

TECHNICAL ADVISORY NOTE



#93A

Efflorescence in Masonry

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Efflorescence on masonry walls is almost always made up of carbonate and sulfate salts. Although some brick may contribute to the formation of these salts on some occasions, when a significant amount of efflorescence appears on a wall, the source is almost certainly cementitious materials, such as mortar, concrete, or concrete block. These salts dissolve in water which has soaked into the cementitious material. The "salty" water then migrates through the masonry to the surface where the water can evaporate, leaving the salts behind on the surface. This is why efflorescence shows up on brick faces, even though the brick is not the source of the efflorescence.

For efflorescence to occur there must be (1) a source of salts, and (2) water, and (3) evaporation.

1. SALTS: Portland cements and masonry cements contain components which contribute to efflorescence, partly because it is simply not feasible to manufacture pure cements.

A. A major contributor to efflorescence is often concrete block. To limit this efflorescence:

1. provide a clear cavity between the brick and the block, or
2. provide a water-resistant membrane between the brick and block,
3. prevent water from reaching concrete block by;
 - * flashing under copings and sills,
 - * waterproofing exposed cmu

B. Mortars can be providers of efflorescing salts:

1. All types of cements may contain these impurities. Low alkali masonry cements or Portland cement (defined as "less than 0.60% soluble alkalies per ASTM C114") should always be specified to reduce tendency to effloresce.
2. Some people are concerned about the "secret" ingredients and inert fillers that are used in masonry cements as proprietary additives to the portland cement base.
3. Mortar proportions and mixing procedures should be carefully controlled to make sure the cements become completely hydrated and cured as quickly as possible.

4. Sand for mortar must be washed in accordance with ASTM C144. Unwashed sands could contribute potentially efflorescing salts.

5. Sand should be properly graded in accordance with ASTM C144, in order to create tight and well-cured mortar joints.

C. Contact between the brick veneer and wet concrete components allows the dissolved salts to migrate into the brick. Therefore, any such contact should be avoided, through the use of cavities, waterproof membranes, or wall flashings. Where contact cannot be avoided, the availability of water should be limited, since without water, efflorescent salts will not dissolve or migrate.

2. WATER. It takes a fairly significant amount of water over a period of time to dissolve enough salts to create an efflorescence problem.

A. Water is necessary during masonry construction to mix mortar and to provide cement hydration in the mortar. Excess water required for mixing, but not for hydration, may dissolve efflorescing salts and migrate into brick units. This is especially true in winter when evaporation is slow and the water remains in the masonry longer.

B. During construction, walls are exposed to precipitation.

1. Keep walls covered until all masonry work is complete and all openings are closed.

2. Seal or protect all open expansion joints immediately.

3. For composite walls, drape or protect all concrete masonry, not just the tops of the walls, from exposure to precipitation.

C. After construction, efflorescence would only be caused by excess water continuing to enter the walls.

1. Use good copings, sills and other materials, with proper flashings and detailing.

2. Specify Portland/lime mortar Type N for best watertight bonding.

3. Maintain sealants and repair cracks judiciously.

3. EVAPORATION is important to the proper performance of a masonry wall. The concept of preventing evaporation to prevent efflorescence is dangerous. Water trapped within a wall system can do all types of damage. Therefore, limiting salts and water penetration, as discussed above, are the only good solutions to preventing efflorescence. Water repellents which are "breathable" may be used, but they are only temporary, they are expensive, and they may have side effects such as discoloration or damage to other materials. We suggest repellents not be used, except in extreme cases as a resolution to faults which might otherwise require drastic solutions, such as demolition.

4. OTHER ISSUES RELATED TO EFFLORESCENCE.

A. "New building bloom" (efflorescence on new construction) is fairly common during winter and spring, because cold weather slows evaporation of the water which entered the walls during construction. It is especially critical, therefore, to cover walls during construction to prevent precipitation from EVER saturating the masonry. Just one saturation while mortar is new can cause long-lasting efflorescence.

B. Masonry cleaning solutions (to remove mortar on new construction) can greatly increase the dissolution of efflorescing salts. Therefore, they must not be allowed to soak into the masonry. The proper cleaning process includes completely wetting the surface with clean water prior to applying a chemical cleaner, and thorough rinsing quickly after cleaning.

C. The fact that brick are the only masonry materials required to be pre-tested for efflorescence has misguided some into believing that they are the cause of efflorescence. Yet, brick that have been proven to be non-efflorescing are used on many walls that effloresce terribly, pointing out the reality that brick are NOT usually the cause of efflorescence.

As a final reminder, the following cannot be overstated:

The best advice for efflorescence is to do absolutely nothing to "clean" it. New building bloom will disappear on its own. For persistent efflorescence, there is probably a persistent source of water, and the source of the water causing the efflorescence should be found and stopped. Nothing else. **"Cleaning" will NOT make efflorescence better - only worse!**
