Executive Summary

A recently completed project for the FHWA (Perkins et al. 2004) used the ratio of permanent to resilient (dynamic) geosynthetic strain observed in test sections to establish a growth relationship of this ratio with pavement load cycles to determine the effect of confinement of the reinforcement on the base aggregate layer through restraining shear stresses created between the reinforcement and the base. Geosynthetics showing a faster growth of reinforcement strain ratio with normalized pavement load applications resulted in larger levels of confinement of the base. Within the context of a mechanistic analysis, this procedure provided a means of assessing the stiffness of the base at different periods of pavement life and was used with pavement damage models for rutting to determine the effect of the reinforcement on rutting. In the course of this completed project, data from 3 test sections were evaluated.

In this UTC project, reinforcement strain data from approximately 18 additional large-scale laboratory and field-scale HVS test sections previously reported by Perkins (1999, 2002) are evaluated. These test sections involved the use of different aggregates, subgrades and geosynthetic materials. Several sections were constructed using the same geosynthetic but with different aggregates and with a different thickness of aggregate. Permanent to resilient strain ratio data were compared by plotting this data against a normalized and shifted load cycle number.

In general, the data presented in this report suggests that of the variables incorporated in the test sections (geosynthetic type, subgrade strength, aggregate type, aggregate thickness) only geosynthetic type influences the shape of the normalized curve. The shift value of the normalized curve appears to be dependent on the number of load cycles the pavement can carry before reaching 25 mm of permanent surface deformation, which in turn most likely accounts for variables such as subgrade strength, aggregate type and aggregate thickness. The differences in curve shape between the different geosynthetic types is not as distinct as expected and more work is needed to improve strain measuring techniques to improve this situation.