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摘要集

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目　录

Laterally-loaded pile-MSE wall system performance under different design configurations

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Abstract: The need for constructing a shallow or deep foundation (e.g. piles) in a mechanically stabilized earth (MSE) wall for superstructure support has increased. However, the performance of laterally loaded piles within the MSE wall and their interaction with soil and reinforcement are not fully understood. Limited full-scale tests and numerical studies have been conducted to evaluate the behavior of laterally-loaded piles within MSE walls. In this study, thirteen reduced-scale model tests were performed to investigate the effects of changing the wall configuration (wall height, and reinforcement spacing and length) and the pile location on the performance of the pile-MSE wall system under static lateral loads. This experimental study found that the piles in high walls could develop larger maximum compressive and tensile strains. Low walls resulted in larger wall facing deflections and maximum tensile strains in the geogrid reinforcement. Small reinforcement spacing and long reinforcement length resulted in higher pile lateral load capacities, smaller wall facing deflections, and smaller reinforcement tensile strains. The pile offset from the back of the wall facing is a critical factor that affected the pile capacity, the wall facing deflection, the reinforcement tensile strain, and the lateral earth pressure distribution behind the wall facing.

Keywords: Geosynthetics, Displacement, Lateral load, Pile, Wall

Effect of internal drainage on deformationbehavior of GRS wall during rainfall

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Abstract: Global warming-induced changes in the pattern and amount of precipitation are important from the viewpoint of long-term stability of geo-structures. In this paper, the effectiveness of in-plane drainage provided by permeable geosynthetic reinforcement was evaluated as a means to relieve the rainfall infiltration effect on GRS walls backfilled with marginal soil. A series of laboratory tests were performed using a reduced-scale model geosynthetic reinforced soil (GRS) wall (constructed with due consideration of the similitude law) with different rainfall characteristics and backfill soils. Layers of nonwoven geotextiles were used as reinforcement as well as in-plane drainage media. The results showed that the inclusion of internal drainage facilitated the dissipation of pore water pressure, thereby reducing the wall facing displacement. The discharge water volume and volumetric water content data measured in the reinforced soil zone supported the observation. The degree to which the internal drainage improves the deformation behavior of the GRS wall during rainfall was found to depend on the rainfall characteristics and the backfill soil type. Practical implications of the findings are discussed in detail.

Keywords: Geosynthetics, geotextile, geosynthetic reinforced soil wall, rainfall infiltration, internal drainage, reduced-scale model test

Damage of geotextile due to impact of stones

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Abstract: Impact tests of stones on a geotextile or two loosely connected geotextiles (composites) have been performed and analysed to investigate the mechanisms that lead to perforation. The geotextiles were mounted on a concrete cylinder of 0.8m internal diameter, filled with uniformly graded dry sand. Drop tests were performed with concrete blocks of different shapes weighing approximately 40kg. The drop heights varied between 0.25 and 5.5m. Results show that the shape of the stone has an important influence on the critical drop height at which the geotextile is perforated. Furthermore, it appeared from image processing that the tensile strains in a woven geotextile develop in the direction of the yarns, starting from the point of impact. However, in a nonwoven geotextile, the tensile strains develop rather uniformly centred at the point of impact. An important result for composite material consisting of a woven and a nonwoven geotextile was that the lower geotextile was always the first to be damaged. This was also found in the field tests. A possible explanation is the friction between the sand and the lower geotextile, resulting in an additional tensile loading on that geotextile. This explanation is confirmed by numerical simulations.

Keywords: Geosynthetics, Damage during installation, Impact stones, Tests, Numerical simulations

Shaking table tests on bridge abutments reinforced by EPS and geogrid

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Abstract: This study is aimed at improving the seismic stability of bridge abutments. To study the effects of the combined use of a block of expanded polystyrene (EPS) and geogrid, a series of 1g shaking table tests were conducted on a reduced-scale model of a cantilever-type bridge abutment and its backfill soil. The experiment results indicated that the base sliding and tilting of the wall can be further reduced by partly replacing the backfill soil with blocks of EPS, in combination with the use of the middle-height geogrid. Moreover, the relative settlement of the backfill soil at the interface with the wall could be reduced by the combined use of EPS and geogrid. Furthermore, the resultant normal force and rotational moment acting on the wall from the backfill soil during excitation also became small for the reinforced wall with both EPS and geogrid.

Keywords: Geosynthetics, Shaking table, Geogrid, EPS blocks, Bridge abutment, Retaining wall