LOADING, UNLOADING AND RELOADING ON SQUARE FOOTING WITH GEOGRID AS A REINFORCEMENT

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Abstract

Superstructure transmits its loads to the foundation, and then to ground. Loading, unloading and reloading is happens in petroleum tanks and ship repair tracks. This paper presents laboratory tests were carried out on square footing having dimensions of 0.1 X 0.1m for different densities of 16.10kN/m^3 , 16.89kN/m^3 , 17.29kN/m^3 .Coated yarn geogrid is used as reinforcing material. In the present. Paper investigations were carried on by varying number of reinforcement layers such as N = 0, 1 2, 3.Drawn conclusion is as density of foundation bed increases, settlement of the footing decreases and as number of layers of reinforcement increases, settlement of the footing reduces.

Keywords: *Geogrid, square footing, LVDT, loading, unloading, reloading*

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1. INTRODUCTION

Foundation is lowest part of structure. A properly designed foundation transfers load throughout the soil without overstressing of soil. Overstressing of soil result in excessive settlement or shear failure of soil. In the present study investigations were carried out on the loading, unloading and reloading on square footing with geogrid as a reinforcement material. Varied parameter is number of reinforcement layer (N =0,1,2,3.)

2. EXPERIMENTAL STUDY

2.1 Test Equipment

The tests were performed in a tank with length, breadth, and width of 60cm. Sides of the box is stiffened with the help of battens. The test tank is filled by raining technique as shown in the figure.1.

Fig 1: Sand pouring technique

Sand is poured from the funnel by maintaining required distance of free fall to achieve required density. Experimental setup is shown in fig 2.

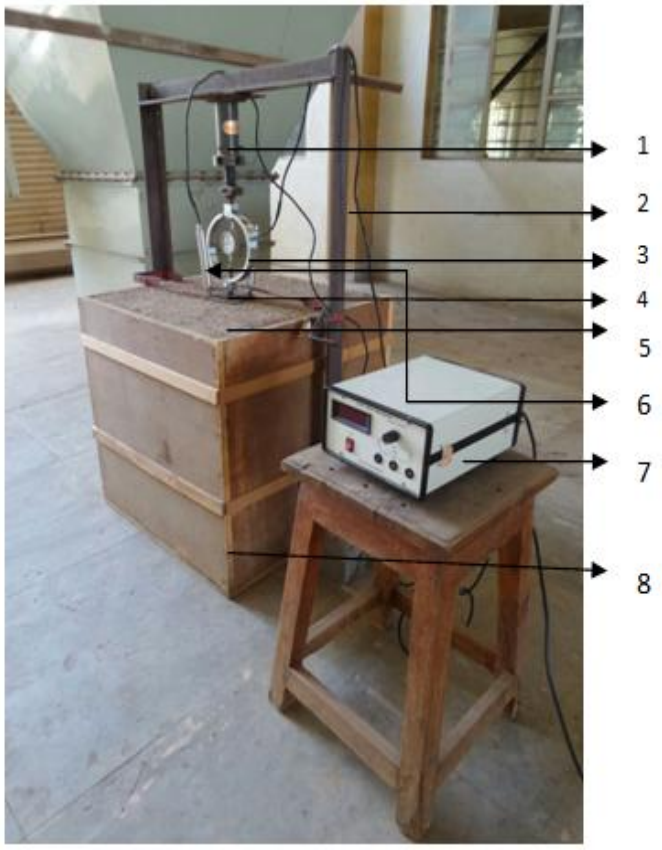

Fig 2: Experimental setup in laboratory 1)Screw jack, 2) Loading frame 3)Proving ring 4)Model footing 5)Sand 6)LVDT 7) LVDT display unit 8) Test tank

Load is transferred via metallic ball to model footing to sand beneath it. LVDT (linear varying displacement transducer) is used to measure settlement of the footing. Coated yarn geogrid is used as reinforcing material.

2.2 Soil

Locally available Malaprabha river sand was used for present study. Properties of sand are given in table 1.

Table 1: Properties of sand

Sl. No.	Parameters	Results
1	Sieve analysis	
	Effective Size, D_{10} (mm) D_{30} (mm) D_{60} (mm) Uniformity coefficient (C_u) Coefficient of curvature (C_c)	0.40 0.50 1.10 2.75 0.56
2	Specific Gravity (G)	2.51
3	Maximum Dry unit weight γ (kN/m^3)	17.29
4	Minimum dry unit weight γ (kN/m^3)	16.10
5	Angle of internal friction (φ) for density Maximum dry unit weight – 17.29kN/m^3 Minimum dry unit weight – 16.10kN/m^3	38 32

From these results, Soil classified as poorly graded sand.

2.3 Placing Of Geogrid

First the test is done without reinforcement and for the test with reinforcement, the geogrid layer is placed at a depth of .33B [10] from the base of footing. Fig 3 shows the placing of geogrid. Since in this test, width of square footing is 0.1m, the depth of first layer for layer 1 is taken as 3.3cm from base of the footing and width of reinforcement is 60cm For 2nd layer , first layer is at 3.3cm and next is at 8.2cm from the first layer and for 3rd layer first layer is at 3.3cm, second and third layers at 5.5cm from first layer and second layer.

Fig 3 Placing of geogrid at 3.3cm from the base of the footing

3. RESULTS AND DISCUSSIONS

From the obtained results from laboratory tests following curves are plotted.

3.1 Pressure Settlement Curves

These curves are plotted for N=0,1,2,3, for different densities.

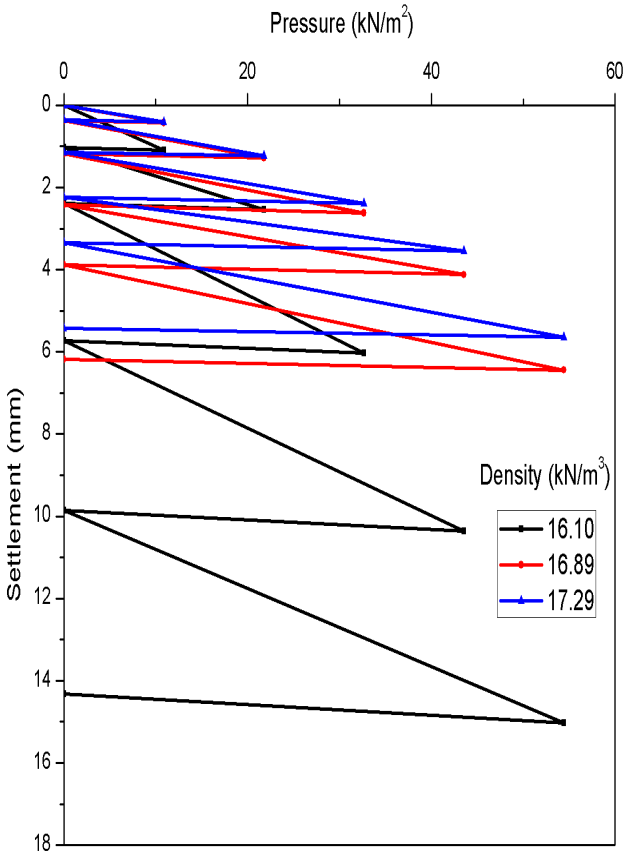

Fig 4: Pressure settlement curves for N=0 with different densities for square footing

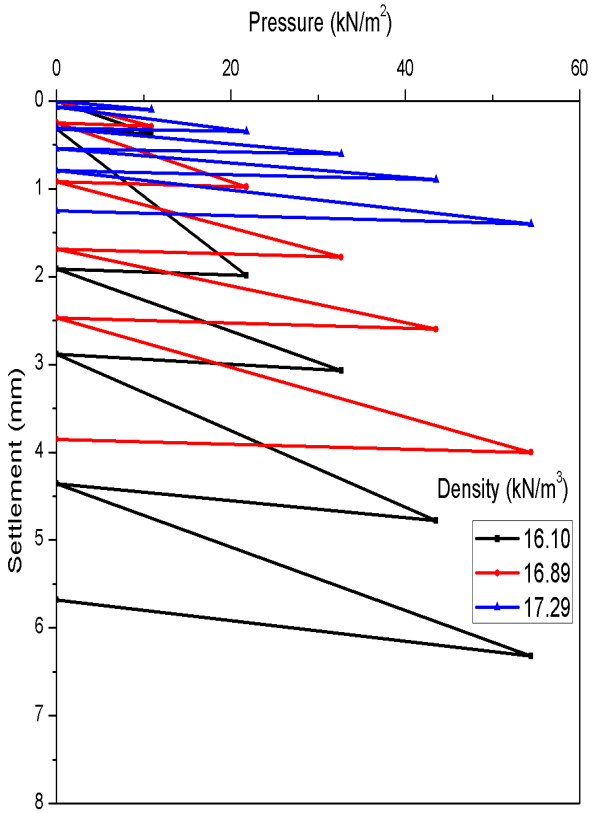

Fig 5: Pressure settlement curves for N=1 with different densities for square footing

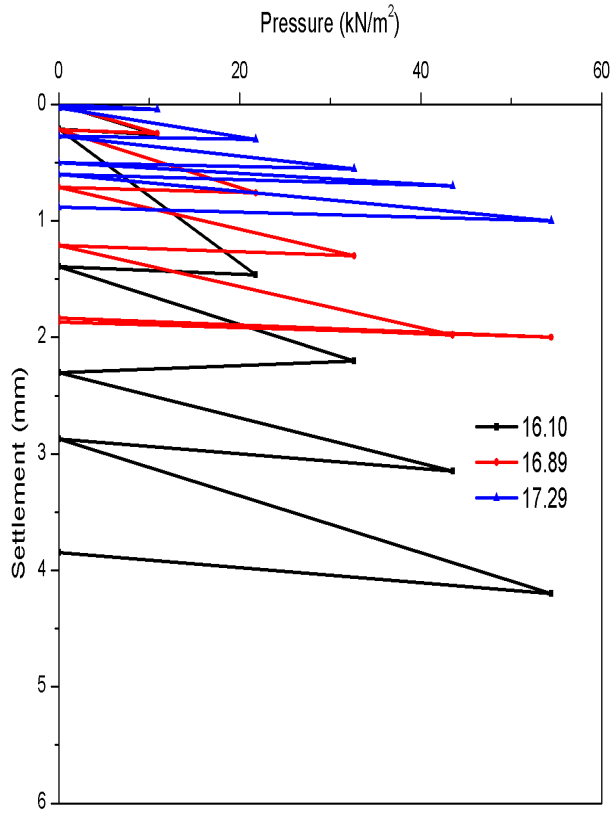

Fig 6: Pressure settlement curves for N=2 with different densities for square footing

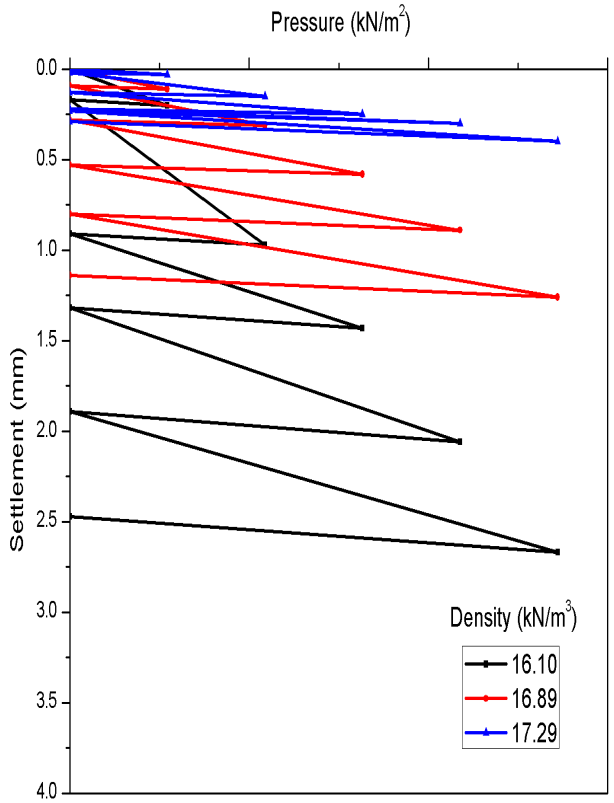

Fig 7: Pressure settlement curves for N=3 with different densities for square footing

4. CONCLUSION

From the above graphs it can be concluded that, with use of geogrid settlement of the footing can be reduced. As number of layers increases, Settlement of the footing decreases and as the density of foundation bed increases, it leads to decrease in settlement.

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