

EXECUTIVE SUMMARY

This study provides guidance and recommendations to identify, promote, and advance the use of geosynthetic materials across Federal Lands Highway Division (FLHD) in the Roadway, Bridge/Structures, and Geotechnical areas. Personnel from FLHD and its client organizations were surveyed to determine current use and barriers to implementation of geosynthetic technologies. A review of recent literature and existing national design guidelines was undertaken to determine the current state of practice and possible technologies that could be implemented in the near future. Recommendations were formulated to provide the basis for a multi-year effort that will culminate in advancing the use of geosynthetic materials in FLHD highway projects. Target technical areas included slopes, walls, deep patches for soft shoulders, reinforced soil foundations (embankments, shallow foundations), moisture barriers, liners to control/prevent seepage, unbound pavement layers and bound pavement layers.

The advanced recommendations are classified into three categories: i) Broad guidelines for specifications updating, ii) Implementation of specific design approaches for expedient utilization of best practice technologies, and iii) System-level recommendations for further development prior to wide acceptance for a particular technology application.

The broad guidelines include updating FLHD geosynthetics usage procedures to include design guidelines and to update the standard specifications in light of these guidelines. In addition, it is imperative to include design guidance on using both geotextile and geogrids in reinforcement applications. This will likely not be a part of an updated FP-03, but should at least be a recognized set of documents that will guide and standardize relatively simple designs. It is also recommended to develop/adopt procedures to evaluate proprietary systems that use geosynthetics.

The implementation of state of practice design approaches is recommended to assist FLHD professionals with the design of geosynthetics structures that are commonly used in practice today. There are well documented design approaches for MSE walls, reinforced soil slopes, and embankments on reinforced soil foundations. A standard design process for these applications can include the development of charts that standardize the design of reinforced walls or slopes while being sufficiently flexible to economize such a design. Simple computer modules could also be developed to aid FLHD personnel in investigating the sensitivity of the design to key input parameters. Such modules could be developed for designs of many of the applications listed above.

FLHD could also adopt a series of short courses with a logical sequence to specifically emphasize applications of interest to them. This series of educational efforts should be specifically designed and targeted toward FLHD professionals, and should be digitally recorded and distributed agency wide. This effort should also include an aggressive education program for construction managers, engineers, and technicians who inspect MSE walls, reinforced soil slopes, and other projects on which geosynthetics are used.

System-level recommendations for further developments include specific suggestions for the nine areas considered in this study. For all technical areas covered in this report, previously built structures should be revisited to collect data on their performance (in a non-destructive or destructive manner as circumstances allow). Such performance data should be presented in context of the as-built design and document any lessons learned.

The proposed recommendations also identify suggested priorities for future FLHD development in each of the nine areas of study. These priorities were determined in concert with FLHD personnel and reflect the items most likely to significantly affect geotechnical and roadway practice in the next three to five years. In some cases, action on these prioritized recommendations can be solely contained to FLHD. In other cases, FLHD will likely need to partner with other organizations to accommodate some of the development efforts needed to produce a widely accepted, calibrated design method for deployment in practice.