

SALT ATTACK ON CONCRETE MASONRY SEGMENTAL PAVING

A BRIEF EXPLANATION OF THE SEQUENCE OF EVENTS AND CONDITIONS THAT CREATE THE ENVIRONMENT IN WHICH SALT ATTACK OCCURS.

When concrete is repeatedly wetted by a salt water solution, with alternate periods of drying during which pure water evaporates, some of the salts dissolved in the salt water solution are left behind in the form of crystals, (mainly sulfates) in the concrete pores and surface of the concrete unit.

These crystals re-hydrate and grow upon subsequent wetting, and thereby exert an expansive force on the surrounding hardened cement paste within the concrete unit when this growth occurs.

This expansive force is greatly amplified by the ability of the salt crystal to grow rapidly to many many times its original crystal dimension upon wetting.

This rapid growth causes the concrete paste surrounding the crystal to “burst”, exposing the aggregate in the concrete masonry unit.

Such progressive surface weathering, commonly known as salt attack, occurs in particular when the ambient temperature is high and insolation is strong so that drying occurs rapidly in the pores of the concrete over some depth from the concrete paving surface.

Thus, intermittently wetted surfaces are vulnerable, as are areas of paving around a salt water swimming pool particularly in the splash zone.

Horizontal or inclined paving surfaces are particularly prone to salt attack, and so are surfaces wetted repeatedly but not at short intervals so that thorough drying can take place.

Salt water can also rise by sorption or capillary action.

Evaporation of the pure water in this instance will again leave behind salt crystals, which when re-wetted, can and will cause degradation of the surface.

Salt attack can extend to a depth of several millimetres within the paving unit.

Hardened cement paste and the embedded fine aggregate particles are removed, leaving behind protruding coarse aggregate particles.

With time these particles become loosened, thereby exposing more hardened cement paste which, in turn, becomes liable to salt attack and the process continues until such time as the wetting and drying cycle is stopped.

It should also be noted that, unless the aggregate is dense and has a very low absorption, the aggregate itself is also liable to damage.

Because the attack of concrete by salt solutions is physical in nature, the type of cement used is of little importance per se but, to ensure low permeability of the surface zone of concrete, the choice of concrete mix is critical.

Good mix design, utilising high quality material to ensure a very dense cement paste mix is achieved, is paramount in reducing the risk of salt attack.

Wet-cast concrete paving units, as produced by UrbanStone, are thus very resistant to salt attack although, as can be seen from the test certificates, there will be an effect on the product when subjected to ‘severe salt attack situations’ as determined by the current standard.