

Tech Brief

Development of a Design Guide for Ultra Thin Whitetopping (UTW)

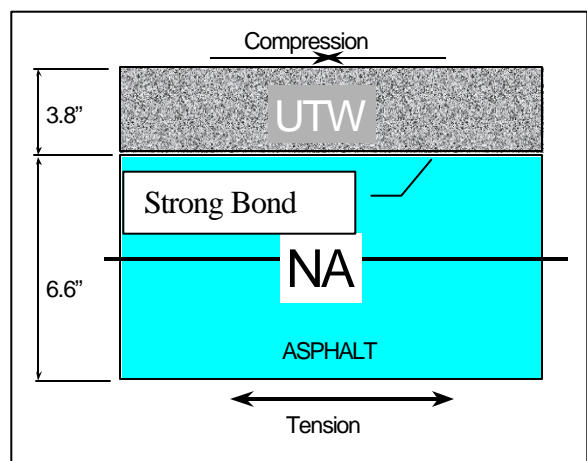
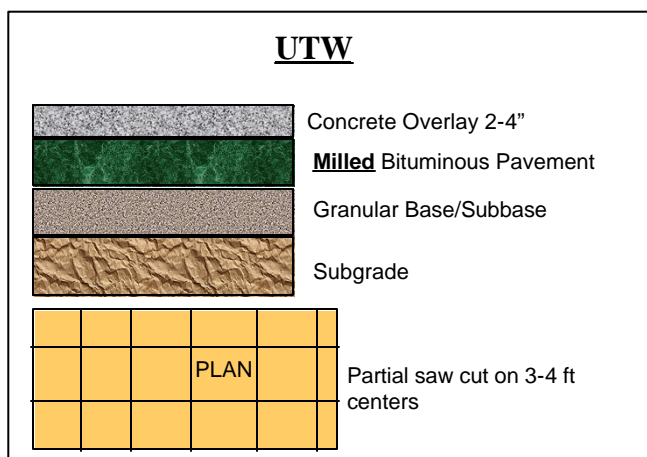
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BACKGROUND

Concrete overlay of deteriorated asphalt pavements (whitetopping) has been a viable alternative for improving the structural integrity of pavement for over six decades. The thickness of such overlay usually exceeds six inches, however, a recent technology has emerged, known as Ultra-Thin Whitetopping (UTW). Ultra-Thin Whitetopping (UTW) is a construction technique, which relies on a strong bond between the asphalt layer and the concrete overlay. It involves placement of an concrete overlay with reduced thickness, ranging from 2 to 4 inches, the application of which has been targeted to restore or rehabilitate, deteriorated asphalt pavements with fatigue and/or rutting distress.

HERE'S THE PROBLEM

UTW has been employed in several experimental projects with great success, but there exists a need beyond the experimental observations, for a thorough understanding of UTW and a rational design procedure. This will provide an insight into the contribution of the many variables in a UTW pavements system.



BUT HOW CAN IT BE DONE?... HERE'S THE SOLUTION

To develop a comprehensive design methodology pertaining to the thickness of UTW, we conducted field evaluation (cores, FWD, and distress) of a UTW installation that was constructed a part of a previous research project. This was followed by development of a Finite Element model for the analysis of an AC pavement with UTW. The analysis included AC and base layers; the stiffness modulus of UTW, AC and base layers; size of UTW panels; UTW-AC bond interface; and load transfer variables. Finally, verification of the developed model was the result from a series of conducted experiments.

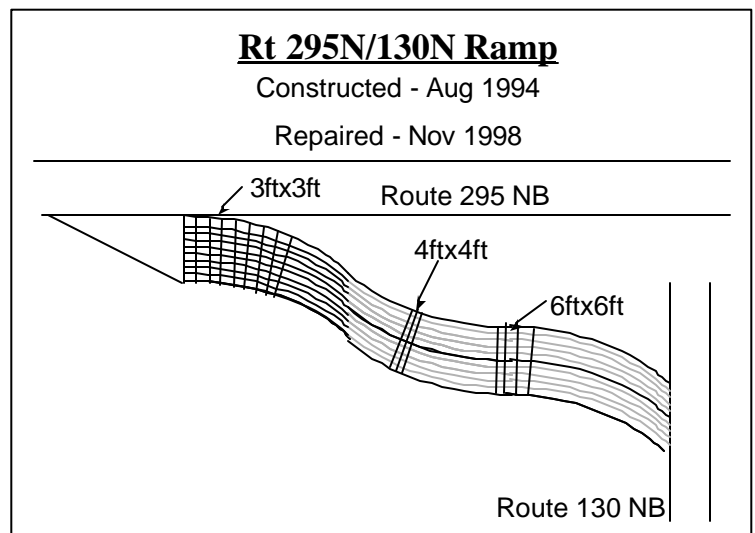
THESE ARE OBJECTIVES...

- To identify and address the important factors contributing to the performance of the UTW pavement system.
- To present an interim design procedure that will be fine-tuned by further observation of UTW pavement systems.

HERE IS WHAT WE DID...

We evaluated the UTW installation on the New Jersey Route I-295 ramp to evaluate the performance of three different panel sizes occurred. Non-destructive testing and visual surveys were carried out over these selected samples, and the results of which underwent statistical analysis.

This was followed by development of a finite element model for the analysis of an AC pavement with UTW. As this underwent analysis, a parametric study was also conducted to identify the parameters that affect the response of an AC pavement with an UTW overlay. This was subsequently followed by the finite element model verification step leading towards the design procedure. The essential parameters for a design procedure were all considered. The result was the development of the design procedure, which was based on the stress analysis in the pavement system, under a dual tire single axle load.



What We Found...	Our Recommendations...
<ul style="list-style-type: none"> • It is essential to develop a strong bond between the existing asphalt layer and the concrete layer • 2-3 foot saw cut patterns are effective in controlling cracks. • After milling, the asphalt layer should be thick enough to reduce the stresses in the UTW layer. 	<ul style="list-style-type: none"> • UTW used on ramps, should be placed shoulder to shoulder. • 2-3 foot saw cut patterns • The asphalt layer after milling should be at least 5 inches thick. • The section should contain a thickened header (8 inches) as a transition between the UTW installation and the adjacent pavement.

WHAT IS THE NEXT STEP?

The next step after the successful implementation of this design guide for Ultra Thin Whitetopping (UTW) is to refine the design procedure based on observations of UTW performance.

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<p>A final report is available online at http://www.state.nj.us/transportation/research/research.html</p> <p>If you would like a copy of the full report, please FAX the NJDOT, Bureau of Research, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Bureau@dot.state.nj.us and ask for:</p> <p>Report Title: Development of a Design Guide for Ultra Thin Whitetopping (UTW)</p> <p>NJDOT Research Report No: FHWA-NJ-2001-018</p>	