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Static Behaviour of Geo-Cell Confined with Reinforced Soft Clay Soil

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Abstract:

- ***Engineers often experience difficulties in starting any construction work on soft clay because there is no hard strata at a depth of 15 m.***
- ***The application of a Geo-cell structure provides a comparatively harder stratum at the top of the soft subgrade.***
- ***Therefore, experimental investigations have been carried out on the stability of a Geo-cell reinforced soft soil structure, to evaluate the effect of the Geo-cell.***

Keywords:

- ***Preparation of soil specimens***
- ***Geo-cell insertion***
- ***Testing of soil sample***
  - ***Specific gravity of soil***
  - ***Particle size distribution***
- ***Liquid limit test***
- ***Plastic limit test***
- ***Swelling index test***
- ***Modified proctor test***
- ***Unconfined compression test***
- ***Triaxial test***
- ***Triaxial test***

I. INTRODUCTION

During the last three decades geo-synthetics are being extensively used to improve the Properties of poor soil, like to increase the drainage property, to reduce the compressibility, to Improve the shear strength, etc. In order to increase the bearing capacity of soft clay, use of Geo-cell is also being extensively used and so on. Dash et al. (2003) reported that provision of Geo-cell reinforcement improves the load carrying capacity of foundation soil. Normally a geo-cell Is a three-dimensional, honey-comb like structure made of geo-synthetics interconnected by Joints. Geo-grids are normally used to make the cage and geotextiles or geo-membranes are put Inside the cage for retaining the Filling material like sand, gravel or boulder. The geo-cells may Be triangular, square, rectangular or hexagonal in plan depending upon the nature of utility. Geo-cells have been found to be useful for base reinforcement of embankments and Subgrade soil, reinforcement below shallow foundations and steep slopes and in other Applications where the soil should withstand the high tensile stresses. Flexural rigidity of the Geo-cells plays an important role in increasing the strength of soil against bending. In the Present study, effects of Geo-cell in modifying the shear strength of soft clay under static and Dynamic loading have been under taken. A series of Triaxial compression tests have been carried Out on 75 mm diameter clayey soil samples reinforced with four interconnected Geo-cell placed At different depths from the top of the sample.

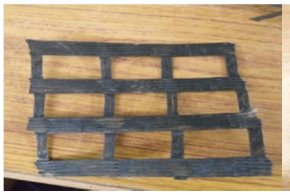


Fig 1 - Geo-grid

Fig 2 - Geo-cell

II. EXPERIMENTAL DESIGN

1) In this project we want to design & experiment about the Geo-cell insert at different height, in previous research we found that addition of Geo-cell provides increase the strength.
2) Different Height of Geo-cell insert at UCS Soil Sample and Triaxial Soil Sample such as L/2, L/3, L/4 etc. distance.

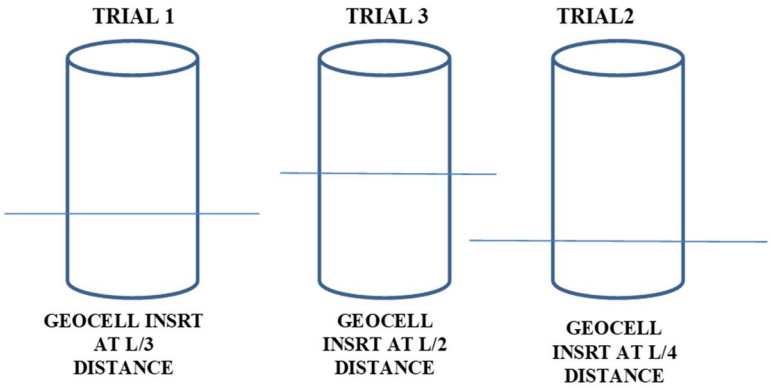


Fig 3 - Geo-cell insert at different height

III.SCOPE

1) In this present study an effort has been taken to enlighten the use of Geo-cell as a reinforcing material and physical properties with original clay soil.
2) The induced apparent excessive strength depends on the height of the Geo-cell from the top of the sample.
3) There is a degradation of strength of soil after some loading cycles, however, the degradation is marginally less once geo-cells are inserted into the soil.

IV. RESULTS

A. *UCS Test*

We achieve the maximum UCS Strength by applying the Geo-cell at L/2 distance confined with reinforced soft clay soil.

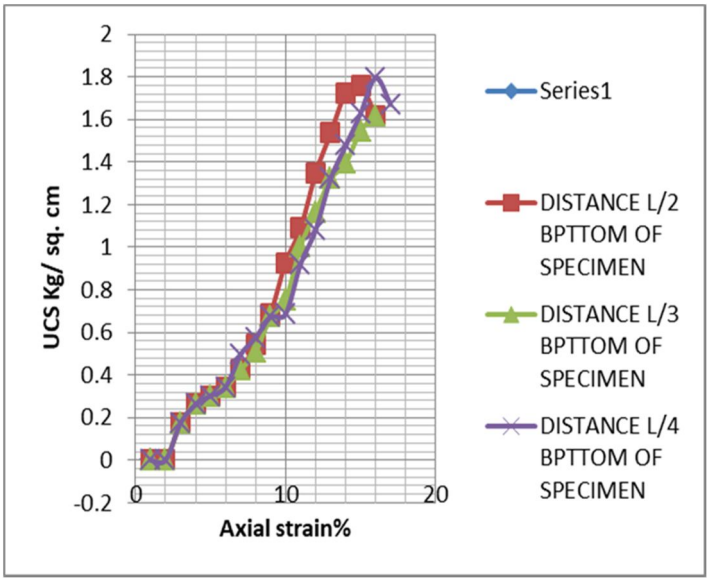


Fig 4 - Comparison graph of geocell insert at different depth

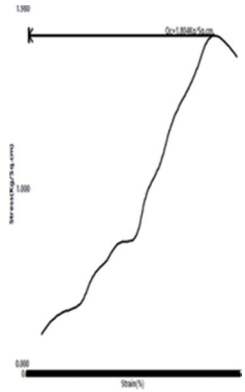


Fig 5 - UCS Geo-cell insert at L/2 distance

B. Triaxial Test

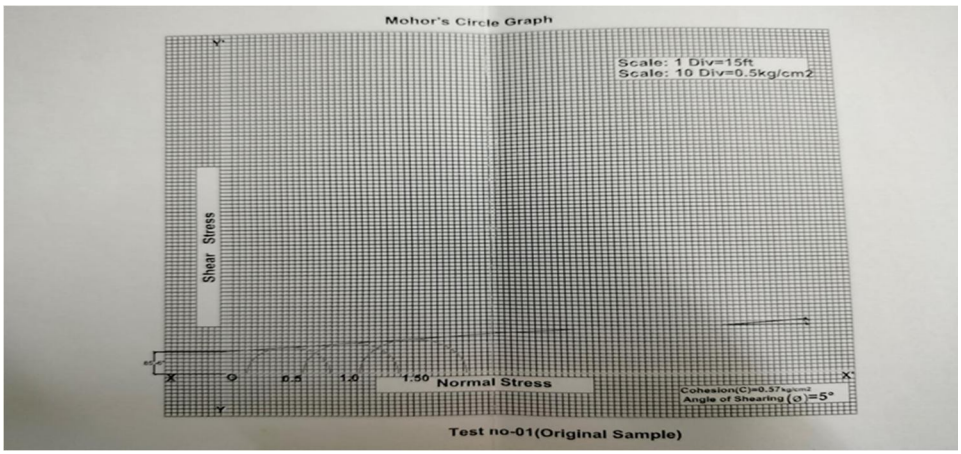


Fig 6 – Triaxial Test of original soil sample

Angle of shearing= 5^0, Cohesion (C) = .57kg/cm^2

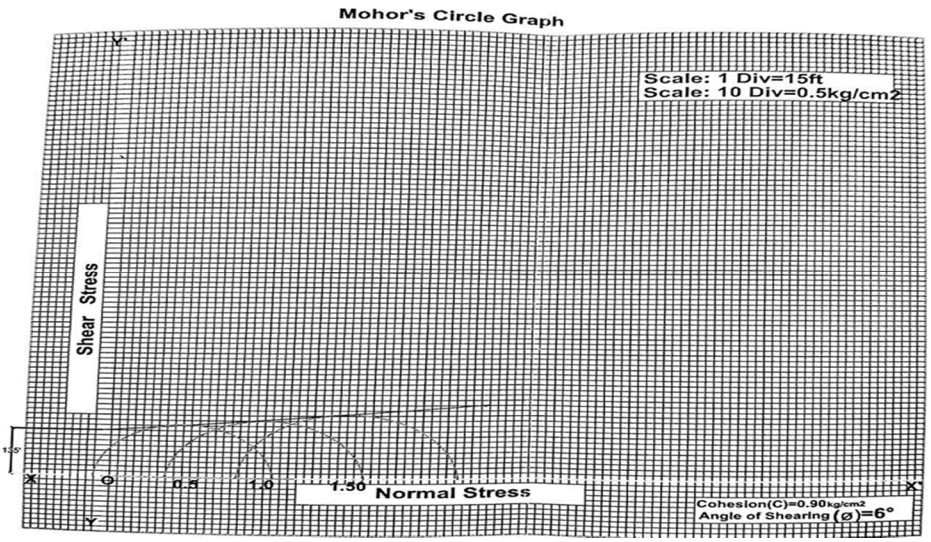


Fig 7 - Triaxial test of original soil sample + Geo-cell

Angle of shearing = 6^0 , Cohession (C) = 0 .90kg/cm^2

TABLE

TABLE 1 - GEO-CELL INSERT AT L/2 DISTANCE

Disp. Dial gauge	shear Disp cm	corrected area	proving ring	shear (kg)	shear stress (kg/sq cm)	Axial strain (%)
0	0	11.3411	0	0	0	0
50	0.05	11.4163	2	2	0.1752	0.658
100	0.1	11.4924	3	3	0.261	1.316
150	0.15	11.5695	3.5	3.5	0.3025	1.974
200	0.2	11.6477	4	4	0.3434	2.632
250	0.25	11.7269	5	5	0.4264	3.289
300	0.3	11.8072	6.4	6.4	0.542	3.947
350	0.35	11.8887	8.2	8.2	0.6897	4.605
400	0.4	11.9712	11	11.11	0.9281	5.263
450	0.45	12.0549	13	13.13	1.0892	5.921
500	0.5	12.1398	16.2	16.362	1.3478	6.579
550	0.55	12.2259	18.6	18.786	1.5366	7.237
600	0.60	12.3132	20.8	21.216	1.7230	7.895
650	0.65	12.4018	21.4	21.828	1.7601	8.553
700	0.70	12.4917	20.0	20.200	1.6171	9.211

V. CONCLUSION

In this present study an effort has been taken to enlighten the use of Geocell as a reinforcing material and physical properties with original clay soil. Based on the experimental observation in current study following conclusions can be made.

1) The induced apparent excessive strength depends on the position of the geocells from the top of the sample. It is observed that when the geocells are placed at half of the diameter /width of the loading area, maximum benefit in strength is achieved.

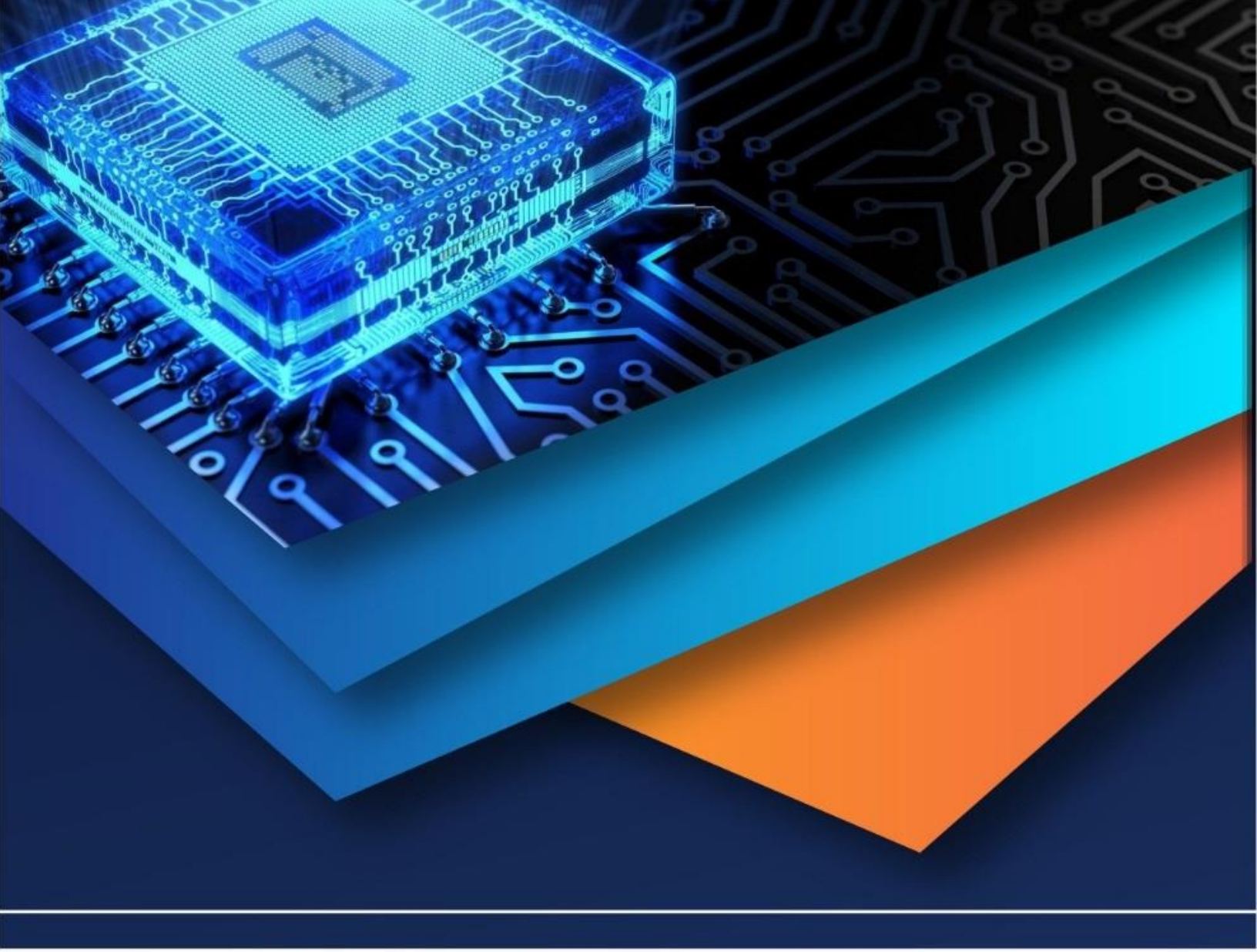
2) Geocell reinforced soil does not show any failure stress under unconfined condition.

3) There is a degradation of strength of soil after some loading cycles, however, the degradation is marginally less once geo-cells are inserted into the soil.

4) Lesser damping ratio and higher secant shear modulus are obtained if the soil is reinforced with Geo-cell.

REFERENCES

[1] Bush, D.I., Jenner, C.G., Bassett, R.H., 1990. The design and construction of geocell foundation mattress supporting embankments over soft ground. Geotextiles and Geomembranes 9, 83-98.
[2] Dash, S.K., Krishna swamy, N.R., Rajagopal , K., 2001. Bearing capacity of strip footings supported on geocell reinforced sand. Geotextiles and Geomembranes 19, 235–256.
[3] Leshchinsky, B., Ling, H., 2013. Effects of geocell confinement on strength and deformation behaviour of gravel. J. Geotech. Geo environ.Eng., ASCE 139 (2), 340- 352.
[4] Fakher, A., Jones, C.J.F.P., 1996. Discussion of bearing capacity of rectangular footings on Geo-cell reinforced sand, by Yetimoglu, T., Wu, J.T.H., Saglamer, A. J. Geotech.Eng. ASCE 122 (4), 326e327.
[5] Madhavi, G.L., Vidya, S.M., 2007. Effects of reinforcement form on the behaviour of geo-synthetic reinforced sand. Geotextile and Geomembrane25 (1), 23-32.
[6] Selig, E.T., McKee, K.E., 1961. Static and dynamic behaviour of small footings.J. Soil Mech. Found. Div. ASCE 87 (6), 29e47.
[7] Dash, S.K., Sireesh, S., Sitharam, T.G., 2003. Model studies on circular footing supported on Geo-cell reinforced sand underlain by soft clay. Geotextiles and Geomembranes. 21 (4), 197-219.
[8] Rajagopal, K., Krishanaswamy, N.R., Latha, G.M., 1999. Behaviour of sand confined with single and multiple geocells. Geotextiles and Geomembranes 17, 171–184.
[9] Bathurst, R.J., Karpurapu, R. 1993. Large scale triaxial tests on geocell reinforced granular soils. Geotechnical Testing Journal 16 (3), 296-303.
[10] Dash, S.K., Rajagopal, K., Krishnaswamy, N.R., 2001b. Strip footing on geocell reinforced sand beds with additional planar reinforcement. Geotextiles and Geomembranes 19, 529–538.
[11] Seed, H.B., Idriss, I.M. 1971. Simplified procedure For evaluating soil liquefaction potential. Soil Mech. Found. Div., ASCE 107 (9), 1249-1274..
[12] Singha, S. and Dey, A.K. 2014. Dynamic properties of clay dampers. National Seminar on Geotechnique Today -Prediction, Modeling& Construction, IGS, Kolkata chapter, Kolkata, Feb 28-March 1, pp 141-146. 225



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