

## Model Tests on Geogrid-Reinforced Sand-Filled Embankments with a Cover Layer under Cyclic Loading

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**Abstract :** The structure of sand-filled embankment with cover layer is treated with tipping clay modified with lime on the outside of the packing, and the geotextile is placed between the stuffing and the clay. The packing is usually river sand, and the improved clay protects the sand core against rainwater erosion. The sand-filled embankment with cover layer has practical problems such as high filling embankment, construction restriction, and steep slope. The reinforcement can be applied to the sand-filled embankment with cover layer to solve the complicated problems such as irregular settlement caused by poor stability of the embankment. At present, the research on the sand-filled embankment with cover layer mainly focuses on the sand properties, construction technology, and slope stability, and there are few studies in the experimental field, the deformation characteristics and stability of reinforced sand-filled embankment need further study. In addition, experimental research is relatively rare when the cyclic load is considered in tests. A subgrade structure of geogrid-reinforced sand-filled embankment with cover layer was proposed. The mechanical characteristics, the deformation properties, reinforced behavior and the ultimate bearing capacity of the embankment structure under cyclic loading were studied. For this structure, the geogrids in the sand and the tipping soil are through the geotextile which is arranged in sections continuously so that the geogrids can cross horizontally. Then, the Unsaturated/saturated Soil Triaxial Test System of Geotechnical Consulting and Testing Systems (GCTS), USA was modified to form the loading device of this test, and strain collector was used to measuring deformation and earth pressure of the embankment. A series of cyclic loading model tests were conducted on the geogrid-reinforced sand-filled embankment with a cover layer under a different number of reinforcement layers, the length of reinforcement and thickness of the cover layer. The settlement of the embankment, the normal cumulative deformation of the slope and the earth pressure were studied under different conditions. Besides cyclic loading model tests, model experiments of embankment subjected cyclic-static loading was carried out to analyze ultimate bearing capacity with different loading. The experiment results showed that the vertical cumulative settlement under long-term cyclic loading increases with the decrease of the number of reinforcement layers, length of the reinforcement arrangement and thickness of the tipping soil. Meanwhile, these three factors also have an influence on the decrease of the normal deformation of the embankment slope. The earth pressure around the loading point is significantly affected by putting geogrid in a model embankment. After cyclic loading, the decline of ultimate bearing capacity of the reinforced embankment can be effectively reduced, which is contrary to the unreinforced embankment.

**Keywords :** cyclic load; geogrid; reinforcement behavior; cumulative deformation; earth pressure

**Conference Title :** ICGE 2019 : International Conference on Geotechnical Engineering

**Conference Location :** Rome, Italy

**Conference Dates :** September 17-18, 2019