

## Efflorescence

### **Definition:**

Efflorescence is the exudation of mineral salts to the surface of the cement product. The chemical composition is a varying mixture of carbonates, sulfides, sulfates, chlorides and other salts of calcium or sodium.

Efflorescence is a whitish bloom that can appear on the surface of plaster, masonry, concrete or EIFS. This bloom may appear in a powder form or also as an unattractive green or brown stain. It should be noted that these stains typically do no physical harm to the surface of the material and are typically a cosmetic concern. However, staining can occur in the finish material if the efflorescence is left on for a long period, leading to difficult or even the impossibility of removal.

### **Mineral Salts Origins:**

Materials used in making cement plaster contain some water-soluble salts. In most cases the amounts are very small and efflorescence is not an issue. Some soils carry an excessive amount of soluble mineral salts and can be brought up the wall through capillary action.

### **Surface Appearance:**

The transport mechanism that carries the mineral salts to the surface is water. Rains or cool damp weather followed by a warm sunshine is the most likely time for efflorescence to appear. Cement that stays wet or damp will allow the salts to slowly dissolve and are then brought to the surface by water evaporation. Typically, rain water runs down the face of the wall and small amounts get absorbed by the stucco at and into hairline cracks. The crack will absorb the moisture but rarely allow more than an incidental amount of moisture into the system. Cool weather keeps this small area wet and allows water-soluble salts to be drawn out when the sun warms the wall and evaporation begins. When the water is gone, the salts are left on the surface in the appearance of efflorescence.

### **Removal of Efflorescence:**

Often efflorescence on the surface of stucco walls is washed away by the rain or simply by hosing it off. In some cases, it may be necessary to attempt additional cleaning methods. It is always best to start with simple procedures and then graduate to more intense measures if the simple procedure fails to remove the efflorescence. The first method should be to attempt to dry brush the efflorescence powder off the wall. If unsuccessful, it will be necessary to wash the wall with an acid wash of a vinegar or muriatic acid solution or a product specifically manufactured for efflorescence removal. Always follow manufactures instructions.

Because efflorescence is an alkali, vinegar and muriatic (hydrochloric acid) solutions provide an effective method of removal in that they neutralize the alkali during application. Both must be diluted with water before application.

Vinegar - Vinegar is the least corrosive and dilution ratios can vary widely. Solution ratios may range from a 10:1-(10) part vinegar to (1) part water, to a less concentrated 1:1-(1) part vinegar to (1) part water. A more diluted formula can have the same effect as plain water for most colors but may be applicable for the very dark colors. (see application caveats)

Muriatic Acid - The recommended ratio is one (1) part muriatic to ten to twelve (10-12) parts water. Extreme caution must be exercised when using muriatic acid, this point cannot be emphasized too strongly as muriatic acid is extremely caustic and corrosive.

- Always add acid to water!
- Do not inhale fumes. (wear properly fitted respirator)
- Wear protection. (safety glasses, gloves, boots and long sleeve clothing)
- Protect plants and shrubs.
- Provide containment of acid runoff when required.

### Application Caveats:

- Always test the acid solution in an inconspicuous part of the wall to ensure it won't harm the appearance.
- The affected area should be pre-wet with water; this includes the surrounding wall areas and where "run-off" is anticipated. Never apply an acidic solution to a dry surface.
- To avoid slight change in color shade, it is recommended to clean from architectural break to architectural break.
- A Hudson type sprayer can be used to spray the acid solution and in some instances, it may be necessary to use a stiff bristle brush and lightly scrub the area.
- After treatment, rinse the wall thoroughly with clean water.
- Where run off is anticipated, the solution must be either contained or rinsed thoroughly to dilute.
- It is not uncommon for a slight stain to be left on the surface when the effloresces is removed.

### Methods to Mitigate Efflorescence:

WCC has seen a rise in efflorescence on stucco projects, finished with either cement stucco or acrylic finishes, that incorporate darker finishes. With darker colors, the temperature of the plastered surfaces has a higher temperature rise during a warming trend after cool rainy weather. Dark colors absorb more heat than lighter colors causing a faster and deeper rate of moisture evaporation. If dark colors are used, there are some preventive measures that can help reduce the likelihood of efflorescence.

*As with all cement stucco claddings, proper hard floating (densification), and wet curing of the brown coat will help to close off the capillary pathways that allow efflorescence to migrate to the surface. This is applicable for all stucco assemblies regardless of finish type.*

#### Cement Finish

- Sealers may be used but should be specifically designed for stucco finishes. \*
- When possible, do not allow water from sprinklers, roof drains, porch runoff etc. to splash onto the stucco surface.

#### Acrylic Finishes

- Apply a clear or colored primer to the stucco base coat. (follow manufacturers specifications) \*
- Apply a polymer enriched cement base coat to the stucco surface prior to the application of the acrylic finish coat.\* This is effective in providing a permeable surface that limits moisture transmission into the stucco base coat.
- Add a lamina layer, 4oz mesh embedded into a polymer enriched base coat.\* This will act as a more robust seal against moisture transmission by further limiting hairline cracks.

\* Denotes additional cost to owner