Geocomp CORPORATION

Technologies to manage risk for infrastructure

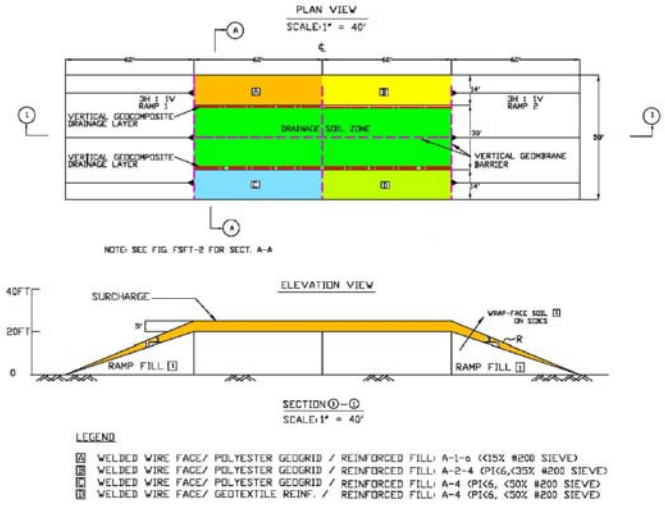
Mechanically Stabilized Earth Wall

Our survey of mechanically stabilized earth (MSE) wall practice indicated that there are records of both successful and failed walls constructed using "high fines" and/or "high plasticity" soils in the reinforced zone. Those walls with stability problems appeared to have high water pressures in the reinforced zone that led to excessive deformation or collapse.

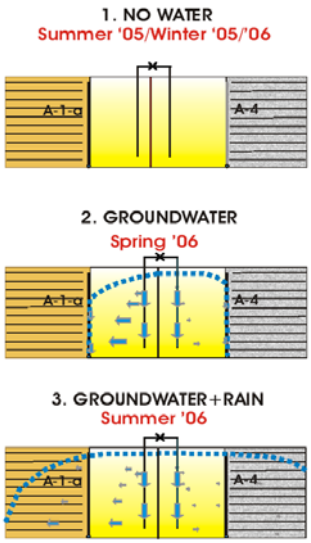
We concluded that a higher quantity of fines could be safely allowed in the reinforced fill provided: (1) the properties of the materials are well defined, and (2) controls are established to address the design issues and limit the development of positive pore water pressures in the reinforced fill.

To test this principle, the National Cooperative Highway Research Program (NCHRP) has funded an innovative test wall project to establish properties for "high fines" reinforced soils and to develop/test associated design controls that give acceptable performance. The field test will demonstrate the role of pore water pressure in the reinforced fill and the importance of including a positive drainage system behind the reinforced fill zone to obtaining good wall performance.

The work program started in June 2005 and comprises four full-scale test sections: one with A-1-a reinforced fill, one with A-2-4 reinforced fill, and two with A-4 reinforced fill. Three of the four walls employ a flexible, welded wire facing system and polyester geogrid reinforcement while the fourth has geotextile reinforcement in lieu of a polyester geogrid. The



Test wall: plan and section



Typical wall performance cycle

test sections have been designed so that they demonstrate acceptable performance for the normal design conditions, but show distress when subjected to extreme conditions of high pore water pressures in the reinforced fill and a surface surcharge load.

The project time scale allows the walls to be monitored through two winter seasons to document the effects of freeze-thaw conditions on the performance of different reinforced soils. Reinforced soils containing higher fines may be more susceptible to damage from freezing conditions.

Instrumentation Program

The monitoring system developed for the test wall is a combination of electronic sensors, optical deformation monitoring and

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manual readings. Overall response of the wall face and structure are recorded using Automated Motorized Total Stations (AMTS) and high-precision reflective prisms. The total stations are robotic and programmable to record 3-dimensional deformations on hundreds of targets on the wall face during construction and over the longer-term. Internal wall performance (i.e. strains on reinforcement, water pressures, temperature) is recorded electronically using Geocomp's iSiteTM data logging system.

Appropriate warning levels for each instrument (prismatic target or electronic sensor) have been developed from the numerical modeling of the wall construction. When sensors record change exceeding the warning level, electronic notices will be sent to key personnel indicating that deformations are occurring at that instrument.

The instruments/sensors are read as often as required, with data relayed periodically or in real-time to Geocomp's iSiteCentral web-based reporting service by cell phone-modem.

All data is accessible through any WEB browser to authorized users and will provide the project team with up-to-date process readings plotted in engineering units at any time from any location with WEB access.

Manual verifications readings are also made, including periodic inclinometer measurements to provide redundant deformation measurements of the wall face.

The benefit of this extensive monitoring program is to identify the effects of environmental changes, such as temperature and rainfall on the performance of the wall to a degree of detail not previously possible.