit for purpose.

However, clay brickwork has history on its side. Numerous buildings around the world have stood the test of time for hundreds and even thousands of years against other building materials and under adverse and extreme conditions.

3.6.1 Exposure Zones

In parts of Southern Africa, where the climate and peculiar local conditions combine to produce a harsh environment, certain types of face bricks used externally may suffer from weathering.

Broadly, experience and SABS 0249: *Masonry Walling* has shown that Southern Africa may be grouped into four exposure zones:

Zone 1 Protected: All inland areas more than 30 km from the coastline

Zone 2 Moderate: The 30 km zone along the coast, but excluding the sea spray zone

Zone 3 Severe:
- The sea spray zone such as the seaward sides of Durban Bluff and other exposed coastal headland areas;
- The 15km coastal zone from Mtunzini northwards to the Mozambique border, including Richards Bay; and
- The coastal belt of Namibia.

Zone 4 Very severe:
- Areas such as Walvis Bay where moisture from the sea mist and high ground water tables, soluble sulphates in the soil, and/or rapid temperature changes combine to create the most severe exposure and weathering conditions; and
- Industrial areas where high acid or alkaline discharges occur.

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3.6.1.1 Recommended Exposure Zones for Facings

Certain facing bricks may not be suited to external exposure in Zones 3 and 4. The recommended exposure zone to which each product is suited should be indicated by the manufacturer.

In several instances, special selection of clay facings from a factory can provide a product with enhanced durability performance suited to more severe exposure applications.

3.6.1.2 Recommended Specifying Procedure

Marketing and sales personnel should ascertain themselves with the exposure zone, site orientation in terms of prevailing winds, driving rain, etc. and insist that specifiers clearly identify the type of brick and its required performance criteria in bills of quantities and on architectural drawings. Sales staff should ensure that in all structures to be built in severe and very severe exposure zones, bricks are supplied with the manufacturers' warranty to the effect that they are "fit for purpose". Similarly, bricks to be used below ground or in damp to very wet conditions should be specified and supplied to quality standards ensuring their adequate performance over time.

3.7 Initial Rate of Absorption (refer SABS 0164-1.B-4.1.1)

The bond between brick and mortar is largely influenced by the demand of the brick to absorb water by suction and the ability of the mortar to retain the water necessary for the hydration of cement.

Structural units of clay with an initial rate of absorption exceeding I,8kg/m².min. should be moistened prior to laying to reduce the rate to between 0,7 and I,8kg/m².min. This is a requirement of SABS 0164-1: *The structural use of masonry Part 1: Unreinforced masonry walling.*

3.8 Fire Resistance, Acoustic and Thermal Performance of Various Walling Types

3.8.1 Fire Resistance

Fire resistance rating is a measure of the length of time a walling element will resist a fully developed fire. Failure occurs in an element when its resistance is overcome in a defined way. Firstly, if it collapses or its structural ability is impaired, it is said to have failed at the time of collapse. Secondly, a wall can fail if it develops cracks and fissures through which hot gas or flame can pass and, thirdly, an element can fail if the temperature on the side away from the fire exceeds a certain level.

Values of fire resistance of typical clay brick walls are given in figure 3.6.

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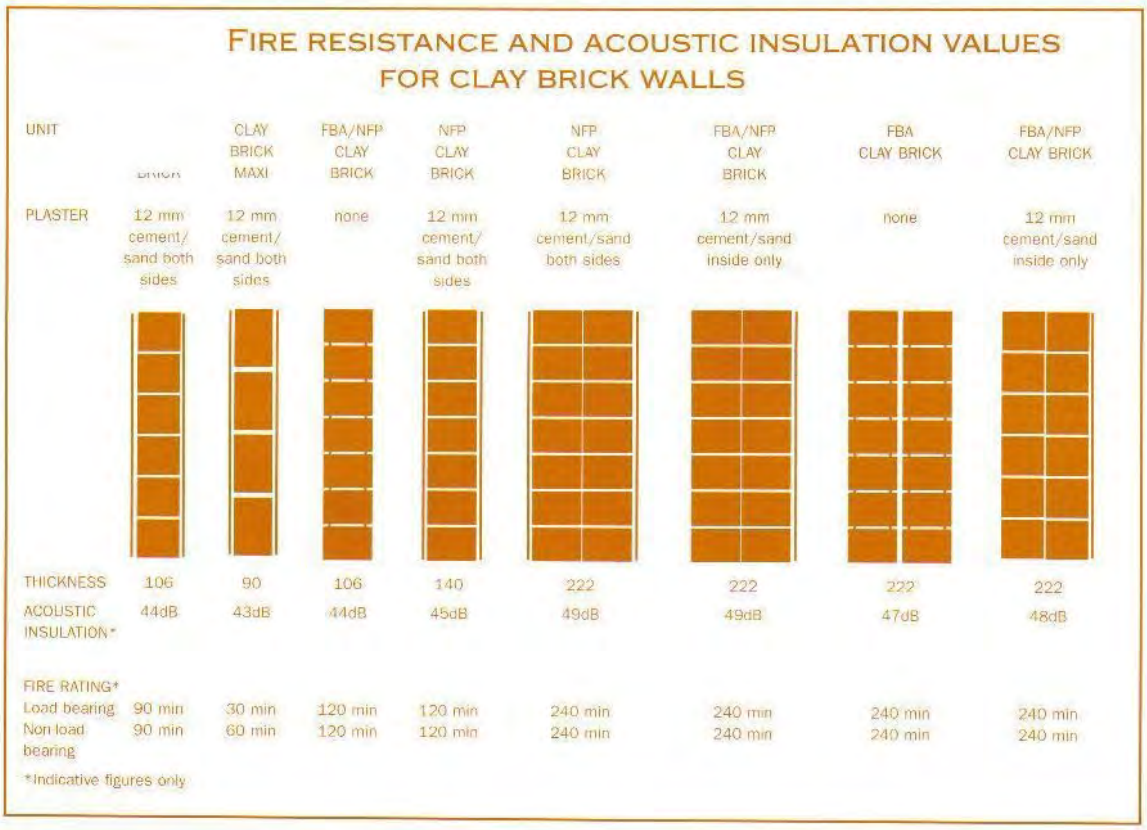
Figure 3.6: Fire Resistance and Acoustic Insulation Values



3.8.2 Acoustic Insulation

Values of acoustic insulation of typical clay brick walls are given in Figure 3.6.

Acoustic insulation, measured in decibels (dB), is the ability of a wall to resist the transmission of airborne sound. The measurement is based on a logarithmic scale and is not linear, which implies that halving or doubling of the insulation value would be represented by a 6dB change.

As mass is the best defence against noise penetration, the heavier walling products will generally perform better.

3.8.3 Thermal Properties

The thermal properties of a wall are related to its ability to transmit or resist the movement of heat and to its capacity to store thermal energy.

3.8.3.1 Thermal Transmittance

Thermal transmittance, (U value) is measured in Watts (W) per square metre (m^2) per degree Celsius, W/m^2 °C as the rate of heat flow through an element, e.g. a wall. The lower the U value, the better the insulation properties of the wall: it has a greater resistance to the flow of heat. The U value not only takes into account the resistance offered by the wall, but also the outside and inside surface resistance. Since the U value notionally provides a measure of the heat flow through a wall, it is the figure used to compare the performance of different constructions and to make energy-use calculations.

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3.8.3.2 Thermal Capacity

Thermal capacity is measured in Joules (J) per square metre (m^2) per degree Celsius, J/m^2 °C, and is a measure of the degree of heat that can be stored by a wall. Clay brick walls, with their high thermal capacity, have the ability to store heat during the day and release this heat at night. In climatic regions where there are high temperatures during the day and low temperatures at night, this results in thermally comfortable dwellings with a reduction in energy consumption to cool or heat the buildings.

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QUANTITIES
OF
BRICKS & MORTAR

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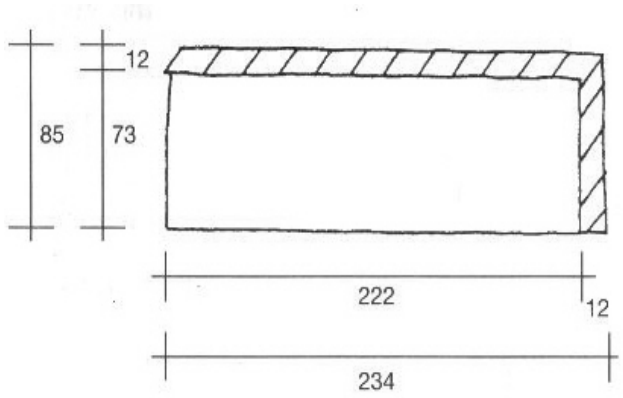
PART 4
QUANTITIES OF BRICKS AND MORTAR

4.1 Format Size (Standard Imperial)

Bricks are manufactured to a size of 222mm (long) x 106mm (wide) x 73mm (high) and it is recommended to use 12mm mortar joints. Therefore the format size becomes 234mm (long) x 118mm (wide) x 85mm (high) - Figure 4.1.

Figure 4.1 : Brick Format

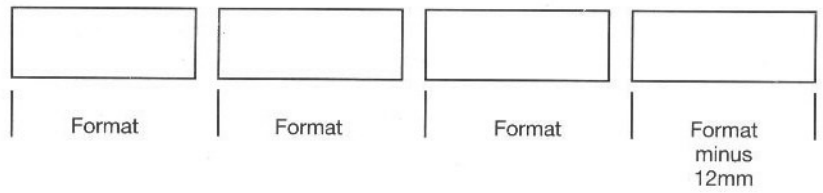
Brick Size 222mm (long) x 106mm (wide) x 73mm (high)



The format length, i.e. 234mm is the spacing of stretcher perpends. The format width, i.e.118mm is the spacing of header perpends. The format height, i.e. 85mm is the coursing height.

It should also be noted that the actual length of a brickwork panel is less by one 12mm joint than the overall distance between format lines - Figure 4.2

Figure 4.2 : Length



The actual widths of openings between brick reveals are greater by one 12mm joint than the width between format lines - Figure 4.3

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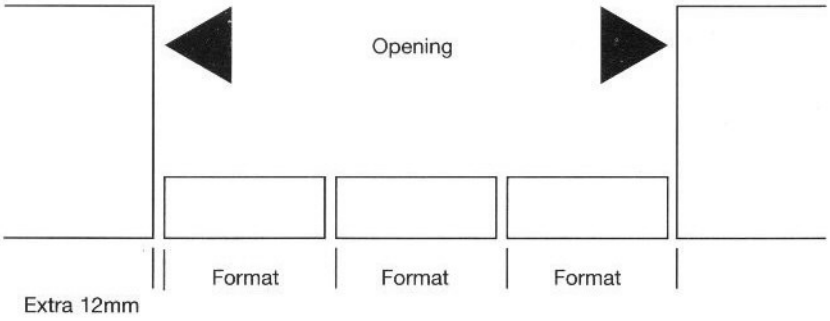
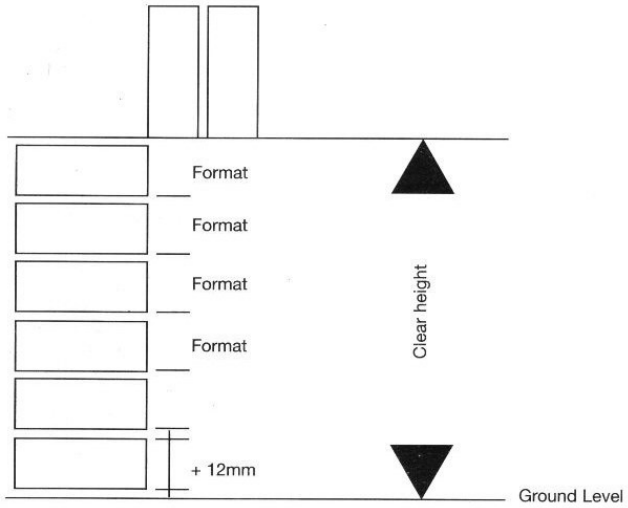
Figure 4.3 : Widths of Openings



The height of brickwork measured conveniently between the tops of the courses is equal to the format height: multiplied by the number of courses. The clear height of an opening (measured to the brickwork) is therefore greater by one joint than the coursing height of the opening - Figure 4.4

Figure 4.4 : Coursing Height



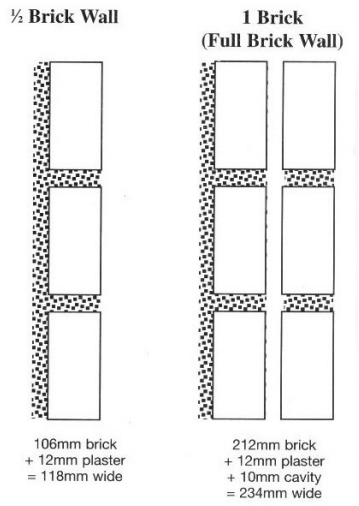


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Table 4.1: Brick Coursing

No.	Vertical	Horizontal	No.	Vertical	Horizontal	No.	Vertical	Horizontal
1	85	234	34	2890	7956	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	2340	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	6786	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	5610	15444	99	8415	23166
						100	8500	23400

Table 4.2: Quantities

Brick	Thickness	Quantities/m²	
		Bricks	Mortar (ℓ) 12mm Full Joint
222 x 106 x 73mm	½ Brick	51	21
	1 Brick	102	43
	1½ Bricks	153	66
	Cavity	102	42

Note:

i. No allowance has been made for waste
ii. The bedding mortar is across the full joint width
iii. 1000 litres *(ℓ)* = 1 cubic metre (m^3)

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CLEANING
OF
CLAY BRICKWORK

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PART 5
CLEANING OF CLAY BRICKWORK

5.1 Causes of Efflorescence

Efflorescence results when soluble salts in the masonry units or mortar leach to the surface. Water penetrating the masonry dissolves the salts. Later, as the wall dries, the salt solution migrates to the surface, and the water evaporates, depositing the salt on the surface of the masonry.

For efflorescence to occur, three conditions must exist simultaneously:

a) Soluble salts must be present within the masonry assembly
b) Water must come in contact with the salts to form a solution.
c) The salt solution must migrate to a surface where the water can evaporate

In conventional masonry construction exposed to weather, it is virtually impossible to eliminate salts, prevent water penetration, or construct the wall with no paths for water migration. The only practical thing to do is to minimise the extent of these three contributing factors.

Soluble salts may be present in the masonry units or the mortar, or they may be carried into the wall by rain or groundwater. Because the white efflorescence appears on the face of the masonry units, the bricks are generally blamed. But this usually is not the case. Though virtually all clay brick contains some salts, their effloresing potential is small. Bricks that are relatively free from impurities are readily available throughout South Africa. Dense to moderately absorptive units are least troublesome.

5.2 Preventing Efflorescence

Regardless of the impurity of the materials used, efflorescence is not likely to occur if proper precautions and high quality workmanship are employed. To prevent efflorescence the following good building practices must be considered:

a) Use masonry units of low to moderate absorption
b) Use low-alkali, non-staining or white cements in the mortar
c) Store masonry units off the ground and protect them with waterproof covers
d) Cover the top course of unfinished walls to keep out water
e) Flash parapet walls correctly
f) Install drips on cornices or projecting members
g) Install through-the-wall flashing at ground level to prevent the capillary rise of moisture from the ground
h) Install flashing in walls in places where water can accumulate once it enters; construct weep holes in the exterior width of the wall immediately above the flashing. Be sure joints of the flashing are lapped and sealed and the ends are turned up and sealed
i) Caulk all joints between masonry and door and window openings
j) Construct full, tight, weatherproof mortar joints; use concave or V-shaped joints where the masonry wall will be exposed to rain
k) Seal cracked mortar joints

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5.3 Removing Efflorescence, Stains and Smears.

Most efflorescence in well-designed, well-built masonry is temporary. Because the salts are water-soluble, the stain often disappears with washing or normal rain and weathering. As time passes, less and less efflorescence occurs, unless there is an external source of salts. As a wide variety of different types of efflorescence and stains occur on brickwork, different techniques are employed to remove the different types.

5.3.1 General Precautions when cleaning brickwork

Staining can mar the appearance of brickwork, but incorrect cleaning techniques can cause permanent damage. Consequently, any proposed method of cleaning should be tried out in a small unobtrusive area and left for at least a week to judge the results before the whole job is tackled. The techniques given here are intended for do-it-yourself work in removing relatively small areas of staining. A specialist contractor should be engaged for cleaning large areas of brickwork.

It is preferable to use wooden scrapers and stiff fibre brushes to avoid damaging the bricks but where chemicals are to be used, the brickwork should be thoroughly wetted with clean water to prevent it absorbing the chemicals, and rinsed thoroughly with clean water afterwards. Adjacent features such as metal windows and the area at the foot of the wall should be protected from splashing of the chemicals.

Many of the chemicals recommended are caustic, acidic or poisonous, so care should be taken and protective clothing and goggles should be worn. Volatile solvents should only be used indoors under conditions of good ventilation. It is essential to identify the type of stain or deposit before any cleaning operations are undertaken.

5.3.2 Preparation

Remember to thoroughly wet the brickwork with clean water before applying any chemical, and wash down with clean water afterwards.

Bricklaying should be managed carefully to prevent unsightly staining from mortar.

5.3.3 Cleaning Mortar Smears from New Masonry

Well trained bricklayers try to complete their work free from blemishes and smears. Most brickwork however requires some cleaning down. The only unequivocally recommended "chemical" for removing mortar smears from brickwork is clean water and the cleaning operation should be done on the day or the day after completion of the brickwork. The use of copious amounts of clean water and a bristle brush remain the most cost effective method of cleaning down freshly smeared, new masonry (warm to hot water usually works better than cold).

5.3.4 Hardened Mortar on New Brickwork

Once mortar has set and become hardened, the water and bristle brush cleaning method will no longer work and a chemical agent will have to be used. These products have as their main component, hydrochloric acid (spirits of salts or muriatic acid) together with "modifiers", or phosphoric acid and inert filler, or oxalic acid and inert fillers.

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The most successful, universally used agent is a weak solution of hydrochloric acid in water (1 part acid to 10 parts water). Products based on a phosphate ester which is also suitable for the removal of vanadium are often used.

The manufacturer's instructions must be strictly followed. Where possible, remove larger pieces with a scraper, then wash down with a diluted solution of acid cleaner.

- Wet the brickwork thoroughly with water
- Remove mortar with a proprietary acid cleaner
- Remove any residual acid in the brickwork by washing down with water

When removing mortar smear from brickwork that has a potential to exhibit vanadium staining, the following final procedure is then recommended:

- Treat the brickwork with a 15% to 20% solution of Potassium Hydroxide to prevent the recurrence of the vanadium stain

Note: Light coloured face bricks are particularly susceptible to severe staining if too harsh an acid is used.

5.3.5 Staining on Newly Erected Masonry that has saturated during construction

Free lime leaching out under excessively wet conditions often emanates from mortar joints or from cast concrete and stone members of the structure. If clean water and scrubbing down does not work while the masonry is still fresh, and carbonation has occurred, acid treatment is likely to be required.

The cheapest and most widely used chemical is hydrochloric acid in solution of 1:10 - acid to clean water - as used for hardened mortar in 5.3.4 above.

The acid acts by dissolving both the cement and the lime from the mortar causing it to disintegrate so it can be washed away with clean water. The stronger the acid solution, the quicker the action but the greater the danger of mortar joint attack and acid staining, especially with light coloured face bricks. The use of stronger than the recommended acid solutions should be handled by knowledgeable and experienced contractors who will wash off or neutralise the acid before "brick burn" staining occurs.

Note: Mineral acids such as sulphuric and phosphoric acids should not be used for cleaning mortar smears. They are not volatile and remain in the brickwork after being absorbed causing negative reactions within the bricks and mortar.

5.3.6 Efflorescence (White Crystals or White Furry Deposit)

The most common colour is white but green, yellow and brown occur. Most new brickwork exhibits some temporary efflorescence as soluble salts are carried to the surface of the brick by water while the brickwork dries out.

The amount of efflorescence is related to the amount of water in the brickwork, the length of time it has to absorb the salts, and the drying out of the wall. New bricks often contain less salts than bricks in the wall due to the fact that soluble ground salts can be drawn up into bricks and brickwork if bricks are incorrectly stored on site, damp proof courses are faulty, or salt carrying water enters the wall through faulty copings, flashing or water pipes.

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Although unsightly, as the salts are usually water soluble, this usually disappears rapidly from new brickwork by the action of wind and rain. Efflorescence will cause no damage to the wall unless they persist for a long time, in which case this could signal a set of deeper problems than the efflorescence itself. Brushing or sponging down the wall at times of maximum efflorescence will also help. The salts brushed off should not be allowed to accumulate at the base of the wall, otherwise they may be carried back into the brickwork by subsequent rain.

Note: In the case of common, white, water soluble salts, light brushing and hosing down with clean water provide the best overall treatment. The use of either alkaline or acid treatment is not recommended as it may well increase the salts in the wall; neither will the application of paraffin or oil help to mask the 'white' and will moreover prevent efflorescence from being washed and brushed off the surface.

Figure 5.1: Efflorescence on a Brick

Figure 5.2: Wall with Efflorescence

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5.3.7 Vanadium Staining

Light coloured face bricks appear to have a greenish surface discoloration (sometimes in shades of yellow). The thin film on the surface of the bricks is not harmful and normally weathers away in time. The effects on the aesthetics can cause customer/client unhappiness, which requires that an accelerated removal be undertaken. The treatment under these circumstances consists of a number of chemical options such as oxalic acid, hypochlorite and strong alkaline treatment.

Bricks that are prone to vanadium staining often give an early warning signal after they have become wet and have been allowed to dry out. Fresh brickwork that exhibits early vanadium staining should be brushed with a bristle brush and hosed down. If this approach fails, only then should alternative chemical treatment be tried.

Wash down with a 20% solution of Potassium Hydroxide. Do not wash the wall with clean water afterwards. (Hydrochloric or sulphuric acid should never be used on vanadium stains since it 'fixes' them and turns them brown.)

Some cleaning contractors have reported successful vanadium staining removal with both acetic acid and hydrogen peroxide.

Figure 5.3: Green Vanadium Stains

5.3.7.1 Oxalic Acid

Although commonly used in Australia and the U.K. for severe cases of vanadium staining, its use in South Africa is not popular with brickmakers. Oxalic acid should be mixed in solutions of between 20 - 40 grams per litre of water. A series of tests on small sections of the affected area will determine the best strength for the overall job. The action will be more rapid if the oxalic acid solution is applied hot and all solutions should be applied to dry wall surfaces. When the stain has been removed, the wall should be neutralised by applying a solution of 10g of washing soda per 1 litre of water to the treated surface and this should be allowed to remain on the wall. It is most important to carry out this neutralisation step in order to prevent any further unwanted action by the oxalic acid.

Note: Oxalic acid is extremely toxic.

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5.3.7.2 Hypochlorite Treatment

Apply a solution of 100g per litre of water using either a pool chlorine or a household bleach based on sodium hypochlorite. As with the other options, always test a small area first prior to treating the whole area. Solutions that are too strong can lead to further problems.

5.3.7.3 Alkaline Treatment

Wash the wall with a solution of l00g to 1 litre of water using either caustic soda or washing soda (use the corresponding potassium salts if available as these will be less likely to cause visible secondary efflorescence). If such secondary efflorescence occurs, wash it off with clean water.

5.3.8 Manganese Stains

Bricks may exhibit a dark brown to violet stain where manganese dioxide has been used to pigment them brown or grey, or where manganese occurs naturally in the raw materials.

Brush the stain with a solution of 1 part acetic acid and 1 part hydrogen peroxide in 6 parts of water.

Figure 5.4: Manganese Stain

5.3.9 Rust or Iron Stains

The brown rust stain produced by iron or steel embedded in brickwork or so near it that water can run from the metal onto the bricks can usually be removed by applying a solution of oxalic acid in water (1 part to 10 parts of water by mass).

If the stain is heavy, wash the affected areas with a solution of 50g oxalic acid, 20g sodium fluorite and 15g citric acid per litre water. Wash down the treated area with a solution of bicarbonate of soda (50g/l).

Brown staining which does not respond to this treatment, particularly at the junction of the brick and mortar, is probably due to manganese.

Note: Remember that oxalic acid is extremely toxic.

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Figure 5.5: Rust Stain

5.3.10 Bitumen and Tars

Bitumen, creosote and tars used on site must be handled with care and be properly stored. Their generally low surface tension allows for quick and deep penetration into the surface of brickwork making them difficult to remove. Their chemical resistance to both acids and alkalis is high, adding to the difficulties of their removal.

In general terms, remove all excess matter with a wooden or plastic scraper to avoid damaging the brickwork and follow this with the application of and scrubbing with a solution of a commercial degreasing agent (emulsifier) mixed with paraffin. The mix proportions should be established with the chemical supplier. When the stain appears to have been dissolved, clean the paraffin solution off with a solution of the emulsifier mixed with water only.

Note: Do not wet brickwork with water first.

5.3.11 Smoke and Soot

Scrub with a household detergent or a scouring powder that contains bleach, followed by a good rinse. The more stubborn patches can be removed from the brick pores using trichloroethylene, although good ventilation is needed if this is used indoors.

5.3.12 Paint (Including Graffiti)

Water-based PVA's, acrylics and the various enamels on brickwork cause different problems - hardened, old paint being the most difficult to remedy. The surest method of paint removal from brickwork is sand blasting (wet or dry) followed by power sanding. This procedure is also the most abrasive. Both methods usually abrade the faces of the bricks and cause damage to the mortar joints, therefore a chemically based treatment is preferable.

Where the type and brand of paint is known, the paint manufacturer should be approached for guidance to the best paint solvents and paint removers.

Scrubbing with copious amounts of water will usually remove wet, water based paint. Small areas on which paint may have been accidentally spilt, may be cleaned through applying a commercial paint remover or a solution of trisodium phosphate (1 part to 5 parts of water by mass). Allow the paint to soften, and remove with a scraper. Wash the wall with soapy water and finally rinse with clean water.

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Paint on difficult surfaces including strongly textured face brick has been successfully removed using poultices and gels. The caustic poultice typically consists of 300g of caustic soda dissolved per litre of water and made into a thick paste with an inert filler such as diatomaceous earth, or using flour, methylcellulose wallpaper paste or similar. The poultice is left on the wall surface for 24 to 36 hours and is removed by first hosing down with water and subsequently (if necessary) with a high pressure water jet.

Again, it must be stressed strongly, ***caustic substances are extremely hazardous and great care must be taken to avoid contact with skin and eyes.***

In addition to, or instead of the caustic poultice, gels containing mixtures such as methylene dichloride, iso-amylacetate, ethyl-methyl-ketone and methylated alcohol, or other similar mixtures are being used by professional cleaning contractors. Each firm tends to develop their own secret recipe.

5.3.13 Oil Stains

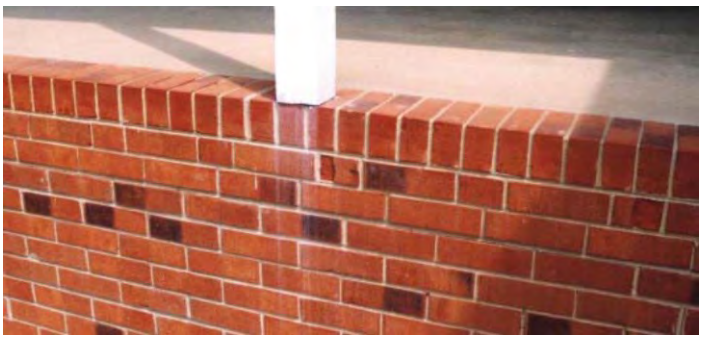
Oil spills will involve either mineral oils used in the automotive and engineering industries, or vegetable oils such as linseed, sunflower, peanut and castor. The treatment will depend on the type of oil to be removed.

Mineral oils will require solvents such as petrol, benzene and naphtha, while vegetable oil stains should be treated with methylated spirits, turpentine and trichlorethylene.

Treatments for the removal of tars may also prove effective in removing oil stains.

Note: The complete removal of oil stains is difficult to impossible. However, most oils, when exposed to long periods of weathering, will break down and get washed away by rain. Over time, the staining will be hardly visible to the naked eye.

Figure 5.6: Stains from Paint



5.3.14 Industrial Pollution, Dust and Grime

Air pollution is a constant problem in most industrial areas and in cities often causing buildings to look dirty and drab. Regular treatment using simple and low cost processes should be incorporated in the buildings' ongoing maintenance programme. Ingrained grime and airborne chemical attacks only become serious and expensive problems if left unattended over time.

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Remove loose dirt from exposed parts of buildings, especially horizontal surfaces such as sills, copings, and deep raked mortar joints, etc., by regularly hosing down. Grime adhering to the surface should be scrubbed and washed down with detergent and water and then rinsed with clean water.

Where staining has become fixed, the services of a professional cleaning contractor should be sought. Steam cleaning and chemical treatment may prove the only options.

5.3.15 Organic Growths

Micro-organic growths such as fungi, moulds, lichens and mosses on brickwork often cause unwanted dark stains or smears on portions of buildings and garden walls.

The most common micro-organic growths occur in constant shade but are often encouraged by high and prolonged humidity, poorly ventilated spaces and damp or wet conditions both inside and outside buildings. High water condensation in mass housing under certain climatic and social conditions, may result in black mould spots internally.

Eradication by chemical substances will be a waste of money without addressing the root causes such as rising damp, water ingress from above and from leaking walls, pipes and roofs. These defects should be tackled as a priority.

Organic growths can be killed with a solution of Copper Sulphate (1kg to 10 litres of water) or a proprietary weed killer.

Boiling water or steam is very effective in cleaning mosses.

Figure 5.7: Stains from Organic Growths

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5.3.16 Running Water

Water running regularly down the surface of brickwork produces pattern staining and this can usually be removed by scrubbing after wetting with a high pressure mist spray of cold water. If this is not effective, the treatment recommended for mortar should be followed.

Moisture movement concentrates salts and is the main cause of all staining.

Figure 5.8: Stains from Running Water

5.3.17 Timber

These stains are due to water spreading tannin or resin from the timber across the bricks and mortar. Normally they can be removed by scrubbing with a 1:40 solution of oxalic acid in hot water.

5.3.18 Lime and Lime Bloom

Follow treatment recommended for 'Mortar and Mortar Smear'.

In older brickwork lime staining originating from the reinforced concrete structure can be particularly difficult to remove. It is important to stop the flow of moisture through the structure to overcome the problem.

5.3.19 Large Projects - Multi-Story Buildings

Sandblasting is not recommended as a solution.

High pressure cleaning is suitable if well managed by experienced contractors and with agreement and pre-planning between the architect, contractor, sub-contractor and brick manufacturer.

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- Hand labour should be used to remove large mortar particles
- Cleaning should only start about seven days after the building is complete, when the mortar is set
- Metal, glass, wood surfaces, etc., should be appropriately masked
- Cleaning should commence at the top of the building, working downwards
- The walls should be saturated with clean water before chemicals are applied
- Choice of application pressures and chemicals are critical to the operation

Figure 5.9: Lime Stains

5.4 Site Safety Precautions when Cleaning Brickwork

Some of the recommended cleaning methods involve the use of chemicals that could be dangerous if not used correctly.

a) It is important that any safety warnings issued by the chemical suppliers should be carefully read and strictly adhered to
b) When using chemicals, protective clothing such as gloves, suitable face protection, safety boots and overalls should be worn
c) Adequate ventilation is required in confined spaces when using chemicals
d) When using flammable materials, cigarettes, naked flames and other sources of ignition should be carefully controlled
e) When diluting acids, ALWAYS add acid to water and not water to acid
f) Any clothing that is contaminated with chemicals should be disposed of safely
g) When using any chemicals, care must be taken not to damage, contaminate or stain any adjoining material
h) Care must be taken to protect personnel operating in the area of the cleaning from any hazard created by the operation

It is particularly important with all cleaning methods for trials to be carried out on a small, preferably inconspicuous area, to determine the effect of the chemicals before treating a larger area.

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WARNING:

The cleaning of brickwork and the removal of stains is a universally accepted practice and is an established component of general maintenance programmes in the built environment. However, as emphasised, many of the substances and chemical compounds which have been found to be efficacious, are potentially dangerous to people. Some are classified as poisons. All cleaning systems involving the use of chemicals as well as those using mechanical methods should only be undertaken with the full knowledge of all potential dangers to human and animal health and with the appropriate safeguards and precautions put in place.

The Clay Brick Association and its members will not accept any responsibility for the actions of any person or third party who are either directly or indirectly the cause of damage to persons and property as a result of the cleaning recommendations contained in this technical guide, neither will the Clay Brick Association accept liability for any and all harmful effects to their health and lives.

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INFORMATION REQUIRED FROM CUSTOMERS

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PART 6
INFORMATION REQUIRED WHEN SELLING CLAY BRICKS

1. Location and Application

The use of clay bricks, selected for their durability, in an area that is geographically close to the factory manufacturing the bricks poses few problems as the local knowledge of the exposure conditions and the performance of the bricks concerned, by both the brick manufacturer and building contractors, will ensure that only products suited for their intended purpose will be used.

It is when bricks are specified by an architect or client away from the centre of manufacture, and with the building being erected by a contractor unfamiliar with the properties and performance of that particular brick, that the risk of the brick not being suited to its particular application is increased.

Although architects and specifiers will ascertain the exposure zones, site orientation in terms of prevailing winds, driving rains, etc., and identify the type of brick and its required performance criteria, sales staff should assure this by asking questions such as:

a) Where (in what part of the country) is the building going to be constructed?
b) What is going to be built and where in the building are the clay bricks to be used?

2. Requirements

Where a particular clay brick is not specified, sales staff needs to determine:

a) The product type i.e. NFP, NFX, FBA, FBS or FBX.
b) Where necessary the colour of the product, for example, many clamp operations sort bricks into light, dark and mixed batches. Are the bricks to be used for a new building or is it an addition to an existing building?
c) Where possible the whole order of clay bricks should be supplied from the same kiln, clamp or batch in order to avoid colour banding. For larger quantities a reference sample of ten bricks each can be kept by both the supplier and the builder. For very large quantities (100 000 units or more) that are delivered over a long period of time, a reference sample wall can be built on site to ensure that the agreed quality is delivered.
d) What texture is required?
e) What quantity of bricks are required and over what period of time?
f) When is the first delivery required? Where necessary a delivery schedule can be agreed with the customer.
g) What quality of brick will be delivered? Agree on size tolerances, warpage, crushing strength etc.
h) Are special shape bricks required?
i) The customer must be informed about the delivery details.
j) What packaging format will be used?
k) What size truck must be used to deliver?
l) How will the bricks be off-loaded i.e. by forklift truck, by crane, by hand or by tipping?
m) What is an acceptable percentage waste and chippage on delivery?
n) Where necessary explain to the customers what efflorescence is and how to clean it?
o) How will complaints be dealt with?

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GLOSSARY OF TERMS

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GLOSSARY OF TERMS

AGGREGATE	Any hard, inert material, i.e. 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
BAT	Portion of a brick larger than a quarter
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 a wall provided by the adhesive property of mortar
BROKEN BOND	The use of part bricks to make good a 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 wall tie with a space between them, usually at least 50mm wide
CHASES	Recesses cut in walls to accommodate service cables or pipes
CLOSER	The last masonry unit or portion of a unit laid in a course
COPING	The materials or masonry units used to form a cap or a finish on top of a wall, pier, or chimney, to protect the masonry below from water penetration, commonly extended beyond the wall face and incorporating a drip

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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
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 galvanized sheet iron shaped to prevent entry of rainwater
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

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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
HEADER COURSE	A continuous course of header brick
INITIAL SET	The first setting action of mortar, the beginning of the set
JOINT REINFORCEMENT	Steel reinforcement placed in mortar bed joints
JOINTING	The finishing off of joints between courses of masonry units before the mortar has hardened
LAP	The distance the bricks of one course overlaps the bricks of another course
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

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PERPENDS (PERPS)	Vertical lines controlling the vertically 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 a 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
QUOIN	Corner brick — the first brick of each course at the corner
RACKING BACK	The steps left in the brickwork back when pulling up corners
REINFORCED BRICKWORK	Brickwork incorporating steel wire or rods to enhance resistance to loads
REINFORCING	Metal that is built into brickwork e.g., reinforcing bars, brick force
RETAINING WALL	A wall that provides lateral support to higher ground at a change of level
REVEAL	The area of walling at the side of an opening which is at right angles to the general face of the wall
RETEMPERING	To moisten mortar and re-mix, after original mixing, to the proper consistency for use.
ROOF TIES	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 that sets but does not harden. Used to exclude wind driven rain from movement joints and around door and window frames

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SILL	The part of the brickwork directly below a window
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 fired at low temperature ranges, producing units of relatively high absorptions and low compressive strengths
STRETCHER	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)
THRESHOLD	The section of the floor at the doorway
TOOTHING	Leaving indents in the wall. This means removing every second brick when adding new brickwork to existing brickwork
WALL TIE	A metal piece that connects leaves of masonry to each other or to other materials
WATER ABSORPTION	The amount of water 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

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QUESTIONS

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QUESTIONS

PART 1 - PRODUCT TYPES AND CLASSES (NOMENCLATURE)

1. Explain the following classes of clay brick produced in South Africa:
   - Non Face Plaster (NFP) (3)
   - Face Brick Aesthetic (FBA) (3)
   - Face Brick Standard (FBS) (3)
   - Face Brick Extra (FBX) (3)
   - Non Face Extra (NFX) (3)
   - Engineering Units (E) (3)

2. Name five textures used on clay bricks in South Africa (5)

3. What, in general, is an acceptable appearance of a clay brick (4)

TOTAL MARKS (27)

PART 2 - PRODUCT SPECIFICATION AND PHYSICAL PROPERTIES

1. What are the dimensions of the most commonly used brick in South Africa, the "Imperial Brick"? (3)

2. What are the tolerances for the Individual units of the FBS class clay brick? (3)

3. What are the average tolerances for 32 units of the FBS class clay brick? (3)

4. What are the warpage tolerances for FBA & NFP bricks and FBX bricks? (2

5. What is the minimum allowable compressive strength of individual NFP clay bricks? (1)

6. What is efflorescence? (3)

7. Describe a heavy degree of efflorescence on clay bricks? (3)

8. Name the three groups of irreversible moisture expansion ranges that clay bricks are normally classified into? (3)

9. Give the four regional geographic exposure zones for clay bricks in South Africa? (8)

10. What is meant by the fire resistance rating of clay bricks? (2)

11. What is meant by the acoustic insulation of a clay brick wall? (2)

TOTAL MARKS (33)

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PART 3 - QUANTITIES OF BRICKS AND MORTAR

1. What is meant by the building terms, format length, format width and format height? (3)
2. How many bricks and mortar per m² in half a brick thickness wall? (2)
3. How many bricks and mortar per m² in a full brick thickness wall? (2)
4. How many bricks and mortar per m² in a cavity wall? (2)

TOTAL MARKS (9)

PART 4 - CLEANING OF CLAY BRICKWORK

1. For efflorescence to occur, what three conditions must exist simultaneously? (3)
2. To prevent efflorescence, what good building practices must be considered? (10)
3. What is the best method for cleaning mortar smears from new masonry? (2)
4. What is the best method for cleaning hardened mortar on new brickwork? (2)
5. What is the best method for cleaning efflorescence on new brickwork? (2)
6. What is the best method for cleaning vanadium staining on new brickwork? (2)
7. What is the best method for cleaning organic growth on new brickwork? (2)
8. What safety precautions must be taken when using chemicals to clean brickwork? (4)

TOTAL MARKS (27)

TOTAL MARKS FOR THE TEST (96)

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EVALUATION FORM

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EVALUATION FORM FOR CLAY BRICK TELESALES COURSE

TRAINING MATERIAL

Good ↔ Not so good

Comments:

INFORMATIVE

Good ↔ Not so good

Comments:

VALUE IN YOUR WORKPLACE

Good ↔ Not so good

Comments:

OVERALL IMPRESSION

Good ↔ Not so good

Comments:

First Name: _____ Surname: _____

Company: _____ Position: _____

E-mail: _____ Phone: _____ Fax: _____

Please list the names of friends or colleagues you feel would benefit from this training

First Name	Last Name	Position	Company	Phone Number

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