A Project Report on

Experimental Investigation for Determining Bearing Capacity of Soil by Using Geotextile

Submitted in partial fulfillment of the requirements

for the degree of

Bachelor ofEngineering

By

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Prof. VedprakashMarlapalle

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DECLARATION

We declare that this written submission represents my ideas in our own words and where others ideas or words have been included, We have adequately cited and referenced the original sources. We also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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We take this opportunity to thank all our Professors and non-teaching staff who have directly or indirectly helped our project, we pay our respects and love to our parents and all other family members for their love and encouragement throughout our career. Last but not the least we express our thanks to our friends for their cooperation and support.

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ABSTRACT

Geotextile utilization plays an important role in the construction of highways with no additive layers, such as asphalt concrete or cement concrete, or in a subgrade layer which affects the bearing capacity of unbounded layers. From laboratory& experimental study's carried out to evaluate changes in the load bearing capacity of reinforced soil with these materials in highway roadbed with regard to geotextile properties.The tensile strength of geotextile and thesoil-geotextile interaction are the major factors that influence the improvement of soil. Change in fine content within the sand can change the interface behavior between soil and geotextile.Geotextile are often used as a proper ground improvement method to improve bearing capacity and reduce settlement of superstructures.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1

Introduction

1.1 General

In developing country like India due to the remarkable development in road infrastructure, Soil stabilization has become the major issue in construction activity. Stabilization is an unavoidable for the purpose of highway and runway construction, stabilization denotes improvement in both strength and durability which are related to performance. Stabilization is a method of processing available materials for the production of low-cost road design and construction, the emphasis is definitely placed upon the effective utilization of waste by products like Geo Jute,and fly ash, with a view to decreasing the construction cost.

The prime objective of soil stabilization is to improve theCalifornia Bearing Ratioof in-situ soils by 4 to 6 times. The other prime objective of soil stabilization is to improve on-site materials to create a solid and strong sub-base and base courses. In certain regions of the world, typically developing countries and now more frequently in developed countries, soil stabilization is being used to construct the entire road.

Geotextile are often used as a proper ground improvement method to improve bearing capacity and reduce settlement of superstructures. In addition, because of high permeability of stone column material, consolidation rate in fine soils increases and liquefaction potential in liquefiable soil may also be reduced. The bearing capacity of long ordinary stone columns (OSCs) with occurrence of bulging failure at upper parts of the column mainly depends on confinement offered by surrounding soft soil. In very soft soils, OSCs may not offer significant load capacity due to very low lateral Confinement. Thus, it is necessary to provide additional confinement by vertical encasing with geosynthetics (VESC) or using horizontal geosynthetic reinforcement layers (HRSC).

The mechanical properties of soil as a granular material depend on its friction, cohesion, interlocking, and confinement. The inclusion of geosynthetics as a mechanical stabilization method improves the mechanical properties of soil Geosynthetics are widely used to improve the performance and stability of fills and foundations. The parameters varied in this study were the thickness of sand layer and the width of geotextile reinforcement in relation to the width of the footing.

In this study, laboratory tests were conducted on geotextile reinforced soil with and without a cement-treated interface, and the results were compared. In addition, a numerical model was calibrated and used to model the effects of the cement treated zone on the bearing capacity of the footing. Foundations are sometimes built on slopes or near the

edges of slopes. Examples of such practice are buildings or roads constructed in hilly regions and foundations for bridge abutments resting on granular fill slopes. The bearing capacity of a foundation constructed near the edge of a slope assumes its importance in view of the fact that performance of the structure depends on the stability of the slope and the soil bearing capacity. When a shallow footing is placed on top of a slope and subjected to axial loading, it results in areduction of ultimate bearing capacity as compared to that constructed on a horizontal ground surface. The stability of a foundation located on top of a slope is further affected by the edge distance and the slope angle.

In this work, the ultimate load capacity of an eccentrically loaded surface and shallow strip footing close to a reinforced sand slope and other matters, such as failure surfaces, load–displacement curves, rotations, etc. of footings were examined experimentally. Also this they had discussed about unpaved roads in low volume traffic areas to change it with use of Geotextile reinforcement to improve weak soil so that to prevent interruption of traffic service due to road failure and also to reduce maintenance cost. Laboratory model test results for the ultimate bearing capacity of strip and square foundations supported by sand reinforced with geogrid layers have been presented. Based on the model test results, the critical depth of reinforcement and the dimensions of the geogrid layers for mobilizing the maximum bearing-capacity ratio have been determined and compared.

The uses of geotextile in many engineering applications have become more apparent andhave proven to be an effective means of soil improvement. In early applications in roads and airfield construction, emphasis was laid on the separation function of the geotextile.Resl and Werner carried out the laboratory tests under an axisymmetric loading condition using nonwoven, needle-punched geotextiles. The results showed that the geotextile layer placed between subbase and subgrade can significantly increase the bearing capacity of soft sub grades. Raw materials such as polyester.Geosynthetics is applicable in various purpose of constructions such as reinforced retaining walls, coastal protection,river training, highways , airports, urban roads, ground improvements etc..In this study, the CBR test carried out on nonwoven needle-punched geotextile combines with the granular soils with different grading, the geotextile reinforcement placed between three different subgrade layers and the comparison betweenbearing capacity of soil with and without geotextile reinforcement under axisymmetric loading condition was investigated.

Soil is considered by the civil engineer as a complex material. Apart from the testing and classification of various types of soil, in order to determine the stability and physical properties, the knowledge of problems related to foundation design and construction, pavement design, design of embankments and excavation, design of earth dams are necessary.

Geosynthetics are polymeric products, commonly available in the form of geogrids, geotextiles, geo membranes and geocells, which are frequently used in civil engineering practice. The polymeric nature of the material makes different geosynthetics products durable under different ground and environmental conditions. Common applications of geosynthetics in the field of geotechnical engineering include improving strength and stiffness of subsurface soil beneath shallow foundations and pavements, providing stability to earth retaining structures and slopes, ensuring dam safety, to name a few. Early applications of geosynthetics in 1960s were about their use as filters materials in the United States and as soil reinforcement in Europe.

A geogrid is one of the most common geosynthetic products that are often used for improving mechanical performance of subsurface soil under external loadings. Geogrids are widely used as reinforcement layers in mechanically stabilized earth (MSE) and geosynthetic reinforced soil (GRS) walls, as a measure of slope stabilization and as reinforcement in subsurface soil below pavements and footings. Soils are weak in tension; good tensile capacity of geogrids allows the reinforcement layers to take over a significant part of tensile stresses generated within a soil mass due to the action of external loading. Thus, geogrids act as "reinforcing" element and enhance load-deformation behavior of reinforced soil mass. Geogrids are commonly made of polymers; nowadays different a variety of geogrids are made of polypropylene1 or high density polypropylene (HDPP).

As compared with the unreinforced base, the geocell-reinforced base can provide lateral and vertical confinement, tensioned membrane effect, and wider stress distribution. According to Giroud and Noiray, (1981) lateral confinement, increased bearing capacity, and tensioned membrane effect was identified as the major reinforcement mechanisms for geotextile reinforcement.

With growing interest in employing shallow foundations to support bridges and other heavy structures, it is important to study and explore all potential combinations ground improvement and foundation solutions that would allow the use of shallow foundations even in conditions for which a deep foundation would otherwise be selected. Footing on reinforced clay is such an alternative foundation solution. Notwithstanding the fact that footings bearing on reinforced clays can be an effective and economic alternative to other expensive foundation solutions, studies focusing on such foundations are rather limited in number.

Moreover, in addition to consolidation and long-term creep settlement (which are most frequently quantified for footings on clay), immediate settlement (i.e., settlement at a time shortly after load application) of foundations bearing on reinforced clay should be studied adequately to establish serviceability 4 criteria that may govern the design. Following such an objective, the present study aims to quantify immediate load-settlement behavior of a strip footing resting on geogrid-reinforced clay through the influence factor Iq (which will be discussed in chapter 4). Furthermore, effects of several parameters related to reinforcement arrangement and properties of soil and reinforcement on foundation performance (i.e., bearing capacity and settlement) are analyzed.

Retaining structures are constructed at nearly every highway, road and railwayprojectsandused against for slopes andembankments. Retaining structures are classified under two main groups. These are permanent structures such as retaining walls, reinforced earth structures, anchored walls and temporary structures such as sheetpilewallsand braced cuts. Retaining walls are mostly preferable elements among them and there arethree types such as cantilever, gravity and counterfort (Das, 1984). Retaining walls constructed by using reinforced concretesoconstruction of retaining walls needs money and time.On the other hand, weaksubsoilconditionsand slope heights increase the cost.Therefore alternative methods such as reinforced earth structures are used especially last 50 years. Reinforce dearth structureis also known as Mechanically Stabilized Earth Wall andis a specific reinforced soil system.

Geosynthetic reinforced soils are increasingly used in various structures such as earth retaining walls, embankments, foun-dations and also in pavement design. In recent years, geosyn-thetic have revolutionised many aspects of our practice, and in some applications, they have entirely replaced the tradi-tional construction material. In early applications in roads and airfield construction, emphasis was laid on the separation function of the geotextile. The geotextile sheeting partially replaced the conventional sand filter-separation layer. In many cases, the use of a geosynthetic can significantly increases the safety factor, improves performance and reduces costs in comparison with conventional design and construction alternatives. The inadequate bearing capacities of shallow foundations of buildings that results in many practical problems during construction work may be solved by imple-menting the geosynthetic reinforcing technique to strengthen the properties of the weaksoil.

Geosyntheticis a planar product manufactured from polymeric material to be used with soil, rock, earth or other geotechnical engineering-related materials as an integral part of a human-made project, structure or system . Geosynthetics can improve the soil performance, increase the safety factor and reduce the construction cost of project. Geotextiles are one of the largest categories of geosynthetics. a geotextile is a permeable geosynthetic made of textile materials.The results of studies on soil reinforced with nonwoven geotextile showed that the ultimate bearing capacity of soil increases with decreasing spacing of geotextile layers.In addition, nonwoven geotextiles can reduce soil brittleness by providing smaller loss of post-peak strength. The bearing capacity on both: reinforced and unreinforced sand loaded by a strip footing. The use of strip footing as reinforcing elements. The study that effect the length of strips on the bearing capacity and found that the bearing capacity of reinforced sand increases with increasing the length of the aluminum strips from 3B to 7B (where B is the width of the footing);The mechanism of reinforcement with geotextile is based on the friction between sand and geotextile.However, the mechanism of reinforcement withgeogrid is based on the interlock between sand and geogrid.In most previous studies, geogrid and woven geotextileswere used for soil reinforcement and nonwoven geotextileswere used for filtration.

Soil, especially granular, is relatively strong under compressive stresses. When reinforced, significant tensile stresses can be carried by the reinforcement, resulting in a composite structure which possesses wider margins of strength. This extra strength means that steeper slopes can be built. Geotextiles have been utilized in the construction of reinforced soil walls since the early 1970's. Geotextile sheets are used to wrap compacted soil in layers producing a stable composite structure. Geotextile-reinforced soil walls somewhat resemble the popular sandbag walls which have been used for some decades. However, geotextilereinforced walls can be constructed to a significant height because of the geotextile's higher strength and a simple mechanized construction procedure.

1.2 Aim:

This project has been taken up to**Experimental Investigation for Determining Bearing Capacity of Soil by Using Geotextile**with the following objective.

1.3 Objectives:

1. To find out the optimum depth of Geotextle.
2. To have economical structure by effecive utilization of geotextile.

Chapter 2

Literature Review

2.1 General

Latha and Murthy (2007) used three reinforcing method, viz. horizontal layers, vertical encasement, and randomly distributed discrete fibers for a sand column with 38mm diameter and 76mm height in triaxial device. They compared stress–strain behaviour of sand columns reinforced with horizontal layers and vertical encasement with the equal area of reinforcement material.

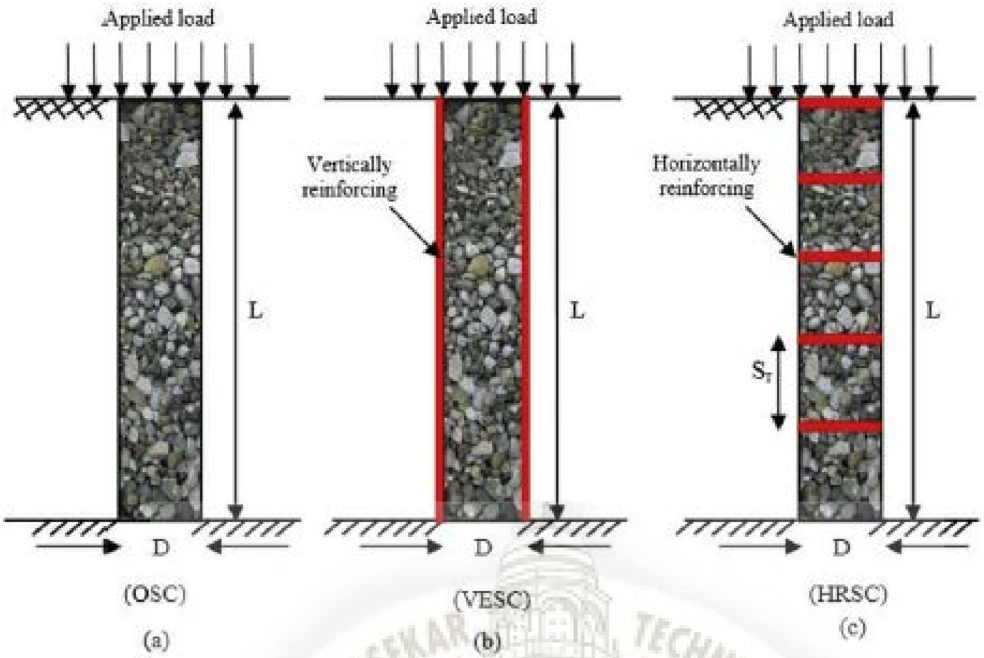

Fig 2.1 Schematics of (a) OSC (b) VESC (c) HRSC

Nguyen et al. (2013) studied interactions between soil and geotextile layers bytriaxial tests on sand columns, with 50mm diameter, reinforced with horizontal layers of nonwoven geotextile. They studied strain and stress patterns generated on reinforcing geotextile sheets. They found that the peak of mobilized tensile force occurs at the center of the reinforcing sheets and reduces to approximately zero at the stone column periphery.

Prasad and Satyanarayana (2016) performed a series of tests on single HRSCs with 60, 23 and 50mm diameters, respectively and found that the load carrying capacity of HRSCs increases with increasing the number of the horizontal reinforcing strips and decreasing the spaces between them.

Guido et al. (1986) reported a 12% increase in the bearing capacity of a foundation placed on two-layer planer reinforcement when compared to the bearing capacity of the same foundation placed on a single layer of reinforcement located at a depth 0.25-time greater than the foundation width.

Tafreshi and Dowson (2010) reported a 50% increase in the ultimate bearing capacity when two layers of planer reinforcement were used instead of a single layer. The different bearing capacities reported in these experiments could be the result of using different materials, reinforcement lengths, and depths.

Chen and Abu-Farsakh (2015) developed an analytical method to calculate the effect of the number of reinforcement layers on the bearing capacity of strip footing in terms of the number of layers, the depths of the reinforcements, and other parameters. Increasing the length of the reinforcements improves the ultimate bearing capacity of the foundation up to a certain limit, at which point a further increase shows no additional improvement. The optimum length of the reinforcements for a maximum increase in bearing capacity is 3- to 6-times the foundation width. The depth of the reinforcement is another parameter influencing the bearing capacity of a foundation. The suggested optima depths of the first and last layers of reinforcement are approximately 0.33 to 0.5- and 1.25-times the foundation width, respectively.

Ebadi et al. (2015) used cement treatment to increase the interface shear strength of soil and a non-woven geotextile. A limited number of studies have been conducted on the effects of cement treatment of the interface between the soil and reinforcement on the bearing capacity of a foundation. The objective of the present study was to investigate the effects of the cement treatment of the soil-geotextile interface on the bearing capacity of foundation built on reinforced soil.

D.M. Dewaikar including unpaved roads, low embankments, and large stabilized areas such as oil drilling platforms. The geotechnical performance of a granular fill layer compacted over soft clay layers may be further improved by placing a layer of geosynthetic reinforcement on the surface of the clay prior to placement of the fill.

Guido et al. (1986) and Tafreshi and Dawson (2010) reported a 10 to 15% increase in the bearing capacity of a foundation built on geocell-reinforced sand when compared with the same footing built on geotextile-reinforced sand.

Table 2.1Basic Properties of Sand

D (mm)	**0.4**
D30 (mm)	**0.6**
D60 (mm)	**1.2**
Cu	**3**

Cc	**0.75**
w	**2%**
Φ	**35°**
γ	**16.1kN/ m³**

Bayram Ali Uzuner et al. (3 April 2014) By Department of Civil Engineering, different failure mechanisms have been asserted and defined. It is known that usage of reinforcement usually increases the bearing capacity of soil by changing the failure mechanism. The bearing capacity of the eccentrically and inclined loaded footing is less than the centrally loaded footing. Footings always rotated towards the eccentricity side when eccentrically loaded. Rotation angle increased with increasing eccentricity. Ultimate load capacities of eccentrically loaded strip footings decreased with increasing eccentricity. General shear failures occurred in dense sand conditions. The use of geotextile reinforcement improves the load–displacement behaviour of footings from a settlement condition point of view.

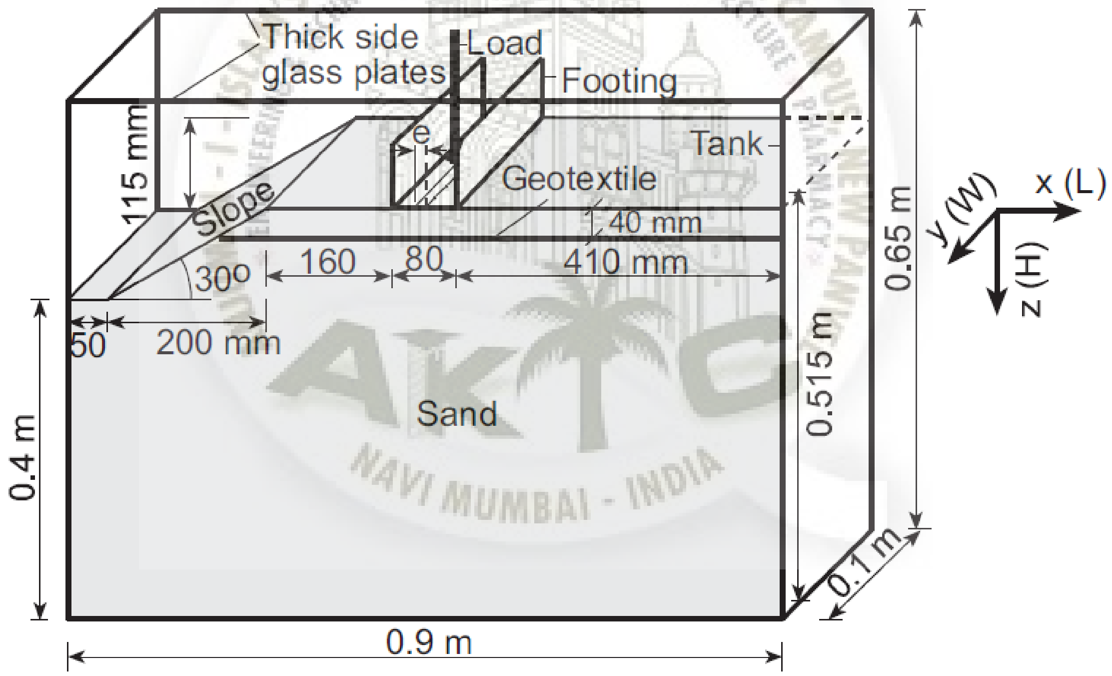

Fig2.2Three dimensional schematic view of the experimental system

Mahmoud Nazirizadet al.(2017) published By World Academy of Science, Engineering and Technology International Journal of Civil. The aim of this study was to investigate the role of nonwoven geotextile in the bearing capacity of two types of soils. Three types of Geotextiles in different weights per square Meter. The specific objective of this study was to investigate the number and types of geotextile layers on the bearing resistance of samples reinforced by geotextile. Different test where conducted and results generally showed that with the utilization of geotextile in the states of one and two layers, the resistance of samples against loading increased appreciably. The application of geotextile in two layers showed that it increased the CBR values. Based on the CBR results, the CBR values increased with the application of one layer geotextile, the maximum CBR values in clayey and sandy soils were approximately 3 and 2.6 times greater than those without reinforcement.

M.T Omar et al.(January 15, 1993) ByDepartment of Civil Engineering and Mechanics, So-cthern Illinois University at Carbondale, U.S.A.Laboratory model test results for the ultimate bearing capacity of strip and square foundations supported by sand with geogrid reinforcement have been presented. Based on the model test results, out puts can be drawn for development of maximum bearing capacity, the effective depth of reinforcement is about 2B for strip foundations and 1.4B for square foundations the maximum depth of placement of the first layer of geogrid should be less than about B to take advantage of reinforcement. The influence of foundation size and scale effects has not been investigated. Consequently, these findings cannot be directly transported to full-size foundations without additional verification.

American Society for Testing and Materials. A.B.O.A. Standards (ed.) vols. 04–09 (1977) Reinforced soil is a composite material in which elements of high tensile resistance are implemented to increase the tensile resistance of the soil. Geotextiles are one of the major groups of geosynthetic products that are used for soil reinforcement. This paper deals with the effects of using nonwoven geotextile to improve the ultimate bearing capacity of footings resting on sand with medium density.

Resl and Werner (1986) carried out laboratory tests under an axisymmetric loading condition using nonwoven and needlepunched geotextiles. The results showed that the geotextile layer placed between the soil layers can significantly increase the bearing capacity of soft subgrades.

Li *et al*. (2012) reported the work in this field of research. Geosynthetic produced from polymers is widely used to reinforce soils. The reinforced soil structures are under to stress or creep.

Palmeira et al. (1998)have stated that geosynthetics reinforcement can be used to increase the factor of safety of embankments on soft soils, particularly for shallow foundation layers. They have presented back analysis of some reinforced embankments that can be found in literature using stability methods commonly employed. The results obtained suggest that these simple methods are useful tools for predicting factor of safety of reinforced embankments when the required input data are available and accurate

Kumar and Saran (2003)have conducted laboratory tests on closely spaced strip and square footings on geogrid reinforced sand. The study was carried out to evaluate the effect of spacing between the footings, size of reinforcement and continuous and discontinuous reinforcement layers on bearing capacity and tilt of closely spaced footings.

Ghazavi and Mirzaeifar (2010)have studied uses of geosynthetics reinforcement to increase bearing capacity and reduced settlement of the soil. Many analytical, numerical and experimental studies have performed to evaluate the behavior of reinforced soil foundations built in various soil types.

Chapter 3

Methodology

3.1 General

The main objective of the study is to obtain optimum depth of geotextile so as to have maximum strength in soil and bear maximum load. The schematic diagram of the experimental setup used for the model footing tests is shown in fig 3.1. The front wall ofthe test tank is fabricated from a 15 mm thick glass to facilitate the viewing of the failure mechanism. The two important constituent materials used in these investigations are soils and reinforcement.

3.2 Experimental work

Tank

It consisted of a mild steel tank having internal dimensions of the tank containing the sand 100 cm (length), 100 cm (width), and 100 cm (height).Having one side with glass fitted of thickness 15 mm.

Model footing

The model strip footing was made by welding 8 mm thick steel plates. The dimensions of the footing in the test set-up are 100 mm (width, *B*) × 100 mm (length) × 8 mm (thick).

Sand and geotextile used

The fill material soil used for the model tests was a locally available sand in Panvel Region.The geotextile reinforcement adopted in this studied was a polypropylene woven geotextile.

3.3 Loading system

The footing was driven to a maximum displacement of 26 mm (corresponding to 20% of footing width) by means of a hydraulic jack and a reaction frame. constituent materials used in these investigations are soils and reinforcement. The load was applied on the plate with a constant displacementrate of 1 mm/min.

Running of typical test

Sand was placed full width of the tank in 50 mm thick layers for 400mm. A 50 mm thick layer was deposited in the tank loosely as a uniform thick (about 50 mm) layer. This loose sand layer was lightly compacted with a wooden hammer in the tank until about 50 mm thick. To confirm the 50mm thickness, horizontal lines at 50mm intervals were drawn on the internal face of the glass plate. This process continued until the sand mass height reached 200mm. Then a geotextile strip was placed over full width of tank and Over it another quantity (2852 g) for a 50 mm thick layer was deposited and loading was given. Further the same process was repeated fordifferent thickness of layers and so on… and loading is given to the respective layer depth.

3.4 Test program

In this study, three series of tests were conducted on the laboratory model:(*i*) a series of tests with different fill thickness(*H*) to footing width (*ii*) Without a geotextile reinforcement at the interface. (*iii*) A series of tests with the width of geotextile (*B*′) being varied from 3*B* to 8*B* while the optimum fill thickness was kept constant.

Table 3.1 Load bearing capacity of soil without geotextile

Sr. No.	Load(kN)	Settlement (mm)
0	0	0
1	0.12	1
2	0.13	2
3	0.25	3
4	0.27	4
5	0.32	5
6	0.35	6
7	0.4	7
8	0.43	8
9	0.47	9
10	0.49	10
11	0.5	11
12	0.52	12
13	0.56	13
14	0.59	14
15	0.61	15
16	0.67	16
17	0.69	17
18	0.72	18
19	0.73	19
20	0.79	20

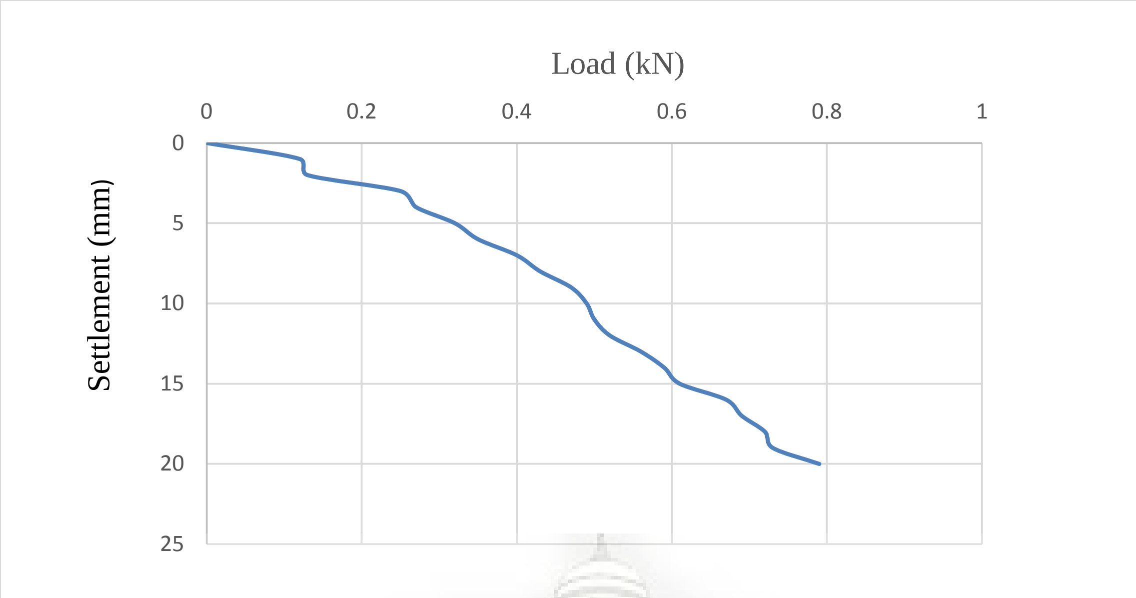

Figure 3.1 Load vs Settlement curve for soil without geotextile

Figure 3.2 Soil without geotextile

Table 3.2 Load bearing capacity of soil with geotextile

	Load(kN)			
Settlment(mm)	**50**	**100**	**150**	**200**
0	0	0	0	0
1	0.3	0.6	0.28	0.23
2	0.3	0.66	0.3	0.3
3	0.36	0.7	0.4	0.34
4	0.38	0.75	0.56	0.43
5	0.45	0.8	0.6	0.44
6	0.46	0.83	0.63	0.5
7	0.52	0.91	0.7	0.51
8	0.55	0.91	0.8	0.53
9	0.56	1.03	0.85	0.57
10	0.62	1.1	0.86	0.6
11	0.68	1.2	0.86	0.66
12	0.7	1.21	0.89	0.7
13	0.75	1.28	0.9	0.71
14	0.82	1.35	0.93	0.72
15	0.83	1.36	0.99	0.74
16	0.88	1.47	1	0.77
17	0.93	1.58	1.05	0.8
18	1	1.61	1.08	0.83
19	1.02	1.72	1.2	0.88
20	1.07	1.82	1.22	0.93

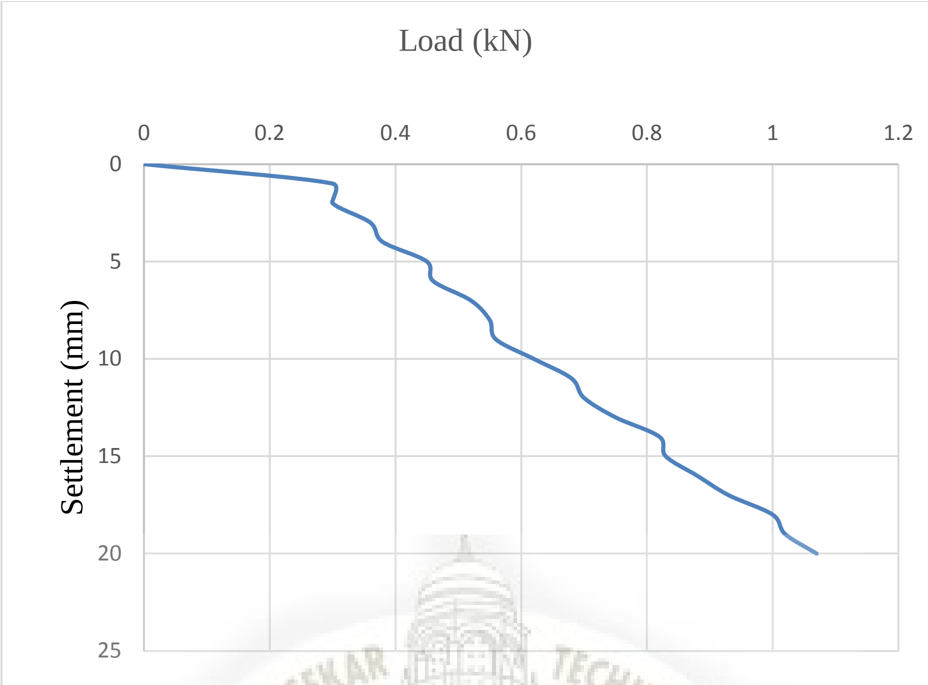

Figure 3.3 Load vs Settlement curve for soil with geotextile layer at 50mm

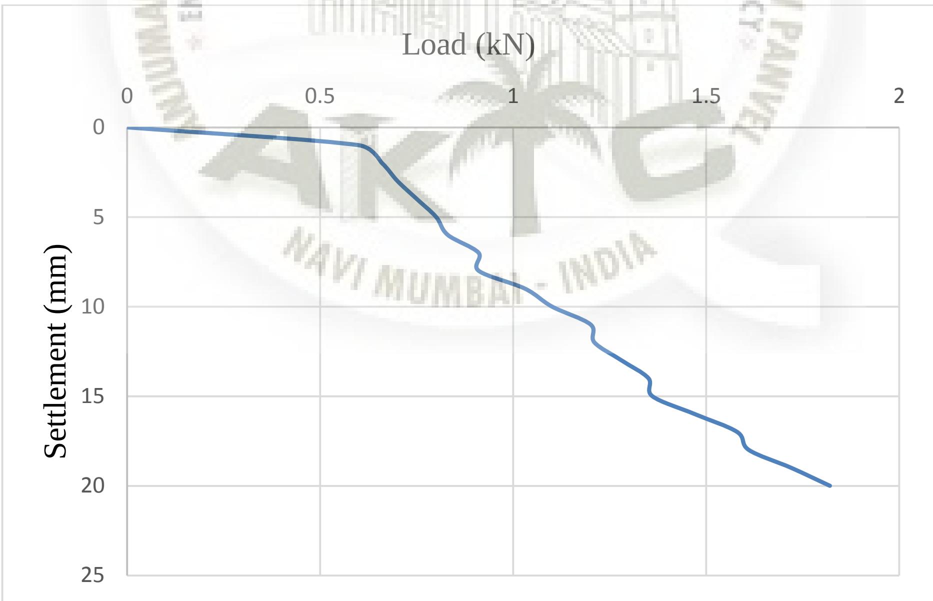

Figure 3.4 Load vs settlement curve for soil with geotextile layer at 100mm

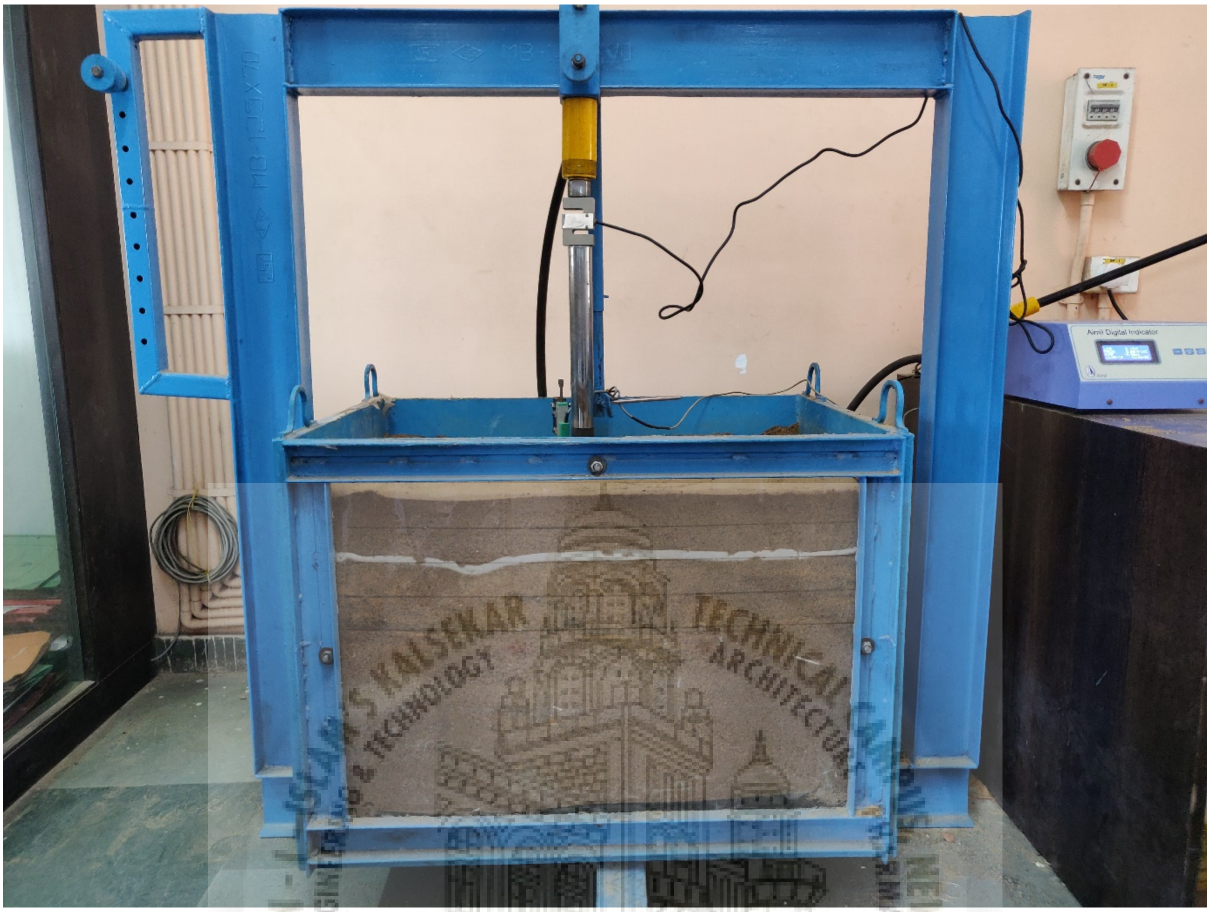

Figure 3.5 Geotextile layer at 100mm from top

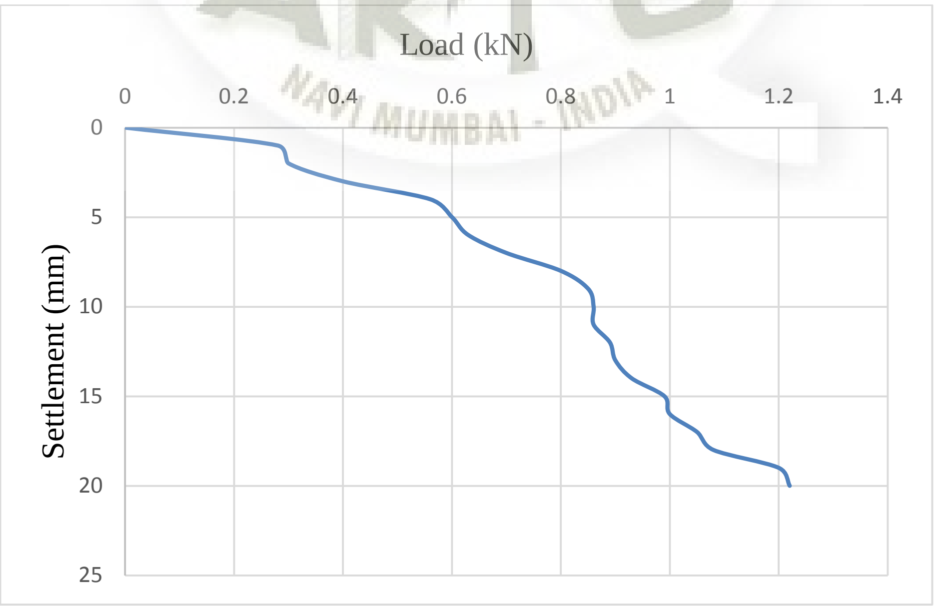

Figure 3.6 Load vs Settlement curve for soil with geotextile layer at 150mm

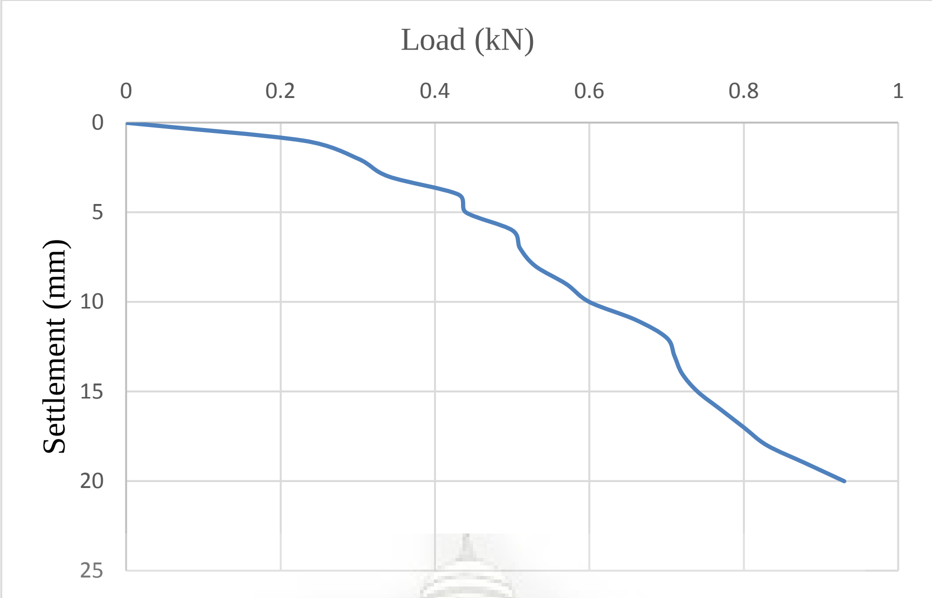

Figure 3.7 Load vs Settlement curve for soil with geotextile layer at 200mm

Figure 3.8 Geotextile layer at 200mmfrom top

Table 3.3 Load bearing capacity with spacing of 50mm strip

	Load(kN)			
Settlment(mm)	**50**	**100**	**150**	**200**
0	0	0	0	0
1	0.28	0.58	0.23	0.15
2	0.29	0.63	0.25	0.16
3	0.33	0.67	0.39	0.28
4	0.34	0.73	0.45	0.3
5	0.41	0.75	0.59	0.36
6	0.44	0.8	0.61	0.37
7	0.49	0.81	0.67	0.42
8	0.53	0.89	0.78	0.45
9	0.55	0.97	0.8	0.5
10	0.59	1	0.82	0.51
11	0.65	1.01	0.84	0.55
12	0.68	1.1	0.87	0.55
13	0.72	1.19	0.89	0.57
14	0.77	1.2	0.91	0.6
15	0.81	1.29	0.97	0.63
16	0.85	1.37	0.99	0.7
17	0.89	1.55	1.01	0.73
18	0.95	1.57	1.05	0.77
19	0.99	1.7	1.15	0.78
20	1.03	1.79	1.19	0.81

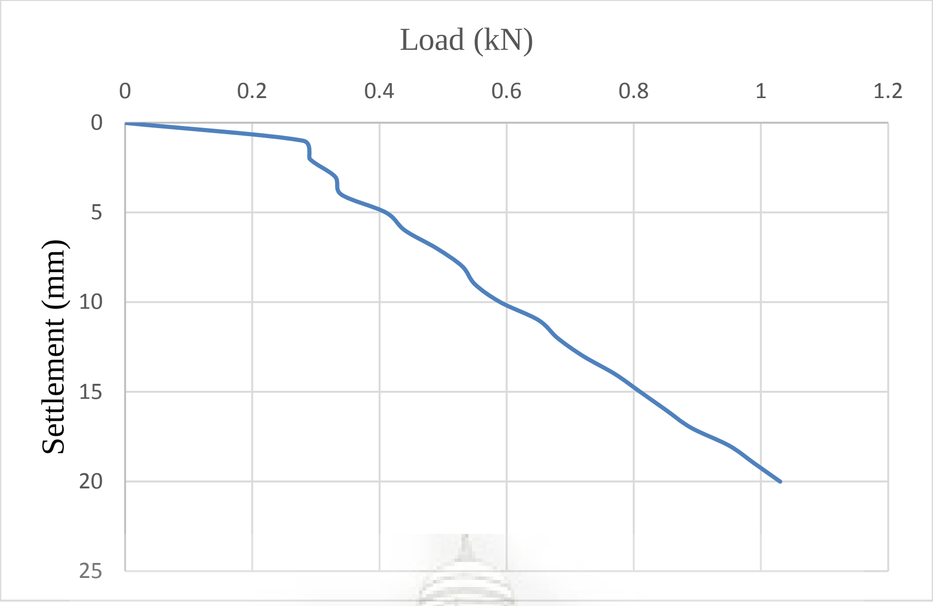

Figure 3.9 Load vs Settlement curve for soil with geotextile strips (50mm spacing) at 50mm from top

Figure 3.10 Geotextile strips (50mm Spacing) at 50mm from top

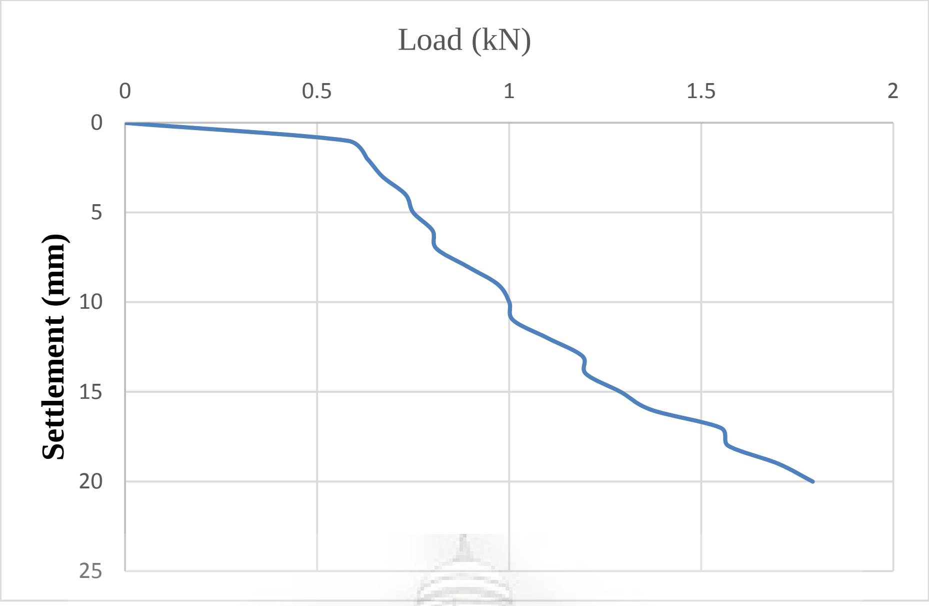

Figure 3.11 Load vs Settlement curve for soil with geotextile strips (50mm spacing) at 100mm from top

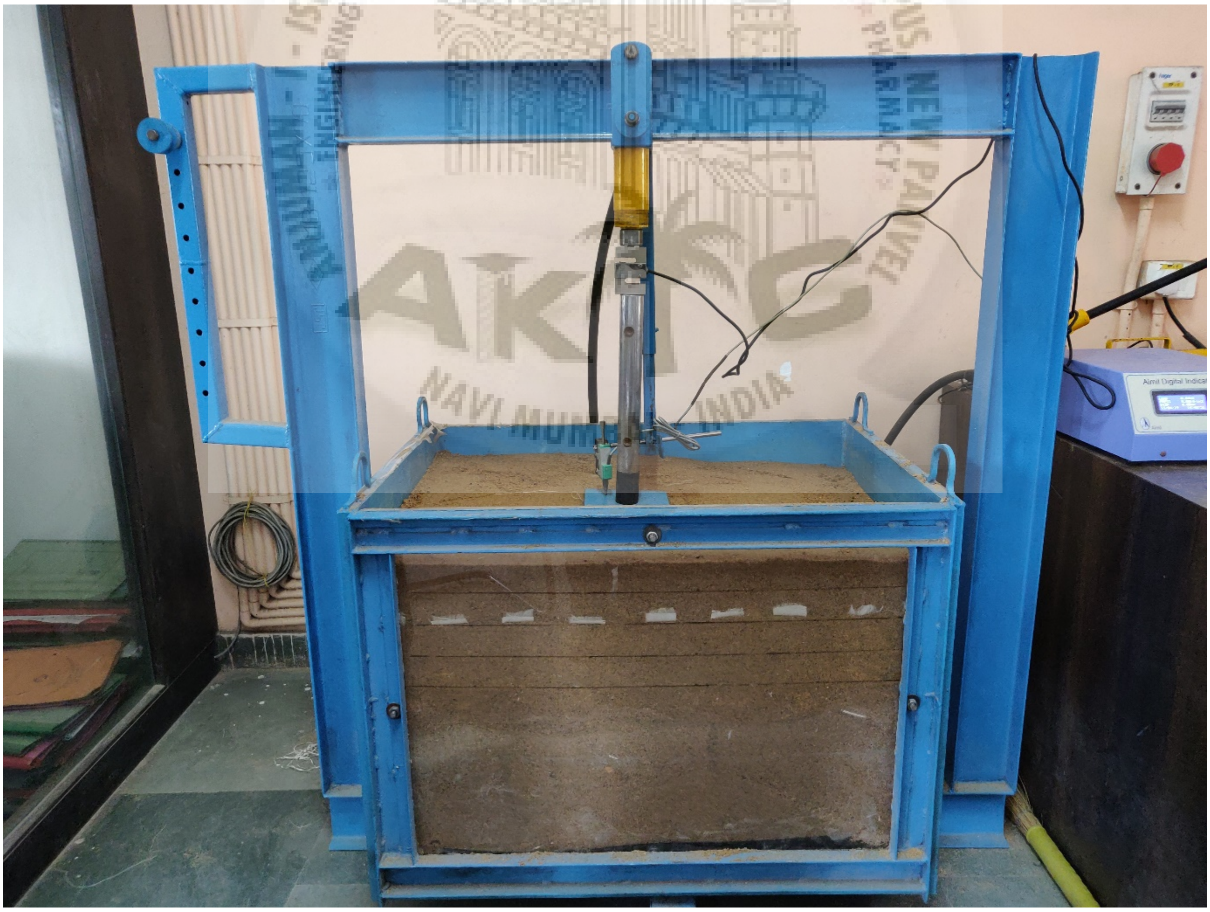

Figure 3.12 Geotextile strips (50mm Spacing) at 100mm from top

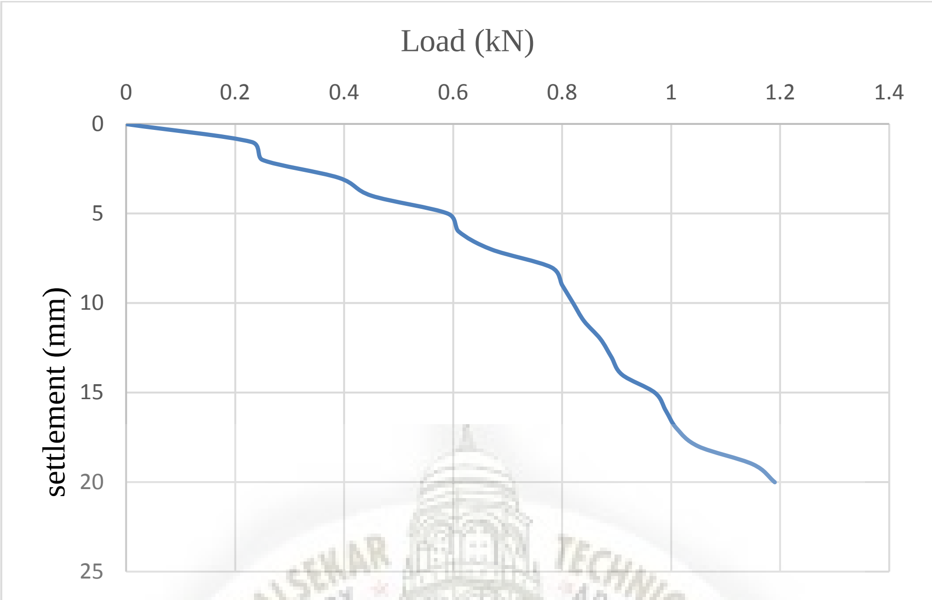

Figure 3.13 Load vs Settlement curve for soil with geotextile strips (50mm spacing) at 150mm from top

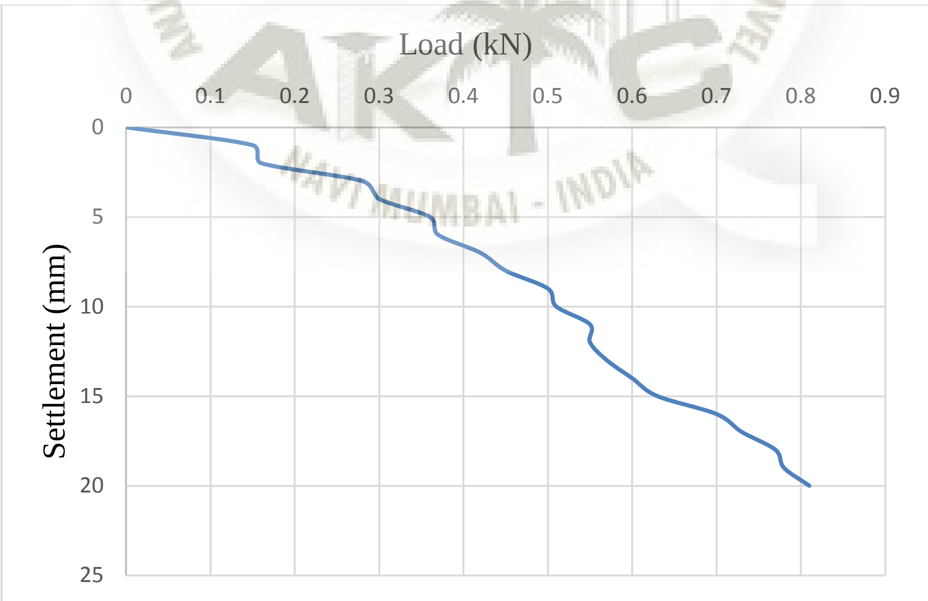

Figure 3.14 Load vs Settlement curve for soil with geotextile strips (50mm spacing) at 200mm from top

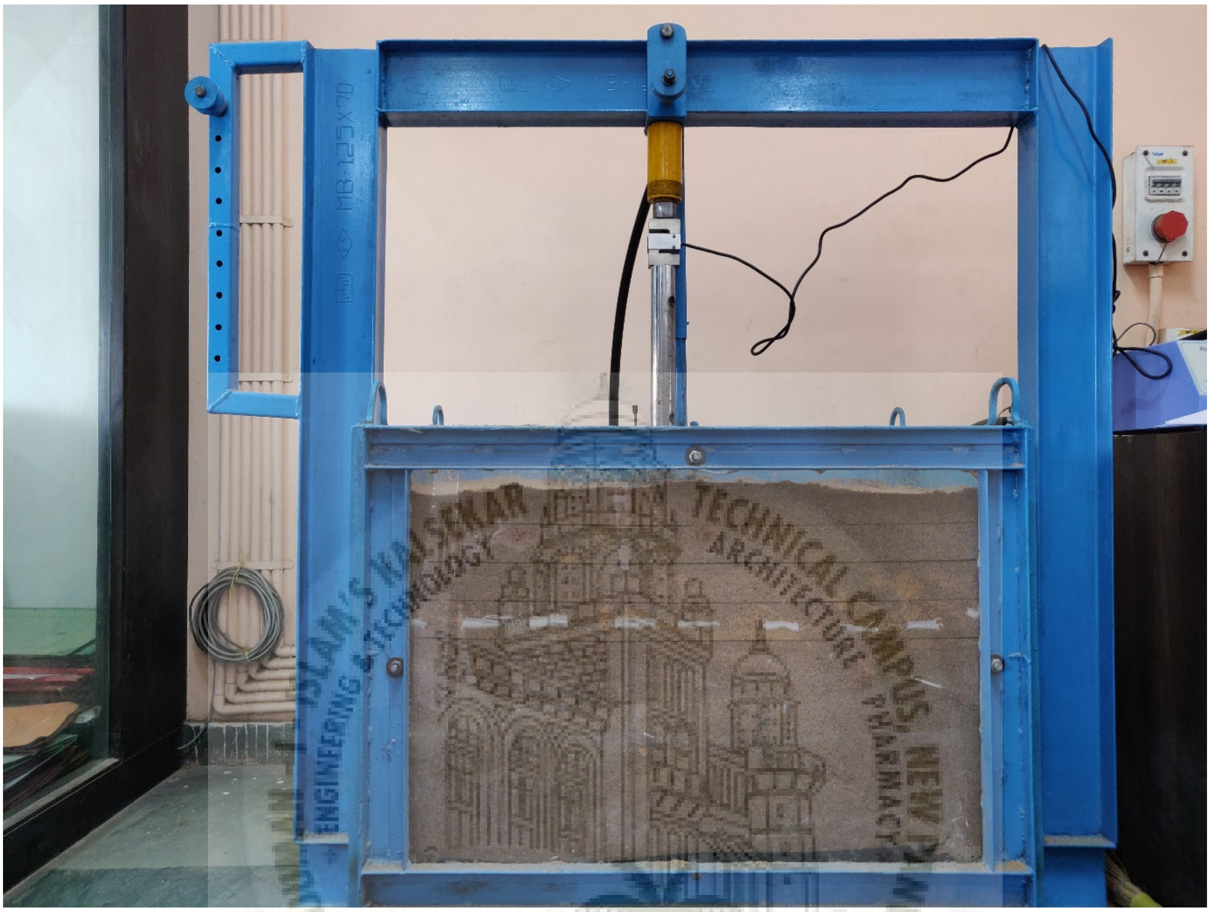

Figure 3.15Geotextile strips (50mm Spacing) at 200mm from top

Table 3.4 Load bearing capacity with spacing of 100mm strip

	Load(kN)			
Settlment	**50**	**100**	**150**	**200**
0	0	0	0	0
1	0.2	0.55	0.21	0.13
2	0.21	0.57	0.23	0.14
3	0.25	0.53	0.25	0.26
4	0.31	0.68	0.36	0.29
5	0.39	0.7	0.45	0.31
6	0.41	0.76	0.59	0.33
7	0.45	0.78	0.61	0.39
8	0.47	0.79	0.67	0.42
9	0.5	0.85	0.78	0.44
10	0.55	0.87	0.8	0.53
11	0.6	0.95	0.82	0.53
12	0.63	0.98	0.84	0.55
13	0.69	1	0.87	0.58
14	0.73	1.01	0.89	0.6
15	0.79	1.21	0.91	0.62
16	0.8	1.29	0.97	0.68
17	0.83	1.32	0.99	0.7
18	0.89	1.39	1.01	0.73
19	0.92	1.46	1.09	0.74
20	0.95	1.5	1.11	0.75

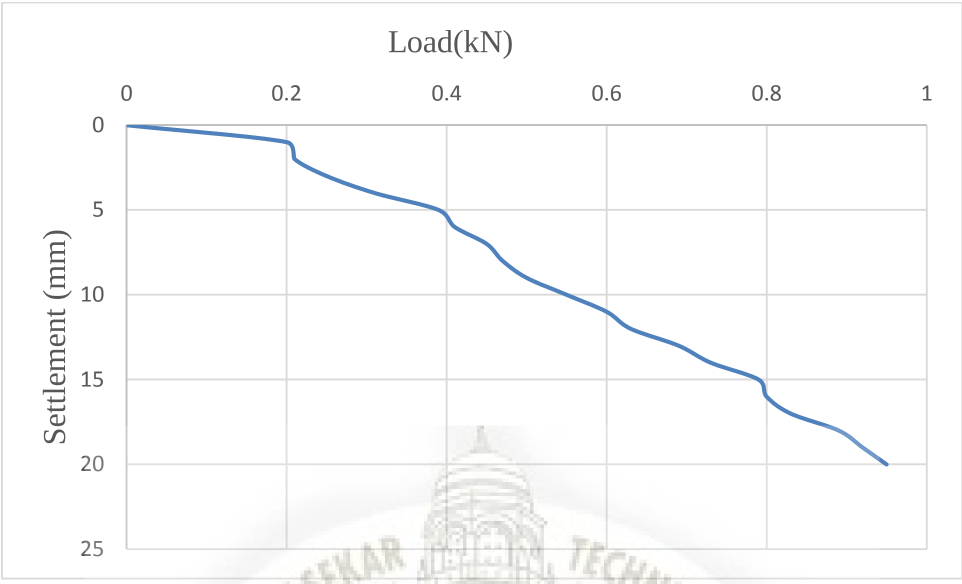

Figure 3.16 Load vs Settlement curve for soil with geotextile strips (100mm spacing) at 50mm from top

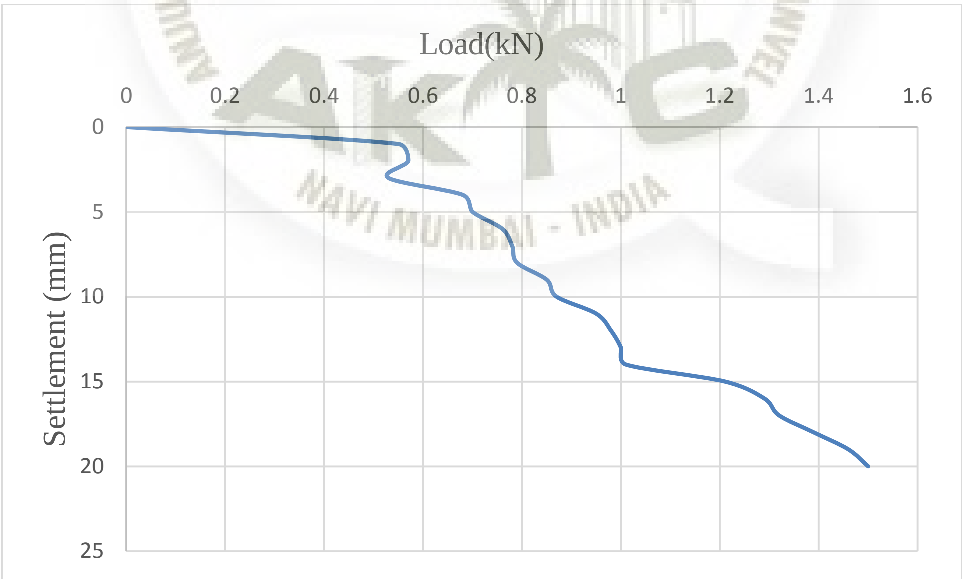

Figure 3.17Load vs Settlement curve for soil with geotextile strips (100mm spacing) at 100mm from top

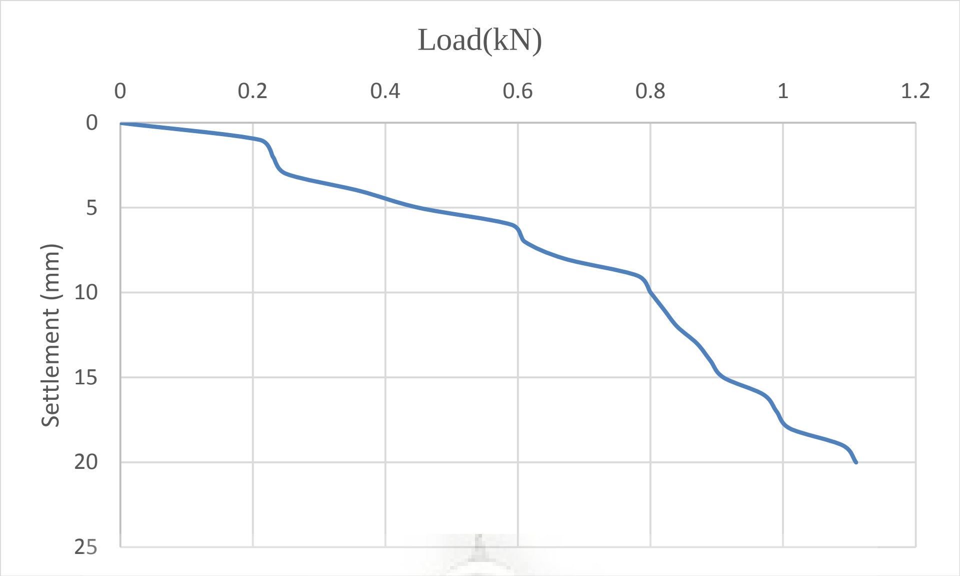

Figure 3.18 Load vs Settlement curve for soil with geotextile strips (100mm spacing) at 150mm from top

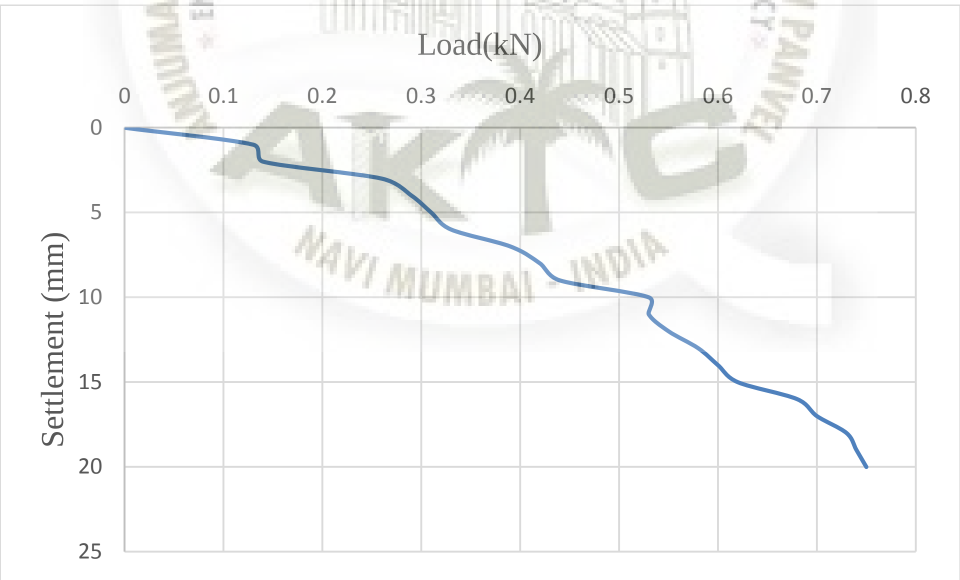

Figure 3.19 Load vs Settlement curve for soil with geotextile strips (100mm spacing) at 200mm from top

Chapter 4

Results

4.1 Bearing capacity of soil without geotextile layer:

In this loading we just applied simple loading on the soil. In this type of loading as the loading is increased settlement is also increases. Eg 0.12 kN load the settlement was 1mm and for 0.32 kN load the settlement increased upto 5mm. This showed that the settlement increases as the loading increases.

4.2 Bearing capacity of soil with geotextile layer at 50mm from top

In this type of loading the geotextile layer was placed at an interval of 50mm from the top. As the loading was applied on the soil the bearing capacity of the soil increased because of the application of the geotextile for settlement as compared to without geotextile. The settlement for 1mm settlement was 0.3 kN and for 5mm the settlement was 0.45 kN. This showed that the geotextile was giving effective layers as compared to non geotextile soil.

4.3 Bearing capacity of soil with geotextile layer 100mm from top

For effective result we increased th depth of placing of geotextile to 100mm from 50mm to get the effective readings. In this the geotextile was placed at abut 100mm from the top. Same procedure was done for above two test. Loading was applied on the top of the soil. As loading was applied it ave better results than 50mm layer of geotextile. For1mm settlement the loading was 0.6 kN and for 5mm settlement the loading was 0.8 kN. This showed that the 100mm thick layer was more effective than 50mm layer. For more effective results further test were conducted on the soil at different layer.

4.4 Bearing capacity of soil with geotextile layer 150mm from top

In this type of loading the geotextile layer was placed at 150mm from the top. As the loading was applied on the soil the bearing capacity of the soil increased because of the application of the geotextile for settlement as compared to without geotextile. The settlement for 1mm settlement was 0.28 kN and for 5mm the settlement was 0.6 kN. This showed that the geotextile was giving effective layers as compared to non geotextile soil.

4.5 Bearing capacity of soil with geotextile layer 200mm from top

For better result the depth was increased to 200mm and the loading was applied on the soil. As the loading was applied, the loading at 1mm settlement was 0.23 kN and for 5mm settlement the loading was 0.44 kN. The load berig capacity for this test was less than 100mm. This test was not considered effective.

4.6 Further test were conducted for 50mm (spacing) geotextile strips to get effective results:

4.7 Bearing capacity of soil for geotextile strips at 50mm from top

The geotextile was cut into strips of 50mm wide. Geotextile was placed at 50mm from the top of the soil. The loading was applied on the top of the soil. The loading for 1mm settlement was 0.28 kN and for 5mm settlement the load carrying capacity increased to about 0.41 kN. This was by far the most effective test conducted. Further the depth was increased.

4.8 Bearing capacity of soil with Geotextile Strips 100mm from top

The depth was increased to 100mm from top of the soil. Loading was applied, the load for 1mm settlement was 0.58 kN and for 5mm settlement was 0.75 kN. The load bearing capacity decreased as the depth was increased.

4.9 Bearing capacity of soil with Geotextile Strips 150mm from top

In this type of loading the geotextile layer was placed at 150mm from the top. As the loading was applied on the soil the bearing capacity of the soil increased because of the application of the geotextile for settlement as compared to without geotextile. The settlement for 1mm settlement was 0.23 kN and for 5mm the settlement was 0.59 kN. This showed that the geotextile was giving effective layers as compared to non geotextile soil.

4.10 Bearing capacity of soil with Geotextile Strips 200mm from top

The depth was increased upto 200mm from top of the soil. Load carrying capacity for 1mm settlement was 0.15 kN and for 5mm it was 0.36 kN. This was better than 100mm layer, but not effective than 50mm layer strips.

4.11 For 100mm (spacing) geotextile strips to get effective results

4.12 Bearing capacity of soil withGeotextile Strips50mm from top

The geotextile was cut into strips of 50mm wide. Geotextile was placed at 50mm from the top of the soil. The loading was applied on the top of the soil. The loading for 1mm settlement was 0.2 kN and for 5mm settlement the load carrying capacity increased to about 0.39 kN.

4.13 Bearing capacity of soil with Geotextile Strips 100mm from top

The depth was increased to 100mm from top of the soil. Loading was applied, the load for 1mm settlement was 0.55 kN and for 5mm settlement was 0.7 kN. The load bearing capacity decreased as the depth was increased.

4.14 Bearing capacity of soil with Geotextile Strips 150mm from top

In this type of loading the geotextile layer was placed at 150mm from the top. As the loading was applied on the soil the bearing capacity of the soil increased because of the application of the geotextile for settlement as compared to without geotextile. The settlement for 1mm settlement was 0.21 kN and for 5mm the settlement was 0.45 kN.

4.15 Bearing capacity of soil with Geotextile Strips 200mm from top

The depth was increased upto 200mm from top of the soil. Load carrying capacity for 1mm settlement was 0.13 kN and for 5mm it was 0.31 kN. This was better than 100mm layer, but not effective than 50mm layer strips.

Chapter 5

Conclusion

Different tests were performed on the soil in which the 100mm depthbtest withbstrips was considered as effective because it got almost the same results as that of full length geotextile. 50 % geotextile was considered effective because of the economy.

Fig.3.1 Proposed setup for model footing tests.

1, reaction frame; 2, test tank; 3, hydraulic jack; 4, slotted angle to support LVDTs;5, LVDT; 6,electronic load cell; 7, model footing; 8, indicators and recorders; 9, water outlet; 10, sand column.

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