

Efflorescence

Efflorescence is caused by soluble salt in the materials, this is displayed by the white crystalline substance on the face of the building or structure.

Efflorescence often appears just after the building or structure is completed, when builder, architect, and owner want the new building to look at its best, just the time when you are concerned with the appearance of the new structure.

Efflorescence, white stains, can occur on brick, masonry and concrete. It is caused by salts that are in the brick and mortar or are transferred into the masonry by water. This salt can even be in the dirt used to backfill these walls. When the water evaporates, the salt comes to the surface and dries. Removal can be difficult.

Efflorescence does not normally cause structural damage and will subside and disappear with time and weathering.

Efflorescence is, for the most part, a visual problem. Very rarely does it cause structural problems. It is not a simple problem to correct. Often, the efflorescence diminishes with time.

The condition can occur on concrete as well as brick or masonry surfaces. Several conditions must occur for efflorescence to appear. The soluble salts must be present in the bricks, mortar, or transported by water into the masonry from another source. You need sufficient water to carry the salts, in solution, to the surface of the masonry. Finally, evaporation must take place. This evaporation cause the salts to come out of solution and be left behind as the salt deposits which you see.

The soluble salts, which cause the problem, can come from many chemical elements or minerals. Many of these elements can be found in the materials from which bricks are made. Also, the sand, which is used in the mortar, can have significant quantities of soluble salts. For this reason, it is always best to use washed sand from a high quality sand and gravel pit. The soluble salts can also be present in the soil behind a wall or the water, which was used to mix the mortar.

Efflorescence will in many cases stop on it's own. The efflorescence can cease if supply of soluble salt material in the bricks or mortar becomes exhausted. It can also stop if the source of water, which dissolves the soluble salts, is cut off. The process can also stop if the water in which the salts are dissolved is prevented from getting to the surface of the masonry.

Efflorescence 2.

What is Efflorescence?

Temperature, humidity, and wind particularly affect efflorescence.

In the summer, even after long rainy periods, moisture evaporates so quickly that comparatively small amounts of salt are brought to the surface. Usually efflorescence is more common in the winter when a slower rate of evaporation allows migration of salts to the surface. With the passage of time, efflorescence decreases in severity unless there is recurrent moisture movement through the wall.

Deposits from efflorescence are less noticeable on lighter-colored surfaces than on darker-colored surfaces.

In most cases, compounds that cause efflorescence come from beneath the surface; but chemicals in the materials can react with chemicals in the atmosphere to form the efflorescence. For example, in concrete masonry, mortar, or render, hydrated portland cement contains a substantial amount of calcium hydroxide as an inevitable product of the reaction between cement or lime and water.

Calcium hydroxide brought to the surface by moisture combines with carbon dioxide in the air to form calcium carbonate, which then appears as a whitish deposit. Since calcium hydroxide is much more soluble in water at cold temperatures than at warm temperatures, such deposits are again more common in winter than summer.

Given the characteristics of masonry materials and construction, it is virtually impossible to eliminate all the soluble salts, construction of walls containing no free moisture, or completely eliminate paths of moisture migration.

However, steps can be taken to minimize the extent of these contributing factors.

Good workmanship, design and the quality of the materials are three of the most effective means of limiting the potential for efflorescence.

Provide for good drainage

- Correctly install waterstops, flashing, weepholes, and copings per design details. Maintain clean cavities and unobstructed weepholes during the construction of cavity walls.

Construct good mortar joints

- Tool all mortar joints with a V- or concave-shaped jointer to compact the mortar at the exposed surface and create a tight bond between mortar and masonry unit. Weeping, raked, and untooled struck joints are not recommended in exposed applications.

Efflorescence 3.

- Assure that joints are properly filled. Deteriorated or defective mortar joints should be re-pointed to keep moisture out of the wall.

Ensure proper curing

- Assure adequate hydration of cementitious materials by protecting masonry from cold temperatures, premature drying or improper use of admixtures.

Limit water entry

- Apply paint or other proven protective treatment to the outside surfaces of porous masonry units. Caulk around window and door openings. Seal or otherwise repair cracked joints in walls. Also, use through-wall flashing at ground level to prevent capillary rise of ground moisture.
- Install vapour barriers in exterior walls (interior surfaces of exterior walls) or apply vapourproof paint to interior surfaces and use designs that minimize condensation within masonry.
- If feasible, use wide overhanging roofs to protect walls from rainfall.
- Install DPM or treat with bitumen paints behind retaining walls prior to back filling.
- Install weep holes in retaining walls.

Good site practice, monitoring and control will reduce the risk of Efflorescence occurring in the first place.

- Keep masonry, bricks, blocks etc covered and on pallets and covered at all times.
- Cover the top course of masonry at the completion of each day's work, with plastic sheeting, hessian and planks (not from the scaffold, please) particularly when rain (or snow) is expected.
- Use washed building sand from approved supplier.
- Protect washed sand from ground by plastic sheeting.
- Keep sand covered all the time.
- Use Mortar that is delivered in tubs fresh each day or use Mortar from and approved silo.
- Don't use masonry products, bricks, blocks etc known to effloresce while stockpiled.
- Use bricks that are to **BS EN 771-1: 2003 FL** quality (Frost resistant and Low salt content).
- Use clean fresh mixing water free from harmful amounts of acids, alkalies, organic material, minerals, and salts. Do not use seawater or brackish water for mixing mortar.

Efflorescence 4.

- Be certain that mixer, mortar box, mortarboards, and tools are not contaminated or corroded. Never douse this equipment with salt or antifreeze material.
- Use mortar materials of lower alkali content.
- Special attention to detail is required in coastal areas from sea salt.
- Follow the NHBC 'Good practice guide'.

Note that "reducing moisture content of masonry" does not mean arbitrarily reducing the water content of mortar or allowing walls to prematurely dry out. Both of these measures will contribute to increased permeability of the masonry construction and thus increased potential for recurrent efflorescence.

Since efflorescence often occurs during or right after construction, the first impulse is to immediately wash it off with water or a masonry cleaning solution. This is not advisable, particularly in cool or cold damp weather, when the primary result of such action will be to introduce more water into the masonry wall.

Given time, efflorescence will often disappear by itself or at most may require mild cleaning measures such as dry brushing or rinsing and brushing with a stiff brush. If this does not produce satisfactory results, it may be necessary to wash the surface with a proprietary masonry cleaning solution or a very dilute solution of muriatic acid (1% to 10%). In any case, prior to removing efflorescence from a surface, the surest way to establish an appropriate cleaning procedure is to chemically identify the deposit (see table on next page). Following cleaning, the wall should be thoroughly rinsed with clean water to remove all traces of the cleaner.

It is often helpful to determine the chemical makeup of the efflorescence so that a cleaning solution can be found that readily dissolves the efflorescence without adversely affecting the masonry. Before any treatment is used on any brick wall, the method should be tested on a small, inconspicuous area to be certain there is no adverse effect. In cases involving recurrent efflorescence, the source of moisture should be determined and corrective measures taken to keep water out of the structure prior to attempted removal of the efflorescence.

Removing Some Forms of Efflorescence.

Common compound	Recommended cleaning method
• Alkali sulphate	Stiff brush. If necessary, brush with water.
• Calcium sulphate	Stiff brush. If chronic, add water washing.
• Calcium carbonate	Stiff brush if not adherent. If adherent, apply dilute acid or proprietary cleaning solution to dissolve efflorescence

- Q.1 Which types of bricks are more vulnerable to efflorescence?
- Q.2 How will efflorescence affect steel reinforcement?
- Q.3 Which type of stone is considered the most susceptible of building stones to salt decay?
- Q.4 Why would efflorescence reoccur?
- Q.5 Suggest 10 ways masonry can be protected during construction to reduce efflorescence.
- Q.6 How would efflorescence damage masonry?