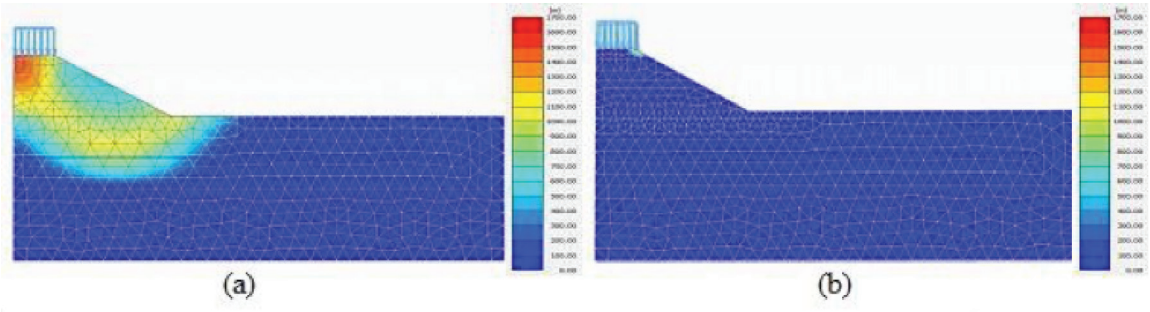
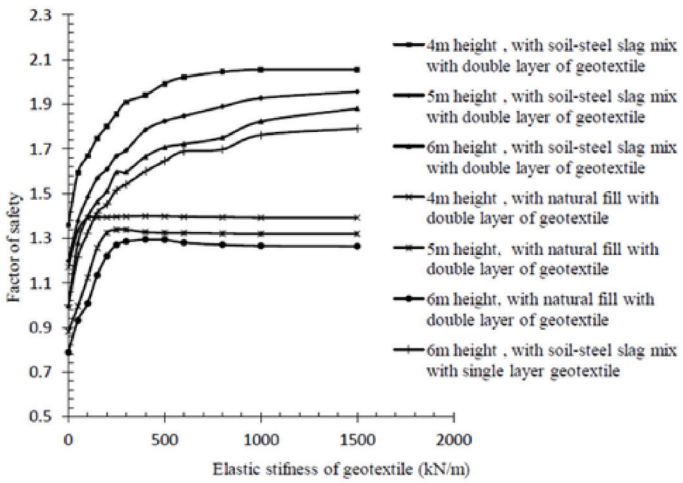
Geotextile reinforced steel slag highway embankment using PLAXIS 3D



Displacement pattern of 6 m high embankment with natural fill (a) without geotextile (b) with geotextile

In India, steel industry produces 8 million tons (MT) of waste for generation of 25 MT steel annually. An attempt has been made to utilise the steel slag as embankment fill material. Comparative study of embankment modelled with different fill materials such as soil-steel slag mix and natural fill material, using finite element method based software PLAXIS 3D has been carried out.

The highway embankment of width 8 meters and 2:1 side slope was modelled using PLAXIS 3D. As the embankment is symmetric with respect to the centre line, only half portion of the embankment was modelled. A nominal surcharge load of 30 kN/m^2 has been used for modelling of traffic load. Stability of the embankment was analysed with and without geotextile of various elastic stiffness ranging from 50 kN/m to 1500 kN/m. Stability of the reinforced embankment was determined based on the factor of safety. To determine stability geotextiles of different stiffness were used until the target factor of safety was achieved. It was found that Soil steel slag embankment was more stable than natural fill embankment. Reinforced embankment with soil-steel slag mix was stable even up to a height of 6 m as factor of safety is more than 1.5. However, embankment with natural fill was stable only up to 4 m height. The stability of embankment increased with increase in the stiffness of reinforcement geotextile reinforcement upto 500 kN/m and then becomes constant.



Effect of elastic stiffness of geotextile on the factor of safety of embankment

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