



Project Summary

Texas Department of Transportation

0-5169: Constructability Review of Surface Treatments Constructed on Base Courses

Background

It is common practice for the Texas Department of Transportation (TxDOT) to construct surface treatments (1-, 2-, or 3-course) directly over base courses, and these surface treatments may act as wearing surfaces. The decision to use surface treatments is based on several factors including low traffic, low initial construction cost, inexpensive maintenance, good-quality subgrade soils, historically favorable experience, and availability of experienced contractors. Surface treatments have a significant influence on pavement performance. Problems associated with surface treatments include flushing/bleeding, debonding of the prime coat or surface treatment, poor ride quality, and loss of aggregate (raveling). When a surface treatment is used as an underseal, its failure may lead to premature failure of the overlying surface layer. Constructability issues related to surface treatments often dictate their performance. However, a formal statewide constructability review of surface treatments over base has never been conducted. The objective of this research was to conduct a comprehensive constructability review of surface treatments and communicate the findings through workshops and a design and construction guide.

What the Researchers Did

A vast volume of research material was collected during this study. A key research task was the state-of-practice review which focused on communicating with surface treatment practitioners from other highway agencies. The researchers attempted to contact all 50 state departments of transportation (DOTs), and 28 states responded to the request.

The researchers visited and interviewed surface treatment practitioners from all 25 TxDOT districts. They also visited 37 construction projects when surface treatment construction activities were in progress. District interviews were guided by a questionnaire consisting of 83 questions that covered topics related to surface treatments, ranging from project selection to continuous improvement. The surface treatment process was divided into three parts — design, construction, and performance — to facilitate analysis of data and other information collected. Research information was used to develop a district training workshop. The workshop was delivered by researchers at 8 regional locations, and each workshop was attended by TxDOT professionals from at least 3 districts. A draft design and construction guide was also prepared for use by TxDOT personnel involved in surface treatment design and construction.

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What They Found

On a national level, 6 of the 28 state DOTs that responded to the survey indicated extensive use of surface treatments. Three states indicated limited use, and the remaining 19 do not use surface treatments as a general practice. The 2-course surface treatment is the most widely used in Texas. However, underseals and 3-course surface treatments are also used by many districts.

The application of a surface treatment appears to be a simple and straightforward process but requires expertise, the correct combination of materials, and the right environment when placing, to achieve desired results. Its success depends to a great degree on the effectiveness with which the base layer is finished and on the method used to ensure sufficient bonding between the surface treatment and the base. Many districts still use slush rolling with excessive water to obtain a smooth surface finish. However, this practice can weaken the structural integrity of the base and accelerate base failures. Other base finishing techniques such as blade-and-roll and the use of a base lay-down machine are likely to provide longer-lasting pavements. The development of less expensive profilometers allows pavement engineers to better control surface treatment ride quality by specifying acceptance criteria for the International Roughness Index in general notes.

Even the most effective design may not ensure a satisfactory surface treatment due to the strong influence construction practices have on performance. The designers are constrained by not knowing the field conditions during construction, and this puts a tremendous burden on inspectors to make critical judgments in the field. Construction of surface treatments, unlike that of seal coats, is typically a small part in a larger construction contract. This can create situations where prime contractors may not have the skilled personnel needed to construct quality surface treatments. The practice of subcontracting this work to a surface treatment specialist should be encouraged.

What This Means

The answer to the question, *Do Surface Treatments Have a Place in Pavement Construction?*, would be an emphatic *Yes*. The surface treatment is the primary tool in the pavement engineer's arsenal to seal the granular pavement layers such as the base, subbase, and subgrade that are significantly influenced by moisture. When a surface treatment is used as an underseal, it can also prolong the life of the pavement structure through improved fatigue resistance. It can also be used as a temporary wearing surface, for a limited time, until the hot mix asphalt concrete is placed. A surface treatment wearing surface is very cost-effective when used under appropriate conditions such as low traffic and rural settings. In such applications, it is important to keep in mind that the surface treatment does not provide structural strength to the pavement. Therefore, use of appropriate construction techniques for the base layer and taking good care of the base are very important.

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