Florida Department of Transportation Research

Evaluation of Roadway Worms/Distortions

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Project Number
BE491

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Current Situation

There are many changes that can occur in asphalt pavement over time, such as potholes, rutting, and other distresses. One of these is blistering, which can appear as a bulge in the surface of the asphalt. Blisters can occur in groups or in chains, and they can become sites of further damage to the asphalt surface by cracking or spalling. Studies have indicated, but not confirmed, that blisters may be caused by moisture trapped between asphalt layers. Despite the common occurrence of blisters, their effect on pavement performance and service life has not been studied.

This pavement shows several kinds of distress: pavement blistering in the center; shoving and cracking right of center; and rutting far right.

Research Objectives

Researchers with Applied Research Associates, Inc., identified causes of pavement blisters and assessed the impact of blisters on pavement performance.

Project Activities

Both field and laboratory studies were used to investigate pavement blistering. Tests were conducted on five Florida roadways on segments of the same construction project both with and without blisters, thus providing ideal pairs of test and control sections for comparison in order to identify the mechanism(s) causing blisters.

Careful observation of the field cores from each of the five sites indicated that blisters are associated with internal deterioration within, and at the interface of, asphalt concrete (AC) layers. The deterioration was more pronounced in the dense-graded AC surface course and included segregation, excessive air voids, stripping, and interface debonding with underlying AC layers, as confirmed by laboratory test results.

More specifically, the laboratory shear test results conducted on the cores retrieved from the test sites indicated that the blister sections generally exhibited lower bond strength, although the strength and the degree of bond deterioration varied substantially between projects and within each project. Furthermore, many field cores (41%) tested for bond shear did not produce meaningful results due to crumbling and failing within the AC mixture itself (rather than the interface), indicating severe loss of durability, stiffness, and strength of the AC. These observations were confirmed with falling weight deflectometer (FWD) measurements at the test sites and modulus of elasticity measurements in the lab.

The researchers concluded that no changes were needed in current design practice in Florida; however, they were able to provide recommendations for paving practices to minimize water and also provide recommendations on the rehabilitation of pavements with blister distress.

Project Benefits

Results from this project provide an explanation of pavement blisters and guidance for repairing blistered pavement. This standard approach can lead to more efficient maintenance operations and improved service life of asphalt pavement.

For more information, please see www.fdot.gov/research/.