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A Review on the Behaviour of Combined Stone Columns and Pile Foundations in Soft Soils when Placed under Rigid Raft Foundation

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In the last few decades, it has been observed that raft foundations are very commonly used as a foundation solution for moderate to high rise structures either by resting on stone columns or on piles in soft soils. It is believed that, combining stone columns and piles in one foundation system is the more suitable foundation for medium rise structures. The combined foundation system provides a superior and more economical alternative to pile, and a more attractive alternative to stone columns in respect to ground improvement. This paper presents the review of existing studies reported in the literature in the last two decades about the behaviour of stone columns under raft foundations and piled raft foundation in soft soil, notably the failure mechanism and the bearing capacity. Also, a limited work from the literature concerning the performance of combined (pile/stone columns) foundation system in soft soil is comprised. Furthermore, very extensive ongoing research work regarding the investigation and study on the performance of combined (pile/stone columns) foundation system in soft soils is discussed. The main goals and methodology to study the performance of the combined (pile/stone columns) foundation systems in soft soil are also addressed.

Keywords: behaviour; stone columns; piled; raft foundation; soft soil

I. INTRODUCTION

Nowadays, construction of medium to high rise buildings are very common due to the expansion and development of urban areas. The foundation system required for such buildings are raft foundations either on the ground improved with stone columns or resting on piles. Piles are employed on soft soils on which foundations have low bearing capacity and high consolidation settlement. They carry load through soft soil to firm stratum through bearing and/or side friction. They are usually deployed for cases of large loads (such as high rise building) applied on poorly densified soils. However, advance planning and heavy equipment are required for driving them. Stone columns consist of crushed coarse aggregates of various size compacted in long cylindrical holes in the ground to ameliorate the performance of soft soils and the rate of consolidation. When installed, stone columns modify the original soil to a composite ground of low compressibility and high shear strength. They are simple and cost-saving alternative. They are best suited for low-rise loaded industrial structures. Combining stone columns and piles in one foundation system, definitely improve the carrying capacity of the system, accelerate the rate of consolidation of the soil foundation, modify the soil foundation to a new upgraded composite ground, and certainly reduce the cost of the geotechnical works (Manojit Samanta & Riya Bhowmik, 2017). It can be advanced that the combined foundation system provides a superior and more economical alternative to pile, and a more attractive alternative to stone columns in respect to ground improvement and amelioration of the

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