

Efflorescence and Colored Concrete

Problems and Practice #6

Quite often on colored concrete projects the concrete contractor will encounter the effects of efflorescence on the surface. It is important for owners and their representatives to understand that this is a normal and expected occurrence during concrete hydration. As concrete hydrates, calcium hydroxide (CaOH_2) is produced at the rate of approximately 145 pounds per cubic yard. This substance provides the concrete with the majority of its alkalinity, but it also reacts with carbon dioxide (CO_2) and water to form calcium carbonate (CaCO_3) or efflorescence.

This efflorescence on the surface of gray concrete typically goes unnoticed, as the color is similar to cured concrete. In a colored concrete application, however, the efflorescence (salts) appears as a white film. As little as 0.2 ounces of calcium carbonate (efflorescence) per one square yard on the surface can cause a significant shift in the color. Efflorescence can occur during the initial curing period or anytime afterwards. It can also result from problems that originate in the subgrade under the slab.

The following may help to reduce the effects of efflorescence on the concrete surface and should be discussed during the pre-job conference:

- Design mix criteria including a low W/C ratio
- Use of pozzolanic admixtures to reduce the amount of raw cement in the mixture; these may include class C fly ash, slag, or metakaolin. These admixtures also react with calcium hydroxide to produce additional cementing material.

- Not covering, protecting or curing surfaces with poly
- Use of breathable covers when protecting inside work from other trades
- Installation of solvent acrylic sealers rated by manufacturers for application shortly after initial set
- Proper subgrade preparation according to ACI 302-1R-04
- Subgrade conditions at time of placement
- Placing and finishing in wet or winter conditions.

It is imperative that all parties understand the causes and conditions surrounding efflorescence and how it affects colored concrete applications. Though efflorescence cannot be eliminated completely, the decorative concrete contractor will take steps to minimize its effects on the final concrete appearance.

Decorative concrete contractors will work with owners and architects in developing specifications and providing mock-ups or samples depending on the scope of the project to address their appearance requirements. If you have any questions, contact your ASCC/DCC concrete contractor or the ASCC Technical Hotline at (800) 331-0668.

