

Executive Summary, Research Readiness Level Assessment, and Technology Transfer

Investigating the Interaction of NDOT Hot-Pour PCC Joint Sealant and Penetrating Concrete Sealers

Research Objectives

Investigate the detrimental effects to the interfacial bond between the hot-pour sealant and the concrete pavement after applying Department approved PCS.

Research Benefits

Verified that penetrating sealers do not break the interfacial bond after application, concrete pavements could become compromised and subject to freeze-thaw damage, chloride attack, and other deleterious effects.

Principal Investigators

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Background

In May 2019, Nebraska Department of Transportation (NDOT) Project Manager and contractor observed discoloration and apparent dissolution of the hot-pour joint sealant during application of penetrating concrete sealer (PCS) on the exit ramps of I-80 and US-83 near North Platte, NE. Discoloration is shown in Figure 1. Contractors sealed the joints with NDOT designation NE-3405 (NE-3405) hot-pour sealant and applied NDOT approved PCS on the concrete surface. NDOT conducted research in February 2018 and determined the bond between sealant and concrete is not compromised by PCS approved by NDOT at the time of the study. In the 2018 study, researchers applied PCS to the interfacial surface of concrete blocks prior to filling them with hot-pour sealant. Based on the field observations on NE-83, PCS potentially impacts the bond between the concrete and hot-pour sealant after application.

Laboratory Investigation

The investigation commenced with a meeting between researchers and Technical Adviser Committee (TAC) members. During this meeting, a plan was developed to test the five PCS products approved by the Department in accordance with ASTM D5329, Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements. After testing completed, a TAC member proposed constructing a modified cupped block to model a depression observed in field application of hot-pour sealant. A set of blocks was constructed following ASTM D5329 with a modification in the form to create a depression. Construction and testing details of each block type are discussed in the following sections. Figure 2 shows a diagram of a block with dimensions in millimeters and illustrates the treated surface and the control surface.

Conclusion

The results show that discoloration occurred when applying the five PCS products to the NE-3405 hot-pour sealed testing blocks. All three test methods of application; spraying, 1-min and 5-min soaks, caused discoloration. The level of discoloration increased with the duration of contact with the PCS.

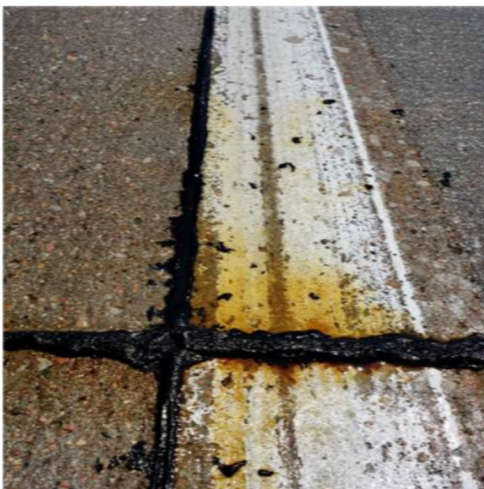


Figure 1 - Discoloration appeared at the joint after contractors applied penetrating concrete sealer.

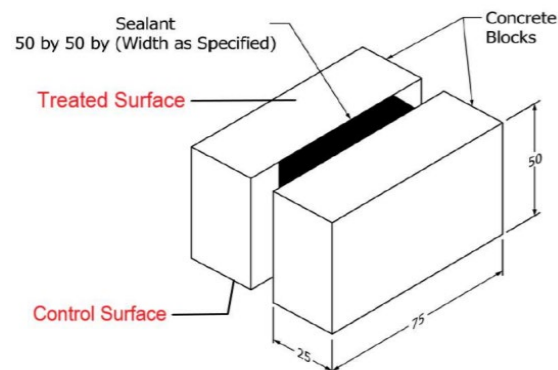


Figure 2 - The diagram of the concrete extension blocks from ASTM D5329 [2]. The treated and control surfaces are identified by NDOT researchers.

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NDOT Recommendations Based Off of Research

Despite discoloration, none of the five PCS products caused de-bonding issues during extension testing. It was determined that the PCS products do not deteriorate of the interfacial bond between NE-3405 hot-pour sealant and concrete surfaces. Maintenance crews and contractors should be advised that some discoloration is normal and should not cause concern.

By Wally Heyen, PCC Engineer

Research Readiness Level (RRL) Assessment

RRL 5

Level 5: Standard Practice

Research/Technology fully implemented and understood. No follow-up is necessary.

Technology Transfer

Presentation to Nebraska and Concrete and Aggregates Association (NC&AA)-2019

Presentation to Association of General Contractors (AGC)- Paving Committee- 2019

**This brief summarizes of In-House Research Project
“Investigating the Interaction of NDOT Hot-Pour PCC Joint Sealant and
Penetrating Concrete Sealers”
Nebraska Department of Transportation Research Program**