

## Brick Technical Bulletin - Cleaning, Maintenance & Repair

BTB 8

Concrete masonry, in the form of Facing Bricks, Darlstone Walling and Architectural Cast Stone, can generally be described as a 'low maintenance' building material. However, there are some important, simple precautions, based on standard best practice, that should be taken to ensure its long term attractiveness and its ability to perform the required structural function. These involve:

- Ensuring that masonry remains weatherproof
- Repairing any cracks or deterioration of joints
- Cleaning off any efflorescence, staining or mould and if necessary sealing the surface

### EFFLORESCENCE

#### Mortar Deposits

Mortar extruded from masonry joints during laying should be cut off with an upward stroke of the trowel. In this way a clean cut can be made without smearing the face of the unit. On completion of laying and tooling, any mortar smears which may be on the face of the work should be removed, firstly with dry brushing and secondly, if necessary, by wet brushing. Do not allow mortar smears and snots to set on the face of the masonry. If these mortar deposits are allowed to set on face masonry, careful use of high pressure water jets, or in extreme cases diluted acid solution, might be needed to remove mortar stains. (Note: See 'Cleaning Concrete Masonry' before testing either water jets or acid solutions). Acid cleaning should be avoided if possible as this could affect the appearance and cause discolouration.

#### Scaffolding

Scaffolding planks should be placed with a clearance of at least 150mm to the wall. This gap allows mortar droppings to fall clear of the plank instead of splattering on the plank and building, disfiguring the wall. At the end of each day's work or when rain interrupts work, the plank nearest the wall should be propped on edge to prevent mortar from being splattered onto the wall by overnight rain.

#### Concrete Droppings

Masonry supporting reinforced concrete slabs and beams is frequently disfigured by residue from a concrete pour. If such deposits are allowed to set it is sometimes impossible to rectify the damage. Protection is best achieved by covering the walls with plastic sheeting. Where this is not done, any concrete on the wall must be thoroughly cleaned off before it sets.

#### Rain Interruption

Overnight, and when rain interrupts bricklaying, the top of newly laid walls should be protected with plastic sheeting or similar. This is essential with face brickwork. When newly laid masonry is saturated by rain, lime is placed into solution either from Portland cement, or from saline (unwashed) sands or hydrated lime in the mortar. This solution absorbs carbon dioxide in from the atmosphere and precipitates as calcium carbonate along the line of the joints. This whitish stain is very disfiguring and not easily removed. Frequently new masonry is marred by bands of calcium carbonate stain to three or four courses of masonry – the result of rain saturating freshly laid work.

### CLEANING CONCRETE MASONRY

Brick layers must take care when laying concrete masonry to minimise mortar staining and in particular must:

- Keep facing bricks as clean as possible while laying and tooling
- Keep unused pallets of bricks and the tops of unfinished walls covered during rain to prevent water penetration and excessive efflorescence
- Clean any snots and mortar smears before they set hard

Remaining stains could be removed following the procedures set out below.

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### Removal of Mortar Stains with Hand Tools

After using a bucket and brush, remove any remaining mortar snots and smears by rubbing the surface with a piece of 'like coloured' brick or a piece of wood. Careful use of a paint scraper, wide bladed chisel or wire brush can be helpful in removing mortar build-up, however care must be taken not to scratch or damage the masonry surface.

### Pressure Water Cleaning

This cleaning method is not a substitute for good building practice and hand cleaning methods and should only be used after these procedures have been carried out if further cleaning is required.

### Essential Preliminaries

Thoroughly remove mortar smears and snots back to a flat surface with hand tools as outlined above. Hand cleaning must not leave any thickness of mortar otherwise pressure water cleaning will damage the masonry face and mortar joints before removing the thickness of mortar.

Allow the bedding mortar to harden for a minimum of seven days prior to pressure water cleaning.

Carry out a pressure water cleaning trial on a typical but inconspicuous area and allow it to dry to determine:

- The effectiveness of this cleaning method; and
- That marking, damage or erosion of the surface has not been caused before proceeding with the general cleaning.

*(Caution: Excessive pressure will lead to damage of masonry units)*

**Note:** *If there is no inconspicuous area, a small wall could be constructed for this purpose.*

### Efflorescence

The term efflorescence is given to a white powdery deposit that forms on the surfaces of porous building materials such as masonry units, mortar and concrete. The temporary appearance of efflorescence or lime bloom is not unusual on new masonry.

For efflorescence to occur, three conditions must be present:

1. There must be soluble salts present;
2. There must be water entering the masonry; and
3. The masonry must be able to dry out.

The absence of any of the above three conditions will prevent efflorescence. Any situation which allows water to enter the wall is likely to promote efflorescence. The most common causes are:

- Poor building practice such as partially built walls left uncovered during rain. Delays in installation of window cills and downpipes can exacerbate this problem, allowing rainwater to enter block cavities and leach free lime to the surface;
- Poor storage of masonry units on site. Before units are placed in the wall they can absorb ground salts and excessive water in the stockpiled masonry and can mobilise latent salts. It is desirable to store masonry off the ground and loosely cover with a waterproof membrane during rain;
- Poorly designed or missing copings and flashings;
- Excessively deep raked joints which allow water to enter the bed face of the masonry (ironed joints are recommended); and

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- Excessively deep raked joints which allow water to enter the bed face of the masonry (ironed joints are recommended); and
- The use of inappropriate additives, such as washing up liquid, in the mortar which makes the mortar act like a sponge.

Good laying practice and site procedures are necessary for controlling efflorescence to a reasonable level. Care should also be taken to ensure that excessive lime is not used in mortar.

In conjunction with dry brushing, the cleaning methods outlined previously will usually remove most 'normal' levels of efflorescence. Dry brush, then wet brush and wash down. It is important to remove as much efflorescence as possible with DRY brushing because powder efflorescence is water soluble. Wet brushing can dissolve the powder and the dry unit can re-absorb it. If high levels of efflorescence are present on walls exposed to continual wetting from rain or other sources of dampness over an extended period, calcification or hardening of the lime tends to take place. The powdery lime gradually becomes a very hard film of calcium carbonate. If this occurs it will almost certainly require professional advice and specialised cleaning methods for its removal.

Wall sealers also help to prevent future efflorescence, mould growth and general staining by reducing water absorption from rain.

Most cement based masonry products can be prone to efflorescence and allowances must be made by the purchaser for this occurring. Marshalls products include inhibitors both within and on the surface to minimise this effect.

### Detailing to avoid Efflorescence

The following measures should be taken to minimise the occurrence of efflorescence in masonry walls.

#### Tops of Walls and Parapets

Walls and parapets should have protection such as flashings or capping to the top surface. A common source of staining of masonry is water entering walls and cavities at this point via the exposed horizontal surface.

#### Window Cills

Window cills with an inadequate projection provide a source of water entry to the walls and will promote staining. The incorrect installation of window flashings will exacerbate this problem.

#### Flashings

Flashings should protrude to the outside face of the brickwork. If the flashing is stopped short of the weep holes in the external leaf, any moisture entering the wall will be channelled into the units, permeating the mortar, dissolving calcium hydroxide and eventually passing to the outside, precipitating as efflorescence.

#### Masonry Units

Marshalls concrete masonry units have efflorescence potential of nil or slight due to the inclusion of additives and surface treatments on the face of bricks, thus minimising the risk.

Class 4	For general applications (except as listed for M4):
	Preferred: 1 part cement, 5 parts sand plus plasticiser.
	Alternative: 1 part cement, 1 part lime, 6 parts sand.
Class 6	For applications subject to saline wetting and drying, in aggressive soils, in severe marine environments, in saline or contaminated water including tidal splash zones and within 1km of an industry producing chemical pollutants:
	Preferred: 1 part Type cement, 4 parts sand plus plasticiser.
	Alternative: 1 part Type cement, ½ part lime, 4½ parts sand.

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### Movement Joints

Walls should include well positioned movement joints to prevent indiscriminate cracking of the walls that would permit ingress of moisture. Movement joints should be correctly sealed.

### Weep Holes

Cavity walls should include numerous well positioned weep holes to allow any moisture in the cavity to escape. Cavities should be free of mortar droppings. This is crucial to reduce lime leaching onto the face of the masonry.

### Removal of Mortar Smears

The external face of the masonry should be kept clear of mortar smears.

## SAFETY PRECAUTIONS AND WARNINGS

- When using chemicals, care must be taken to avoid damage to adjacent materials and finished surfaces. Masking and plastic sheeting may be necessary.
- To avoid personal injury, wear protective clothing and a vapour cartridge breathing mask, particularly in confined areas, as recommended by chemical manufacturers.
- NEVER mix chemicals that you are unfamiliar with, particularly chlorine and acid as this will emit deadly chlorine gas. Always follow the chemical manufacturer's recommendations.
- Dilute acid by adding the acid to water. Never add water to the acid. Ideally use a pre-diluted proprietary cleaner.
- Harsh acidic chemicals should never be used for the cleaning of brickwork.

Chemical waste must not be allowed to run down drains and storm water outlets in accordance with Environmental Agency Regulations.

### Pressure Water Cleaning

Pressure water cleaning may be carried out with pressure not exceeding 7MPa (1000psi), the volume not exceeding 20 litres/minute and a fan jet of a minimum 40 degree width, held not closer than 500mm from the wall. Cleaning should be continuous and even. The pressure jet should never be stationary and should not 'needle' or zero in on mortar stains as surface erosion will almost certainly occur.

Note: If this method is not totally successful, further hand cleaning and scraping should be carried out prior to further pressure water cleaning.

### Caution

High pressure water blasting can cause personal injury and damage masonry. Mortar joints can be blown out and face brickwork marked and eroded.

Zero degree or needle jets, narrow fan jets and turbo jets should not be used on brickwork because all concentrate the water pressure on too small an area which can cause damage.

Minimal pressure should be used to avoid mortar blowouts and/or damage to the face of units.

Experienced operators should carry out pressure water cleaning in accordance with the above recommendations only after appropriate trials have taken place.

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### Acid Treatments

Only if hand cleaning and pressure water cleaning methods have failed to fully remove mortar stains should acid treatments be considered for cleaning of concrete brickwork.

***Note:** Acids react with and dissolve cement, lime and oxide colourants in concrete masonry units and mortar joints and are thus capable of etching, fading and streaking the masonry finish. When acid is applied to dry brickwork without pre-wetting it is drawn below the surface it is intended to clean. Salts may reappear when the masonry dries out.*

If it is considered necessary to use an acid for general cleaning it should only be used after trialling in an inconspicuous area, as outlined under 'Essential Preliminaries' and strictly in accordance with the following procedures.

Hydrochloric Acid based cleaners can be tested at a strength of 1 part acid to 20 parts water. A less aggressive alternative is powdered Citric Acid which can be used at strengths up to 1 part acid to 10 parts water (by volume).

### Procedures for Acid Cleaning

Remove mortar spots and smears as described under 'Removal of Mortar Stains with Hand Tools'.

Working from the top of the wall down in vertical 'runs'. Thoroughly pre-wet (SOAK) an area of brickwork of approximately 2m<sup>2</sup> at a time.

Apply diluted acid to the water-soaked area using a brush or broom with a horizontal (sideways) action to prevent runs and streaks.

Within 2 to 3 minutes rinse this area from top to bottom under tap pressure only. Pressure clean this area thoroughly, gently and evenly, as outlined previously. Repeat steps 1 to 5 as necessary to achieve the best compromise between cleaning and damage caused by excessive treatment.

### Other Stains

#### Timber

These can usually be removed by the application of a chlorine solution, preferably Sodium Hypochlorite (household bleach), onto the dry surface. Reapply as necessary to achieve the desired result.

#### Clay or Loam Stains

If not too severe and intransigent, these stains may be removed with a solution of 50ml household detergent and 500 grams of oxalic acid dissolved in 4 litres of warm water. Lightly pre-wet the surface then apply the above solution with a nylon brush. Rinse off and repeat as necessary. Pressure water cleaning as outlined previously may be of assistance.

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### Mosses, Moulds and Lichens

These commonly appear as a green to black area, often with a hair like growth, around damp areas such as taps, gutter overflows, south facing walls, etc.

1. Scrape off any thickness of moss/mould/lichen.
2. Pre-wet the mouldy area.
3. Apply a chlorine solution, preferably Sodium Hydrochlorite (household bleach), at sufficient strength to kill mould within approximately 1 hour.
4. Scrubbing with a stiff brush or broom will normally assist.
5. Thoroughly flush the surface. If mould remains, repeat steps 1 to 3 as necessary to kill and remove the mould.
6. Pressure water cleaning, as outlined previously, may assist.

## REPAIRS

Repairs to Marshalls bricks and masonry may be required to remedy any minor chips or cracks, both of which are relatively easy to carry out depending on the severity of the damage. In certain instances, where for example only one unit is involved, it may be more acceptable to leave the damaged unit where it is rather than replace it with something which may be more obvious. In all cases a full risk assessment should be carried out and all appropriate PPE equipment used where necessary.

### Chips

As Marshalls bricks and masonry are through coloured (although some may have supplementary faces applied) any minor chips can be repaired using an appropriately coloured fine mortar or repair mix. The chipped area should be free of loose material and be pre-treated with a pva solution. To avoid overspill the surrounding area should be masked with adhesive tape. The repair material should be mixed to a workable consistency that allows it to be pressed into the chip without slumping. Any excess should be struck off but leave some material slightly proud. After curing the excess material may be sanded down or textured to match the adjacent faces. If required the whole brick face can then be tinted or stained to match the remainder of the wall.

### Cracks

There may be two types of crack which need to be remedied; one which is relatively minor and can be classed as a minor or micro crack, ie. less than 0.1mm in width; and another which is relatively wide and more obvious. In the latter case the crack may appear to have continued right through the unit. This is typical of cracks resulting from shrinkage of the unit or structural movement.

In the case of the micro crack, which appears to be on the surface of the unit, the crack may appear more obvious as it attracts dirt. In many instances this crack may heal itself by the process known as autogenous healing whereby a combination of moisture and absorbed carbon dioxide from the atmosphere reacts with unhydrated cement within the brick matrix. Any residual dirt around the crack can be cleaned off as outlined in the above sections.

Larger cracks, possibly resulting from drying shrinkage or structural movement, may be treated in a number of ways.

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1. If no further movement or expansion of the crack is anticipated then the crack can be raked out as deep as possible, but maintaining as thin as width as is viable. All residual dust should be blown out and the crack filled in the same way as detailed above for repairing chipped areas. If necessary a very fine, light coloured sand may be rubbed into the joint to help match the brick texture. An alternative to repair mix is to use a mastic gun containing material similar to that used in any movement joints. Again, fine sand can be incorporated into the surface of the repair.
2. Wider or more obvious cracks, or those which may have a tendency to reappear because of movement within the structure, may require the introduction of bed joint reinforcement above and below the cracked areas in order to stabilise the movement prior to any repairs to the unit itself. In certain instances the customer may wish to cut out and replace any cracked bricks, although care should be taken to match up the mortar to the surrounding areas. There are a number of specialist contractors and suppliers skilled in the installation of brick stitching systems and reference should be made to these if required. Marshalls will be pleased to assist with this information. Should the bed joint reinforcement be installed with the existing bricks in place then a traditional repair such as detailed above may be carried out.