International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

CASE STUDY ON APPLICATIONS OF LIME–CEMENT GROUTING TO STRENGTHEN SOIL CHARACTERISTICS

[1]N.SAIPAVAN, [2]CH.GAYATHRI

[1.] M. Tech StudentDepartment of Geotechnical engineering, JNTUH college of engineering, (TS) .India..

*Email-:*saipavan.sr@gmail.com

[2.]M.TechStudentDepartment of Geotechnical engineering, JNTUH college of engineering, (TS) .India.

Email-: gayathri.chitikeshi@gmail.com

ABSTRACT: Formulating solution to obtain the requiredengineering properties by means ofstabilizing the soil forplacing infrastructural unit without undergoing large settlement,grouting is widely used restoration method forimproving the relative density of the soil strata. This paperhas analyzed two case scenarios about soil stabilization toaccommodate reinforced cement concrete (RCC) structureto facilitate production units. Considering the soil characteristicsand to avoid further collapse of the nearby establishment,injecting lime–cement composition to strengthenthe loosen earth bearing capacity at certain depth has beenfollowed. Accordingly, researchers have shown to mend onthe discrepancy happened in both cases regardingstrengthening of disturbed soil strata up to 2 to 2.5 timeswith respect to Standard Penetration Test-Number ofBlows (SPT-N) values after carrying out pre- and post-dynamiccone penetration tests (DCPT) up to an averagedepth of 6 to 6.5 m from finished ground level (FGL), byusing of grout injection procedure. Following methodologyhas been emanated and after conducting several trialsresulted in appreciable improvement in soil consistency.Researchers believe that the study will be comparativelymore suitable for improving problematic soils in South-Asian continent. In both cases, desired soil bearingcapacity has been attained in most economical way andwithin stipulated time frame.

KEYWORDS: Formulating,postdynamic,Reinforcement,Stability,Construction,Geotechnical

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

1.INTRODUCTION

Strengthening soil properties, grouting reinforcement suchas injecting grout slurry into soil is becominga very convenienttechnique considering cost effectiveness and sustainability[1]. Stabilization of soil generally denotesimproved bearing capacity of soil, increase in soil strengthand stability under adversarial moisture and stress state [2].Among numerous techniques and devices to stabilize theterrestrial, grouting or injecting cementous solution andadditives is one of the mainstream proceduresusedworldwide to fill the voids within a structure, or dislodgingthe gases and liquids within these [3].To strengthen andprevent the ground from permeation of water or any failureafter excavation, groutinjection is widely used [4]. In theprocess, injection of grout in soil is conducted in a way thatthearrangement of the soil particles is not disturbed whileonly the void portion is occupied by a process ofpermeationwhich can be termed as seepage [5].The scope of work will involve stabilization of sub-soilup to specified depth below formation level, by injectinglime–cement grout and eliminating anypossibility of furthersoil movement. This will be done by filling the voidsin existing backfill/loose soil,on both sides of the wall,with lime–cement grout injected under low pressure on theinitial stage.Injection will be done under gravity flow andthen under moderate pressures that can be increased up to5to 6 kg/cm2. Uniform distribution of grout material alongfull envisaged depths will be achieved byinjection throughperforated pipes in each grout hole.

Probable Reasons for Rail Deflection

After analyses of observed data, nature and type ofdeflections observed and otherconsiderations, possiblereasons of the track deflection were discussed and arerepresented below:

(a) Shear failure or bearing capacity failure is alwaysaccompanied with large settlements

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

of theunderlyingsoil. Since no settlements had been observed aftersurvey and the levels appear to beintact, thepossibility of shear failure of the soil might had beenruled out.

(b) Overturning failure or tilt of foundation is manifestedby deflections in both vertical andlateral directions.Again, since no vertical settlements had beenobserved, this mode of failuremight also had beenruled out.

RESULTSANDINFERENCE:

The major observations for both the Site A and Site B areas follows:

(a) Sub-soil up to 6.0 m/6.5 m depth below F.G.L. washeterogeneous fill material consisting ofgrayishbrown, silty sandy clay mixed with pebbles, gravelsand rock fragments, etc. Last layerwas highlyweathered and disintegrated rock (almost transformedto soil, i.e., residual soil)

(b) For easy but quick means for assessing compactnessof soil, dynamic cone penetration tests (DCPT)following IS: 4968 (Part-1)-1976 [10] were taken upfirst. SPT-N values converted from dynamic coneresistance (Ncd) revealed that the compactness/consistencyof this layer increased with depth. Consideringcompactness/SPT-N values in all DCPT logs, thelayer has been subdivided and identified as Stratum-IA and Stratum-IB.Stratum-IA: This layer extended from groundsurface to minimum and maximum depth of1.50 m to 3.60 m. SPT-N values at differentlocations vary within a range between 1 and 3,except some stray high values in the range of 4 to11. The average N-value would be in the range of 1.Striatum-IB: Beyond 1.50 m to 3.60 m, SPT-Nvalues widely varied from 4 to 24, having averageN-value of 6.

(c) Next operation was sinking of 50-mm-diameter grout holes up to 6.0 m/6.50 m depth below F.G.L. Three rows drilling of boreholes were carried out up to predetermined depth of 6.0 m/6.5 m below F.G.L. on

CONCLUSION:

It has been noted that even after grouting, the top2.0–2.50 m from F.G.L did not indicate anyappreciableimprovement in consistency, as evident from pre and postDCPT results. Based onthis observation,

suitable recommendationsmay be included in the report to address theissue.As a guideline, suggestions regarding such recommendationsare given below:

Post-grouting tests have indicated that the top soil, up to2.0–2.50 m from F.G.L., did notindicate appreciableimprovement consistency. It was therefore suggested toadopt either of thefollowing measures to improve theconsistency of the top soil:

(a) Carry out secondary lime–cement grouting in betweenthe already executed grout holes, fordepths up to3.0 m (minimum). Grout materials, mix proportion,grouting procedure, etc., mayremain the same as forthe primary grout holes.

(b) Alternatively, the entire area may be thoroughlycompacted by several passes of 8–10 Tvibro-roller sothat the top soil is sufficiently densified.

REFERENCES

[1]. Zhu M, Zhang Q, Zhang X, Hui B (2018) Comparative study ofsoil grouting with cementslurry and cement–sodium silicateslurry. In: Santulli C (ed) Advances in materials science andengineering. Hindawi Limited, pp 1–10. https://doi.org/10.1155/2018/1893195

[2]. Sabat AK, Pati S (2014) A review of literature on stabilization ofexpansive soil using solidwastes. Electron J Geotech Eng19:6251–6267

[3]. Kazemian S, Huat B (2009) Assessment and comparison ofgrouting and injection methodsin geotechnical engineering. Eur JSci Res 27:234–247

[4]. Azadi MR, Taheri A, Taghichian A (2017) Optimization ofcement-based grouts usingchemical additives. J Rock MechGeotech Eng. https://doi.org/10.1016/j.jrmge.2016.11.013

[5]. Pandey S (2015, July 24) Grouting

[6]. Bearce RG (2015) Geometry assessment and strength/stiffnessmonitoring of lime andcement modified soils via characterizationof curing-induced property changes estimated fromseismic wavepropagation techniques and electrical resistivity. MountainScholar

[7]. Kazemian S, Huat B, Prasad A, Barghchi M (2010) A review ofstabilization of soft soilsby injection of chemical grouting. Aust JBasic Appl Sci 4:5862–5868

[8]. Pereira RS (2018) Soil stabilization with lime for the constructionof forest roads. Floresta eAmbiente 25(2):e20150077

[9]. IS: 4968 (Part-1)-1976 Indian standard code of method for subsurfacesounding for soilsdynamic method using 50 mm conewithout bentonite slurry

[10]. Ranjan G, Rao A (2000) Basic and applied soil mechanics. NewAge International (P)Limited, New Delhi.