Globally Proven Construction Solutions

Efflorescence – Causes, Prevention and Removal

TDS-1159

The occurrence of efflorescence is a potential problem, amongst other things, whenever Portland cement products are used.

Primary efflorescence is regarded as efflorescence that is the product of, the tile, tile fixing materials or undesirable fixing practices where specific site conditions exist during the drying and curing stage of the installation.

Secondary efflorescence is regarded as efflorescence that is a product of, specific site conditions affecting the cured installation or background of the installation.

Efflorescence is a process that results in a whitish crystalline deposit, on or near the surface of the finish, which is generally composed of, but not limited to, re-crystalline calcium, sodium, potassium salts from bricks, mortars, cement, other common masonry building materials. These salts and minerals travel to the surface, using water as their transport mechanism where exposure to the environment evaporates the water, resulting in recrystallization of the salts on the surface. Exposure of the initially soft and friable salts on the surface to carbon dioxide, converts the salts to harder, denser more difficult to remove deposit.

There have been many industry articles and resources available that speak on the issue of efflorescence. It is important to note that efflorescence is not considered a defect of the installation materials, but rather a naturally occurring issue common to all Portland cement based products and certain finishes.

The best way to prevent efflorescence is to better understand what it is and how it happens. Three things have to happen for efflorescence to become a problem:

1. There must be soluble salts present (these salts can be present in Portland cement products and other finishs from the manufacturing and hydration process).
2. Water must be present in the setting bed, mortar bed and/or grout where the soluble salts can be put into solution (solute).
3. Some type of force (hydrostatic, gravity, capillary movement, etc...) has to bring the solute to the surface of the installation.

If all 3 things occur and the water evaporates, a white powdery residue will be left on the surface. The remaining salt or powdery residue will over time react with the carbon dioxide in the air. In the case of calcium hydroxide after reaction with carbon dioxide, will form calcium carbonate. These salts can be calcium carbonate, sodium carbonate, potassium carbonate, or calcium hydroxide depending on the source of the Portland cement raw materials and any additives that may have been added to the concrete or mortar.

Eliminating any of the 3 needed circumstances will eliminate the occurrence of efflorescence.

The best ways to help minimise the occurrence of efflorescence are:

1. Use setting materials that don't contain soluble salts such as (e.g. LATAPOXY® 300 Epoxy Adhesive or LATAPOXY SP-100 Adhesive.)
2. Use grouting materials that don't contain soluble salts such as LATICRETE SPECTRALOCK® PRO Premium Grout*, LATICRETE SPECTRALOCK 2000 IG or LATAPOXY SP-100 Epoxy Grout.
3. Use higher performing Latex thin-set (e.g. LATICRETE® 257 TITANIUM Adhesive, LATICRETE 254 Adhesive or LATICRETE 211 gauged with LATICRETE 4237 Latex Additive) which will absorb less moisture and mitigate the movement of moisture through adhesives.
4. Use higher performing fortified calcium aluminate grouts such as LATICRETE PERMACOLOR® Grout or PERMACOLOR Select^ Grout which will absorb less moisture and mitigate the movement of moisture through the grout.
5. Use physical barriers to prevent water from entering and traveling under tile installation systems. Provide adequate coverage and distribution of adhesives to prevent water pathways under installation systems.
6. Ensure adequate drying of the substrate and each subsequent stage of the tile installation system. Protect the tiling works from wet and damp site conditions.

Unfortunately, at this point, there is no clear cut answer for the total elimination of efflorescence. The use of an epoxy setting material as mentioned above will help reduce efflorescence, but no guarantee can be provided that efflorescence won't occur.

^United States Invention Patent No.: 6,784,229 (and other Patents)
*United States Patent No.: 6,881,768 (and other Patents).

Removal of Efflorescence from Surfaces Which Are Not Sensitive to Acid (e.g. granite, slate, clay brick, etc...)

Most types of efflorescence are acid-sensitive and because they are typically a buildup of limes, salts and/or soluble mineral deposits usually dissolve when in contact with acid. Since efflorescence is sensitive to acid, STONETECH® Restore™ Acidic Cleaner, a heavy duty acidic cleaner, works well in dissolving and removing efflorescence in most instances. It is good practice and strongly recommended to conduct a test area in an inconspicuous area to determine suitability and acceptability. If it is determined that the procedure is acceptable then use the following application instructions:

1. Mask off and protect any surrounding areas that will not be treated. Cover or protect any steel or metal (especially if used interior) to protect from acid corrosion.
2. Apply mixed solution at the light duty dilution level as listed on the product label. Stronger dilutions may be used if required.
3. Apply to the surface using clean mop, towel, sponge, or sprayer. Be careful not to apply to areas which are not affected by efflorescence.
4. Agitate with a stiff white nylon scrub brush, white nylon pad, or appropriate floor machine. (Do not use colored pads or brushes as this can lead to color bleeding in the substrate)
5. Rinse area with a lightly dampened clean mop, sponge, towel or wet vacuum. Do not over apply rinse water. Water is one of the key factors in the development of efflorescence. Rinse well enough to remove any cleaner residues only. **DO NOT OVER WET.**
6. Allow the surface to completely dry to determine the desired results. Repeat as necessary.
7. Sealing the surface using a STONETECH impregnating sealer (e.g. STONETECH BulletProof®, STONETECH Stone, Tile & Grout Sealer, STONETECH IMPREGNATOR PRO® Sealer, STONETECH Heavy Duty Exterior Sealer, etc...) should minimize efflorescence from recurring.

Removal of Efflorescence from Surfaces Which Are Acid Sensitive (e.g. marble, limestone, concrete, travertine, etc...)

STONETECH RESTORE™ is an acid based product which, when applied to acid-sensitive surfaces, can react with the surface and alter its appearance. If an acid-sensitive surface is already textured, this may not cause a problem which is noticeable. If this is the case, you should conduct a test area in an inconspicuous area to determine suitability and acceptability. If the user determines that this procedure is acceptable, then proceed as directed above.

To remove efflorescence from acid-sensitive surfaces follow these application instructions below:

1. On flat surfaces, remove the efflorescence by using a dry, white nylon scrub pad and by hand or rotary sander with the white nylon pad attached. Oftentimes, most of the efflorescence deposits can be removed following this process.
2. If this process does not completely remove the efflorescence, or on textured surfaces where the above step is not possible, additional treatment is required. Use STONETECH Polishing Powder for polished surfaces or STONETECH Honing Powder for unpolished surfaces. These two products contain abrasives, so it is strongly recommended to conduct a test area to see the effect on the surface finish.
3. Mask off and protect any surrounding areas that will not be treated.
4. Apply the STONETECH Polishing Powder or STONETECH Honing Powder to the affected surface.
5. Add water until you achieve a milk-like consistency.
6. Agitate with a stiff white nylon scrub brush, white nylon pad, or appropriate floor machine.
7. Rinse area with a lightly dampened clean mop, sponge, towel or wet vacuum. Do not over apply rinse water. Water is one of the key factors in the development of efflorescence. Rinse well enough to remove any cleaner residues only. **DO NOT OVER WET.**
8. Allow the surface to dry completely to determine the effectiveness of the process. Repeat if necessary.
9. Sealing the surface using a STONETECH impregnating sealer (e.g. STONETECH BulletProof®, STONETECH Stone, Tile & Grout Sealer, STONETECH IMPREGNATOR PRO® Sealer, STONETECH Heavy Duty Exterior Sealer, etc...) should minimize efflorescence from recurring.

Install tile and stone with the LATICRETE System materials and your installation will be covered by a comprehensive 100% labour and materials warranty however efflorescence is not regarded as a defect but a natural condition of Portland cement where included in a system.

For technical support, answers to installation questions and information on how to obtain a full LATICRETE System Warranty covering labour and materials, contact LATICRETE Technical Support on 1800 331 012 or technicalservices@laticrete.com.au

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