Geosynthetics

Selecting reinforced fill soil for MSE retaining walls

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Mechanically Stabilized Earth (MSE) retaining walls on public sector transportation projects are generally conservatively designed with "low fines" reinforced soils. Private MSE walls are less conservatively designed, and use a variety of reinforced soils (NCMA recommends 35% < 0.075mm or greater). It is also clear from the literature that the combination of reinforced soil consisting of fine-grained soils (either "high" fines or "high" plasticity) and water in the reinforced zone were the principal reasons for serviceability problems (excessive deformation) or failure (collapse).

However, a higher quantity of fines can be safely allowed in the reinforced fill, provided the properties of the materials are well-defined and controls are established to address the design issues. The potential savings from replacing AASHTO reinforced fill materials with marginal reinforced fill materials could be in the range of 20% to 30% of current MSE wall costs.

A full-scale field test is currently being conducted in order to establish properties for "high fines" reinforced soils and associated design controls that give acceptable MSE wall performance. The field test includes provisions to demonstrate the role of porewater pressure in the reinforced fill and the importance of including a positive drainage system to obtain good wall performance. Based on the survey of the literature, to date, full-scale test or experimental MSE walls have not rigorously evaluated this important aspect.

The full-scale field test is primarily funded by the Transportation Research Board, under the National Cooperative Highway Research Project (NCHRP) 24-22, with a portion funded by the National Concrete Masonry Association (NCMA). The objective of NCHRP Project 24-22 is to develop selection guidelines, soil parameters, testing methods, and construction specifications that will allow the use of a wider range of reinforced fill materials within the reinforced zone of mechanically stabilized earth (MSE) walls.

NCHRP Project 24-22 includes four sections:

1) One section with an AASHTO A-1-a reinforced fill to provide a baseline of performance for current AASHTO and FHWA standards.

2) A second section with an AASHTO A-2-4 reinforced fill to demonstrate that non-plastic, silty sand materials with up to 35% fines (of no plasticity) can provide suitable reinforced fill for MSE walls.

3 & 4) The third and fourth sections with an AASHTO A-4 material to demonstrate that silty soils (50% fines) of low to moderate plasticity can provide suitable reinforced fill for MSE walls.