

Stabilizing Granular Shoulders with Soft Foundation Soils: Iowa Case Histories

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ABSTRACT

Granular shoulders underlain by soft foundation soils can undergo severe rutting when subjected to traffic loads. Traffic loads induce normal and shear stresses, which cause bearing capacity failure of the foundation soil and, consequently, surface rutting. Considerable rutting can be a threat to drivers and is difficult to maintain. Recently, a field reconnaissance study was carried out to evaluate the causes of granular shoulder problems in Iowa. The study revealed that out of 21 problematic granular shoulders, 50% suffered from a soft subgrade layer where the California Bearing Ratio (CBR) was 10 or less. Granular shoulders with soft foundation soils are currently maintained by adding granular material. This, however, is a temporary solution, since it does not address the soft foundation condition. To evaluate alternative rehabilitation procedures, two test sections overlying soft subgrade soils were constructed and monitored. The first section was stabilized by mixing the top 300 mm of the subgrade layer with about 20% class C fly ash. The second test section was stabilized by placing three different biaxial geogrids at the interface of the granular and subgrade layers. To monitor the performance of both sections, field tests including dynamic cone penetration, Clegg impact, and plate load tests were performed. Field results indicate the success of both stabilization techniques in alleviating shoulder rutting. In this paper, observations from a field reconnaissance study, the construction and monitoring of two shoulder test sections, and recommendations for repairing shoulders with similar problems are discussed.

Key words: granular shoulders—rutting—shoulder maintenance—subgrade stabilization—unpaved shoulders