Ground Improvement Techniques

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Abstract:

Ground Improvement techniques are often used to improve sub soil properties in terms of their bearing capacity, shear strength, settlement characteristics, drainage, etc. These techniques have a wide range of applicability from coarse grained soils to fine grained soils. Depending upon the loading conditions and nature of soil, a suitable technique which is also economical needs to be adopted. This paper gives the concept and theory of a few ground improvement techniques and describes the practical application of these techniques.

Keywords:

ground improvement techniques, light weight materials, chemical treatment, compaction grouting, jet-grouting, geo-textiles, geo-drains, reinforced earth, micro-piles, soil nailing, biotechnical stabilization, centrifuge tests, case histories.

Introduction:

Ground improvement, is the modification of existing site foundation soils to provide better performance under design and/or operational loading conditions. Ground improvement techniques are used increasingly for new projects to allow utilization of sites with poor subsurface conditions. Previously, these poor soils were considered as economically unjustifiable or technically not feasible and are often replaced with an engineered fill or location of the project is changed. In short, Ground improvement is executed to increase the bearing capacity, reduce the magnitude of settlements and the time in which it occurs, retard seepage, accelerate the rate at which drainage occurs, increase the stability of slopes, mitigation of liquefaction potential, etc.

Ground Improvement techniques may be broadly classified in to following categories:

a) Improvement by increasing effective stresses
b) Improvement by reinforcement
c) Improvement by structural fills
d) Improvement by admixtures

Based on the soil conditions, a suitable method of ground improvement should be considered keeping in view of the economic feasibility as well as the time frame. In practice, ground improvement is widely used in a broad construction spectrum from industrial, commercial and housing projects to infrastructure construction for dams, tunnels, ports, roadways and embankments. This paper presents four different ground improvement techniques along with a case history for each of the technique as an example.

Literature Review:

Sneha P. Hirkane, N. G. Gore, P. J. Salunke(ISSN: 2319–9598, Volume-2, Issue-2, January 2014):Ground Improvement techniques are often used to improve sub soil properties in terms of their bearing capacity, shear strength, settlement characteristics, drainage, etc. These techniques have a wide range of

applicability from coarse grained soils to fine grained soils. Depending upon the loading conditions and nature of soil, a suitable technique which is also economical needs to be adopted. This paper gives the concept and theory of ground improvement techniques and describes the practical application of these techniques

Raju V.R.(1st March, 2008 Hyderabad)**:**Ground Improvement techniques are often used to improve sub soil properties in terms of their bearing capacity, shear strength, settlement characteristics, drainage, etc. These techniques have a wide range of applicability from coarse grained soils to fine grained soils. Depending upon the loading conditions and nature of soil, a suitable technique which is also economical needs to be adopted. This paper gives the concept and theory of a few ground improvement techniques and describes the practical application of these techniques along with a case history for each of the techniques.

Methodology: following methods for ground improvement are

1) Without adding admixtures.
2) With adding admixtures.

Project Development:

Before starting any construction project, contractors need to ensure that they commence construction project on hard ground. If the construction of building is not done on solid ground, then it may lead to repairs and instability later on. Therefore, modern techniques such as dynamic compaction and jet grouting are essential.

Conclusion:

An increasing proportion of building development takes place on poor ground, presenting the engineering geologist with the challenge of satisfactory site characterisation and the geotechnical engineer with the challenge of providing satisfactory foundation performance at low cost. Ground treatment using stone columns provides a means of modifying ground behaviour so that ground properties are improved and heterogeneity is reduced. However, the economic design of such schemes relies upon satisfactory characterisation of the geotechnical properties of the weak made ground and/or natural soil deposits overlying the competent soil layers or rock. Historically, this has restricted the potential use of ground improvement techniques, as appraisal for suitability has been limited by the lack of geotechnical parameters. Treatment of the ground prior to building can reduce uncertainty, and, consequently, ground improvement/treatment is of increasing importance within the practice of geotechnical engineering.