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‘‘SOIL GROUND IMPROVEMENT BY VIBRO COMPACTION’’

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Abstract: The deep vibration compaction method is widely used for ground improvement of granular soils. The porosity of the soil is reduced and therefore liquefaction due to dynamic excitation is prohibited. The deep vibration com-pactor consists of an unbalanced mass inside a steel tube. The mass located inside the tube is rotating around the vertical axis of the compactor such that the compactor is oscillating during the compaction process. Therefore, the vibration energy is directly transferred from the tube into the surrounding soil. Numerical simulations of this pro-cess are performed using a coupled Eulerian-Lagrangian Method (CEL).

I. INTRODUCTION

The Vibro Stone Column technique is one of the most widely-used ground improvement processes in the world, although its potential for improving Irish sites has yet to be fully exploited. Historically the system has been used to densify loose granular soils, but over the past 35 years, the system has been used increasingly to reinforce soft cohesive soils and mixed fills. This paper will describe the technique, applicable soil types, settlement and bearing capacity calculations, recent research areas and an Irish case study.

Vibro-Flotation is a collective term for forms of ground improvement brought about by inserting a vibrating poker into the ground, and includes Vibro-Compaction and Vibro-Replacement. The latter process is often referred to as (Vibro-) Stone Columns.

Vibro-Compaction was realised with German river-borne granular soils in the 1930s, but it was not until the 1960s that Stone Columns were deployed for improving cohesive soils. Stone Columns were first used in Ireland in the 1970s. The technique is continuing to gain popularity today due to the considerable savings to cost and programed schedule that it can offer over conventional piling solutions in many circumstances.

The Vibro-Replacement process is discussed in this paper along with a description of the mechanism of stone column behavior under load and associated design philosophies. A checklist for the use of stone columns in marginal ground conditions and some practical findings from recent research programmers are also presented. Ample references are provided for those interested in engaging with the topic in more detail.

India has large coastline exceeding 6000kms. In view of the developments on coastal areas in the recent past, large number of ports and industries are being built. In addition, the availability of land for the development of commercial, housing, industrial and transportation, infrastructure etc. are scarce particularly in urban areas. This necessitated the use of land, which has weak strata, wherein the geotechnical engineers are challenged by presence of different problematic soils with varied engineering characteristics. Many of these areas are covered with thick soft marine clay deposit, with very low shear strength and high compressibility. The Vibro Stone Column technique is one of the most widely-used ground improvement processes in the world. Vibro-Flotation is a collective term for forms of ground improvement brought about by inserting a vibrating poker into the ground, and includes Vibro-Compaction and Vibro-Replacement. The technique is continuing to gain popularity today due to the considerable savings to cost and programmed schedule.

II. METHODOLOGY

01. Improve the load bearing capacity of soil
02. Increase soil strength
03. Reduction in the flow of water (Water seepage)
04. Decrease future settlement of foundation (Lower Compressibility)
05. Increase the shear strength of soil
06. Increase Soil Stability
07. Reduction in soil swelling (Expansion) and collapse (Soil Contraction)

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III. LITRATURE REVIEW:

Most types of ground improvement are intended to work with the existing ground whereas rigid inclusions (piles) are intended to bypass the ground to some extent. While stone columns will transmit some load to the soil by shear stresses (along the column-soil interface) and end bearing (at the column base), the predominant load-transfer mechanism (unless the column is very short) is lateral bulging into the surrounding soil. The relevant column stresses are depicted in Figure 3, while Figure 4 illustrates the bulging phenomenon in model granular column tests in clay carried out at the University of Plymouth. The passive resistance of the surrounding soil dictates the column performance under load. Generally the column bulging will be greatest close to the top of the column where the overburden pressures are lowest

CONCLUSION

1.The Irish construction industry has been slower than many of its European counterparts to recognize the technical and economic advantages that Vibro Stone Columns can provide.
2,Ireland has an abundance of soft estuarine and alluvial soils and these may be improved sufficiently to allow standard foundations to be constructed at shallow depth, without the need to resort to deep piling.
3.Where ground conditions are suitable, stone column solutions have been shown to be more cost effective than trench fill in excess of 2m depth. In addition, stone columns can offer considerable contract programmed savings over other ground improvement methods, such as preloading and vertical drains.As with all geotechnical projects, a thorough site investigation with adequate information on soil strength and compressibility is essential.

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