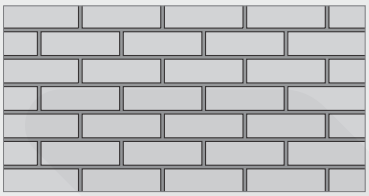
RADHA KRISHNA BRICKS IND.
Designer Bricks Manufacturer

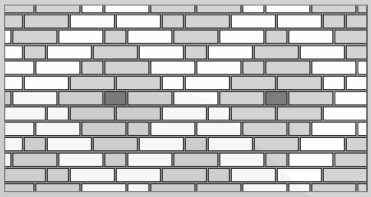
TECHNICAL INFORMATION A

BRICK WORK BONDS DESIGN & SPECIFICATION

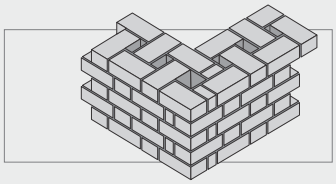
Stretcher Bond



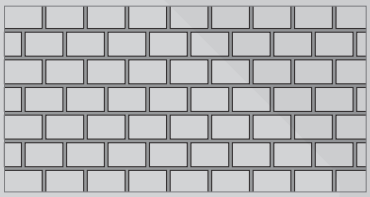
Flemish Garden Wall



Quetta Bond

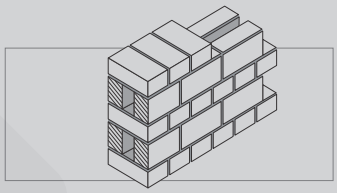


Header Bond

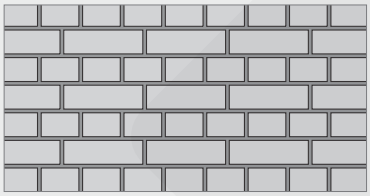


Stack Bond

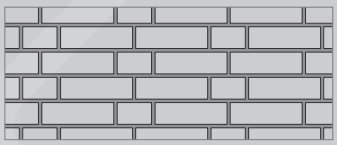
Dearne's Bond



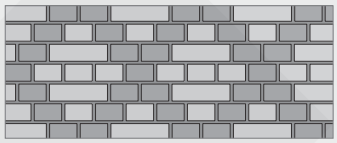
English Bond



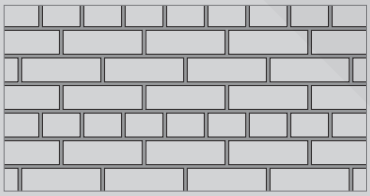
Monk Bond



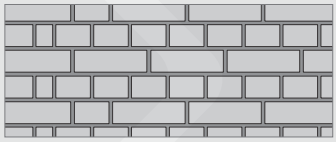
Diamond Diaper



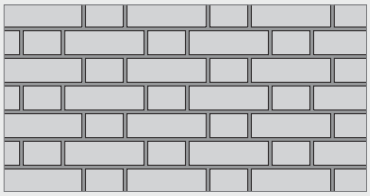
English Garden Wall



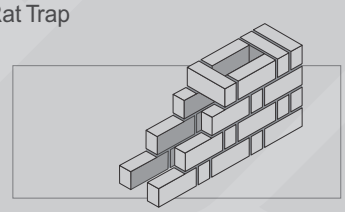
English Cross Bond



Flemish Bond



Rat Trap



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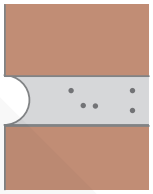
TECHNICAL INFORMATION B

DESIGN & SPECIFICATION CONSIDERATIONS MORTAR JOINT PROFILES

The perfect selection of mortar joint material / Chemical / adhesive is essential for long term performance of masonry. Masonry that remains saturated is more susceptible to frost and sulphate attack. The choice of joint profile should therefore be based first on performance criteria with aesthetic considerations being secondary. Tooling of the joints to compact the mortar improves durability and rain-shedding qualities. The strength of mortar also affects long term durability of brickwork therefore, it is recommended to seek advice on what mortar strength and joint profile is most suitable for a particular application and exposure zone.

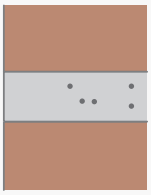
Quality of Workmanship

- The quality of workmanship on site can have an overriding effect on the weather resistance of the brickwork.
- Bricks should be laid on a full bed of mortar.
- Care should be taken to ensure that mortar is not scraped onto the exposed face of the brick.
- All cross joints and collar joints should be fully filled.
- Immediately after the brick is laid, excess mortar should be removed from the external face of the wall.
- However, customers are advised to use suitable mortar & recommended chemicals for joints/ grout.



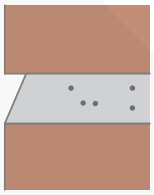
Curved (Bucket Handle)

This joint gives an improved appearance over a flush joint, with little reduction in its strength. Owing to the compressing of the joint and the superior bond, it has good weather resistance and is suitable for all grades of exposure.



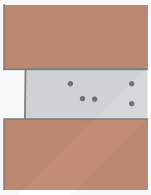
Flush

This gives maximum bearing area and is often preferred when coarse textured / hand mold bricks are used. With some brick types the finish may appear a little irregular. Suitable for moderate and sheltered exposures as the mortar joint has not been compressed by the finishing tool.



Struck or Weathered
(Weather-struck)

This produces a contrasting effect of light and shade on the brickwork. Such joints, when correctly formed, have excellent strength and weather resistance and are suitable for all grades of exposure.



Square Recessed (Raked)

This can produce interesting articulated joints, but weather resistance and strength will be considerably less than other joints. This joint is suitable for interior brick work. Recommended width is 10mm for joints

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TECHNICAL INFORMATION C

DESIGN & SPECIFICATION CONSIDERATIONS THE USE OF CLAY BRICKWORK IN LANDSCAPING SITUATIONS

Clay facing bricks have been used with great success and longevity in buildings. Survival of the older buildings is down to numerous factors including location, design and workmanship and avoidance of instances of damage or dereliction.

Moisture is the biggest enemy of construction materials. Successful construction is focused around the prevention of its entrance into the buildings fabric.

Design detailing plays an important role in shedding rainfall away from the walling and minimising permanent saturation. However, when the walling is subjected to rainfall, individual bricks are only being wetted from one side (or 1 stretcher and 1 header in the case of corners).

Historically, depending on location, various building materials have been used that were readily available and suitable for keeping the weather out. Slate, stone, thatch, brick, wood, lime mortar etc. In conjunction with design detailing they lasted many years. Today these materials are still used along with newer material developments. However, perception and expectation of the performance of the more traditional materials is increasingly under scrutiny from the Consumer.

Because these materials have been seen to seemingly survive for so long, the expectation is that they can be used in any manner for any effect, not only in buildings but increasingly in landscaping situations, and still withstand the elements.

Clay facing brick can be used with great success in garden and boundary walling if associated materials and the design are appropriate to the geographical location and exposure to weathering.

Bricks in landscaping situations will not perform durability-wise in the same manner as if they were used in a building. They are in a much harsher environment subjected to saturation from rainfall and groundwater which can contain numerous impurities that could be harmful to brickwork. They are rarely constructed with this in mind. Often house-owners will construct half brick thick walls (100mm) as a cost saving boundary or edging solution.

1. PREVENT PERMANENT SATURATION OF FACING BRICKWORK

Brickwork garden walling should be a minimum 215mm wide for stability. At least 4 courses of Engineering quality bricks should be at ground level (2 courses below and 2 course above) to minimise the upward rise of moisture by capillary action. The downward flow of water through the jointed coping/capping can be prevented by inserting a high bond DPC under the capping or coping course. Moisture will also attack from the rear in retaining wall situations therefore **for improved durability the faces of retaining brickwork in contact with all soils and clays must be protected with a minimum 2 coats of bitumen or self adhesive membrane before backfilling.**

Consideration is also needed regarding the type of material that will be placed next to the brickwork. Its proximity may cause increased water run-off directed towards the brickwork (i.e tarmac).

The mortar joint is the path water will take through the brickwork courses. As it drains down it can cause free lime present in the mortar to be released. This can cause unsightly staining (pictured) which needs removal or it will harden and remain visible. Excess moisture can also cause efflorescence to appear.

A strong mortar mix is necessary for the durability of the brickwork. Do not recess mortar joints. Consider whether brickwork will be adjacent roadways where de-icing salts will regularly be used.

Lime stains emanating from mortar. No damp proof membrane has been incorporated under the brick edge capping.

2. ALLOW FOR MOVEMENT OF BRICKWORK AND SURROUNDING MATERIALS

Brickwork will move due to thermal expansion and contraction on a daily basis. For coping and capping courses a compressible movement joint must be provided every 2.5 to 3m. If not stresses may be set up leading to cracking and eventually to frost attack.Paving materials such as concrete blocks, pavers or in-situ concrete tend to expand and contract even more than brickwork. Along any abutting areas of differing materials, consideration should be made for the accommodation of any movement.

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DESIGN & SPECIFICATION CONSIDERATIONS
THE USE OF CLAY BRICKWORK IN LANDSCAPING SITUATIONS

3. STEP SITUATIONS

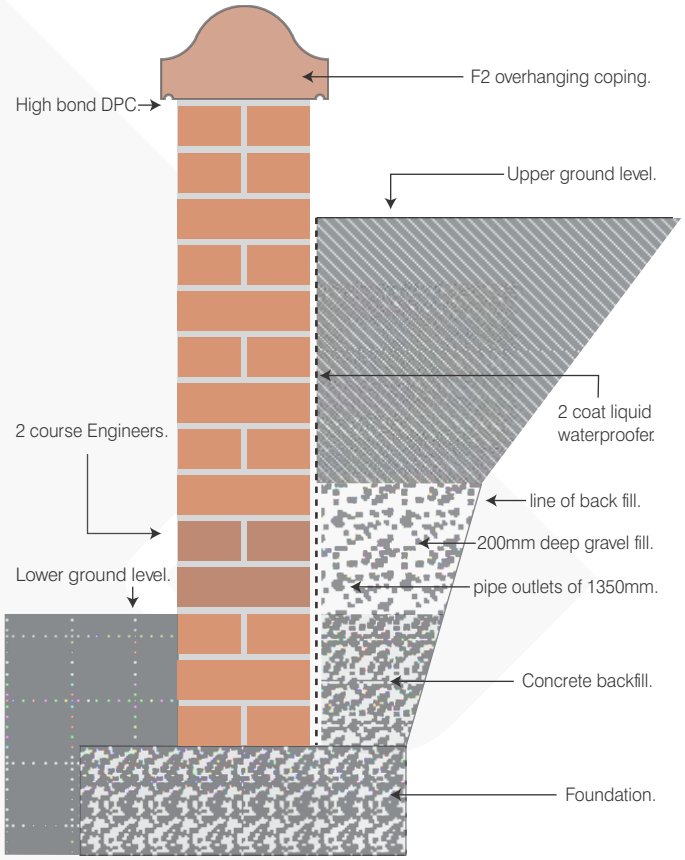
Brick risers in step situations are always at high risk of failure.They are often sandwiched in mortar between concrete treads and subjected to saturation and thermal expansion and contraction. Clay facing bricks should not be used or it should be expected that brickwork may need more frequent replacement if used in this situation. The mixing of different materials in the same structure should be avoided. Proprietary concrete risers or pavers should be used in this application.

RKBI does not offer a durability warranty for facing bricks used in steps, ramps & paths. To prolong the life of your garden walling always;

- Ensure the use of F2 (frost resistant) bricks.
- Carefully consider the mortar mix and mortar joint profile.
- Prevent movement of water through brickwork. Use correct damp proof detailing.
- Allow for thermal and differential movement of materials.
- Use overhanging copings in preference to cappings in garden walling where possible.
- Use proprietary clay pavers and fittings in pathway construction rather than facing bricks.

Chailey Multi Stock Paver
Henley-on-Thames

Swanage Handmade Multi
Milton Keynes



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TECHNICAL INFORMATION D

SITE PRACTICE & TROUBLESHOOTING EFFLORESCENCE

WHAT IS EFFLORESCENCE

Efflorescence is the appearance of salt deposits on the surface of brickwork. They can derive from the brick body, mortar or contamination from other materials or ground water.

CAUSE & EFFECT

Salts within brickwork are dissolved by water which is introduced during construction or from rain. Shrink-wrapped packs of bricks can develop efflorescence if in contact with damp ground and condensation forms within packs. As the brick or brickwork begins to dry out the solution of salts will be drawn to the surface where the salts become more concentrated as moisture evaporates. This tends to be most prevalent when temperatures reach optimum levels for drying, i.e. Spring onwards.

Efflorescence is most prevalent in the early life of the building, particularly the first year. In many areas it will not reappear after the first year, and in those situations where it does, it will be less evident than the initial occurrence.

It commonly occurs in spring, following wet winter working conditions, when the building dries out for the first time.

Visible as a harmless deposit of soluble material on the surface of brickwork, its texture may vary from light and fluffy to hard and glassy depending on its composition. The deposits consist of natural occurring soluble salts which vary considerably throughout the country, not only within the clays used for the manufacture of bricks but also in the constituents necessary for the production of the mortar i.e. sand and cement.

Apart from the salts derived from the bricks and mortar, almost any salt can form efflorescence if it is introduced as a contamination from external sources. The quantities of salts involved are small and a tiny percentage of soluble sulfates in the bricks or the cement is sufficient to account for the amount of efflorescence usually seen.

PREVENTION

Little, if any, masonry is immune from the potential effects of efflorescence.Factors that influence the occurrence of efflorescence are:

- Design and detailing, e.g. lack of protection from sills and copings.
- Site practice, e.g. failure to protect unused bricks and newly built brickwork e.g. not affixing gutter downpipes, leaving cavities open to the elements.
- Site inadequacies -failure to observe design requirements e.g. inadequate formation of DPC detailing.
- Site exposure - specific building elevations can be more at risk than others by their position in relation to prevailing wind and rain conditions. Also particular areas of exposed brickwork, e.g. parapets.

Efflorescence during construction can be minimised by maintaining a high standard of workmanship. Items for particular consideration include the following:

- Bricks should be stacked onto, a clean, firm level surface. They should be protected from rain, mud splashes etc. by covering with waterproof sheeting.
- Turn back the scaffolding board closest to the brickwork at all interruptions to construction.

The first 3 to 5 days after laying (dependent on season), brickwork is most vulnerable to the elements as mortar is still undergoing the hardening process. Newly erected masonry should be covered by waterproof sheeting to protect fresh mortar and open cavities to stop masonry becoming saturated. Hessian is not waterproof. Once the structure is watertight, i.e. roof and windows in place, the building can commence the drying process.

Unless instructed, the method of “dipping” or “docking” bricks prior to laying should be avoided if possible.

Equally important is the incorporation of the appropriate DPC’s, copings and sills at the design stage. No amount of good site management can alleviate efflorescence from badly designed construction.

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SITE PRACTICE & TROUBLESHOOTING EFFLORESCENCE

REMEDIATION

In considering remedial treatments, efflorescence is a transitory effect which should preferably be allowed to weather away naturally. Its removal can be accelerated by replicating weathering conditions for example;

- dry-brushing with a soft to medium nylon/bristle brush (awire brush should not be used). The residue should be collected and removed so that it does not re-enter the brickwork at a lower level.
- using a sponge dampened with clean water to draw out salts. Excessively wetting brickwork may force some re-dissolved salts back in to the brickwork which will re-appear as it dries. The use of a silicone waterproofing treatments should be avoided since this may result in more permanent problems.

The majority of efflorescence concerns relate to newly constructed brickwork. Recurrent efflorescence on older established brickwork can often be taken as an indication that water is entering the masonry as a result of failure of design detailing or other protective measures, e.g. faulty gutters, tanking materials etc.

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TECHNICAL INFORMATION E

SITE PRACTICE AND TROUBLESHOOTING VANADIUM STAINING/EFFLORESCENCE

WHAT IS VANADIUM

One of the mineral elements found in the raw material of clay bricks is 'vanadium' which normally only occurs as a complex salt in fire clays used in the production of buff coloured products. It can however, on very rare occasions, also occur in red and brown products.

CAUSE & EFFECT

Like most soluble salts it requires saturation to bring it to the surface when it appears as a yellowish stain that may change to a greenish or even light brown colour.

Vanadium does not come and go in the same manner as a white efflorescence and should really be described as a stain.

The discoloration is only on the surface of the brick but its intensity and the speed at which it can appear during construction can be a cause of concern for the user.

PREVENTION

Vanadium staining can be largely avoided by the protection of bricks and newly built brickwork to avoid saturation. The first 72 hours after laying, brickwork is most vulnerable to the elements as mortar is still undergoing the hardening process.

The stain will disappear in time due to the effect of normal weathering and should not return.

REMEDIATION

Under no circumstances should a standard acidic brick cleaner be used as this may "fix" the stain and turn it brown in colour.

Once the structure is watertight, if removal of the stain is required manually, brush on an oxalic acid solution (100g/litre) and, when the stain is bleached apply a washing soda solution (12g/litre) and leave on the wall.

Testing on an inconspicuous area is advised and all health and safety guidelines from the cleaning solution manufacturer should be strictly followed.

It is important to stress that the hardening of the mortar joints and the protection offered within a completed building will eliminate any repetition of the problem.

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TECHNICAL INFORMATION F

SITE PRACTICE AND TROUBLESHOOTING
IRON STAINING ON BRICKWORK

WHAT IS IRON STAINING

Iron salts can form a significant part of natural clay materials. Iron staining occurs on some “stock” bricks and on certain types of wire-cut bricks, particularly those made with clays with a high iron content. It takes the form of a dark brown stain leeching from the brick body.

CAUSE & EFFECT

If, after production, the bricks are exposed to saturation in certain conditions iron salts will migrate to the surface, in much the same way as the common white efflorescence, where they oxidise to produce a stain that is usually brown in colour, very similar to rust.

If the stain remains only on the bricks then arguably the discoloration may not cause too much concern. However, it does tend to run, and very quickly discolours the mortar joint as well.

Work carried out over a number of years showed conclusively that saturation of immature brickwork is the main cause of the problem.

PREVENTION

When good site practice prevailed and bricks and brickwork were correctly protected by waterproof sheeting until the mortar was mature, the problem of staining is virtually eliminated.

The first 3 to 5 days after laying (dependent on season), brickwork is most vulnerable to the elements as mortar is still undergoing the hardening process. Newly erected masonry should be covered by waterproof sheeting to protect fresh mortar and open cavities to stop masonry becoming saturated. Once the structure is watertight, i.e. roof and windows in place, the building can commence the drying process.

Hessian sacking is commonly used as protection but this is not waterproof and can, if saturated, be a source of staining, which can then be mistaken for iron staining.

REMEDIATION

Iron staining on bricks will often disappear, in time, by natural weathering. It does not, however, disappear and reappear like “white efflorescence”.

On mortar joints the simplest method to quickly improve the appearance, is to clean the joints with a half round file. This readily removes the stain from the joint and restores the brickwork profile.

If total cleaning is required, the use of any propriety brand of brick cleaner, used as part of the normal cleaning down process, will remove the stain and any minor staining reoccurring should be allowed to weather away naturally.

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TECHNICAL INFORMATION G

DESIGN & SPECIFICATION CONSIDERATIONS EXPANSIVE PARTICLES

Expanded lime particle.

WHAT ARE EXPANSIVE PARTICLES?

They are small fragments of naturally occurring material, expansive in nature, of a size large enough to cause disruption to the surface of a brick when it expands slightly with the absorption of moisture.

CAUSE & EFFECT

The presence of potentially expansive particles in clay deposits containing compounds such as Gypsum, Siderite and Lime, is quite common in the brick Industry. Occurrence is usually controlled during factory processes as the particles are either ground too finely during clay preparation to cause problems, eliminated during firing, or are situated well beneath the surface of the brick where they are quite harmless. Occasionally, due to a combination of factors, small particles can be deposited on or near the surface of the brick face.

After firing, when the brick absorbs moisture, a chemical reaction takes place. The particles swell which, if close enough to the surface may cause portions of the brick face to "pop" off.

The results are small pits in the surface of the brick with a white (lime) or purple (siderite) spot in the centre.

This is not uncommon. It is strictly an aesthetic issue and will not affect the structural integrity of the brick. It is only the loss of a small portion of the surface of the brick and the exposure of the differing body colour underneath which causes concern.

'Surface blows' usually occur during construction due to hydration, or in the first few months of the life of the brick once it has come into contact with moisture, whether in the form of rain or general atmospheric damp conditions. It is unlikely to continue to develop for much longer after the occurrence has been noticed.

We recommend that all brickwork should be viewed from approximately 3 metres away. Appearance of brickwork will vary significantly with the type of clay brick chosen. The guidelines suggest 10m as a viewing distance and also suggest the size of expansive particles or chips is limited to 15mm in diameter.

REMEDIATION

To overcome the aesthetic issue, the following remedial treatment can be performed;

The expanded particle is drilled out to provide a more substantial key for a filling material. The depression is then filled with a suitable material, such as a compound of a cementitious/resin nature, which is coloured to closely match the original brick colour and additions of various sands etc. are used to provide a similar texture.

The filler is then cured and if any further work is required to more closely resemble the brick surface this is then done. The whole surface of the brick including the filled area is then tinted to blend in with existing brickwork.

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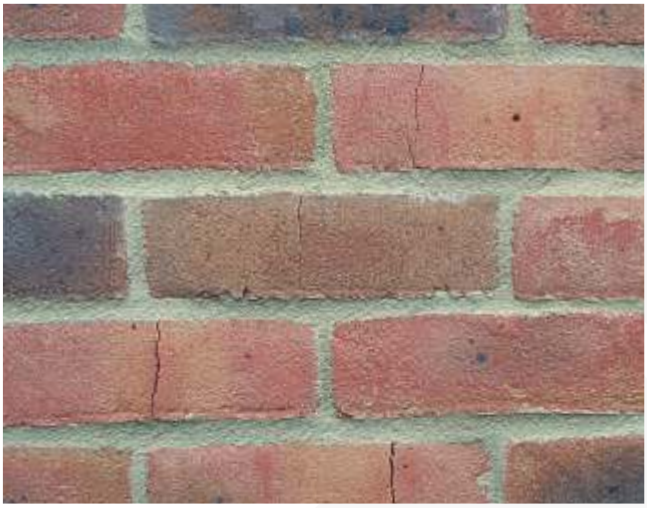
TECHNICAL INFORMATION H

SITE PRACTICE AND TROUBLESHOOTING
CRACKS IN BRICK FACE (FIRECRACKING)



Fire-cracks in clay brick. Cracks do not extend into the mortar joint suggesting their presence when built in.

WHAT IS FIRECRACKING?

Dependant on clay and the manufacturing process, the finished appearance of clay brick products will vary greatly. Some bricks may contain cracks of varying degree (sometimes referred to as fire-cracks) as an inherent feature created during the manufacturing process. They may take the form of fine crazing on the brick surface, or larger cracks found on the body or face of the product.

CAUSE & EFFECT

Surface tensions during the manufacturing process caused by temperature fluctuations create fine cracks or crazing and are an inherent feature of many products.

Although they can extend into the brick body the product remains durable as it has undergone the firing process during their presence.

Fire-cracks are usually visible on the product as delivered, however, they can be masked by the texture and surface sands used in the manufacturing process becoming visible after bricks are laid as a result of natural weathering of exposed brickwork.

Generally on 'stock' bricks the best side can be selected as the fair face.

The appearance of brickwork will vary significantly with the type of clay brick chosen.

We recommend that all brickwork should be viewed from approximately 3 metres away, and deliveries of bricks should be compared to a reference panel agreed by all parties at the start of work, thought to be representative of current production and quality. The 'aesthetic characteristics' should be assessed upon delivery.

The guidelines suggest 10m as a viewing distance, cracks should not be 'significant' and brickwork viewed as a whole and not on an individual basis.

During construction, bricks with questionable 'defects' should be put aside by the builder for inspection by the manufacturer or, often with Stock bricks, the most desirable face can be selected by the bricklayer to be the stretcher or header on show.

However, the presence of such cracks is not detrimental to the brickwork performance. They will not increase in size or affect the durability of the brickwork.

If there is doubt as to whether cracking in brickwork is due to surface fire-cracks or structural movement always consult the manufacturer or a structural engineer.

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RADHA KRISHNA BRICKS IND.
Designer Bricks Manufacturer

TECHNICAL INFORMATION I

SITE PRACTICE AND TROUBLESHOOTING
DIMENSIONS AND TOLERANCES

The tolerance is the difference between the stated Brick size and the average actual size.

QUICK GUIDE TO MEAN SIZE TOLERANCES FOR STANDARD BRICK DIMENSIONS.

Declared Size mm	T1 Lower & upper limits	Tolerances mm
40	37-43	±3
50	47-53	±3
65	62-68	±3
68	65-71	±3
73	70-76	±3
80	76-84	±4
90	86-94	±4
102	98-106	±4
190	184-196	±6
215	209-221	±6
225	219-231	±6
227	221-233	±6
290	283-297	±7

T2 Lower & upper limits	T1 Lower & upper limits	Tolerances mm
38-42	±2	Deviation in mm declared by the manufacturer. (may be wider or closer than the other categories).
48-52	±2	
63-67	±2	
66-70	±2	
71-75	±2	
78-82	±2	
88-92	±2	
99-105	±3	
186-194	±4	
211-219	±4	
221-229	±4	
223-231	±4	
286-294	±4	

On construction sites, should a concern be raised on size and to assess whether bricks conform to the quoted tolerance, first establish which tolerance the product has been supplied to.

Sample 10 bricks by randomly choosing from a consignment and taking the selection from a minimum 6 packs where possible. Remove any superfluous material, blisters or loose particles of clay adhering to each brick.

In practice, it may not be necessary to demonstrate that all dimensions are within the tolerances stated.

Place the bricks in contact with each other in a straight line upon a level, flat surface, as shown in the diagram below, ensuring that all bricks are in the same direction. DO NOT fit bricks together by alternately turning them around.

Measure the overall dimension to the nearest millimetre using a retractable steel pocket rule. Then divide the figure by 10 to give the mean value for each dimension to the nearest whole mm. Compare the figure against our stated tolerance for that product.

LENGTH ARRANGEMENT A - Faces forward (frog up if applicable).

Length measurement to nearest round mm.		Divide by 10 rounding to the nearest whole mm	

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SITE PRACTICE AND TROUBLESHOOTING
DIMENSIONS AND TOLERANCES

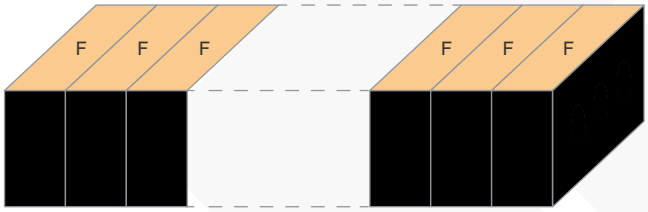
The tolerance is the difference between the stated Brick size and the average actual size.

WIDTH ARRANGEMENT B - Faces forward (frog up if applicable).

measurements should be rounded to the nearest whole mm.

Width measurement to nearest round mm.		Divide by 10 rounding to the nearest whole mm	

WIDTH ARRANGEMENT C - Faces up (frog to one common side, if applicable).



Height measurement to nearest round mm.	Divide by 10 rounding to the nearest whole mm

RANGE VALUE

The range tolerance covers the overall difference within a sample between the largest brick and the smallest and may be called upon to resolve problems with significant size variation within a consignment.

mm	40	50	65	68	73	80	90	102	140	190	215	227	290
R1	4	4	5	5	5	5	6	6	7	8	9	9	10
R1	2	2	2	3	3	3	3	3	4	4	4	5	5
Rm	A range in mm declared by the manufacturer (may be wider or closer than the other categories). Please refer to the product data sheet for quoted figure.												

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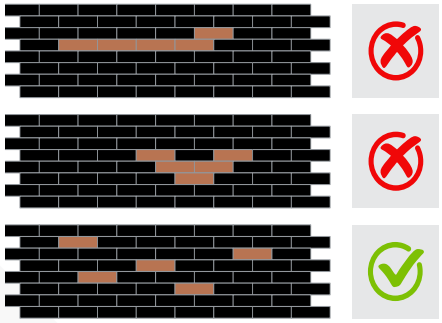
TECHNICAL INFORMATION J

SITE PRACTICE AND TROUBLESHOOTING
COLOUR VARIATION OF BRICKWORK

Clay bricks can vary slightly in colour from batch to batch for a variety of reasons including clay mix, sand/stain colour and small differences in firing conditions. Like other products such as wallpaper, carpets etc. it is important that the total quantity required is ordered and preferably delivered at one time and discussions with the supplier should take place to ensure that individual properties are built with bricks from the same batch. Delays in placing total orders and accepting deliveries may result in colour variation

Workmanship on building Sites states that "To achieve a good blend, units should be loaded out from at least three packs. It is advisable to draw form the packs vertically rather than horizontally" therefore reducing the occurrence of 'banding'.



Mortar difference

Mortar difference

If mixing is maintained within deliveries and between deliveries, there should not be a problem.

Comparing deliveries against the site reference panel will highlight unacceptable variations. However, for a variety of reasons, instances of unacceptable colour 'banding' do occur. All brickwork should be viewed from a minimum distance of 3 metres.

Firstly it is necessary to ascertain what exactly has caused this effect. Sometimes it is not the colour of the brick which causes a 'patchy' appearance, but in fact, the mortar.

Mortar of differing strengths or of variable ingredients will dry to a different colour. This can cause an optical illusion making the bricks appear a different colour when in fact they may be consistent with surrounding brickwork.

To further illustrate this, mortar of differing colours can be used in a variety of ways to create stunning effects. The photograph on the right shows a pattern created solely by changing the colour of the mortar. The bricks are the same but the visual effect appears to show different coloured bricks being cleverly built in to create geometric patterns.

To remedy serious colour variations the colour of brick and mortar can be changed by a method known as tinting. It is the technique of applying colour-fast pigments to give a permanent tint to the surface of brick masonry.Tinting has proved successful for well over fifty years and, although initially developed for use on clay bricks, has subsequently been applied with equal success to a variety of materials including all types of fired clay, concrete bricks/ blocks, calcium silicate bricks, mortars and natural stone.

The materials tinted are not required to remain the same over a long period of time. Indeed it is a necessary characteristic of the treatment that it allows the substrate to weather at a similar rate to the surrounding un-tinted materials, thus maintaining a consistent appearance. Consequently the tinting materials are normally quite thin and ideally soak into the surface onto which they have been applied.

Tints should be used with care as incorrect mixing and application could lead to brickwork being spoiled. Specialist contractors should be employed to carry out such treatments as their wealth of experience will lead to a more sympathetic blend between treated and untreated brickwork.

Consistent and thorough mixing of products on site, whether it be mortar materials or bricks, will minimise the necessity for remedial tinting and should be an important factor in good site practice.

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TECHNICAL INFORMATION K

DESIGN & SPECIFICATION CONSIDERATIONS
PREMATURE FAILURE OF BRICKWORK DUE TO MOVEMENT

Many free standing and retaining walls may fail prematurely due to the lack of provision for movement.

Even if the correct durability level of clay bricks are used, (F2 – Severe Exposure) inadequate provision for movement occurring over the expected life of the structure can lead to a chain reaction of events that will ultimately lead to frost failure. This is not a fault in the product but a lack of design consideration.

THERMAL MOVEMENT IN BRICKWORK

Many factors dictate how much brickwork will move due to temperature changes. The orientation and geographical location of a wall will be a major influence, also, the brick type and the strength of the mortar. Each unit will expand when heated by the sun and over a short distance the total movement may be insignificant. Over longer distances something will have to take the strain, preferably an easily compressible joint.

In boundary walling, unlike larger structures, there is not the mass of brickwork to restrict thermal movement. Therefore movement joints (often referred to as expansion joints) must be provided at a maximum of 5 to 6 metre spacing with a maximum of 2.5 – 3 metres from a corner or change of direction. They must commence at foundation level and continue through the coping or capping courses.

The capping course is more prone to expansion and contraction compared to the rest of the walling as temperature fluctuation will be greater and there is far less restraint. It is therefore important to increase the allowance for movement in the coping or capping course therefore additional mid-point movement joints will be required every 2.5 – 3 metres.

It is wrongly assumed that laying an Engineering Brick as a capping along the top of the wall eliminates the need for a proprietary brand of high bond damp proof membrane. Water will percolate through cracks in the mortar/brick interface. The DPC must be at least the full width of the wall and sandwiched within the mortar joint.

Code of Practice requirements are for a strong designation (i) mortar in coping and capping courses but the stronger the mortar, the more brittle it is and the more likely to crack. Mortars should never be stronger than the bricks used.

PINCHING EFFECT

Lack of provision for movement will result in a 'pinching' effect to the capping, this is first observed when minor chipping starts to occur at the edges of the bricks next to the mortar and often leads to early failure.

Sometimes damage to the bed joint and the perpend joints can also be seen. In rare cases, where the bricks cannot move due to restraint at either end, the capping may lift clear of the wall on which it was set.

Pinching effect

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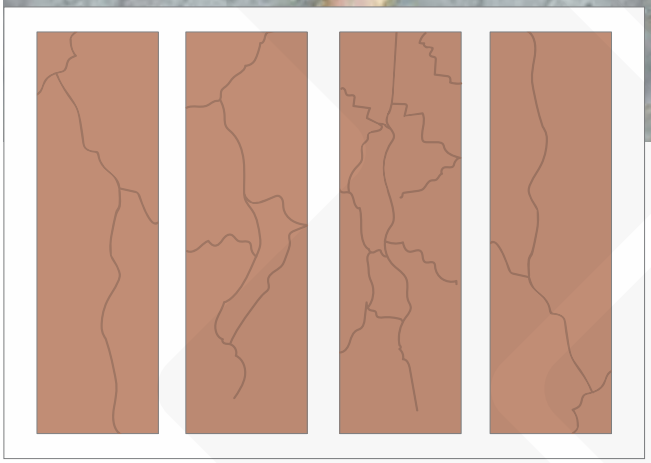
TECHNICAL INFORMATION L

SITE PRACTICE AND TROUBLESHOOTING
CRAZING



The effect of crazing is not uncommon to dense, strong wire-cut bricks especially if they have a smooth face finish. It is, however, far more noticeable on smooth blue types of brick.

The crazing is as a result of the stresses set up on the surface of the bricks when the material cools after the semi-vitrification that takes place during the high temperature firing.

Crazing or the effect of fire crazing is often referred to as fire-cracking or webbing and can be of a simple hairline crack or as a fine web-like pattern.

The crazing is undetectable to the eye whilst the bricks remain dry prior to use or whilst very wet.

It is often superficial and will not detract from the overall performance. The fine hairline cracks, although unnoticeable during selection, are certainly a part of the character of the bricks. The changing weather conditions simply aggravate the crazing to a degree when they become most apparent, especially after saturation when the moisture may remain in the cracks for far longer periods of time.

A Publicly Available Specification which is intended to cover aspects of aesthetics.

ALC brickwork should be viewed from approximately 3 metres away, and deliveries of bricks should be compared to a reference panel agreed by all parties at the start of work, thought to be representative of current production and quality.

guidelines suggest 10m as a viewing distance, cracks should not be ‘significant’ and brickwork viewed as a whole and not on an individual basis.

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TECHNICAL INFORMATION M

SITE PRACTICE & TROUBLESHOOTING
COATINGS ON BRICKWORK
ANTI-GRAFFITI, WATER-PROOFERS AND WATER-REPELLENTS

Unsuccessful anti-graffiti coating

ANTI-GRAFFITI COATINGS

There are materials which are applied to new brickwork with a view to making subsequent removal of graffiti easier, i.e. they create a surface coating which is easily removable by steam cleaning so taking the graffiti with it.

Sacrificial coatings as they are known are advertised as enabling graffiti to be removed with more ease. They will need to be re-applied each time the wall is cleaned but are virtually invisible to the eye and are removed by hot water pressure washing.

Some types of treatment however, are not satisfactory there has been an unacceptable deterioration of the coat, i.e. it has gone brittle, opaque and flaked off, creating a most unsatisfactory appearance.

Before using any coatings it is advisable to seek written assurances from the manufacturers that they will not cause deterioration of the brickwork as a consequence of its application.

Complaints of rain penetration in half-brick thick walls occur frequently and it must be accepted that driving or persistent rain will penetrate 102mm of masonry.

In general, little rain penetrates the brick itself in well-constructed walls, either it is of engineering density and acts like a raincoat, repelling the water and forcing it to run down the face of the brickwork, or it is of stock brick density and performs rather like an overcoat, absorbing quantities of rain before shedding the surplus down the external fabric. The quality of the mortar joint however provides a critical path for the rain to penetrate. The use of the correct mix of mortar with good quality workmanship will improve the rain resistance.

If a water repelling agent is deemed necessary it should be applied only on dry brickwork for maximum penetration. The water repelling agent differs from water proofers and sealants, whereas a water-repellent will be impregnated into the ‘pores’ of the brickwork; a sealer or proofer is merely a surface coating which does not allow the bricks to ‘breathe’.

Such treatments have a limited life, requiring re-application after a number of years. The only permanent solution to rain penetration is the provision of a properly constructed cavity wall, but surface treatments will help to reduce the amount of penetration which occurs, but cannot necessarily totally eliminate the ingress of water.

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TECHNICAL INFORMATION N

SITE PRACTICE AND TROUBLESHOOTING
LAYING 'FROGGED' BRICKS

The terminology for the indented portion in moulded bricks is reputed to have derived from the indented marks that pit and brickwork ponies left in soft earth -the cleft in their hooves being called a 'frog'.

Workmanship on building sites states that; "Unless otherwise advised, lay single frog bricks with frog uppermost Fill all frogs with mortar..... Brick walls built with frogs down and unfilled are weaker and less resistant to sound transmission. Advice should be sought as to whether bricks laid frog down are acceptable".

Many bricklayers prefer to lay bricks frog down as they believe it to be a faster method and it uses less mortar. However the performance of the brickwork can be affected by insufficiently filled frogs.

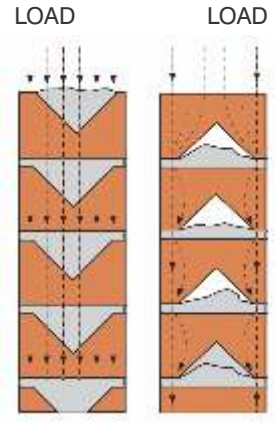
STRENGTH AND STABILITY

Compressive strength tests on frogged bricks have traditionally required them to be fully filled with mortar beforehand. The resulting figures are used by engineers in calculating the loads brickwork can support. Brickwork with unfilled frogs will fail at lower loads.

SOUND INSULATION

Building Regulations require dwellings to be constructed to certain standards so as to reduce the levels of transmission of sound between and within dwellings.

For solid masonry walls the resistance to airborne sound depends mainly on the mass per unit area of the wall (density).



Load evenly distributed throughout wall by mortar in frogs

Load concentrated at edges by lack of mortar in frogs

To maximise this:

- Fill and seal all masonry joints with mortar.
- Use bricks that extend to the full thickness of the wall.
- Lay brick frog up to achieve required mass per unit area and avoid air paths.

FIXINGS TO BRICK WALLS

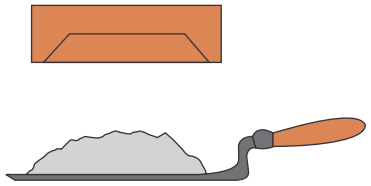
Fixings to walls must be used with care so as not to disrupt the brickwork. The whole structure is less fragile when the voids are fully filled with mortar and there is maximum bonding of all surfaces.

AESTHETICS

When laid correctly, the creases on the face of handmade or simulated handmade bricks form a 'smile'. Aesthetically it will look better if all the bricks are uniformly laid but will also help to shed water.

EXCEPTIONAL CIRCUMSTANCES

In very exceptional circumstances It is possible to lay bricks with the frog down and fully filled but it can be time consuming and suitable for particular details only i.e. if 'handed' bricks are not available for either side of an opening it may be possible to invert some on one side. This may not be acceptable for some textured products.



Load trowel with sufficient mortar to fill frog

To lay bricks with frogs down and filled, the trowel must be loaded with sufficient mortar and brick and trowel lowered into position.

It is not intended that voids in perforated bricks are filled with mortar.

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TECHNICAL INFORMATION 0

APPLICATION & CONSTRUCTION
BRICK SLIPS - FIXING (OTHER THAN PANEL SYSTEMS)

INTRODUCTION

Brick slips can be used to facilitate the achievement of certain architectural details, or to provide a brick veneer to structures of other materials. They are often used internally to provide an attractive, low maintenance finish but this note is mainly concerned with the more rigorous requirements of external application, exposed to the weather. Fixing may be by a combination of mechanical support and adhesive mortars or, in increasing situations, by adhesive alone.

MATERIALS

TYPES OF SLIP

Slips can be made either by wire cutting from an extruded column of clay before firing or by saw cutting from standard bricks. This latter method has the advantage of the ability to vary thickness within reason to suit the application. It is also a practical means of producing slips from hand-made and stock type moulded bricks. Corner units can also be produced and this results in aesthetically effective repairs to damaged bricks in existing buildings as well as claddings to various substrates

TYPES OF ADHESIVE

Although some manufacturers specialise in one type of material whilst others provide a range of types, available adhesives/mortars generally fall into the following categories for fixing to concrete substrates:

1. Sand/Portland cement mortar
   Conventional sand/cement mortar is not recommended for slip fixing. Adequate bond strength will rarely be attained and will be much affected by the suction rate of the particular slip and of the substrate.
2. As above - modified by the addition of Styrene Butadiene Rubber (SBR)
   SBR - modified mortar is available in pre-packaged form, which should reduce the possibility of site mixing errors of the three components. The use of such materials is well documented and established and very high bond strengths are achievable if the correct procedures are followed.
3. Epoxy and polyester resin based systems.
   These are capable of developing bond strengths of the high level usually associated with these materials. They have the advantage of rapid hardening but will normally need support until the initial cure has taken place.
   They tend to be expensive, relatively difficult to work and unsuitable for thick beds. They can also be temperature sensitive and liable to give poor strength if used beyond the optimum period after mixing.
4. Cement based adhesives.
   These are capable of bond strengths nearly as high as epoxy or polyester materials. They are perhaps the most straightforward to use with little scope for error and good initial grab, reducing or eliminating the need for support.

   They also have working characteristics more similar to those of normal mortar.
5. Rubber latex based material.
   Latex based materials are useful for applications where a degree of movement and vibration is anticipated, as they remain flexible when set. Tensile failure loads will tend to be lower than with other adhesives due to the low cohesive strength of the material itself, but this flexibility can be a distinct advantage in certain situations since forces are not passed directly back to the substrate. This type is relatively easy to mix and work and is particularly useful for application internally to timber surfaces.
6. Silicone based adhesives.
   Used with various proprietary brick slip systems. Obviously, the suppliers preferred method of working should be closely followed and the adhesive used be suitable for the application in question.

   The use of pre-assembled panels will often be preferable to individual slip fixing on site although the latter offers greater flexibility. In this case, site pointing will enable a uniform appearance to be achieved, avoiding a stitching effect between panels.

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TECHNICAL INFORMATION

APPLICATION & CONSTRUCTION
BRICK SLIPS - FIXING (OTHER THAN PANEL SYSTEMS)

Many adhesive companies offer technical advice on which product is best for any given application. It is important that their advice is sought. Ibstock Technical Services can supply manufacturers contact details on request.

Regardless of which type of adhesive is chosen, the following points must be observed during fixing: -

1. The general level of workmanship and supervision needs to be of a high standard.
2. The substrate to receive the slips must be clean, dry and free from dust, mould, and oil or, in the case of concrete, loose surface laitance.
3. Nearly all adhesive systems require some form of support until the initial set has taken place. Subsequent courses may be conveniently spaced by fillets of mortar between the slips, or plastic/wooden spacers may be used. Final pointing, after the adhesive has set, should be in normal sand/cement mortar to match the in-situ brickwork but modified mortars are available for use with proprietary gun-applied systems.
4. With most adhesive types, the slips should be 'buttered' with the mix over the whole rear face to avoid any voids in the bed in which water could collect and force off the slips under freezing conditions. Proprietary systems may have different arrangements and be applied by a gunning arrangement to the substrate.
5. The permissible bed thickness will vary with different systems and the manufacturers recommendations must always be followed. If differences of line occur requiring a greater thickness than that recommended, an initial render coat of the adhesive may be required. Specific advice on this matter should be sought from the manufacturers. In general 6mm represents a normal bed thickness with most adhesives, although most can be used at up to 12mm in small areas.
6. Manufacturer's instructions and advice should be strictly followed.

It is most important that allowance be made for both vertical and horizontal movement and that compressible joints are incorporated in the design for this purpose. This is particularly relevant to brickwork infill panels to concrete framed buildings; a compressible joint must be incorporated at the top of each storey- height panel to minimise the tendency for the slip cladding to the floor slab above being squeezed off by a compression buckling effect.

POINTING UP

After adhesion to the substrate pointing can be carried out using the traditional mortar and trowel method or, for larger expanses, a gun injection pointing system will give speedier results.

METAL FIXINGS

Ancon	Brick slip fixings	0114 275 5224	www.ancon.co.uk
Halfen	General metal fixings	0990 316 300	www.halfen.com

POINTING SYSTEMS

Easipoint	Gun injection pointing system	-	www.easipoint.co.uk

METAL FIXINGS

Ibstock Kevington	Brickwork Components™	0844 800 4575	www.ibstock.com
Ibstock Kevington	Fastwall™ brick slips on grp backing - suitable for gable ends etc.	0844 800 4575	www.ibstock.com
Ibstock Kevington	Faststack™ Pre-fabricated Chimneys	0844 800 4575	www.ibstock.com
Ibstock Kevington	Pre-cast components	0161 480 2621	www.ibstock.com
Ibstock Rockwool	Brickshield - Insulated external cladding system	-	www.brickshield.com

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