

Efflorescence in Masonry Walls

Overview

Efflorescence is a white or light colored substance on the surface of concrete, brick, cast stone and other types of masonry walls. Efflorescence crystals are soluble alkaline salt deposits that have been brought to the surface of the wall by the migration water within the wall. All masonry will have some degree of efflorescence after construction, which is not harmful and may disappear over time or which can be removed by post-construction washing. Persistent, repeated or excessive efflorescence may indicate excessive internal moisture, rising damp or other problems which should be investigated and addressed to avoid more serious damage.

New Construction

The best way to minimize efflorescence is to ensure proper detailing and construction to minimize moisture content and control the migration of water. A number of approaches should be followed for new construction:

Wall Detailing. Walls should be detailed to minimize exposure and absorption of water. Walls should be properly flashed, following details published by the International Masonry Institute, Brick Industry Association and Sheet Metal and Air Conditioning Contractor's National Association (SMACNA). Mortar joints should be tooled and compacted. Overhangs, eaves, copings, rakes and other details should direct water away from wall surfaces.

Cavity Walls. Cavity walls should be detailed to minimize water infiltration and to provide adequate drainage for the cavity. This requires a properly detailed cavity of sufficient width, with moisture barriers, through-wall flashing and weep holes at shelf angles and all other horizontal barriers. Properly detailed flashing at doors and windows, scuppers and all other wall terminations and penetrations are required.

Landscape Walls. Masonry should be waterproofed to control rising damp, which is moisture absorbed from surrounding earth. Retaining wall backfill should be granular and adequately drained to ensure that the material is not saturated and hydrostatic pressure minimized. The ground around walls should be well drained, slope away from the wall, and not be densely vegetated.

Material Selection. Soluble salts are a component of Portland cement and can be in brick and other wall components. Selecting low alkali Portland cement, clean sand and salt-free water will reduce efflorescence. Admixtures can also be added to mortar and concrete to control efflorescence.

Material Storage. Material should be stored so that excess moisture and contaminants are not absorbed and introduced into the wall system. Masonry units should be stored under cover and elevated off of the ground.

Existing Construction

Excessive efflorescence should be removed from existing walls. Walls should be gently washed with water or a mild detergent or acidic solution that will dissolve the efflorescence salts without

damaging the wall. Sandblasting, wire brushes are abrasive methods are not recommended, especially on brick and soft stone. Washing can draw out additional salts, so repeated washing may be necessary. All work on historic buildings should follow National Park Service recommendations.



To prevent the reoccurrence of efflorescence existing walls should be examined for defective mortar joints, flashing and other potential entry points for water. The building should also be examined for internal sources of excess moisture. DTR's Technical Bulletins *Unwanted Moisture in Buildings, Parts 1 and 2* examine some of the causes of excess moisture and some of the techniques for moisture investigation. If excessive moisture is found, a course of action should be undertaken to correct the problem, which may be invasive and costly or may be as simple as regrading or the maintenance of drains, gutters and other water conveyance systems.

ASTM Standards

The following standards address a number of aspects of material selection and specification:

ASTM C 67, *Standard Test Methods of Sampling and Testing Brick and Structural Clay Tile*, includes a test for determining whether masonry units are likely to cause efflorescence. Units are partially immersed in water, dried and examined for signs of efflorescence. ASTM C 67 is of limited use, because it does not test mortar and other wall components that may contribute to efflorescence.

ASTM C 150, *Standard Specification for Portland Cement*, includes provisions for specifying low-alkali Portland cement which will reduce efflorescence in mortars and concrete.

ASTM C 1400, *Standard Guide for Reduction of Efflorescence Potential in New Masonry Walls*, provides information for reducing the potential of efflorescence in new masonry walls.

Further Reading

Brick Industry Association, Technical Note 23A, Efflorescence Causes and Prevention.

Brick Industry Association, Technical Note 20, Cleaning Brickwork.

National Park Service, Preservation Brief 1, Assessing Cleaning and Water-Repellent Treatments for Historic Masonry Buildings.

National Park Service, Preservation Brief 7, Dangers of Abrasive Cleaning to Historic Buildings.

