

# “WHITE DEPOSITS ON BRICKWORK”

## ADVISORY NOTE

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## **“TYRONE BRICK”**

### **WHITE DEPOSITS ON BRICKWORK**

#### **INTRODUCTION**

The appearance of “white deposit” on brickwork is commonly referred as “Efflorescence”. However there are two main types of “white deposit” which can occur on brickwork, one being efflorescence and the other being carbonated lime (Lime Bloom). Unlike efflorescence the deposits of carbonated lime will not disappear when the brickwork is wetted by water. The purpose of this advisory note is to describe the nature, likely causes and how to prevent the occurrence of “white deposit”. Possible ways of treating the deposits are also explained.

#### **EFFLORESCENCE**

##### **(1) Nature**

Efflorescence generally appears on new brickwork drying out for the first time. It will generally occur during a period of good drying after a period of wet conditions. The springtime and late autumn are periods of the year when this type of weather conditions is most likely to prevail. It is a temporary occurrence and is usually washed away by rain showers. It sometimes re-occurs during future drying periods in diminishing amounts. Persistent occurrences would indicate other problems which usually revolve around the ingress of water into the brickwork. Efflorescence is normally comprised of one or more of the sulphate and carbonate compounds of the elements sodium, calcium, potassium and magnesium. The efflorescence salts although being very unsightly are quite harmless. The salts are predominantly water soluble.

##### **(2) Causes**

Efflorescence is formed on the surface of brickwork when salts present within the brickwork are transferred to the surface in solution. The salts are deposited on the surface by evaporation of the water. Efflorescence can only be produced on the surface of brickwork if the following conditions prevail.

- (a) Water soluble salts are present within the brickwork.
- (b) Sufficient moisture exists within the brickwork to dissolve the salts.

- (c) The solution containing the salts can find a path to the brickwork surface, where evaporation can take place leaving a white deposit (efflorescence).

From this it follows that efflorescence cannot form on the brickwork unless water is present within the brickwork, either during or after construction. The physical appearance of the efflorescence depends on several factors and indeed the combination of factors. The following factors can all be relevant:-

- (a) The chemical composition of the salts present within the brickwork.
- (b) The quantity of salts present within the brickwork.
- (c) The pore structure of the materials used to form the brickwork i.e. bricks, mortar.
- (d) The materials through which the salts have passed.
- (e) The quantity of water present within the brickwork.
- (f) The degree of evaporation at the brickwork surface.

When the salts dry out, they are usually more noticeable on the brick faces of the brickwork. Because of this it is assumed the bricks are the source. It is recognised that the salts whilst migrating through the brick body to the surface, can originate in the bricks or the constituents of the mortar. The water of construction, sand, cement and lime can all contain salts. Salts can also originate in ground water or even the ground where materials are stacked prior to use.

### **(3) Prevention**

It is very difficult to avoid completely the possibility of efflorescence occurrence. This is because of the many conditions which with only slight variation can contribute to the appearance of efflorescence on brickwork. However this can be greatly minimised by the consideration of the following points when designing and constructing brickwork.

#### **(1) Facing Units**

The choice of a brick type with a low soluble salt content should be used in exposed conditions. Indeed the use of a brick with a low soluble salt content is advisable in all facing brickwork situations. BS EN771-1:2003 is the standard for the manufacture of

clay facing bricks. Active Soluble Salt Designations S<sub>1</sub> and S<sub>2</sub> are quoted in the standard, with S<sub>2</sub> being the lower brick body soluble salt content designation. “Tyrone Brick” has all their brick ranges tested on a regular basis by an independent agency (CERAM Building Technology) for soluble salt contents in accordance with the standard. As stated on our “Specification and Standard Performance Sheet” and on all Brick Product Data sheets, the “Active Soluble Salt” level falls into the S<sub>2</sub> designation. This is also backed up by the latest and ongoing independent test certificates from CERAM. Copies of these certificates can be supplied to a customer upon request.

There is no standard test in BS EN 771-1:2003 for determining the likelihood or the degree of white deposits which could appear on brickwork. Because of the many factors outside the control of the brick manufacturer on site and during construction, any test quoted in previous standards proved to be an unreliable determination for the likelihood of Efflorescence occurrence in service. Ongoing research into the determination of this likelihood continues to be of interest to many clay brick manufacturers.

“Tyrone Brick” facing bricks are suitable for use in all facing brickwork situations if relevant good building practice is being adopted as described in the following sections.

## **(2) Mortars**

Mortar mixes specified should not be stronger than necessary for good durability in any particular situation. Research has shown that increasing the proportion of cement in the mortar will increase the amount of soluble salts present in brickwork which increases the risk of efflorescence occurrence. Portland cements with a high free-alkali content are more likely to produce efflorescence than cements of a lower alkaline content. In general cements with a free alkali level of less than 0.1% should be used. It is advisable to use well washed sands as the fine aggregate in the mortar. Reference to BS 5628: Part 3 2005 Section 5.7 gives guidance in the selection of a mortar mix by a designer. In general a mortar designation (iii) used with bricks manufactured by “Tyrone Brick” is quite common. In practice this means a 1:1 : 5-6 cement: lime: sand, or a 1:5-6 cement: sand mortar. The latter assumes a plasticiser is being added to the mix. Concerning the use of plasticisers in mortars, they are usually added in small amounts as per manufacturer’s instructions. Used properly plasticisers are unlikely to contribute to efflorescence, however used in excessive amounts to work up partially dried mortar is likely to cause problems. Domestic detergents for dish-washing should never be used as a substitute for plasticisers.

### **(3) Damp Proof Courses**

The inclusion of D.P.C's and flashing to prevent the ingress of rising damp and rainwater into brickwork should be specified by the designer as required. Parapet walls, free standing walls with copings, chimneys, etc., all need special attention.

### **(4) Workmanship**

All "Tyrone Brick" facing brick packs are supplied to the customer with full length plastic type hoods. The packs are supplied on wooden pallets. Whilst the pallets are mainly for ease of handling, they assist in keeping the base of the pack off the ground where it could become contaminated with soluble salts. The plastic hoods are solely designed to resist the ingress of moisture when the packs are being stocked prior to use. It cannot be over stressed the importance of keeping the bricks dry before use. When the pack is opened and not all the bricks are used, it should be re-covered using a waterproof sheet. As the bricks tend to be at the lower end of the water absorption scale for clay bricks, they should not be pre-wetted or "dunked" during very dry weather before building. When laying the bricks the mortar should be workable so that all the joints are well filled. It is generally accepted that incompletely filled joints are the most common cause of rain penetration into brickwork.

This type of condition is known to cause persistent problems with efflorescence during drying periods. The type of joint used when constructing the brickwork can be relevant. A raked joint is likely to cause problems with rain penetration.

Partially completed brickwork should be covered to exclude rain water penetration into the brickwork. The open tops of walls to be capped should be covered temporarily to prevent rainwater running down into the brickwork. This can be done by tarpaulins or polythene sheeting. The importance of excluding moisture from the brickwork during the setting period cannot be over stressed.

## **CARBONATED LIME**

### **(1) Nature**

Lime bloom usually forms on the mortar joints, although it can leach over the brick surfaces. Unlike efflorescence it becomes semi-solid and insoluble by water after a period of time. The action of the air affects the soluble solution leaching out of the mortar and chemically changes it to an insoluble carbonate of lime. Lime bloom will not weather away naturally and will require cleaning. (See Section on Treatment).

### **(2) Causes**

Lime bloom is caused by soluble compounds of calcium leaking out of fresh mortar. This can be prompted by the brick being saturated with water before laying. Fresh brickwork which is left exposed to rain water at the wall top is very vulnerable to this condition. Portland cement can also contribute to this condition especially in mortars where the proportion of cement is quite high. Sometimes a dense mortar of this type will cause the water of construction to dry through the brick, which in turn can cause problems with lime bloom on the brick surface, leaving the joints relatively clear.

### **(3) Prevention**

It is extremely important to prevent rainwater percolating into the fresh brickwork. It is equally important to ensure the bricks being used are dry before being built. Saturated bricks should not be built under any circumstances. Mortars should be used as designed and with care. Special attention should be given to lime-cement-sand mortars and to the use of plasticisers. The same procedures for brickwork protection from rainwater apply as for the section on “Efflorescence”.

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## TREATMENT

### (1) Efflorescence

In general efflorescence should be removed from brickwork by the natural weathering process. This is particularly relevant in the case of initial efflorescence which results from the early drying out of brickwork. However if it is felt that the deposit must be removed promptly for ascetic reasons during a period of prolonged dry weather, a method of dry brushing can be implemented. Dry brushing is carried out using a stiff bristled brush to remove the loose white powdered deposit from the brickwork surface. The brush must be used in such a way not to damage the surface of some brick types especially sand textured varieties. The brushed brickwork can be further cleaned by light scrubbing and washing. A fine water spray can be introduced to the brickwork surface covering small areas at a time. The area can be lightly scrubbed using a brush or even a sponge. The area is then washed clean to remove the residue using clean water. It is better to work from the top to the bottom on the area being cleaned, so that the cleaned area can dry out clear. Areas sheltered from natural weathering which are affected by efflorescence can be cleaned by repeated washing using a fine water spray from a hose. This should be done giving sufficient time for the salts to dry out on the surface between washings. Persistent efflorescence can usually be associated with water penetration of the affected brickwork. Examination of the brickwork for design or construction faults which would allow this to happen should be carried out. Any faults discovered should be corrected. Things like leaking guttering or down pipes, faulty D.P.C's or flashing should be investigated. Poorly filled mortar joints or poor quality pointing should also be monitored.

There is no chemical treatment which will clear and suppress efflorescence permanently. Efflorescence which appears early in the life of brickwork and subsequently clears promptly by the action of weathering generally does not cause annoyance, however efflorescence which persists can do. The use of a brickwork sealer to suppress evaporation in these cases is not recommended as a remedy. The trapped salts can crystallise below the surface forming a dirty scum on the surface of the brickwork which could be harmful. As already discussed the source of a water penetration problem should be discovered and remedied. The use of a brickwork sealer to remedy poorly filled or cracked mortar joints is unlikely to be successful.

### (2) Carbonated Lime (Lime Bloom)

Lime bloom which most likely appears on the joints and sometimes leaks over the brick face can be successfully removed by the action of a "Hydrochloric Acid" based brickwork cleaner. Several brands of such a cleaner are available on the market in certain areas. Some manufacturers claim their brands to be more environmentally friendly than others. It is recommended that the relevant "Product Data Sheet" be consulted when choosing

such a cleaner. Most will perform with similar effect, but “Tyrone Brick” can recommend a few brands upon request. It must be stressed that the earlier the problem is tackled the more successful it should be. The reason being that as the lime bloom becomes more stable and engraved into the surface, the more difficult it is to remove. The cleaning procedure for lime bloom involves the wetting of the brickwork using a fine spray concentrating the wetting on the areas to be cleaned.

The “Hydrochloric Acid” based cleaner is then applied to the surface by a brush, covering an area of about 1m<sup>2</sup> at a time. The cleaner is worked into the deposit by brushing. The residue is thoroughly washed away using clean water. A second or indeed a third cleaning may be necessary to remove any remaining difficult deposits. It is recommended that the cleaning be implemented from the top to the bottom of the panel being cleaned. It is unlikely the lime bloom will return after cleaning, however examination of the brickwork for flaws which encourage the ingress of water is recommended.

## **TECHNICAL SERVICE**

The company offers a full technical service throughout the UK and Ireland. Should further queries relating to this subject be sought please contact the Technical Department at 028 8772 8500 [UK] or 048 8772 8500 [S.of Ireland]. E Mail [info@tyronebrick.com](mailto:info@tyronebrick.com)

## **REFERENCES:-**

- (1) BS EN771-1 : 2003 Manufacture of Clay Bricks
- (2) BS 5628 : Part 3 : 2005 Use of Masonry -  
Materials and Components  
Design and Workmanship