Effect of 'spikes' configuration on pullout resistance of biaxial geogrid

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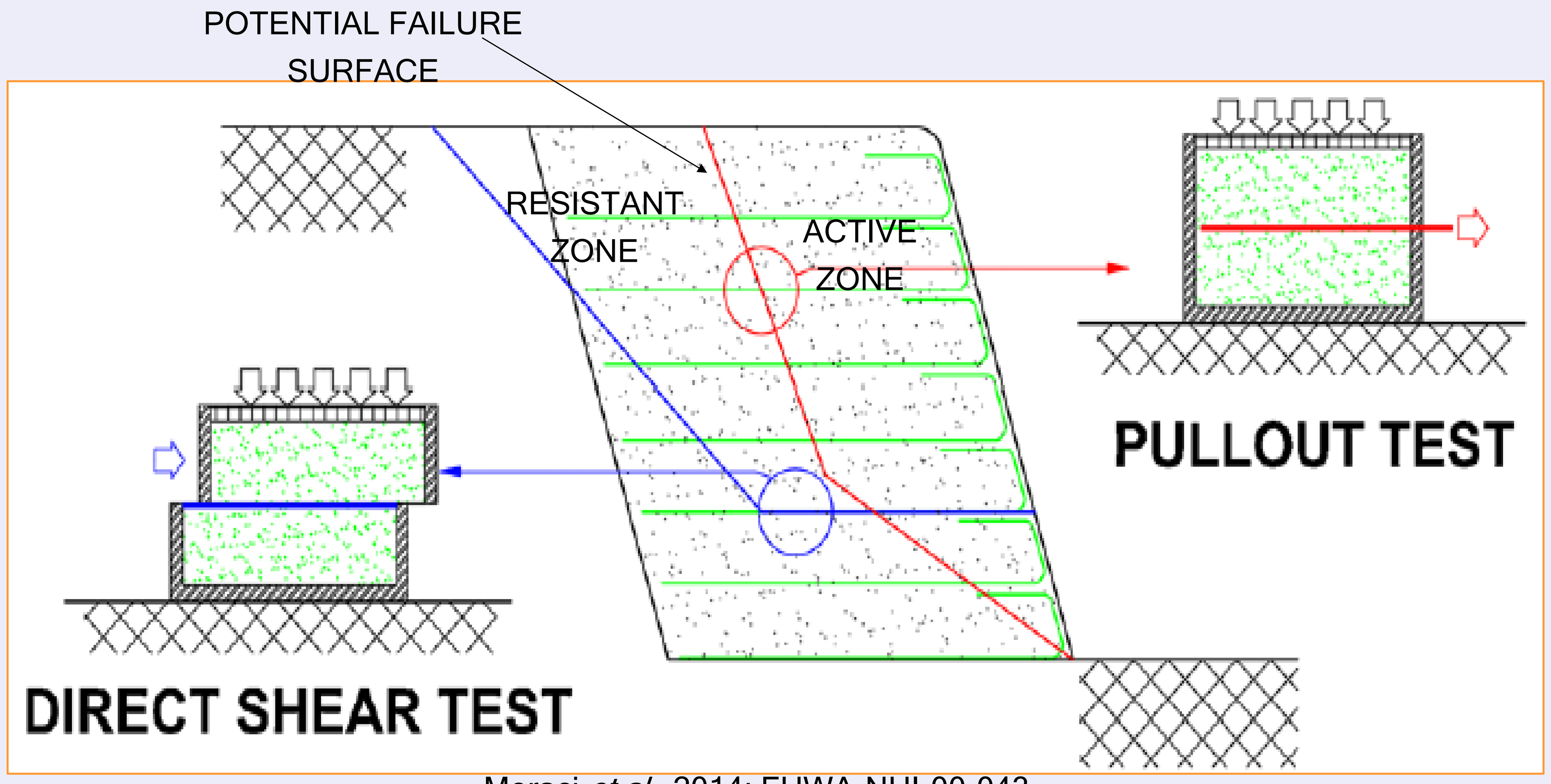
In reinforced soil retaining walls, the geosynthetic carries the load by mobilizing friction and passive/bearing resistance within the "resistant zone" (Fig. 1) behind the failure surface. The pullout resistance of the geosynthetic affects the length used in construction, hence cost.



Moraci *et al.*, 2014; FHWA-NHI-00-043

Fig. 1: Schematic of reinforced soil retaining wall

After adding 'spikes' to biaxial geogrid, many factors were observed to influence its pullout behaviour including configuration of the spikes.

Apparatus and Procedure

Pullout tests were conducted in a 70x40x50cm box using silica sand (D_{50} 0.6) as the backfill material (D_r 90%) and surcharge of 1kPa (Fig. 2). Tensar SS35 biaxial geogrid was used with aluminum 'spikes' of 5x5mm cross section screwed at the nodes (Fig. 3).

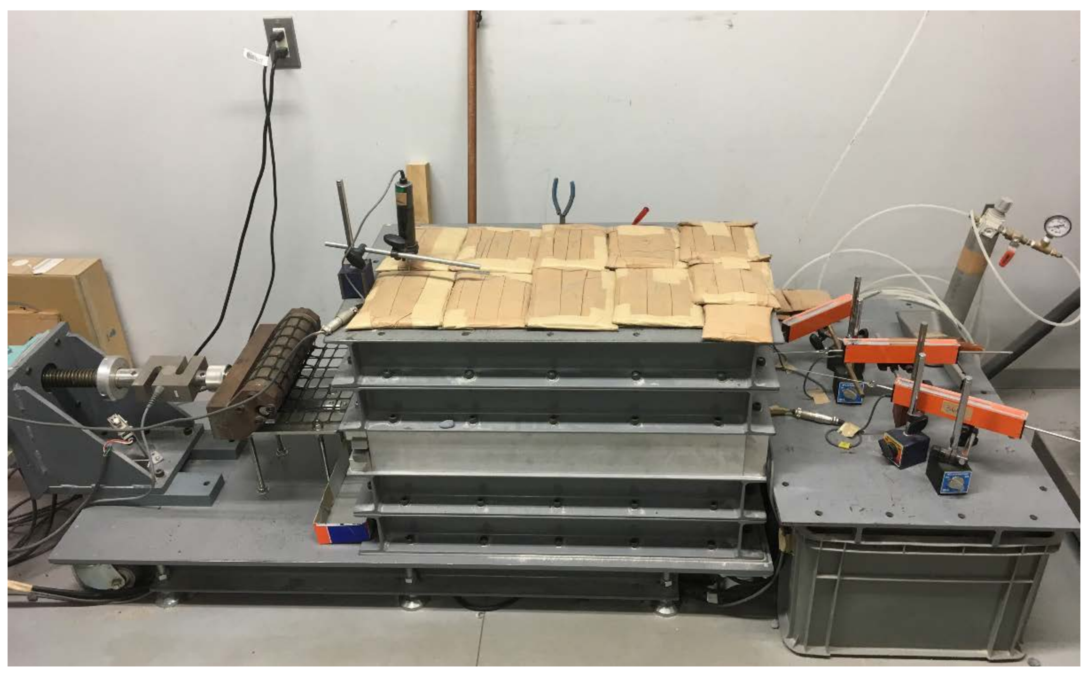


Fig. 2: Test apparatus

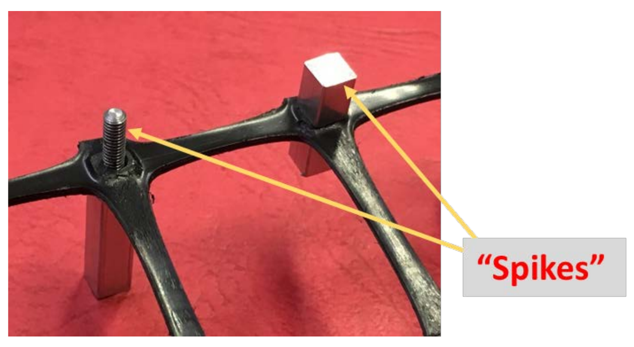


Fig. 3: Aluminum spikes at nodes of geogrid

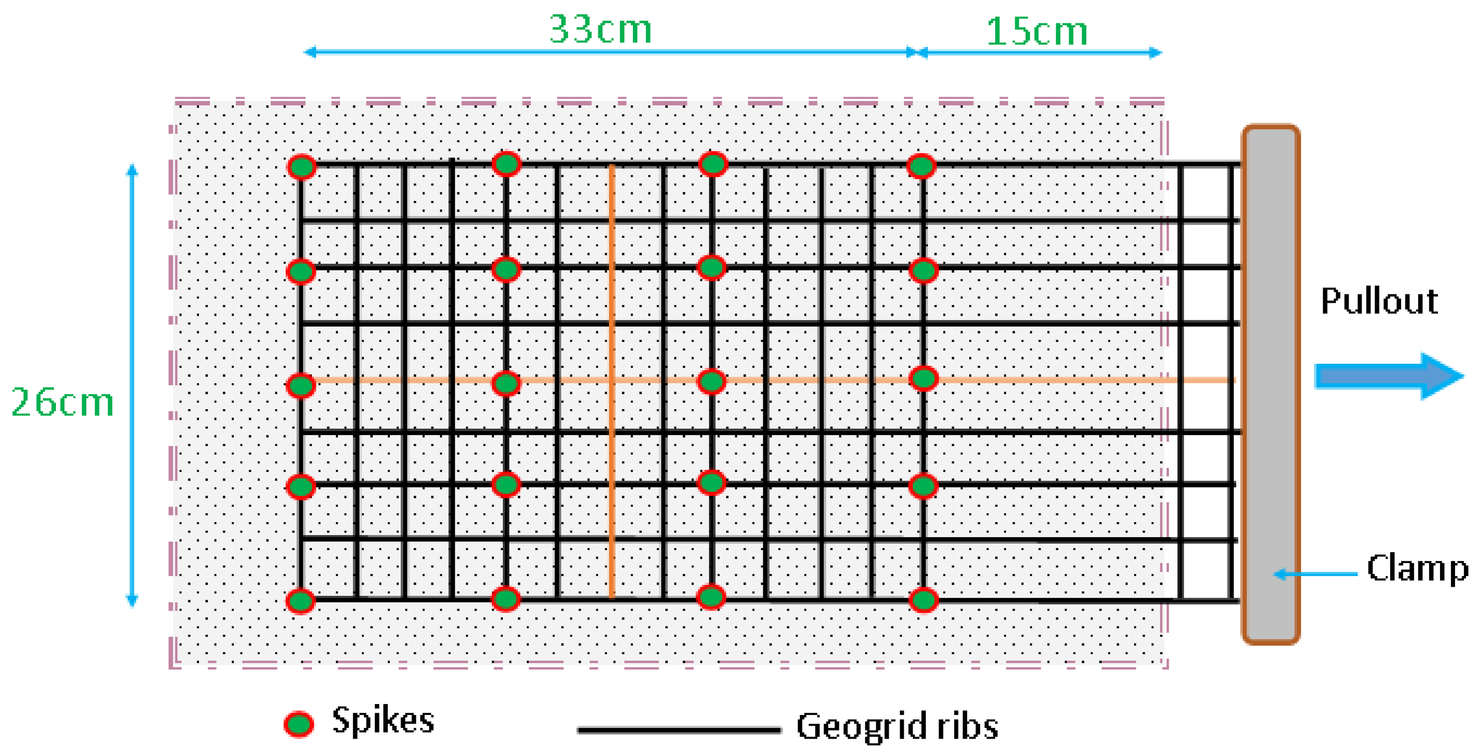


Fig. 4: Position of spikes on the geogrid model

To investigate how the spikes should be attached on the geogrid, 20 spikes of 30mm height were attached on Tensar SS35 geogrid as shown in Fig. 4 & 5. Five configurations a) to e), Fig. 5, were investigated.

Observations

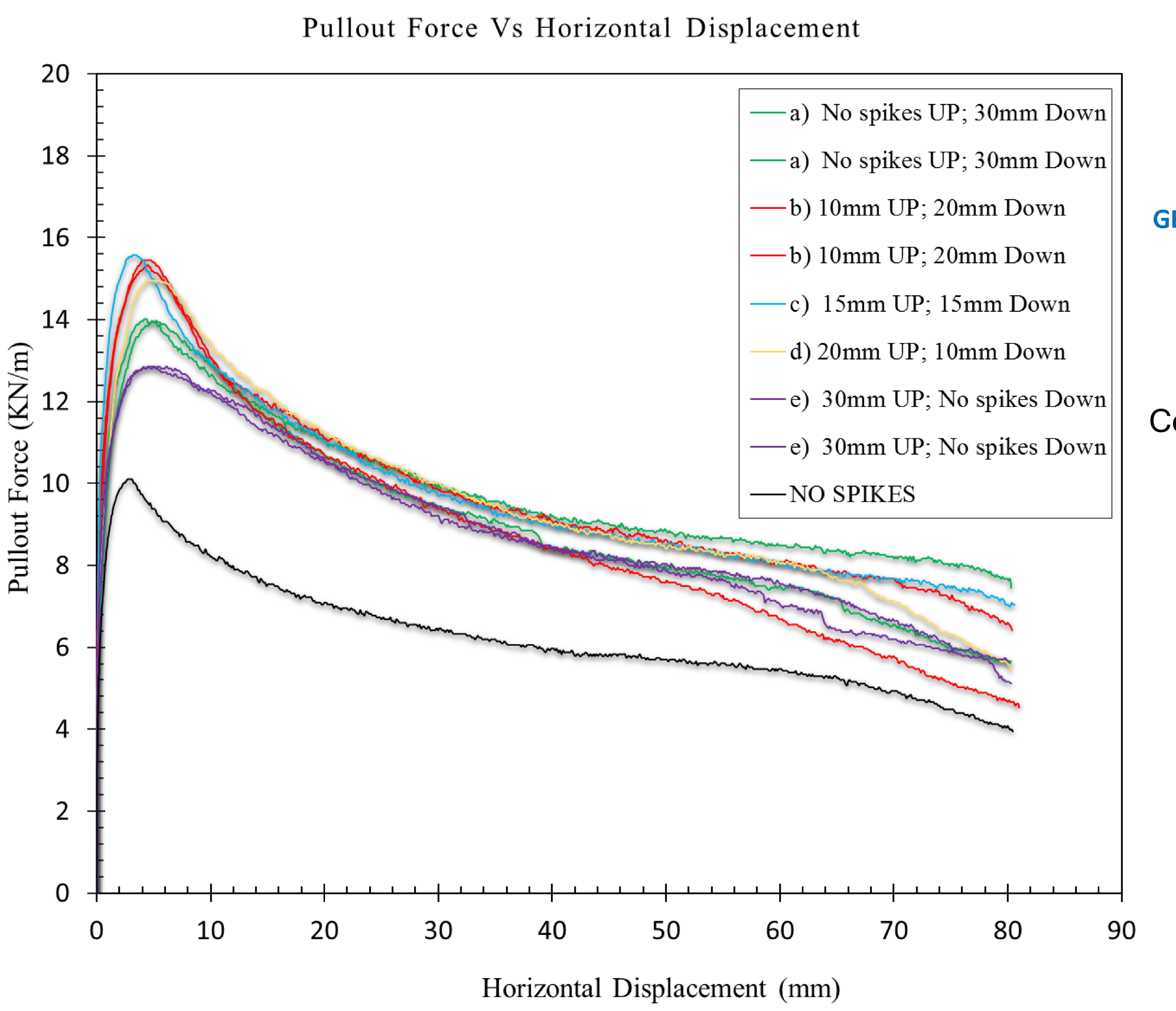


Fig. 6: Effect of configuration of Spikes on Peak pullout resistance

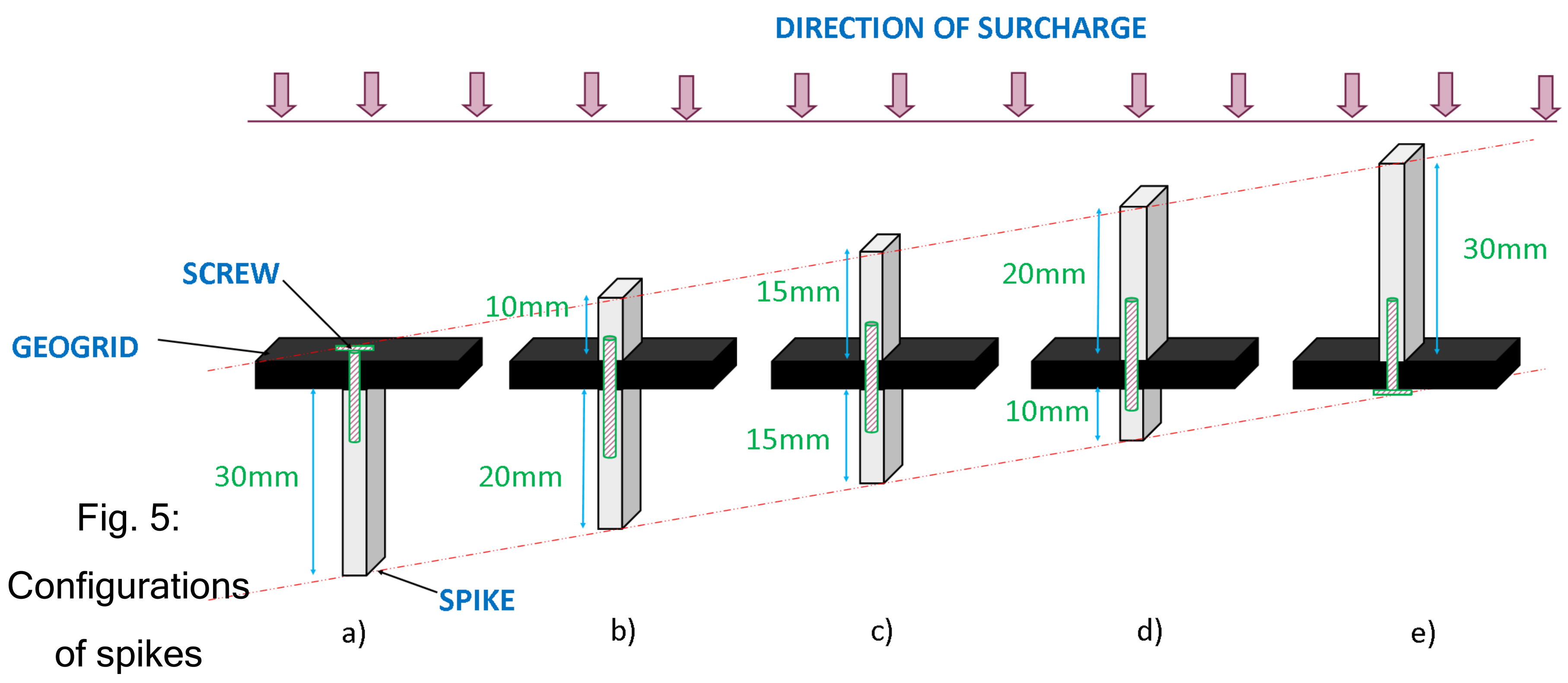


Fig. 5: Configurations of spikes

As shown in Fig. 6, higher peak pullout resistance were noted when the spikes were on both sides (configuration b, c & d) of the geogrid as compared to one side (configuration a & e). This may be attributed to tilting of spikes and unbalanced anchorage when on one side. Also, higher peak values were noted for one-sided configuration when the spikes were on the lower side (a). This may be due to higher pressure and resistance to heaving by the bottom plate of the box.