



DEVELOPMENT OF A FACTORY ON LOT 29138 SERENDAH, SELANGOR – MALAYSIA DYNAMIC COMPACTION/DYNAMIC REPLACEMENT (DC/DR)

Category: Factories and Warehouses
Developer: UMW Corporation Sdn Bhd
Consultant: Johan Setia Perunding
Contractor: WD Infra Sdn Bhd
Area / Quantity: 82,650 m² (5 treatment layers)
Year: Dec 2015- Feb 2016



PROJECT DESCRIPTION

The project consists of ground improvement works to accelerate the filling of a valley for the construction of an industrial complex to manufacture the fan cover of an aeroplane engine.

The facility is to be built across an existing valley at a general level of RL+65.00 m, where the existing valley has its lowest point right in the middle of the future built up area, at level of RL+41.00 m, with stagnant water at level of RL+45.00 m approximately. The surrounding hills are having peak level at RL+80.00 m and above.



Figure 1: Site clearance for ground improvement works

SOIL CONDITION / GEOTECHNICAL PROBLEM

A factory is to be built on a piece of land that geographically is a valley with lowest point at RL+41.00 m and highest point in excess of RL+80.00 m. The land need to be cut and filled to establish a final platform level at RL+65.00 m. In the initial design, filling of the valley is to be done using conventional layer by layer compaction method. Nonetheless, an innovative solution combining Dynamic Compaction (DC) and Dynamic Replacement (DR) is eventually adopted to accelerate the filling of the valley.

The following design criteria shall be respected at level RL+65.00 m after the ground improvement works using DC and DR at the fill area:

- The total post construction settlement shall not exceed 15 cm under the maximum load of 50 kPa (due to the dead and live loads of future structures)
- The maximum differential settlement shall not be more than 1:500

MENARD SOLUTION

Menard has introduced DC and DR method to reduce the filing duration from 4 months to 2 months and also to meet the post construction settlement criteria of 15 cm. DC and DR are the ground improvement methods carried out on site to compact the fill material with thickness of about 5 m. DC is the primary method to compact the fill material. However, since "mini" DR columns are created during the compaction, the technique is eventually called DC/DR.



DEVELOPMENT OF A FACTORY ON LOT 29138 SERENDAH, SELANGOR – MALAYSIA DYNAMIC COMPACTION/DYNAMIC REPLACEMENT (DC/DR)

Category: Factories and Warehouses
 Developer: UMW Corporation Sdn Bhd
 Consultant: Johan Setia Perunding
 Contractor: WD Infra Sdn Bhd
 Area / Quantity: 82,650 m² (5 treatment layers)
 Year: Dec 2015- Feb 2016



DC/DR treatment is carried out in 5 layers i.e. at RL+45.00 m, RL+50.15 m, RL+54.90 m, RL+59.65 m and RL+64.40 m. The total treatment area combining all 5 layers is approximately 82,650 m².

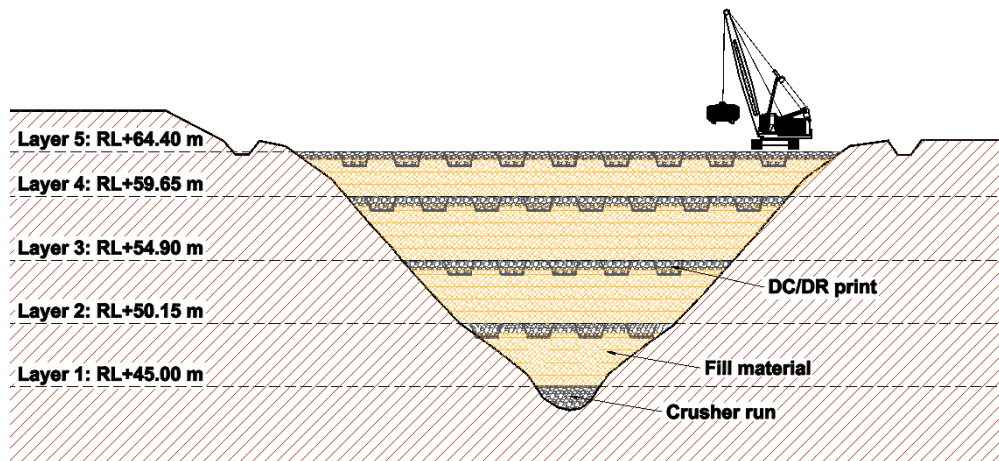


Figure 2: Cross-section of DC/DR works



Figure 3: Ongoing DC/DR works

QUALITY CONTROL

A total of 82,650 m² is improved using DC/DR and this results in the increase of soil strength and at the same time, compressibility and settlements are decreased as a result of the densification.

Pre-treatment and post-treatment PMTs are conducted to determine the Pressuremeter Modulus, E_p of the earth fill before and after the DC/DR treatment. The results show significant increase of E_p after DC/DR works. Based on the E_p obtained, the total post construction settlement due to 50 kPa load is calculated to be 4.2 cm which is lower than the acceptance criterion of 15 cm.