

ABSTRACT

There are significant problems during construction to establish an adequate foundation for fills and/or subgrade for pavements when the natural ground has low-bearing soils. Geosynthetics such as geogrids, geotextiles and/or geocells could provide an alternative, less costly in time and money, to establish an adequate foundation for the fill and/or subgrade. There is extensive evidence in the literature and on DOTs practices about the suitability of using geotextiles in pavements as separators. Previous studies have also shown that the use of geogrids in flexible pavements as a reinforcing mechanism could decrease the thickness of the base layer and/or increase the life of the pavement. In this study, analyses of selected pavement designs using Pavement ME, while considering geogrid-enhanced base or subgrade resilient modulus values, showed that geogrid-reinforcement, when placed at the interface between subgrade and base, did not produce significant benefits, as only a modest increase in pavement life was predicted. In addition, parametric finite element analyses were carried out to investigate the potential benefits of placing a geogrid at the base of a fill over a localized weak foundation zone. The analyses showed that the use of geogrids is beneficial only when: (a) the stiffness of the weak foundation soil is about an order of magnitude smaller than the rest of the foundation soil; and (b) the horizontal extent of the weak foundation soil is at least 30% of the base of the embankment foundation. The largest decrease in differential settlements at the surface of the fill, resulting from geogrid-reinforcement, was less than 20% and, therefore, it is unlikely that the sole use of geogrids would be sufficient to mitigate differential settlements. Based on previous studies, a geocell mattress, which is a three-dimensional geosynthetic filled with different types of materials, could act as a stiff platform at the base of an embankment and bridge over weak zones in the foundation. However, given the limited experience in Indiana on the use of geocells, further research is required to demonstrate that geocells can be effectively used instead of other reinforcement methods.