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Influence of Reinforcement Stiffness on the Performance of Back-to-Back Reinforced Earth Wall upon Rainwater Infiltration

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Abstract : Back-to-back reinforced earth (RE) walls are extensively used in these days as bridge abutments and highway ramps, owing to their cost efficiency and ease of construction. High quality select fill is the most suitable backfill material due to its excellent engineering properties and constructability. However, industries are compelled to use low quality, locally available soil because of its ample availability on site. However, several failure cases of such walls are reported, especially subsequent to rainfall events. The stiffness of reinforcement is one of the major factors affecting the performance of RE walls. The present study focused on analyzing the effect of reinforcement stiffness on the performance of complete select fill, complete marginal fill, and hybrid-fill (i.e., combination of select and marginal fills) back-to-back RE walls, immediately after construction and upon rainwater infiltration through finite element modelling. A constant width to height (W/H) ratio of 3 and height (H) of 6 m was considered for the numerical analysis and the stiffness of reinforcement layers was varied from 500 kN/m to 10000 kN/m. Results showed that reinforcement stiffness had a noticeable influence on the response of RE wall, subsequent to construction as well as rainwater infiltration. Facing displacement was found to decrease and maximum reinforcement tension and factor of safety were observed to increase with increasing the stiffness of reinforcement. However, beyond a stiffness of 5000 kN/m, no significant reduction in facing displacement was observed. The behavior of fully marginal fill wall considered in this study was found to be reasonable even after rainwater infiltration when the high stiffness reinforcement layers are used.

Keywords : back-to-back reinforced earth wall, finite element modelling, rainwater infiltration, reinforcement stiffness
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