This topic is "practice ready." ☐ **Yes** ☒ **No**

Evaluation of Penetrating Sealers Applied to Saw Cut Faces in Concrete Pavement Joints

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Abstract

Premature deterioration of concrete pavements and other infrastructure components has been reported when the concrete is exposed to severe environments, especially in cod regions. Premature deterioration at the sawn joints is observed, and may appear as shadowing when micro cracking near the joints traps water, or as cracks parallel to the saw cut. Research reported up to date sought to understand the mechanisms behind premature joint deterioration that can be summarized as:

- Freeze-thaw damage in saturated concrete, commonly associated with marginal air void systems, damage and typically appears as think flakes near the surface of the slab;
- Chemical attack from certain de-icing salts resulting in oxychloride formation. Distress may appear as cracking at regular intervals parallel to the saw cut or as think flakes.

The application of penetrating sealers should provide an approach to slow and/or prevent the penetration of solutions into the concrete. However, penetrating sealers evaluated in the laboratory are usually tested under accelerated conditions, while the efficacy of sealers applied in the field is only expected to yield results after several years.

In order to validate a testing protocol, a field investigation program is in progress to compare the results observed in an accelerated laboratory program with field performance. During this work, two non-standard tests have been developed and are being conducted on field specimens:

- Drop test: this is a simple approach to assess the quality of a fracture surface at a local scale of less than 0.5 in2. The time for a 20μL water drop to be absorbed into a dry paste surface is

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recorded, where the longer it takes, the lower the permeability. Correlation with lab samples indicates that 28 day old concrete of the quality sought here should take at least 1.5 seconds to absorb.

- Paste expansion test: this test is conducted to assess the ability of the mixture to resist oxychloride formation. A 1-in. slice is cut from below the surface of a cylinder or core and moist cured for 28 days. The samples are then immersed in a 4% MgCl2 solution at 40ºF for several weeks. Previous experience has shown that samples undergoing expansion cause the paste surface to expand above that of the aggregate particles. The size of the step between the aggregate and the paste provides a measure of the ability of the system to resist oxychloride formation.

This paper will discuss these test methods and the data collected to date.

Keywords: Premature deterioration—penetrating sealer —permeability—oxychloride formation