EFFLORESCENCE

INTRODUCTION

Whilst there are varying presentations of efflorescence, the focus of this TECHnote is to outline the nature, causes, control measures and treatment of the more prevalent white efflorescence.

The visual impact of efflorescence on exposed surfaces of recently completed face brickwork, concrete, tiling and render, is well-known. Although primarily aesthetic and temporary in nature, its persistent appearance may point to underlying issues related to material quality, workmanship and moisture management.

The assessment of the underlying causes and effects of efflorescence and its subsequent treatment is essential to not only preserve the visual quality of masonry structures, but also to ensure their long-term durability and performance.

WHAT IS EFFLORESCENCE?

Efflorescence is a term used to describe the chalky or powdery deposit that forms on the surface of porous building materials, such as bricks, concrete and mortar. It is usually white, but may also be coloured yellow, green or brown, depending on the type of salts deposited. For efflorescence to occur it requires the following three conditions to be present at one time:

1. **The presence of water-soluble salts.**
2. **The entry of excess moisture.**
3. **A path for the solution (dissolved soluble salts) to reach the surface and evaporate.**

SOURCE OF EFFLORESCENT SALTS

1. **Efflorescent salts that are already present** in building materials. Most notably general purpose cement (as used in concrete, blocks and mortar), clay bricks and hydrated lime. Importantly, the efflorescence that results is part of the curing process and common in new brickwork, mortar and concrete. As concrete, grout and mortar cures, heat from hydration drives residual moisture, containing soluble salts, to the surface, leaving behind a deposit on evaporation.
2. **Efflorescent salts introduced** into the masonry system from external sources present in the surrounding environment and/or site conditions such as:
   - Rainwater.
   - Marine exposure.
   - Industrial exposure.
   - Groundwater.
   - Contaminated soils.
   - Contaminated sand and water.

CONTROLLING EFFLORESCENCE

1. Reduce the presence of water-soluble salts

- Adopt good site management practices to protect masonry stored on site. Store masonry off the ground on pallets and provide adequate drainage to prevent the uptake of salts from contaminated soils.
- Use clean, washed sand and potable water.
- General purpose cement used in concrete, grout and mortar is a significant source of efflorescent salts. Use low alkali cement to reduce the likelihood of efflorescence occurring.

2. Reduce the ingress of excess moisture

- Adopt good site management practices including:
  - Reduce the use of free water in construction such as for the flushing of cavities, the removal of mortar droppings from new work and in general clean ups.
  - Store masonry units covered and off the ground to prevent exposure to the elements and the absorption of excess water.
  - Provide adequate drainage for the removal of site and roof water.
- Design for weathertightness with particular attention to the detailing, provision and execution of:
  - Flashings, damp-proof courses and membranes.
  - Overhangs, eaves and copings.
  - Weepholes.
- Specify masonry units and mortar suitable to the prevailing exposure environment.
- Provide appropriate landscaping that aids the absorption of groundwater and directs irrigation away from masonry.
- Allow masonry skins to breathe as intended.

3. Minimise the path for the solution to reach the surface and evaporate

- Provide dense mortar joints in masonry to reduce voids.
- Provide tooled joints (e.g. weatherstruck) to shed water.
- Lay well-compacted concrete.
- Select masonry units and mortar suited to the exposure environment to AS 3700 Section 5.

REMOVING EFFLORESCENCE

Remove efflorescence by dry brushing with a stiff bristle brush, making sure to remove accumulated salt from the work area to prevent salts being reabsorbed into the masonry. Follow up by wiping down with an absorbent cloth, rinsing frequently to remove residual salts left from brushing.

CONCLUSION

Efflorescence is not a structural defect, but its presence may signal underlying moisture or material concerns. Correct material selection, effective detailing and high-quality workmanship can largely prevent this issue, and reduce the likelihood of it occurring. Document the required control measures in the relevant NATSPEC masonry construction worksections.

When efflorescence does appear, it should be treated as a signal to review and improve moisture management strategies. In present day masonry construction, efflorescence is a controllable condition and with careful planning and informed decisions, it need not be a persistent problem.

Notes

1. Cleaning mortar droppings from new work is inherently water intensive and adds to the challenge of controlling efflorescence.
2. The application of a breathable sealant as a preventative measure may assist with the ingress of moisture. However, its premature application can also exacerbate the problem by trapping moisture behind the surface, where efflorescence will now form. This can lead to more serious building defects such as brick spalling.
3. AS 3700 can be used as a Deemed-to-Satisfy (DTS) pathway for weatherproofing compliance. Refer to BCA F3D5 and BCA H2D4.

Relevant documents

National Construction Code

AS 3700: *Masonry structures*

CMAA MA55: *The Concrete Masonry Handbook*

Think Brick Australia Manual 20: *The Brickwork Manual*

CCAA: *Efflorescence Datasheet (2006)*

Australian Tile Council: *Tile Reference Manual*

Relevant websites

www.cmaa.com.au

www.thinkbrick.com.au

Relevant worksections

0275 Paving - mortar and adhesive bed

0276 Paving - sand bed

0331 Brick and block construction

0334 Block construction

0335 Brick construction

0631 Ceramic tiling

0632 Stone and terrazzo tiling