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GDM

Interaction between transversal members of square-shaped geocells embedded in sandy backfill soil

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Geo-disaster Mitigation Engineering

Research Objective

The newly-developed square-shaped geocell exhibits higher pullout resistance, compared with the planar tensile reinforcements (e.g. geo-grid; Han et al. 2012). However, if transversal members are close to each other, a softened region will form behind each member that moved by the pullout force and it will affect the passive bearing resistance of the following transversal members. This study aims to study the interaction between transversal members of square-shaped geocell when spacing (*S*) between transversal members changes.

Methodology

A series of pullout tests were conducted for geocell models with different *S* (30, 60 and 360 mm), while the same height of transversal members (40 mm), embedded in Sand No.5 backfill.

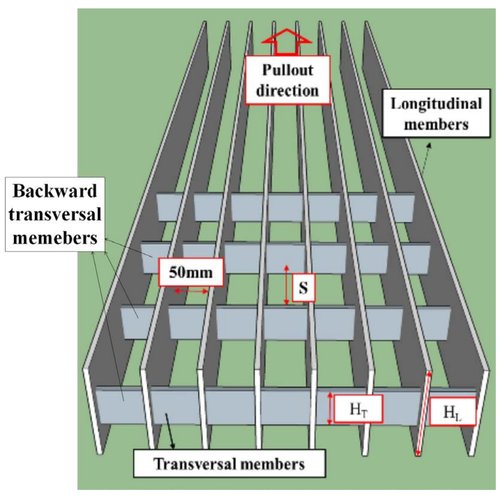

Fig.1. Square-shaped geocell model

Fig.2. Sand No.5 (D_{50}=0.64mm)

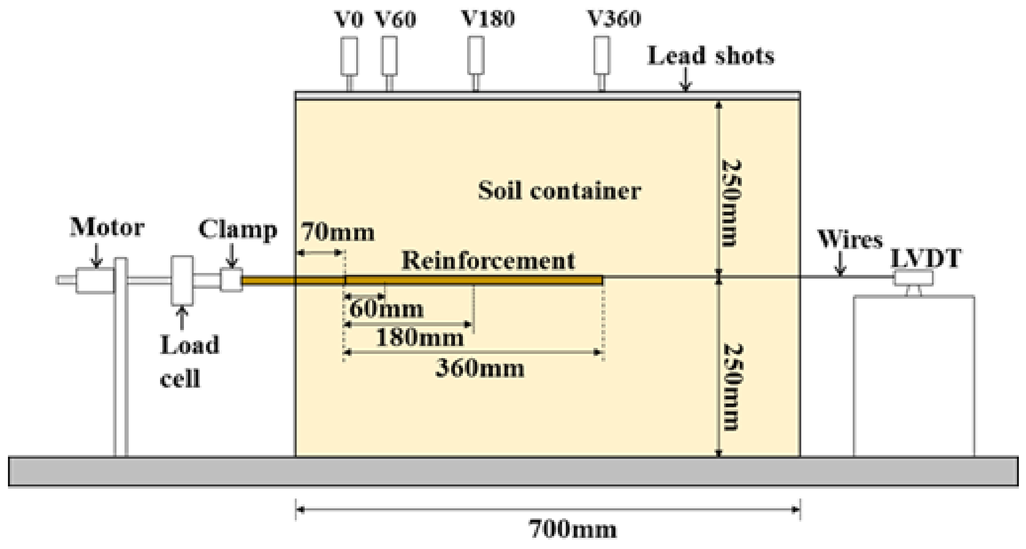

Fig.3. Schematic diagram of pullout apparatus

Test results

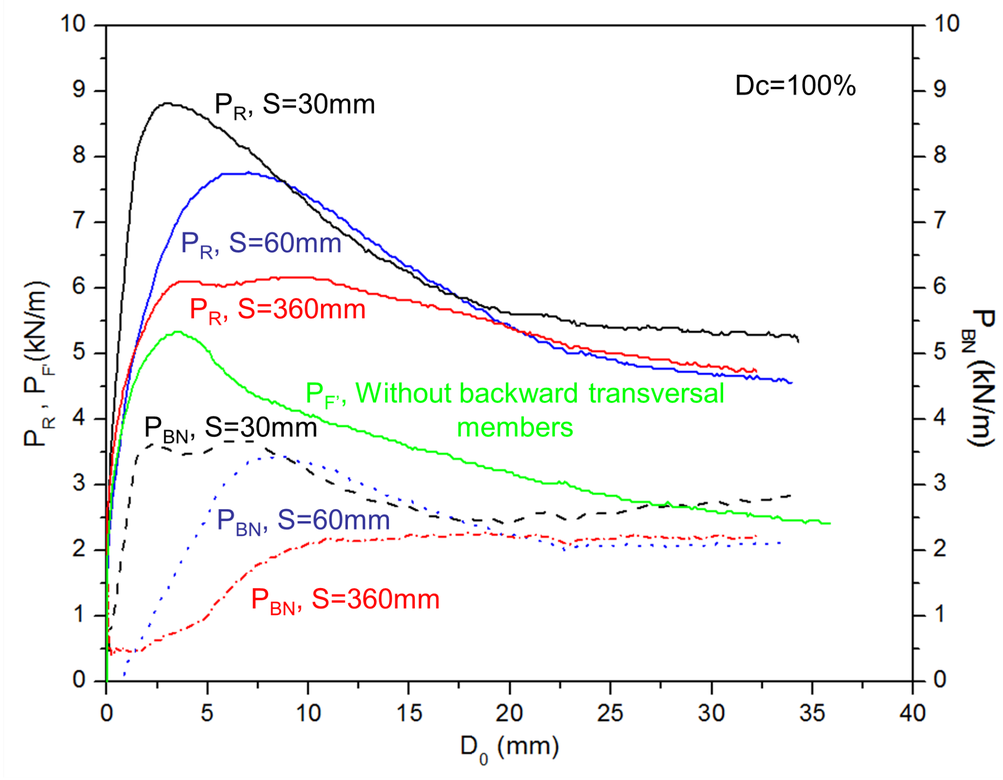

Fig.4. Pullout characteristics (P_R, $P_{F'}$, P_{BN})

Assumption: $P_{BN}= P_R - P_{F'}$

- **Main interaction between soil and geocell:** *skin friction* between soil and longtudinal members, *passive bearing resistance* against transversal members
- **Total pullout reisistance of geocell (P_R) :** the *sum* of the *skin friction resistance* and the *passive bearing resistance,* which were assumed to be independent of each other
- **Passive bearing resistance of backward transversal members(P_{BN}):** the *difference between P_R and $P_{F'}$*, which is the *pullout resistance* of geocell models *without backward transversal members*, that is the *sum of skin ressitance and the passive beaing resistance against the first transversal member*

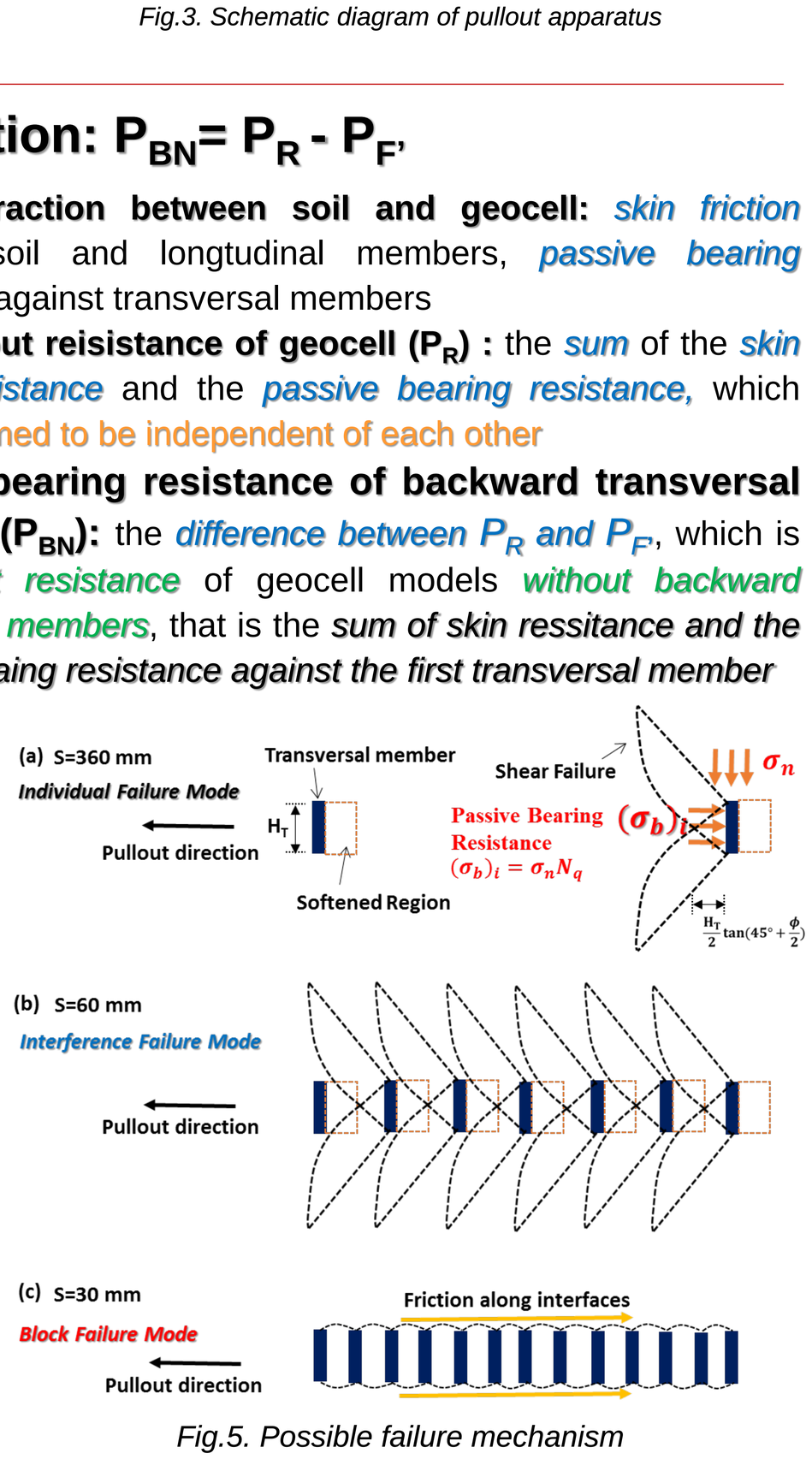

Fig.5. Possible failure mechanism

Individual Failure Mode (S=360mm): the passive bearing resistance was fully mobilized and it was not influenced by the softened region (Fig.5a); the P_{BN} had a hardning behavior (Fig.4)

Interference Failure Mode (S=60mm): the passive bearing resistance was not fully mobilized and it was influenced by the softened region (Fig.5b); the P_{BN} had a softening behavior at D_0=8.0mm (Fig.4)

Block Failure Mode (S=30mm): shear surface caused by transversal members joins together and forms a rough shear surface (Fig.5c); the P_{BN} had a softening behavior at D_0=2.5mm (Fig.4)