

Case Study

# Soft Ground Stabilisation and Reinforcement with **SECUGRID®**





Fig. 1: Secugrid® installation

Pulau Indah is an island off the coastal Klang district located about 40km from Kuala Lumpur, the capital of Malaysia. West Port, the largest port in Malaysia ranked 12th in the World Container Ports at the time of writing, is located on this island. Klang is well known for unfavourable ground conditions and engineering challenges for construction on the widespread soft clay deposits. The so-called “Klang Clay” consists of rather homogenous soft clay (SPT  $N < 4$  or  $s_u < 50\text{kPa}$ ) with a thickness of up to 25 to 30 meters and a water table up to 1 meter below existing ground level.

### Challenge

The project involved the construction of a haulage depot and container truck parking area within an industrial park. The existing foundation was soft, overlain with a previously reclaimed sandy fill of up to 3 meters. Based on results from the Subsurface Investigation (S.I.), the low SPT  $N$  values indicated soft soil profiles at the site up to a depth of 28 to 30 meters below existing ground level.

The initial design for the foundation was based on conventional methods to remove & replace (R&R) the soft soil with sandy fill in order to achieve the required bearing capacity. Excavation of soft soil at high water levels is

slow in inclement weather. The consequential construction delays together with the cost of fill material and temporary shoring would make this step very expensive.

### Solution

The client wanted an innovative solution to construct the foundation. The proposed method would require approval from the Industrial Park Developer and the Local Authority. NAUE’s partner in Malaysia, Alpha Pinnacle, reviewed and provided a ground improvement solution with the stiff biaxial geogrid Secugrid®. The excavation was kept to a minimum and finished with a 300mm thick compacted layer of crusher run as the final working platform layer.

Secugrid® geogrids are laid and welded biaxial geogrids made of pre-stressed high modulus PP or PET polymer bars with textured surface. This technology allows Secugrid® geogrids to have high stiffness at low elongations. With this benefit, Secugrid® can provide a high level of stabilisation and reinforcement even at very low deformations. The stiff geogrids are superior in soil reinforcement elements because they resist high tensile forces at typically very low elongation levels of between 1 and 2%. This provides an immediate force connection and

interlocking with the fill. The improved load-distribution behaviour of the Secugrid® stabilised and reinforced layer also reduced stress concentration on the soft clay layers enabling higher loading to be applied at lower settlement levels.

The client was highly satisfied because Secugrid® was easy to install with minimal installation guidance and required no heavy equipment on site. Due to minimal excavations this solution saved considerable time and construction costs. The installation of Secugrid® with the crusher run was completed in less than a week, ahead of work schedule. This solution met with all relevant local approvals and proved to be a cost-effective solution for soft ground stabilisation and reinforcement.

#### Project Name:

Development of Haulage Depot, Jalan Sungai Chandong, Pulau Indah Industrial Park, Klang, Selangor, Malaysia

#### Client:

Mabah Construction Sdn Bhd, Shah Alam, Selangor, Malaysia

#### Distributor:

Alpha Pinnacle Sdn. Bhd., Subang Jaya, Selangor, Malaysia

#### Product:

Secugrid® 40/40 Q1



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