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Very Thin Overlays in Texas

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HIGHLIGHTS

- Thin overlay is a viable option for many maintenance applications.
- Specification requirements and rational for thin overlays are discussed.
- Excellent skid and crack resistances have been observed to date.
- The 25 mm thin overlay costs 30% less than traditional 50 mm overlay.

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ABSTRACT

TxDOT is expanding its use of Very Thin Overlays (VTO) as they are economically viable in resurfacing operations. Currently, the VTO mixes are placed at thicknesses of 25 mm (or less) rather than 50 mm mats and they are 30% less expensive per square yard than the traditional dense graded materials. The thin mats are also ideal in many urban situations and highly desirable for many maintenance applications. This paper summarized the requirements and rational of the specifications that were developed to ensure successful thin overlay projects. To evaluate the performance of VTO mixtures, three field projects were selected and mixtures were designed for each location using local materials. The VTO performance to date has been very good with excellent skid resistance and crack resistance. Like any overlay, the final IRI is impacted by the pre-existing ride, but the typical range of reduction on roughness is about 35–50%. To mitigate low skid and bleeding of existing seal coat, fine PFC option (19 mm) with a high air void of greater than 20% was constructed. The free asphalt did not migrate to the surface and the thin PFC did increase skid resistance by 400% and substantially reduced tire-pavement noise. District staffs are very pleased with the VTO performance to date, more pavement sections have been scheduled to place the same VTO mixes.

1. Introduction

As our highway infrastructure ages, transportation authorities are looking for cost-effective solutions to preserve and extend pavements life. The transportation authorities have traditionally used 50 mm dense graded Hot Mix Asphalt (HMA) for pavement maintenance overlay/inlay programs. This has served well in the past when there were less budget constraints and where the prices for asphalt binder were substantially lower. Texas Department of Transportation (TxDOT) is exploring new ways to maintain huge highway networks besides doing 50 mm HMA overlay and chip seals. Chip seals are a good way of keeping roads sealed but when this treatment is used adjacent to populated areas it can create problems with road noise. The Very Thin Overlays (VTO) is ideal in many urban situations and highly desirable for many maintenance applications on structurally sound pavements. Fig. 1 shows examples of the candidate pavement sections that are suitable for VTO. Nationally, VTO has been evaluated by a few states with some successes [6,11]. Internationally, Croteau and Hanasoge [4] and Watson and Heitzman [13] have reported successful utilization of fine Stone Matrix Asphalt (SMA). Developed in Germany in the 1960s, SMA mixtures are more durable than traditional dense-graded mixes due to the high binder content and a strong coarse aggregate skeleton or matrix. The space created within the matrix is filled with asphalt-rich mastic. SMA mixes are, therefore, rut-resistant yet very flexible and impermeable. The surfaces also

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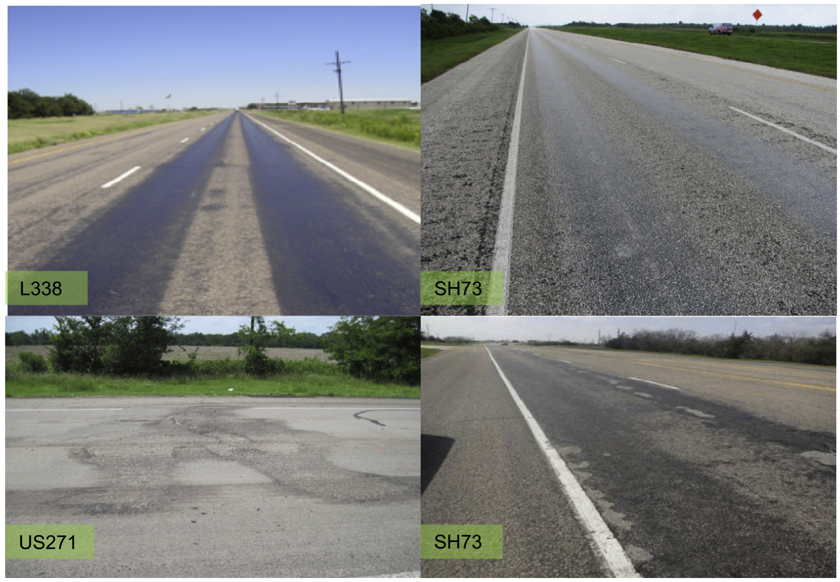

Fig. 1. Candidate pavements for Very Thin Overlays (VTO) with bleeding and raveling surfaces.

Table 1
Examples of cost savings from several projects in the Austin district.

Highway	Actual bid price for 25 mm TOM	Cost estimate for TxDOT conventional dense-graded 50 mm overlay (statewide bid avg)	Cost savings
Thin Overlay cost savings (mix only)			
IH-35	$2,428,209	$3,368,927	$940,719
RM 32	$397,704	$527,723	$130,019
RM 620	$347,254	$534,237	$186,983
SH 130	$557,387	$857,518	$300,131
FM 1431	$431,492	$663,835	$232,342
US 87	$802,929	$1,235,276	$432,347
FM 3406	$285,753	$439,619	$153,867
Total	$5,250,728	$7,627,135	$2,376,407
Percent savings	31%		

have more texture than dense-graded mixes, and therefore provide better skid resistance.

Chou et al. [3] concluded that thin overlays on flexible pavements were almost always cost effective. However, thin overlays on composite pavements were not as cost effective because of greater deterioration prior to overlay and the condition may not be suitable for thin overlays [3]. To see if this was feasible for Texas, TxDOT began to look into the material requirements for VTO and the availability of local materials to meet these requirements since 2007. Recent evaluations of the VTO implementation by TxDOT Districts has reported that VTOs are approximately 30% less expensive per square yard than the traditional 50 mm dense graded materials, as shown in Table 1 [1]. It was found that 25 mm VTO is the equivalent cost of 38 mm of traditional dense grade mix, but with much better crack resistance, frictional properties, and ride quality.

TxDOT has been exploring ways to use VTO as an alternate to seal coats or microsurfacings. Microsurfacing is a durable and stable slurry, composed of fine and coarse aggregate, mineral to Microsurfacing can be found in TxDOT specification Item 350 [8]. Based on filler, polymer-modified emulsion, water, and chemical additives. Detailed information related several field projects, it was found that VTO mixes are much quieter and smoother than a typical seal coat or microsurfacing. Thus, VTO mixes are providing better options regarding the resurfacing of our aged pavement network. However, the constructability is one of the main challenges for VTO as the mat temperature may cool down 3 times quicker than the regular 50 mm overlay [11]. Wilson et al. [15] stated that a 25 mm mat cools at twice the rate as a 38 mm mat. Also, the success of VTO heavily depends on the bonding between VTO and the existing pavement surface challenge. The typical VTO discussed in this paper is placed at a thickness between 13 mm and 19 mm. Fig. 2 shows examples of two pavement sections that had been resurfaced with a VTO mix. VTO overlay specifications have been developed based on the lessons learnt during the construction of several filed trials. This paper summarized the requirements and the rationale of the VTO specifications.

The main objectives of current activities in Texas are to (1) continue to introduce the VTO to more Districts and to provide project evaluation support to ensure that the section is a good candidate for a VTO (2) continue to review and update the mix design procedures (3) assist Districts in monitoring the construction of the new major planned projects (4) continue to monitor the performance of existing projects.

In addition, to evaluate the constructability and performance of VTO mixtures, three field projects were selected and mixtures were designed for each location using local materials. These sections were constructed by Texas Districts and field monitoring was conducted both during and after construction. The monitoring of these three sections is described in this paper. One of this paper's main goals is to promote technical exchange and to provide guidelines so that others can utilize information presented in the paper to duplicate successful VTO projects in their region.