A LITERATURE STUDY ON THE BEHAVIOR OF RING FOOTING OVER REINFORCED SAND

Honey Gaur*

***Assistant Professor, Department of Civil Engineering, Kalinga University, Raipur (C.G.)**

Abstract

Reinforcement was supplied from the bottom up to a depth of B. Experiments on the change in bearing capacity of sand following reinforcing have revealed that there is an increase in bearing capacity. Sand capacity on reinforcement. This increase in bearing capacity increases with reinforcement provided up to a depth of B from the top layer of sand, and then the increase in bearing capacity increases with Reinforcement provided up to a depth of B from the top layer of sand, and then the increase in bearing capacity increases with Reinforcement provided up to a depth of B from Reduces gradually from the top layer of sand to a depth of 1.5B and 2B.

Keyword- Geotechnical properties, sand , testing

Introduction

Any land-based structure's foundation is vital and must be rock-solid in order to support the entire structure. The soil around the foundation has a significant impact on its stability. Their general features, such as specific gravity, maximum and lowest void ratios, and dry density, must all be thoroughly understood. Since the beginning of construction, the necessity to improve soil quality has been recognised. To boost soil strength, the Chinese, Romans, and Incas adopted a number of measures, some of which were so successful that their buildings and roadways are still standing. To prevent sand failure or excessive settling under stress, geosynthetics, geotextiles, and other materials can be used to reinforce the sand. The shape of the foundation, as well as the proportions and conditions of the sand beneath it, determine the bearing capacity of foundations. In symmetrical constructions like silos, chimneys, and oil storage tanks, ring footings are widely used. This study presents the findings of a series of laboratory tests on the behaviour of ring footings over sand reinforced with geosynthetics.

Literature review

Shin et al., (2002) used a laboratory model on granular soil with several geo-grid layers to assess the load carrying capability of a strip foundation under the influence of embedment. For greatest advantage from reinforcement, the crucial reinforcement-depth ratio below the foundation's bottom (d/B)cr is around 2. There was also a discussion of the relationship between the bearing capacity ratio at ultimate load and at low levels of settlement (less than or equal to 5% of foundation width). The bearing capacity ratio is lower at low levels of settlement than it is at full load.

The investigation by Boushehrian and Hataf (2003) was conducted on circular and ring footing. The effects of vertical spacing, the number of reinforcement layers, and the depth of the first layer of reinforcement on the carrying capacity of the footing were investigated in this study. Both experimental and numerical tests revealed that there is an optimum reinforcement embedment depth for which the bearing capacity is maximum when using a single layer of reinforcement. They also discovered that an optimal vertical spacing of reinforcing layers is required for multi-layer reinforced sand. It was also discovered that increasing the number of reinforcement layers increased the bearing capacity, as long as the reinforcements were placed within a certain range of effective depths.

This document covers the model test conducted to assess the bearing capacity of an embedded circular footing supported by multi-layer geo-grid sand beds by Sitharam and Sireesh (2004). Strain in the geogrid layer, pressure distribution on the soil subgrade, and deformations on the fill surface were all measured in addition to load settlement data. The ultimate bearing capacity of the foundation increases as the embedment depth ratio of the foundation grows, according to the test results.

A significant improvement Based on the fundamental law of soil, Kumar et al., (2005) suggested a method to get the pressure-settlement characteristics of rectangular footings resting on reinforced sand. In determining stress, the influence of soil mass weight has been taken into account. Because the effect of roughness on pressure-settlement characteristics has been shown to be insignificant, the base of the footing has been considered to be smooth. Sarannnnnnnnnn (1977). The elasticity theory was used to calculate stresses in soil bulk. The hyperbolic soil model established by Kondner was used to calculate strains (1963). Kumar's model test results have been used to validate the analysis (1997). Up to two-thirds of the ultimate bearing pressure, the predicted and model test results correspond well.

Kumar et al., (2007) The ultimate bearing capacity of a strip footing supported by reinforced and reinforced subsoil with a strong sand layer overlaying a poor bearing capacity sand deposit was examined. The effect of stratified subsoil on foundation bearing capacity, the effect of reinforcing the top layer with horizontal layers of geogrid reinforcement on bearing capacity, and the effect of reinforcing stratified subsoil on foundation settlement have all been investigated using the model test results. The results showed that replacing the top 1B thick layer of existing weak soil with well-graded sand layer and reinforcing it with 2–4 layers of geo-grid reinforcement increased the final bearing capacity of strip footing sitting on the sand by up to 3–4 times.

The laboratory model test and numerical simulation results for bearing capacity of square footing resting on geo-synthetic reinforced sand were presented by Latha and Somwanshi (2009). The impact of various reinforcement parameters such as the kind and tensile strength of the geo-synthetic material, the number of reinforcement layouts, and the configuration of the geo-synthetic layer beneath the footing is investigated. The model test results show that the effective depth of the zone of reinforcement beneath the square footing is twice the width of the footing, the optimum spacing of the reinforcement layer is about 0.4 times the width of the footing, and the optimum reinforcement width is 4 times the width of the footing.

Conclusion

The load carrying capability of reinforced sand was enhanced by adding one layer of geo-grid compared to unreinforced sand. 3. Increasing the number of reinforcement layers from one to four resulted in the optimum response in terms of reinforced sand load carrying capability. To achieve considerable load settlement and bearing capacity improvement, effective geo-grid reinforcement deployment is essential.

REFERENCES

1. Albusoda, B. S. and Hussein, R. S. (2013). Bearing Capacity of Eccentrically Loaded Square Foundation on Compacted Reinforced Dune Sand over Gypseous Soil. Journal of Earth Sciences and Geotechnical Engineering03: 47-62.
2. Azzam, W. R., & Nasr, A. M. (2015). Bearing capacity of shell strip footing on reinforced sand. Journal of advanced research, 6: 727-737.
3. Badakhshan, E. and Noorzad, A. (2015).The load eccentricity effects on the behavior of circular footing reinforced with geogrid sheet. Journal of Rock Mechanics and Geotechnical Engineering07:691-699.
4. Basudhar, P. K., Saha, S., & Deb, K. (2007). Circular footings resting on geotextile-reinforced sand bed. Geotextiles and Geomembranes, 25: 377-384.
5. Boushehrian, J. H., &Hataf, N. (2003). Experimental and numerical investigation of the bearing capacity of model circular and ring footings on reinforced sand. Geotextiles and Geomembranes, 21: 241-256.
6. Chakraborty, M., & Kumar, J. (2014). Bearing capacity of circular foundations reinforced with geogrid sheets. Soils and Foundations, 54: 820-832.
7. Cicek, E., Guler, E., &Yetimoglu, T. (2015). Effect of reinforcement length for different geosynthetic reinforcements on strip footing on sand soil. Soils and Foundations, 55: 661-677.
8. Dash, S. K., Krishnaswamy, N. R. and Rajagopal, K. (2001). Bearing capacity of strip footings supported on geocellreinforcedsand.Geotextiles and Geomembranes19: 235-256.
9. Dash, S. K., Sireesh, S., &Sitharam, T. G. (2003). Model studies on circular footing supported on geocell reinforced sand underlain by soft clay. Geotextiles and Geomembranes, 21: 197-219.
10. Dewaikar, D. M., Guptha, K. G., & Chore, H. S. (2011). An Experimental Study into Behaviour of Circular Footing on Reinforced Soil. International Journal on Advanced Science, Engineering and Information Technology, 1: 630-634.
11. Dhatrak, A. I. and Khan, F. A. (2014). Behaviour of Square footings on PrestressedGeosynthetic Reinforced Sand. The International Journal of Engineering and Science 03: 72-83.
12. Harikumar, M., Sankar, N., &Chandrakaran, S. (2016). Behaviour of model footing resting on sand bed reinforced with multi-directional reinforcing elements. Geotextiles and Geomembranes, 44: 568-578.
13. Indian Standard Institutions, "Code of Practice". 1498 - Classification & Identification on soils for general Engineering purposes, 1888 - Methods of Load test and soils, 2720 - Methods of tests on soils, Part -III - Determination of Specific Gravity, part IV-1985- sieve analysis, part – XIV- The relative density, Part - V - Grain Size analysis.
14. Kolay, P. K., Kumar, S. and Tiwari, D. (2013).Improvement of bearing capacity of shallow foundation on geo-grid reinforced silty clay and sand.Journal of Construction Engineering 10: 205-210.
15. Kumar, A., Ohri, M. L. and Bansal, R. K. (2007). Bearing capacity tests of strip footing on reinforced layer soil. Geotechnical and Gelogical Engineering 25: 139-150. Kumar, A., Walia, B. S. and Saran, S. (2005). Pressure-settlement charecteristics of rectangular footings on reinforced sand.Geotechnical and Gelogical Engineering23:469-481.

16. Latha, G.M., and Somwanshi, A. (2009). Bearing Capacity of square footings on geosynthetic reinforced sand. Geotextile and Geomembrane 27:281-294.
17. Lovisa, J., Shukla, S. K., &Sivakugan, N. (2010). Behaviour of prestressed geotextile-reinforced sand bed supporting a loaded circular footing. Geotextiles and Geomembranes, 28: 23-32.
18. Patil, S. and Rakaraddi, P.G. (2015). The Load Carrying Capacity of Square Footing Resting On Reinforced Sand. IJRET: International Journal of Research in Engineering and Technology04: 2321-7308.
19. Shin, E. C., Das, B. M., Lee, E. S., &Atalar, C. (2002). Bearing capacity of strip foundation on geo-grid-reinforced sand. Geotechnical & Geological Engineering, 20: 169-180.
20. Sitharam, T. G., &Sireesh, S. (2004). Model studies of embedded circular footing on geogrid-reinforced sand beds. Proceedings of the Institution of Civil Engineers-Ground Improvement, 8: 69-75.