



Efflorescence

FACT SHEET 55-022-0211

What is it?

Efflorescence is the movement of salts embedded in concrete and masonry structures after water has carried them to the surface. Efflorescence can be seen as a discoloration and as a powdery or crystalline substance on the face of the masonry. Efflorescence can be a variety of colors and patterns (though commonly white), depending on the materials water is moving through and the chemicals transported by the water.

Why is it a problem?

Efflorescence in itself is typically considered only a visual/aesthetic problem, with the rare structural issue caused by expanding salts. It can look very much like mold, and its unattractive appearance raises concerns. While the salts brought to the surface are rarely harmful, the condition of efflorescence indicates that water is moving through your masonry in ways that are not intended. The presence of uncontrolled water can lead to more serious issues such as mold and structural concerns.

How is efflorescence formed?

Efflorescence is formed when an excess amount of water comes into contact with a surface that has water soluble salts. The water must then migrate to an air exposed surface and evaporate, leaving behind the salts. The water can be introduced when the masonry is being formed, or much later, commonly from rain water or ground water getting behind the wall. Sometimes the constant exposure to salts and chemicals driven into masonry can cause efflorescence erosion. This is more common in roads where salt is used for melting ice.

How is efflorescence prevented?

The best way to prevent efflorescence is with good construction principles and proper design. Preventing water from seeping into a wall or coming through a roof is key to stopping efflorescence from starting. Flashing, water stop, proper drainage and other common construction practices help keep water out.

Using good quality mortar, concrete and clean water during construction is important as it reduces the free moving salts and impurities. Once efflorescence has started, preventing further damage is done by removing the water source, which may require some construction and/or demolition. Sometimes a hydrophobic sealer can be applied, but this is only effective if one can reach the side of the structure where water is entering, not the side where the water is evaporating (the area where efflorescence can be seen).

What is it made of (or what is its chemical composition)?

The chemical composition of efflorescence is not a straightforward answer. Different analyses of efflorescence has detected a variety of chemical salts including (but not limited too): sodium sulfate, potassium sulfate, sodium carbonate, calcium sulfate, sodium bicarbonate, calcium carbonate, sodium silicate, and magnesium sulfate. In general most are alkalis of sodium sulfate (Na_2SO_4) and potassium sulfate (K_2SO_4). To better understand the diversity it is better to explain where the salts originate from. The salts come from a variety of sources, the mortar (or concrete) batch, the water (groundwater or rainwater), and nearby chemical sources (such as a chimney, chemical plant, or leaking chemicals). It may not be possible to eliminate the contaminants in the water, but it is often better to focus on eliminating the water from entering at all.

Are there health hazards?

Ordinarily, efflorescence salts do not pose a hazard; the most common (potassium and sodium sulfates) are only considered a mild irritant when inhaled or when in contact with the eyes, which is not a common problem with most efflorescence, as it does not become a respirable or free floating dust naturally. However, care should be exercised when dealing with efflorescence when the suspected salts come from a chemical process, combustion by product, or waste. Chimneys and other chemical laden areas may move harmful compounds through the masonry and need to

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be evaluated before removing or coming in contact with them. Generally, the biggest health concern with efflorescence is in the removal process, which often involves strong acids. Only professionals with proper personal protective equipment (PPE) and training should utilize efflorescence removal cleaning agents.

How do I know it is not mold?

A common question that often arises from inexperienced survey personnel when conducting the survey of wall stains or potential mold growth is whether or not efflorescence or mold is present. Some kinds of efflorescence are easily distinguishable from mold, others not so much.

When evaluating, remember to keep in mind the conditions needed for mold growth. If the stain appears on a wall that has no food for mold (paper, wallpaper, biological material, etc) mold spores will not grow. Most masonry walls will not support mold growth unless a food source is placed on the wall. Another factor is location. Mold spores often grow in areas with little air movement. If the stain is on an outside wall, exposed to sun and air, it is unlikely that it is mold. Stains that are very uniformly white and 'sandy' or 'powdery' in appearance are often efflorescence. Mold typically varies in color, both often commonly has varying shades of green, brown, or black spots.

When looking at the stain, use of a magnifying glass will help identify features that only mold exhibits, such as 'hairy' spots or a multitude of colors or dots when examined close-up.

While wearing appropriate PPE, such as gloves, eye protection, an approved N95 disposable respirator, scrape off some of the substance, if it crushes into a powder or dissolves in water, it is not mold.

Remember, both efflorescence and mold share something in common, uncontrolled water. Where conditions exist for efflorescence inside a building often the conditions for mold are present.

In any situation, take necessary precautions, wear proper PPE and contact your local Industrial Hygienist for further assistance if needed.

References:

"How to distinguish mold growth from other discolorations" 2006 Mold & Bacteria Consulting Laboratories (MBL) Inc. <http://www.moldbacteria.com/newsletters/2005/mar2005.html>

"CBD-2. Efflorescence" February 1960 T. Ritchie, National Research Council, Canada <http://www.nrc-cnrc.gc.ca/eng/ibp/irc/cbd/building-digest-2.html>

"What causes efflorescence and how can it be avoided?" Portland Cement Association http://www.cement.org/tech/faq_efflorescence.asp

"Efflorescence: Cause and Control" Masonry Institute of America www.masonryinstitute.org/pdf/612.pdf



Figure 1. Typical white efflorescent salts on brick and block masonry

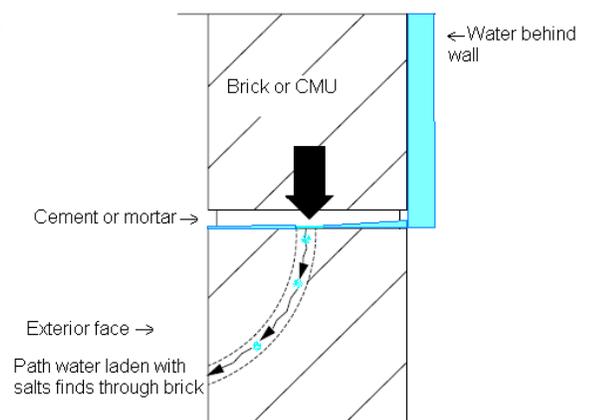


Figure 2. Possible path of water soluble salts that form efflorescence