



Dynamic Replacement

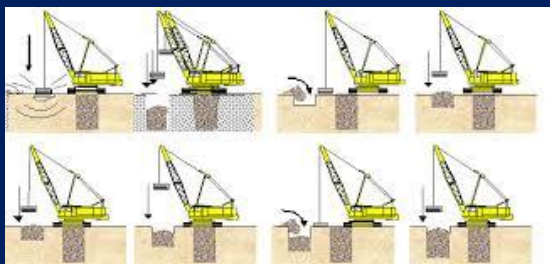
Stone columns installed using dynamic penetration method is an extension of Dynamic compaction. It is generally termed as Dynamic Replacement Method. The technique is being used successfully for many infrastructure projects under different soil conditions (ports, airports, heavy storages, buildings, landfills etc) to densify & make stone columns.

Applications

Dynamic penetration targets inclusion of Stone columns & densification the surrounding soil in order to increase its bearing capacity, decrease post construction settlements, stability for landfills and mitigate liquefaction risks in case of seismic events. It is well adapted for any types of soil with or without saturation, organic waste for various infrastructure facilities like buildings, ware house, roads and highway constructions, tanks, landfill's applications, container terminals, airports apron etc.

Implementation and methods

In this application, the tamping energy drives granular material down into the compressible soils to form large diameter soil reinforcement columns (with diameter around 1.8 to 2.5 m). Additional improvement can be obtained in the underlying layers through the transmission of the energy of the weight at depth. This method thus combines advantages from both Dynamic Consolidation and Stone Columns by creating large-sized Dynamic Replacement Inclusions with high internal shear resistance.



Stone columns installed using Dynamic penetration are formed by dropping a 10 to 15 tons pounders from heights ranging from 10 to 30 m . With this

technique, replacement ratios of up to 20 to 25% can be achieved. Each Dynamic Replacement Column can support loads of up to about 150 tons.



Calibration area

The treatment parameters such as spacing between the Granular columns, Diameter of the columns, required replacement ratio, Quantity of stone etc. are confirmed on site during the calibration period which includes in-situ testing and pounder penetration tests.

Quality control

Stone columns installed using dynamic penetration method is a fully controlled process which relies on the systematic assessment of the achieved soil characteristics by standard penetration tests or cone penetration tests, pressure meter tests. The results of post installing the columns are analyzed in order to quantify the required bearing capacity, settlement reduction, liquefaction treatment etc.

Code & References

- *Guidelines for the design of high Embankments (IRC: 75-2015)*
- *U.S. Department of Transportation-Federal highway Administration (FHWA) Publication No: FHWA-RD-83-026, 027*
- *Geotechnical Engineering books for calculating bearing capacity, settlement & liquefaction mitigations.*

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