

Concrete Floors – Efflorescence

Efflorescence is a white deposit of elements such as alkaline calcium components, hydroxide residues, and salts, on the surface of concrete walls and/or floors. Whilst efflorescence can appear with any concrete structure where there is a water vapour transfer that can bring these constituents to the surface, it often appears in underground car parks areas and other subfloor areas.

Efflorescence is driven by hydrostatic pressure or moisture vapour transmission – the pressure exerted by moisture as it moves through concrete to the lowest point. As the moisture enters and moves through the wall or floor, it dissolves mineral salts present in the cement component of the concrete. This mineral salt solution eventually finds its way to the surface of the concrete. As the water evaporates, it leaves behind the white deposit of mineral salts on the surface.

Efflorescence is not to be confused with laitance, which is the appearance of a layer of loosely bound cement fines on the surface of concrete – see Tech Note 1.3.5 Concrete Floors – Laitance for more information

Issues regarding efflorescence

Excess water in the concrete mix will eventually evaporate and the water content of the concrete will achieve equilibrium. Ideally that should be <6% as measured with a standard moisture meter. Concrete is generally left to fully cure for at least 30 days, but may be significantly longer, depending on the moisture content of the concrete and ambient conditions during curing.

The presence of efflorescence, however, may indicate the ingress of moisture from a source external of the cementitious substrate which would be a sign of a serious problem. Efflorescence will progressively worsen with time and in many cases the salt solution can travel down the face of the wall, leaving a trail of mineral salts. Other problems that can arise from moisture vapour transmission include discoloration of the concrete, the proliferation of mold, moss, mildew and other organic growth, and persistent, musty smells. These can adversely affect the health of occupants.

Beyond occupational health and safety concerns, the problem with efflorescence can also be structural. The continual migration of moisture from the exterior to the interior (and vice versa) of a building can ultimately wash out all soluble salts, leading to severe degradation of the cement matrix, which results in weak and crumbly concrete.

Furthermore, the alkalinity of the concrete may drop, and with it, the ability of the concrete to protect the embedded reinforcing steel from corrosion. The naturally high alkalinity of good quality concrete is the only mechanism that prevents the corrosion of reinforcing steel by passivating the surface. Without protection, steel rapidly corrodes in the presence of moisture, ions and oxygen. The corrosion of reinforcing steel in concrete results in spalling (aka “concrete cancer”) which is difficult and expensive to rectify. See Tech Note 1.3.6 Concrete Floors – Concrete Spalling for more information.



Coating over efflorescence

Simply put efflorescence should not be coated over. The presence of any efflorescence on the surface will provide a poor, friable base for coatings, preventing effective adhesion from occurring.

Even if all the efflorescence is thoroughly removed, moisture will remain in the concrete. Where there is moisture in concrete, there is hydrostatic pressure. Hydrostatic pressure will force the moisture to the surface of the concrete and collect under the coating system, forming blisters under the coating and pushing the coating off.

Fixing efflorescence

Efflorescence will cease when moisture transfer through the concrete stops. This can only be achieved if appropriate and effective waterproofing is installed to prevent moisture entering the concrete. Once the waterproofing has been installed and checked, the existing efflorescence can be removed by several options. But before you start applying a protective coating, here is a suggested procedure; it is a guide only, so please contact your Dulux® Protective Coatings Representative for your particular project needs.

1. Ensure that the concrete has been cured for at least 30 days.
2. Remove all efflorescence, other surface contaminants and loose material. Any one of a number of techniques may be used, including, but not limited to, wire brushing (hand or power tool), dry abrasive blasting or high-pressure water jet. (The use of water will reintroduce some moisture into the concrete and can cause some reappearance of efflorescence. Allow concrete to dry, and wire brush any residual efflorescence). Check for any reoccurring efflorescence, as this may indicate a leakage problem.
3. Check moisture content of the concrete. It should be <6%, as measured with a standard moisture meter. If so, the concrete is ready to coat. If not, go to step 4.
4. Check for an obvious entry point for the moisture (eg. bare concrete areas exposed to rain or to garden soil). Install an appropriate waterproof barrier, as per the manufacturer's specifications and advice, to prevent moisture ingress.
5. If the source of moisture ingress is not obvious, or appears somewhat complicated, a qualified building engineer must be consulted to determine what waterproofing measures are required to seal the concrete to prevent further ingress of moisture. These measures may involve a qualified waterproofing contractor.
6. Once all waterproofing measures have been carried out, allow the concrete to dry out and equilibrate. Recheck moisture content of the concrete to ensure it is <6%, as measured with a standard moisture meter. If so, the concrete is ready to coat.

This Tech Note is a guide only. Any advice, recommendation, information, assistance or service is provided without liability or responsibility, in good faith and is believed by Dulux to be appropriate and reliable. Notwithstanding, you should consult the services of an appropriate industry professional before addressing any specific coating or substrate issues or using any particular product for your specific project requirements.

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