Journal of Advances in Science and Technology
Vol. 19, Issue No. 1, March-2022, ISSN 2230-9659

Selection of Ground Improvement Technique for Costal Road (A Review)

Mr. Mahamud Mubarak Shaikh*

PG Scholar, PVPIT Bavadhan. Pune

Abstract - Every Civil engineering project have its own unique characteristics. The success of project based on Good returns in less financial investment. The engineer must take a determination on how best to achieve the desired goals required by providing a workable solution for each project encountered. If any stage ground Improvement required, it would not be impact any negative. Ground improvement shall help positively to make success of project. The final results of any ground improvement technique shall be give required safe & stable ground, minimum financial impact, less time period and no disturbance to existing establishment, not additional material need to procure etc.

The Marine soil or Soft soil present in approximately 19 hector area near Haji Ali stretch. The main 8 arm interchange are coming in same part. There for heavy foundation required stable ground at least 20.00 T/m2 bearing capacity. The required bearing capacity can't achieve in such critical area. Hence ground improvement required. After improvement technic mentioning required to confirm the settlement. study the various construction method adopting for improve the soil or ground. Every method had it's own pros and cons,which will help to decide the most suitable method for problematic soil to improve it's capacity. So it can be available to carry each type of civil engineering structures. Selection of method based on situation and required results, here are taken case study of Coastal road project.Project duration and economy also main factor affecting on selection

Keywords - Soil, Site Selection Costal Road

----------X----------

INTRODUCTION

Ground improvement this word self-explanatory, which technically define "the procedure typically using to improve poor ground conditions by mechanical means". Poor soil strata is major challenge to all kind engineering structure. Minimum required bearing capacity shall available to design all foundation of structures. In Civil engineering various methods carried out for improve various properties of the soil mass, which is treated to meet project performance requirements. The required safe bearing capacity for design loading with cost & time save also need to consider before of finalization of method. As well as finalization of method also based on several factor, as far as project condition & availability of material for nearby topography are affecting major roll

LITEATURE REVIEW

Hamed Niroumand (2017) Author Conclude that Reinforced stone columns are a ground improvement method to improve the load bearing capacity of the soil. The local soils are by nature, unable to bear the proposed structure. Hence the groundimprovement methods can be necessitated. The area replacement ratio is defined as the area of the stone column to the tributary area per stone column. For foundation applications, coverage should be extended beyond the perimeter of the structure to account for stress spread with depth. The inclusion of horizontal meshes increases the load carrying capacity of granular columns. The performance increased with the increasing of mesh numbers. It was also found that ductile materials in the plate forms were the best reinforcement arrangement for the granular columns. The geosynthetic encasement prevents the contamination of stone column and thus will not reduce the friction between the stone aggregates and clay bed.

Ahmed Naseem A.K (2018) Author Stated that Stone column technique is the economical method for improving the load carrying capacity of softclay soils and decreases the settlement rate. It can be constructed by any two methods. Stone columns with geo reinforcement have improved the bearing capacity of soft clay soils.The stone column bearing capacity has increased with increasing the friction angle of granularmaterials and stone column diameter.The bearing capacity improvement of soft clay soils may not be give better results due to low lateralconfinement. To resolve this issue geo synthetic materials are used for encasement of stone columnsso that it improved the performance.The ultimate bearing capacity of the reinforced stone column increases with the stiffness of thereinforcement.By using geo synthetic materials in stone columns as encasement proves reduction in

settlement.Much research work has been carried out to study the behavior of columns without reinforcement aswell as with reinforcement

P. Yuvaraj (2016) paper finds that Numerous instances arise where the soil at many sites at shallow depths are not having required properties to support proposed structures. In some situations, poor soil conditions may pose problem for the integrity of existing structures. In response to these needs special techniques for the inplace treatment of soils have been developed and are practical effectively. Among the several methods the techniques of stone column is one popular since themethods require less time to implement and improvement is quicker.

Karun Mani (2016) Stone column improves the shear strength of the subsoil to increase the bearing capacity. It improves the stiffness of subsoil to decrease settlements. It has the ability to carry very high loads since columns are ductile. It is more economical than piling. Rapid consolidation of subsoil is facilitated in stone column. Immediate increase of shear strength and friction angle of treated soil occurs. There is no waiting period after installation unlike PVD. Embankment construction can begin soon after installation. When installed in a uniform grid pattern it 'homogenizes' variable soil properties, thereby reducing the potential for differential settlement.

AdhilaHaris and Hany El Naggar (2020) Stone column or vibro replacement is a well-established ground improvement technique and proven to be effective in improving the bearing capacity and reducing post construction settlement in weak soil strata. Stone columns are applicable in a wide range of soils except for soils with a very low undrained cohesion offering very small lateral support. Depending upon the structure it supports (individual footing or rigid slabs), stone columns can be installed in small or large groups with varying grids. The case study of the stone column discussed in the present paper shows that vibro replacement is effectively applied under tank foundations meeting the higher bearing capacity requirements and stringentsettlement criteria. Care must be taken to achieve optimum design in terms of spacing and depth of the stone column to obtain the economic benefit of this simple and environmental friendly technique. Real time monitoring , supervision and quality tests in the field should also be in focus to save time and cost of the project.

SoumyakrishnaEega (2021) Ground improvement is an important requirement in today's construction industry as land reclamation is becoming increasingly popular. Stone column method is one of the efficient and economical method and it is one of the soil stabilizing method that is used to increase the bearing capacity and decrease the settlement of soft soils. In this research paper the bearing capacity, settlement of stone columns and encased stone columns were analysed using a scaled model. Gunny bags are used as geo textile for stone column encasement. The results shown significant improvement in bearing capacity of soil using stone column, the efficiency of stone column is increased when encased with geotextile.

Samuel Thanaraj. (2015) it has been observed that The performance of encased stone column of smaller diameters is superior to that of larger diameter stone columns for the same encasement because of mobilization of higher confining stresses in smaller diameter stone columns. The ultimate load capacity of the reinforced column increases with the stiffness of the reinforcement. Geosynthetic encased stone column reduces settlement almost half that of untreated ground.The ultimate bearing capacity of reinforced stone column and stone column treated beds are about three times and two times that of the untreated bed. While theoretical analyses and model testing results indicate that geosynthetic encased stone column methods can be efficient for soft soil improvement, well-documented case histories of successful utilization are rather limited. There remains a great need for well-documented data sets of field performance scenarios.

R.Oviya (2016) The techniques which increases the ground condition includes compaction, vibration, drainage methods, stabilization techniques, soil reinforcement and application of geotextiles and geomembranes. In this paper we are going to see how the vibration techniques helps in improvement of ground condition in effective way. Vibration techniques includes both vibro compaction and vibro displacement technique. Vibro compaction methods are effectively used in rapid densification of saturated non cohesive soils. This method produces shock waves on loose deposit materials and reduces the liquefaction and settlement of soils. The excess pore water pressure is also reduced by this technique. On the other hand, vibro displacement method consists of active displacement of soil followed by vibration and backfills the pores beneath by soil compaction. In case of construction to be done above the coarse grained soils with less fines, this method can be implemented to improve the ground and soil. This paper on following briefly explains the vibro technique and its applications in ground improvement.

Riya Robert (2017) The stone column technique is an economical and effective method of soft soil stabilization. They are used to support embankments, large raft foundations and isolated footings. Stone columns can improve the load carrying capacity and reduces the settlement of the problematic soil. Construction can be started quickly due to the accelerated dissipation of excess pore water pressure in to the drainage formed by the stone columns Before designing the stone column, thorough subsoil investigation should be done from in-situ test results and bore logs.

Sneha P. Hirkane(2017) In view of achieving the aim and objectives of this study a detailed literature survey was being carried out. It gave us an idea

regarding different methodologies adopted for ground improvement techniques. It was decided to go for the use of the software Microsoft Excel for the calculation of settlement and time period for untreated land. By using this software settlement was calculated. A comparative study was carried out between PVD and stone column. By extracting result we have concluded that PVD is costlier than stone column. It has also seen that settlement by using PVD is more than stone column.

Samuel Thanaraj(2019) observations were obtained from this paper Among the different materials used Aggregates along with the encasement gives higher strength than other materials. The values of other materials are moderately nearer to the value of stone column with conventional material aggregates. The geosynthetic encasement prevents the contamination of stone column and thus will not reduce the friction between the stone aggregates and clay bed. The encasement prevents from bulging effect on the top portions which was studied in detail from the literatures as well. Pressure settlement response of geosynthetic encased stone columns generally shows linear behaviour not indicating any catastrophic failure unlike the conventional stone columns.

Concluding Remark: thorough study on various available modern ground improvement techniques and their applications in civil engineering in present scenario. On the basis of long-term performance results of various ground improvement techniques and its analysis, an efficient design can be developed and a suitable method of ground improvement technique may be adopted for a particular application The reviewed literature concluded about the stone columns and the use of geosynthetics used for the encasement of stone columns experimentally and numerically. By providing encasement it gives more improved results. The stone columns designed are of types short, floating and fully penetrated. In short stone columns punching failure occurred while in fully penetrated stone columns bulging failure takes place. As now a days to fulfil the requirement of land more research is required in the field of construction of stone columns by using different types of geosynthetics according to the availability. The stone columns are constructed single or in groups depending upon the requirement. In group it maybe in triangular or in square pattern based on loading criterion. By using different type of factors according to the location different types of researches takes place to improve the properties of the soft soil. More research is to be required for the same.

REFERENCES

1. The Offshore Ground Improvement Records prepared by BabakHamidi, Jean-Marc Debats, Hamid Nikraz, & Serge Varaksin from Curtin University-Civil Engineering Department. written.
2. The book publishes by Aedermannsd of Trans Tech Publications in the name of “Pressure meter and Foundation Engineering” written by Mr. Baguelin, F., Mr. Jezequel, J. F. & Mr. Shields, D. H. in 1978, useful to understand Concept of foundation, its design, Design requirements varying as per different water level, what are the changes required in soil for foundation design etc.
3. Mr. Berthier, D., Mr. Debats, Mr. J. M., Shcarff, G. & Mr. Vincent, P. in Coasts and Ports 2009 Conference, Wellington, 16-18 September 2009 in the title of “Marine and Land Based Compaction Works at the Port Botany Project, Sydney”-A case study brief the ground modification & improvement done for Port Botany (Sydney) construction work.
4. Author Mr. Varaksin, S. & Mr. Hamidi, B Ground Improvement Case Histories and Advances in Practice in International Conference on Ground Improvement and Ground Control -
5. A Case Study on Ground Improvement Techniques And Its Applications published in International Journal of Scientific & Engineering Research Volume 8, Issue 9, in September-2017 by Mr. ShankoAyele,(M.Sc.), Lecturer in Department of Construction Technology and Management, College of Engineering and Technology, Dilla University, Ethiopia.
6. "Recent Developments in Ground Improvement Techniques- A Review," paper presented by Mr.S. K. Tiwari and N. K. Kumawat, in International Journal of Recent Development in Engineering and Technology, vol. 2, no. 3, 2014.
7. Mr. Hausmann, M (1990), in the name of “Engineering principles of Ground modification” by McGraw-Hill Publications, also reference to understand details Principal regarding ground improvement & results.
8. Mr. Garg, S.K., written book “Soil mechanics and foundation engineering”, to understand different soil mechanics concepts, terms & relation. The properties of soil & correlation are affecting foundation design & hence directly reason for ground improvement.
9. “Soil Improvement Prefabricated Vertical Drain Technique,” publish by Thomson Learning & written by Mr. Bo, M.W., & Mr. Chu, J., Mr. Low, B.K. & Mr. Choa, V. (2003),
10. Mr. Mohammad Bilal from Department of Civil Engineering, Aligarh Muslim University, Aligarh. & Mr. Abdullah Talib from Department of Civil Engineering, IIT Delhi, written book with title of “A Study On Advances In Ground Improvement Techniques”
11. “Soil Improvement Techniques”, by Mr. GaaferManar , Mr. BassioniHesham, Mr. Mostafa Tareq , paper presented in International Journal of Scientific & Engineering Research, Volume 6, Issue 12.

12. Mr. A. Prashant and M. Mukherjee, written "Soil Nailing for Stabilization of steep slopes near railway tracks," a specially for avoid & protection land slide near railway track in 2010.
13. Mr. D. N. Little and Mr. S. Nair, written "Recommended Practice for Stabilization of Subgrade Soils and Base Materials," in 2009, this paper mentioned latest practice for Subgrade & Base stabilization process & results.
14. Mr. R. V.R and Mr. S. Valluri from Hyderabad written on "Practical Applications Of Ground Improvement," in 2008.
15. Mrs. Sneha P. Hirkane, publish in International Journal of Inventive Engineering and Sciences (IJIES), vol. 2, no. 2, in 2014. With title of "Ground Improvement Techniques,"
16. As well as Mr.A. S. Negi, Mr. M. Faizan, Mr.D. Pandey Siddharth and Mr.R. Singh, published there paper with name of "SOIL STABILIZATION USING LIME," in International Journal of Inventive Engineering and Sciences (IJIES), vol. 2, no. 2, 2013.
17. The Rock Manual-The use of rock in hydraulic engineering (2nd edition) which is most known as CIRIA C683 manual , is useful for construction guide line for Marine structure.

Corresponding Author

Mr. Mahamud Mubarak Shaikh*

PG Scholar, PVPIT Bavadhan. Pune