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## Pavon<sup>®</sup> Indeck Crack Sealer Evaluation

### Introduction

The standard way to seal cracks in reinforced concrete bridge decks is the same as it is on pavements, cover them up with hot asphalt cement (pour them with oil). When cracking gets excessive it is impractical to pour all the cracks. In the past MoDOT has applied a seal coat of polymer modified asphalt cement and a hard aggregate chip coating about 3/8 inch (10 mm) thick. This requires expensive materials and equipment to lay down and as it deteriorates it may even cause moisture to get trapped between it and the deck, which can promote more deterioration of the reinforced concrete. A new alternative to these methods, Pavon<sup>®</sup> Indeck Crack Sealer, has been tried in Districts 5 and 7 for sealing deck cracks since 1994. MoDOT's Research, Development and Technology unit did a field study on Indeck Crack Sealer in 1996, but had never evaluated Indeck in the laboratory.

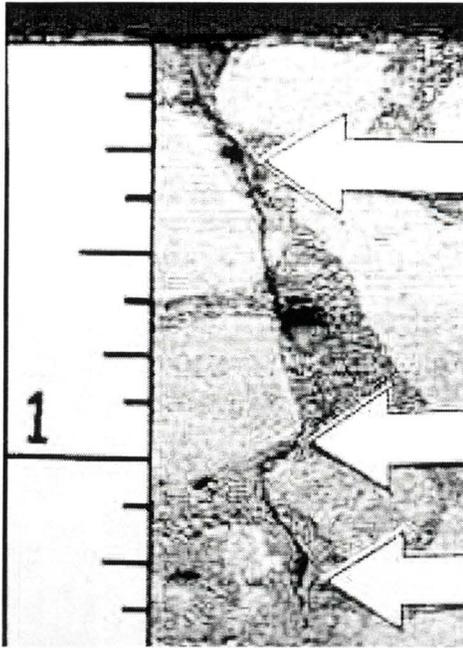


**Application of In-Deck on cracked bridge deck with distributor wand brooms and squeegees.**

### Study Results

In the field study, it was shown that the use of a distributor to spread the Indeck seems to get a uniform and adequate coating to reach all the cracks. If the product is worked well into the deck with squeegees and/or brooms and given time to get a good cure, it had enough time to penetrate the cracks and fill surface voids. Indeck filled cracks from 0.2 mm to 0.4 mm (0.008" – 0.016") wide and larger. At the surface of one core sample the crack width measured 0.4 mm (0.008") and showed penetration of the Indeck of 1 3/8 inch (35 mm) as shown in Figure 1. Sides of the crack were coated completely with Indeck and where there was a small excess the material was still pliable. On one core the crack on the surface was very fine, 0.10 mm (0.004"), the Indeck did not fill the crack (or bridge the gap between the two sides) when looked at under the microscope. However, according to the American Concrete Institute's Manual of Concrete Practice a crack of 0.18 mm (0.007") exposed to deicing chemicals is a tolerable crack width in reinforced concrete, so, it would not be necessary to coat cracks as fine as 0.10 mm (0.004") anyway.

Figure 1



In addition, it was noticed in the cores that when Indeck was applied in the cooler weather of October there was much better penetration into the cracks than when applied in August. In hot weather, thermal expansion of the concrete closes up the cracks. There have also been complaints by some motorists that just after the Indeck application the bridge deck looks slick. However, friction testing showed that there is an insignificant difference from the friction properties of the deck before applying Indeck and after. The Indeck surface was not slick when applied on well-textured and even worn decks if the excess was carefully removed. Additionally, if deemed necessary by the supervisor in the field, if given time to get a good cure, sand can be scattered over the wet surface before opening to traffic.

In a recent laboratory study, cores were taken from the same bridge deck before applying the Indeck, immediately after application and also after 1 year in service. Chloride permeability testing done in the lab showed that the product does reduce the permeability substantially (Table 1). The impervious barrier does decline as the product becomes less pliable but after one year in service, this was negligible. It is believed that the effectiveness will last up to three years or more before another application needs to be applied. The above data indicates, as was speculated in the first study, that the product stays pliable and stuck to the sides of the crack for a short time. However, after the crack moves a few times the bond fails and lets a little more water in. The product does stay pliable for a year or longer and does remain in the crack to plug the cracks and keep permeability low. After several years it becomes less pliable and starts to lose its ability to seal out moisture.

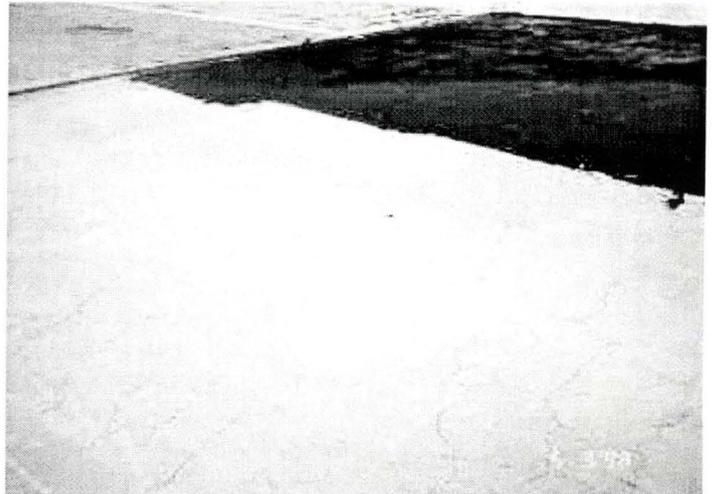
TABLE 1 – Chloride Permeability on Cracked Surface

Bridge A-226R1N, Rt. 67/I-70 – low slump concrete overlay

AASHTO T-277 (low coulombs equals less permeability)		
No Pavon* Indeck, over crack, tested 11/19/98	Pavon* Indeck, over crack, re-tested 4/8/99	Pavon* Indeck, over crack, re-tested 2/23/00
1348	598	741

## Recommendations

Pavon® Indeck Crack Sealer is relatively low cost and is easy for maintenance crews to apply. For badly cracked decks it is very cost effective, even if it may need reapplication in the future. It is not as hard to remove at a future date (traffic wears most of it off the surface) as polymer asphalt seal coats, which need to be milled off. Seal coats also may trap water and cause further deterioration of the deck.



In the foreground is a badly map cracked concrete deck, typical for sealing with Indeck, which is being done in the background

It is recommended that this product be used on more bridge decks with cracking problems. In cases where cracking is severe it is recommended it be used in lieu of polymer modified AC and traprock seal coats. Again, it is strongly recommended that applications be limited to cooler weather in the spring or fall when the cracks will be more open and allow better penetration of the Indeck.

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