TECHNICAL SUMMARY

This study evaluated the effects of a few asphalt additives, that might be considered for use in Florida, on the cracking and rutting resistance of asphalt paving mixtures under Florida conditions. The applicability of the SHRP binder tests for evaluation of conventional and modified asphalts under Florida conditions was also investigated. The additives evaluated include (1) gilsonite, (2) ground tire rubber (GTR) (3) styrene-butadiene rubber (SBR), (4) ethylene vinyl acetate (EVA) and (5) styrene ethylene butylene styrene (SEBS).

The thin film oven test (TFOT) was used to simulate the short-term aging of the binders during the hot-mixing process. The California tilt oven (CTO) and SHRP pressure aging vessel (PAV) processes were used to simulate the additional aging of the asphalt binders in the field. The modified and unmodified binders were evaluated by both conventional and SHRP binder tests, which include (1) Brookfield rheometer, (2) Schweyer rheometer, (3) penetration, (4) Fraass breaking point, (5) SHRP bending beam rheometer, (6) SHRP dynamic rheometer, (7) SHRP direct tension, and (8) infrared spectral analysis.

Seven asphalt mixtures made with five different modified asphalt blends, and two control asphalts were also evaluated. The high-temperature characteristics of these mixtures were evaluated by the gyratory testing machine (GTM) and the loaded wheel tester. The low-temperature characteristics of these mixtures were evaluated by the resilient modulus, indirect tensile strength and indirect tensile creep tests. Asphalt

residues were recovered from the broken samples and evaluated by the various conventional and SHRP binder tests.

The results of the study indicate that the addition of the five types of modifiers could all improve the rutting resistance of the asphalt mixtures. The addition of SBR and GTR could improve the resistance to fatigue cracking as well as low-temperature cracking of the asphalt mixtures. All of the modified asphalts show a lower temperature susceptibility and a reduced aging potential as compared with the base asphalts.

Among the five asphalt additives investigated, the most effective additives for improved rutting and cracking resistance of asphalt mixtures are GTR and SBR The two modified binders with the best high- and low- temperature properties are AC-20 + 15% GTR and AC-30 + 3% SBR.

The test results indicate that the new SHRP asphalt binder tests may be a useful refinement over conventional asphalt binder tests. The dynamic shear rheometer can be a useful tool to graphically fingerprint both unmodified and modified binder rheology to show a distinguishable difference between these two asphalt binders. The bending beam rheometer seems to be a useful device to determine the low temperature stiffness of an asphalt binder.

Based on the limited test data available, the precision of the different SHRP binder tests was also estimated.