

KING ABDULLAH UNIVERSITY OF SCIENCE & TECHNOLOGY THUWAL - KSA



DYNAMIC COMPACTION / DYNAMIC REPLACEMENT

Category: Residential & Commercial
Developer: Aramco
Engineer: N/A
Contractor: Bin Ladin Group – Al Khodary & Sons Contracting
Area / Quantity: 2,700,000 m²



PROJECT DESCRIPTION

The Project consists in the construction of a new university along the red sea about 100 km north of Jeddah in Saudi Arabia.
The Project is a very fast track Project (less than 2.5 years to build the whole university including campus and all related facilities in the desert) and is followed directly by King Abdullah team with Aramco representing the Client.
The whole development is located near the sea over an area where Sabkha material is present. The presence of such material made it impossible to build the proposed development directly on the soil.

SOIL CONDITION / GEOTECHNICAL PROBLEM

Project soil profile:

It was evident that the ground conditions would not meet any of the design expectations. The soil investigation indicated that the soil was highly heterogeneous with 8 to 10 m of loose soil. Soft cohesive soils of 2 to 5 m thick were inter-bedded with loose layers of sand or silty sand. SPT values were as low as 0.

Meanwhile, a solution based on classical foundation such as piles was difficult to be implemented as the layout was not yet fixed when the Works was to be executed. Such a solution would thus have had a dramatic impact on the overall planning, which was not acceptable.



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MENARD SOLUTION

Due to the diversity of the ground conditions; i.e. the presence of loose sands and soft silts, it was decided to optimize the foundation solution by implementing *dynamic compaction (DC)* and *dynamic replacement (DR)* in the project. The choice of the technique was dependant on the soil characteristics of each area.

Soil improvement design parameters were optimized by carrying out a DR/DR calibration program.

Starting from the beginning of mobilization, all ground improvement works were scheduled to be completed within a period of 8 months, but the mobilization of 13 cranes increased production, and the works' duration was even further reduced.



QUALITY CONTROL

Verification for bearing capacity and settlement criteria was achieved by performing one pressuremeter test per every 20,000 m² of ground improvement. One CPT test was carried out per every 6,000 m² of soil improvement to verify the earthquake mitigation requirements.

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