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ADVANTAGES OF REINFORCED EARTH OVER OTHER EARTH RETAINAGE SYSTEMS

INTRODUCTION

The use of reinforced earth should be considered in all earth retainage projects as it is typically considerably more economical than more conventional methods. This technology has been successfully developed, but is not utilized by design engineers as much as it should be, possibly due to the lack of training and experience in such designs.

DESCRIPTION & APPLICATIONS

When reinforced earth is used for soil retainage applications, it is called a reinforced soil slope (RSS). RSS consists of placing alternating layers of tensile reinforcement (geogrid or geotextile) and compacted soil (see Figures 1 and 2). The requirements for the spacing of the reinforcement, tensile strength of the reinforcement, and soil compaction depend on the site conditions. In addition to proper surface drainage, it is common to install an internal drainage system as the RSS is being built to relieve the RSS of any groundwater pressures which can accumulate into the retained soil. To prevent surface erosion, the slope or wall of the RSS is wrapped between the reinforcement layers in some sort of geotextile. The geotextile is then protected in some fashion against UV damage.

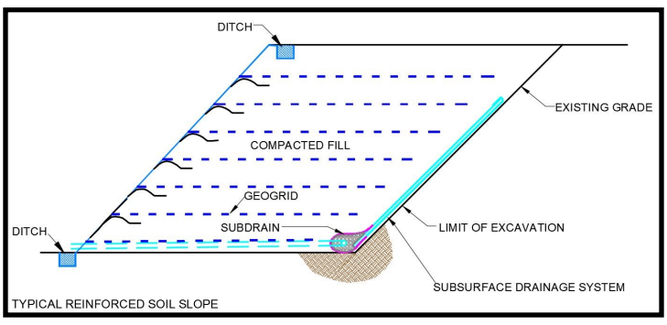

FIGURE 1 DRAWING OF A TYPICAL REINFORCED SOIL SLOPE (RSS)

FIGURE 2 PLACEMENT OF GEOGRID OVER COMPACTED CONTROLLED FILL

RSS systems can be designed for various slope angles up to vertical, with linear to sharp curvilinear alignments and to various heights. RSS systems have been known to reach 242 ft. high. One of the restrictions for its use is the need to have sufficient embedment of the reinforcement in order to develop the necessary resistance against the geogrid failure from slipping (pulling) out of the controlled compacted fill. However, in many instances this is not problematic, or can be solved in some manner. Figure 3 shows a vertical 24 ft. high RSS used for a landfill. Figure 4 shows a completed steeply sloped RSS which is 80 ft. high used for a road embankment.

ADVANTAGES

The use of RSS retainage systems can easily be 50% cheaper than its common counterparts (i.e. MSE walls and various types of gravity or cantilever walls). The time to construct the RSS system should be similar to any other earth retainage construction. Therefore, RSS should always be considered where it is appropriate, especially for large projects where the earth retainage costs are significant.

Moreover, this reinforced earth methodology can utilize on-site fine to coarse grained soils (in lieu of much stricter coarse grained fill requirements with other methods). Another benefit is that RSS systems are much more tolerant to differential settlement from compressible foundation soils compared to a retainage system that includes cementitious elements. Under this scenario, for example, MSE walls with concrete facing may be required to be built in stages with temporary facing to avoid facing damage because of the excessive settlement due to wall loads.

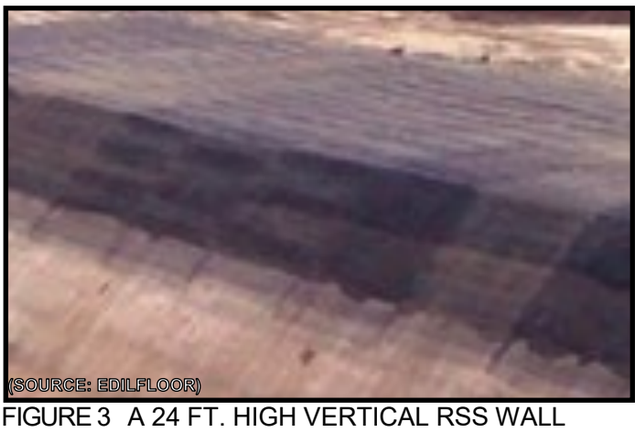

FIGURE 3 A 24 FT. HIGH VERTICAL RSS WALL CONSTRUCTED FOR A LANDFILL

FIGURE 4 AN 80 FT. STEEPLY SLOPED RSS CONSTRUCTED FOR A ROAD EMBANKMENT

Other MEA Publications that may be of Interest:

UPDATE #39: Using Reinforced Soil for Construction of Retaining Structures and Earth Slopes

UPDATE #31: Foundation Construction in Difficult Close-Quarter Condition

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FOR MORE INFORMATION: There is a significant amount of additional information that is available on the above subject. For more information, please contact Dr. Marino at the address listed below.

MARINO ENGINEERING ASSOCIATES, INC.
1370 MCCAUSLAND AVENUE, ST. LOUIS, MISSOURI 63117
PH: 314.833.3189 FAX: 314.833.3448
http://www.meacorporation.com