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Comparison of Load Carrying Capacity of Square Footing Unconfined Soil With And Without Reinforcement

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ABSTRACT

This paper analyses the comparison between the load carrying capacity of unconfined soil with and without Reinforcement .The load carrying capacity can be measured by applying static load. In the laboratory model, soil cubes are prepared by using mould of size 150mm×150mm×150mm. Loads are applied on the soil blocks with (full area) and without reinforcement with 150mm×150mm model square footing. Testes are carried out by using loading frame. Load carrying capacities per unit area of reinforcement unconfined soils are times more than that of without reinforced unconfined soil.

KEYWORDS:- Load carrying capacity, Reinforcement, Model footing, Unconfined soil

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INTRODUCTION

In Civil Engineering, The load carrying capacity is defined as ability of soil to support a load from structure without falling in shear. It is the maximum average contact pressure between the foundation and soil. The mechanical strength of the soil is an important factor which considering as soil behavior, here the strength of the soil can be checked by static load testes. Testes carried out through loading frame to allow the load get penetrate. This test analyses the performances of the stresses- strain behavior in the soil. Tests have been used to determine the material properties for pavement design.soil having cohesion (C) 6 kN/m^2 and angle of internal friction (Φ) is 32 is considered.

The geometric parameters of a footing supported by fiber glass window screen mesh as reinforced. There are four number of fiber glass window screen mesh layers, each having length ‘L’. The top layer of the reinforcement is located at a depth ‘u’ below the bottom of the foundation. The distance between middle layers of reinforcement is ‘h’. In order to conduct model tests with fiber glass window screen reinforcement, it is important to decide the magnitude of s/B to increasing the ultimate bearing capacity.

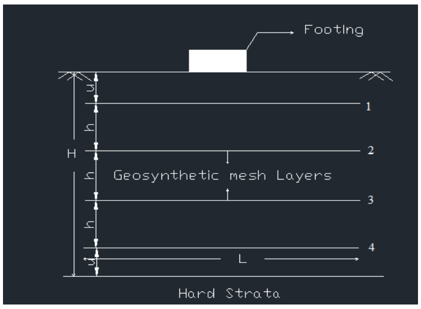


Figure1.Geometric parameters for a foundation supported by reinforced soil bed

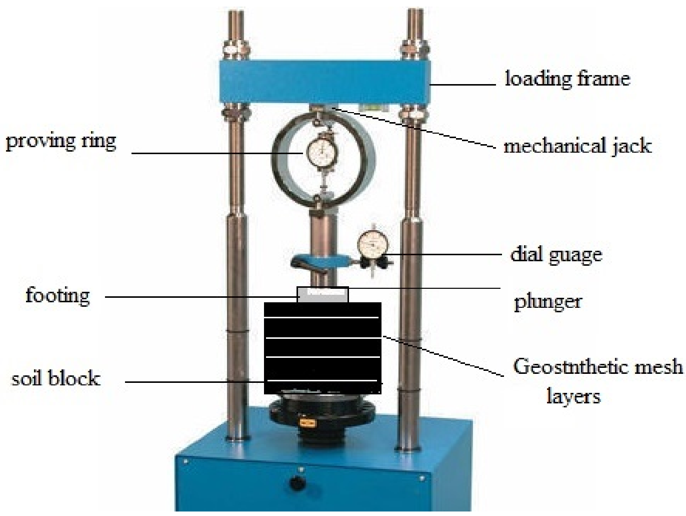


Figure2. Static loading Test setup

LOADS ARE APPLIED ON THE SOIL BLOCKS WITHOUT REINFORCEMENT MODEL SQUARE FOOTING

Aim:

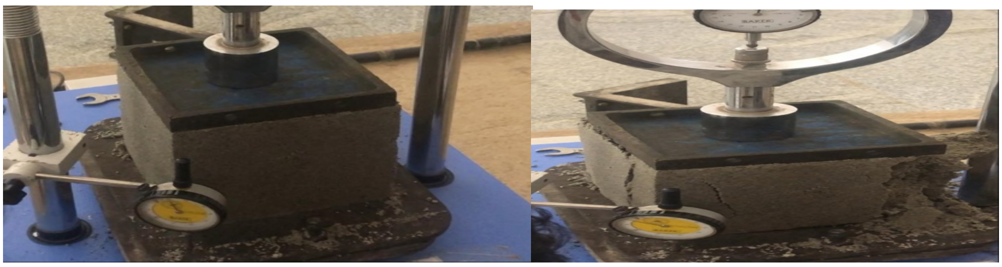
To determine the strength of the stone dust block of 150mm×150mm150mm×150mm by using loading frame machine.

Apparatus:

- Mould having size of 150mm×150mm150mm×150mm with base plate
- Stone dust of size 4.75mm
- Water of required percentage
- Compaction road
- Loading frame machine.

Procedure:

- Take around the 8 kg of stone dust using weighing balance having the size 4.75 mm
- The water having 6% is added to the stone dust and mixed properly.
- Mixed soil is filled by mould of size 150mm×150mm×150mm.
- The stone dust was filled by four layers of each layer is compacted of 56 blows by using compaction rod.
- After compaction unconfined soil is placed in the loading frame machine, a plate is placed on the top of the soil block to apply the static load for full area.
- Dial gauges placed on the bottom of the soil block.
- Note down the proving ring readings and dial gauge readings
- Tests to be continued up to the failure load happened in the soil block



(a)Before failure **(b)After failure**

Figure3. Loads are applied on the soil blocks without reinforcement model square footing

From observation the maximum stress that the wall can withstand is 43.02kN/m^2 corresponding s/B % is 2% and settlement is 300 mm.

LOADS ARE APPLIED ON THE SOIL BLOCKS WITH (FULL AREA) REINFORCEMENT MODEL SQUARE FOOTING

Aim:

To determine the strength of the stone dust block of 150mm×150mm150mm×150mm with reinforcement by using loading frame machine.

Apparatus:

- Mould having size of 150mm×150mm150mm×150mm with base plate
- Stone dust of size 4.75mm
- Water of required percentage
- Compaction road
- Loading frame machine.
- Fiber glass window screen mesh

Procedure:

- Take around the 8 kg of stone dust using weighing balance having the size 4.75 mm
- The water having 6% is added to the stone dust and mixed properly.
- Mixed soil is filled by mould of size 150mm×150mm×150mm.
- The stone dust was filled by four layers of each layers with reinforcement
- Fiber glass window meshes are used as reinforcing material was placed for layers with slandered spacing is compacted of 56 blows by using compaction rod.
- After compaction unconfined soil is placed in the loading frame machine, a plate is placed on the top of the soil block to apply the static load for full area.
- Dial gauges placed on the bottom of the soil block.
- Note down the proving ring readings and dial gauge readings
- Tests to be continued up to the failure load happened in the soil block

(a) Before failure **(b) After failure**

Figure4. Loads are applied on the soil blocks with (full area) reinforcement model square footing

From observation the maximum stress that the wall can withstand is 610.13 kN/m^{2}corresponding s/B % is 4% and settlement is 600 mm.

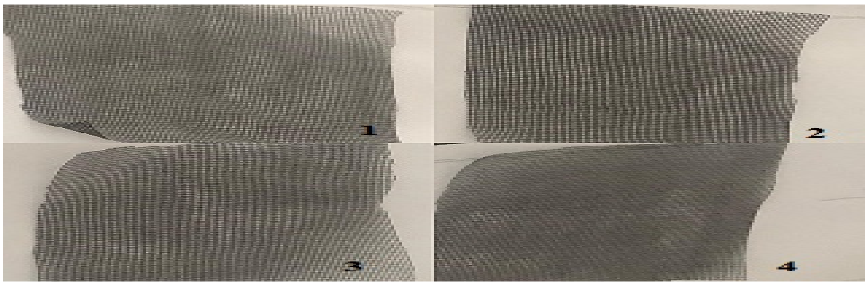


Figure5. Fiber glass window screen mesh after Loads are applied on the soil blocks with (full area) reinforcement model square footing.

Loads are applied on the soil blocks with (full area) reinforcement, after experiment layers of reinforcement doesn't get any cracks is showing below fig5.

RESULT AND DISCURSION

MSE wall using 150mm×150mm×150mm M sand soil block using unconfined soil for square footing with and without reinforcement using loading frame with static loads are performed. Maximum stress, settlement at maximum stress and s/B % at maximum stress are given in below table1.

Load of the block = Proving ring reading (PRR)×4.4(Kg)

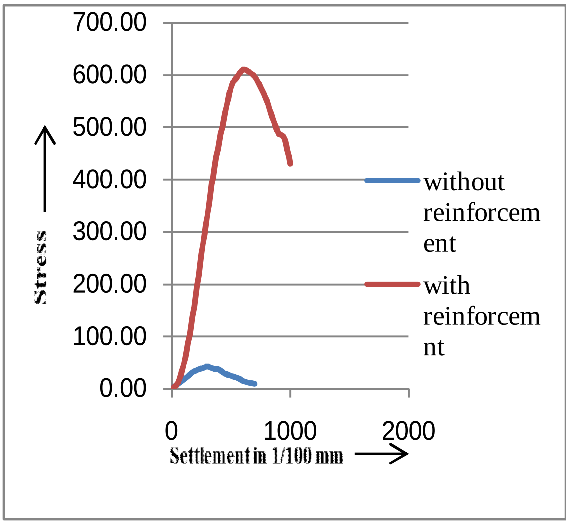
Stress acting on the soil block = Load/ Area

Area of the steel plate = 150mm × 150 mm

Table1. Static test on experimental studies, un-confined soil square footing

Sl no	Experimental details	Maximum Stress (kN/m^2)	Settlement at Maximum Stress (s) mm	s/B % at Maximum Stress	comparison
1	Soil blocks without reinforcement model square footing	43.20	300	2	14.12
2	Soil blocks with (full area) reinforcement model square footing	610.13	600	4	

Stress strain behaviorand bearing capacity s/B % behavior graph obtained by the above laboratory tests. Stress strain graph should be plotted by settlement (mm) and stress (kN/m^2) acting on the soil block. Whereas bearing capacity s/B % graph plotted by bearing pressure (kPa) and footing settlement (s/B in %).



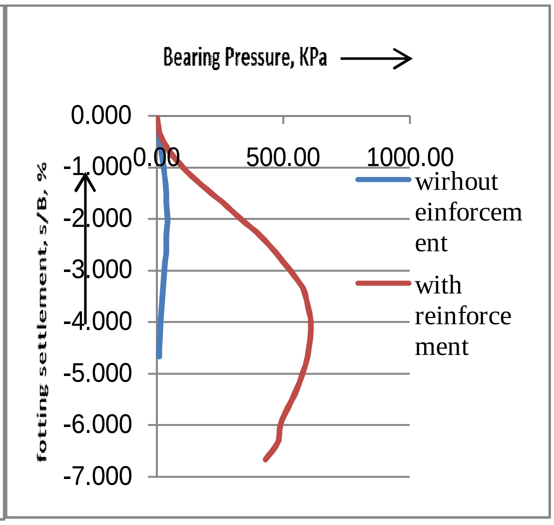


Chart1. Stress strain graph **Chart2. Bearing capacity s/B % graph**

CONCLUSION

Soil blocks without reinforcement model square footingcarries maximum stress of 43.20kN/m^{2}and settlement of 300mm.

By proving 4 layers of fiber glass window screen mesh as reinforcement to soil increases stress to 610.13kN/m^2 and settlement of 600mm.

From the experiment maximum load carrying capacity of 4 layered soil increases to 14.12 times without reinforced soil.

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