

Definition: Efflorescence refers to the crystalline deposit, usually white, that may develop on the surface of Portland cement plaster (stucco). Efflorescence often occurs during periods of damp, wet, and cool weather followed by warm sunshine. Efflorescence is most likely to occur right after the completion of the project during the Fall or Spring. The following compounds can be found in efflorescence:

- Sodium, Calcium, Potassium or Magnesium Sulfate
- Sodium or Calcium Carbonate
- Sodium Bicarbonate or Sodium Silicate

Causes: Efflorescence results from water dissolving salts present within the substrate and then migrating to the surface by water. The water evaporates, leaving the whitish bloom called efflorescence. There are basically two causes of efflorescence: primary and secondary.

Primary efflorescence occurs during the initial cement curing process. Excess water in the plaster can bleed to the surface during cure. This is most common with plaster applications during damp and cool weather.

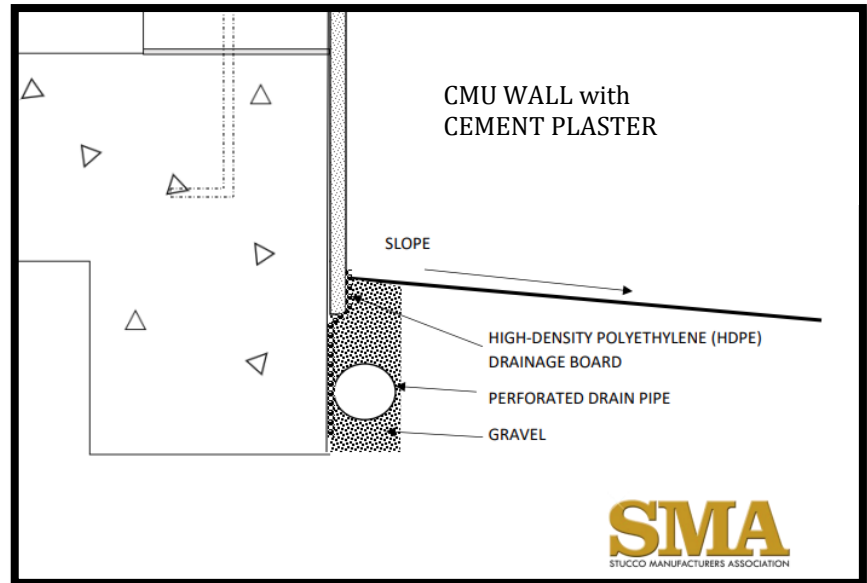
Secondary efflorescence is the result of cured cement plaster that is subjected to water that penetrates into the cement membrane and then migrates back out carrying dissolved soluble salts to the surface. Secondary efflorescence on properly mixed and applied cement plaster occurs most often at hairline cracks. Contrary to popular belief, it is rarely the result of water coming from behind the plaster and exiting at the crack. Typically the water runs down the face of the stucco wall and is absorbed into the hairline crack. Water sits in the crack and dissolves minerals found in the materials. As the wall dries out and warms up, the process of evaporation draws out the mineral rich solution to the surface of the stucco. Long periods of damp and cool weather followed by warm sunshine can lead to efflorescence. If the color of the wall is dark, the wall heats up and can accelerate the evaporation process drawing more salts to the surface. Caution should be given to owners selecting dark colors as efflorescence might increase.



Capillary Action: Capillary action occurs when water adheres to the pores of a material's capillaries, which are fine channels that are usually connected and form a network through the building material. The water moves upwards through the channels due to the strong molecular force of attraction between the liquid and the capillary walls, which goes against gravity. The weep screed provides a weep point and a capillary break. Weep screeds were developed in the 1950s by the Federal Housing Administration (FHA) with the Stucco Manufacturers Association (SMA) to prevent efflorescence issues found in stucco on framed walls. Stucco on masonry walls can be susceptible to efflorescence.

Prevention: Since many factors influence the formation of efflorescence, it is difficult to predict when any will appear. In general, low water absorption is a good practice to minimize efflorescence. Use only clean well-graded sand; cements should comply with ASTM standards. Additives to the cement mix should only be as approved by the cement or stucco manufacturer. Densify and consolidate the brown coat using a hard float to make the plaster more crack and water-resistant is always a best practice.

The masonry wall with a cement plaster coating also benefits from densification of plaster to help close capillaries (see *Capillary Action*). In addition, masonry walls should have good soil drainage at the base, with the earth sloped away to prevent water from ponding against the walls. Adding a High Density Polyethylene (HDPE) board can help not only prevent water intrusion, but efflorescence as well..



Defect: Efflorescence is typically only cosmetic and does not harm the cement plaster. For framed walls, it can even be part of the “Autogenous Healing” process, where salt-like minerals can help seal cracks in Portland cement. The concrete industry publishes extensive studies about autogenous healing in cement and concrete. This also helps explain why efflorescence slows over time. Efflorescence is not considered a construction defect or, by itself, an indication of improper materials or installation.

Remedy: the whitish bloom should be cleaned off the stucco surface as soon as possible. Less aggressive measures should proceed to more aggressive measures until the efflorescence is removed. 1 (least aggressive) to 3 (most aggressive).

1. Brushing the white powder off the wall and rinsing with clean water.
2. A more aggressive step is to use a water-vinegar solution or a product specifically made to clean efflorescence. Follow the manufacturer’s mixing and use directions. Again, if the water-to-solution ratio has options, use the weaker (more water) options first and graduate to the strongest.
3. The strongest cleaning measure is water and a muriatic acid solution. The mixture should be 1 part acid to 10 parts water. NEVER USE JUST MURIATIC ACID. Caution and protection are required to mix and use any muriatic acid product. Muriatic acid is caustic. Areas should be pre-soaked with clean water to prevent staining of unaffected areas. The acid/water solution may be brushed or sprayed on the affected area and then should be quickly rinsed with clean water. Re-application is possible under more extreme cases. In some cases a stain will be left behind and require fog coating (cement finish) or painting (acrylic finish) the stucco wall.

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