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Strengthening Soil Bearing Capacity with the Use of Synthetic Fiber as Reinforcement

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Abstract: ***The spontaneous urbanisation has brought about boom in call for of land, solid for fast and green buildings over it. Hence it's far critical to bolster low bearing potential regions for financial creation practices.To conquer this impediment numerous laboratory tests and research are carried out, comparing the reinforceing impact of geogrid for enhancing bearing potential of soil. This paper objectives to look at the impact of artificial fibrein improving the bearing potential. Krishna river sand is used at exceptional relative density of compaction and handiest one kind of artificial fibre have been used for the tests. The intensity of the muse become various from 0 to B (B=width of foundation). The increase with inside the bearing potential with the availability of synthetic fibre as reinforcement is observed.***

Keywords: Maximum load, Settlement, Synthetic fibre, U/B ratio, Sand, Ultimate load, L/D ratio.

I. INTRODUCTION

A shallow foundation is a type of foundation that transfers building loads to the earth relatively close to the surface. Spread footing foundations, isolated footing foundations, mixed footing foundations, and mat-slab foundations are examples of shallow foundations. Shallow foundations are generally placed on top of cohesive soil, resulting in inadequate bearing capacity and significant settlement issues. This can result in structural damage, a decrease in durability, and a decrease in performance.traditional treatment options include replacing a portion of the weak cohesive soil with a sufficiently thick layer of stronger granular fill, increasing the size of the footing, or a combination of the two.

Reinforced soil foundations are an alternate and more cost-effective option . This can be accomplished by either directly strengthening cohesive soil or by replacing weak soils with stronger granular fill in conjunction with geosynthetic reinforcement. The composite zone (reinforced soil mass) that results will increase the footing's load carrying ability. The use of reinforced soils to sustain shallow foundations has gained a lot of attention in the last 30 years. The behaviour of reinforced soil foundations (rsf) for various soil types has been investigated through numerous experimental, computational, and analytical research.

the first experimental study reported in the literature was conducted by binquet and lee[1] (1975)to evaluate the bearing capacity of sand reinforced by metal strips.abu-farsakh et al. And gill et al.[2] (2013)performed tests on geogrid reinforced foundations and suggested that, to improve bcr, the optimal number of reinforced layers was 3 or 4 layers, and the effective reinforcement depth was1.25b–1.5b, where b is the width of footing.

A. Geosynthetics

Geosynthetic-bolstered soils has been broadly used withinside the creation of road, foundations, railway embankment, keeping partitions and slopes to enhance the stability, bearing potential and stiffness of structures.

Many researchers have experimentally studied the bearing potential of footings on bolstered sandy soils observed that the inclusion of geogrid reinforcement ought to substantially alternate the strain distribution in soils beneath footings, accordingly growing the bearing potential of the foundations. There are many elements that would have an effect on the overall performance of geosynthetic-bolstered foundations, consisting of soil geosynthetics interface interaction, wide variety of reinforcement layers, reinforcement spacing, intensity of the primary reinforcement layer etc…,

B. Synthetic Fibre Used

Geogrid is a geosynthetic material that is widely utilised in geotechnical engineering to improve soil mechanical capacities. Geogrid is regarded to be an effective way to improve the overall performance and carrier life of a variety of earth constructions (e.g. embankments, pavements, foundations and maintaining walls). Applying a layer of geo-textile or geogrid at the bottom or inside the fill layer to improve its bearing capabilities by utilising the structural motion of geogrid is a common practise.

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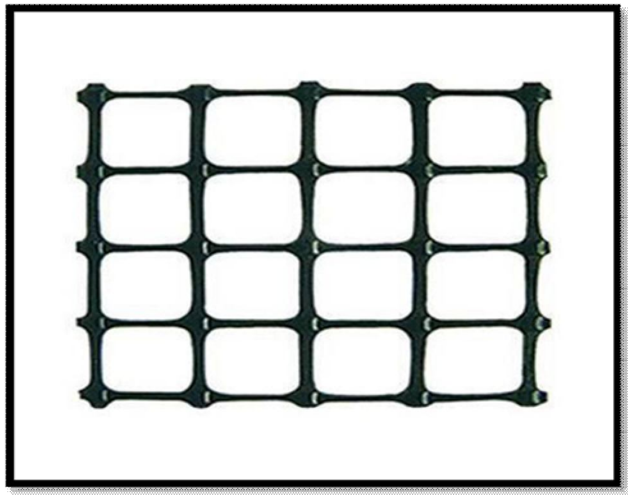
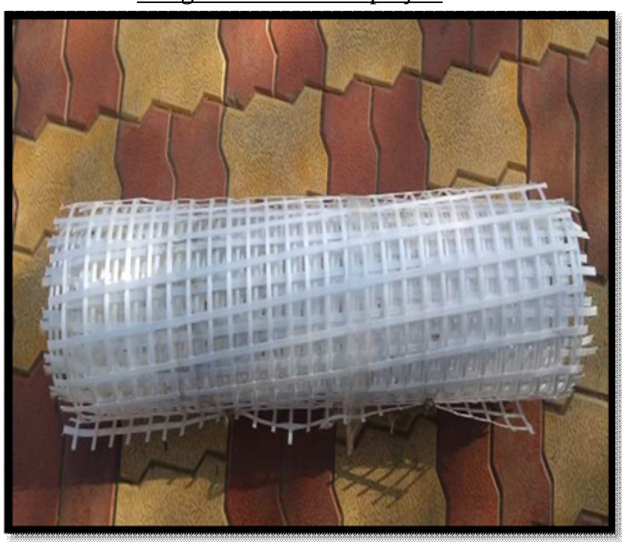
Different types of Geogrids are as follows

Uniaxial geogrid



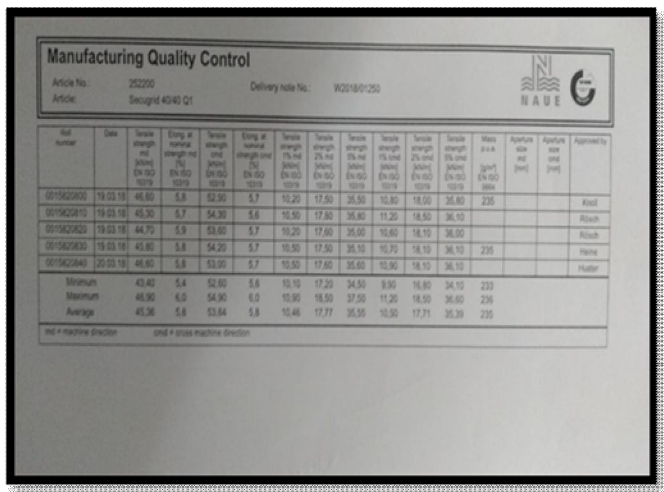
Biaxial geogrid

Geogrid used for this project



Biaxial geogrid

Specifications of geogrid



Manufacturing Quality Control

Article No.: 252200 Delivery note No.: W2018/01250
Article: Secugrid 40/40 Q1

Roll number	Date	Tensile strength md [kN/m] EN ISO 10319	Elong. at nominal strength md [%] EN ISO 10319	Tensile strength cmd [kN/m] EN ISO 10319	Elong. at nominal strength cmd [%] EN ISO 10319	Tensile strength 1% md [kN/m] EN ISO 10319	Tensile strength 2% md [kN/m] EN ISO 10319	Tensile strength 5% md [kN/m] EN ISO 10319	Tensile strength 1% cmd [kN/m] EN ISO 10319	Tensile strength 2% cmd [kN/m] EN ISO 10319	Tensile strength 5% cmd [kN/m] EN ISO 10319	Mass p.u.a. [g/m²] EN ISO 9864	Aperture size md [mm]	Aperture size cmd [mm]	Approved by
0015820800	19.03.18	46,60	5,8	52,90	5,7	10,20	17,50	35,50	10,80	18,00	35,80	235			Knoll
0015820810	19.03.18	45,30	5,7	54,30	5,6	10,50	17,80	35,80	11,20	18,50	36,10				Rösch
0015820820	19.03.18	44,70	5,9	53,60	5,7	10,20	17,60	35,00	10,60	18,10	36,00				Rösch
0015820830	19.03.18	45,80	5,8	54,20	5,7	10,50	17,50	35,10	10,70	18,10	36,10	235			Heine
0015820840	20.03.18	46,60	5,8	53,00	5,7	10,50	17,60	35,60	10,90	18,10	36,10				Hutter
Minimum		43,40	5,4	52,60	5,6	10,10	17,20	34,50	9,90	16,80	34,10	233			
Maximum		46,90	6,0	54,90	6,0	10,90	18,50	37,50	11,20	18,50	36,60	236			
Average		45,36	5,8	53,64	5,8	10,46	17,77	35,55	10,50	17,71	35,39	235			

md = machine direction cmd = cross machine direction

Specifications of geogrid

The geogrid utilised has a 32.00mm aperture and a tensile strength of 45.36 kN/m2.

II. EQUIPMENTS & METHODOLOGY

A number of studies have been conducted to examine the performance of Reinforced Soil Foundations over the last four decades.All of these studies showed that using reinforcements can significantly increase bearing capacity while lowering soil foundation agreement.Fig suggests the geometric parameters for a basis supported with the aid of using bolstered sand fill. B and D, respectively, are the width of the footing and the thickness of the sand fill.

The homes of the sand are tabulated. From the laboratory check results, in keeping with IS-2720 element four with the aid of using Cu and Cc values the sand is assessed as poorly graded sand or properly graded sand. The rectangular footing of regarded dimensions is examined at the sand mattress of various densities crammed withinside the trying out tank of length B and D with the aid of using raining approach method. Sand is dropped from different heights to achieve different densities.Geogrid of regarded homes are used as reinforcement material.

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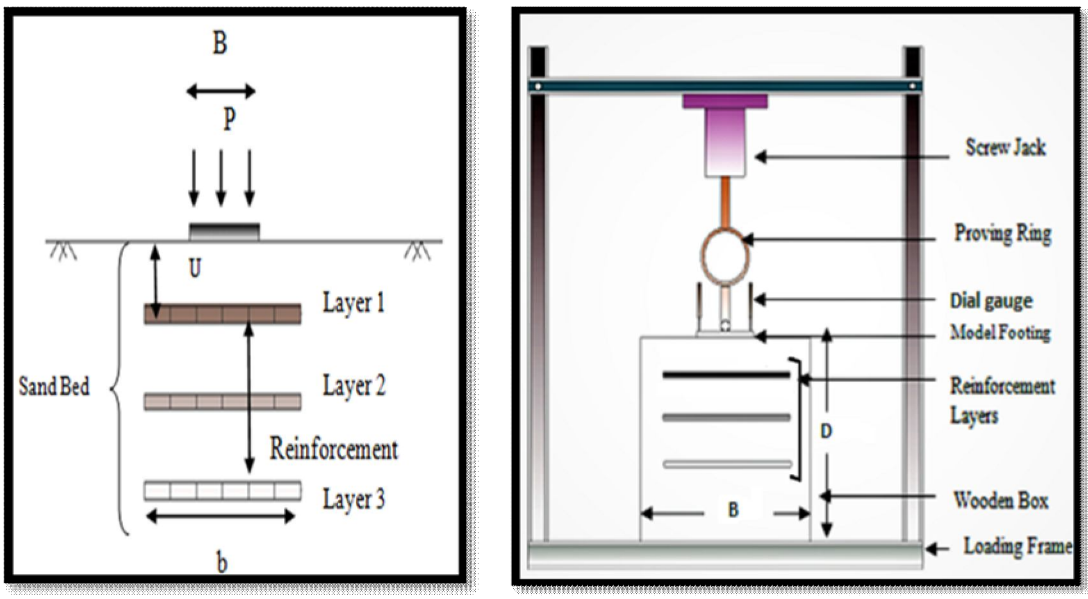
The geogrids reduce into unique period and located at unique layers as proven is beneath figure. The experimental setup is proven beneath. The vertical load is measured using a screw jack of reputed capability. The footing agreement is measured with the use of a proving ring and a dial gauge placed diagonally on the footing.

After the test load with the aid of using agreement curves are plotted in a graph to locate the most reliable intensity of the geogrid and will increase withinside the bearing ability.

A. Geogrid Layer Details



Line diagram of experiment

III. MATERIALS

A. Sand

The sand utilized in work on research is accrued from close by Krishna River near by shaktinagar, Raichur. To remove silt and clay from the sand, grass roots, and different natural substances it is washed after which the in the oven, the washed pattern is dried. After sieving the oven dried pattern on a 4.75mm IS sieve, the sand passing through the 4.75 IS sieve is sieved once more on a 75 IS sieve. For study paintings, the sand pattern is kept with the use of a 75 IS sieve.

B. Geogrid

Geogrids paperwork is distinct form geosynthetics intended for reinforcing. This are classified with the aid of using a highly excessive tensile power and a uniformly disbursed institution of huge openings in among longitudinal and transverse rib. These openings are referred to as aperture. The openings permit sand particle on both facet of the set up geogrid to are available direct touch which will increase the interplay among the geogrid and sand.

C. Test Tank

In the case of non-cohesive soil, the maximum extent of the fault zone is 2.5 times the width of the foundation along the side and 3 times the width of the foundation under the foundation. Taking into account the above criteria, the tank dimensions of 60 cm x 60 cm x 30 cm were used, as shown in Figure 3.2. for 10 cm x 10 cm x 10 mm shoes for experimental work. The tank consists of a 12 mm thick wooden plate, on all four sides of the tank there are 6 mm thick flat horizontal reinforcements in order to avoid bulging during test work.

Properties Of Sand

SYNOPSIS	***SIGNIFICANCE***
GRAVEL (%)	1%
COARSE GRAINED SAND(%)	6.3%
MEDIUM COARSE SAND (%)	68.4%
FINE GRAINED SAND (%)	24.2%
FINES(%)	0.0%
D_{10} (mm)	0.43%
D_{30} (mm)	0.7%
D_{60} (mm)	1.1%
C_U	2.55%
C_C	0.76%
SAND TYPE	POORLY GRADED SAND
Specific gravity	2.65
Density of sand @ 10cm fall (g/cc)	1.595
Density of sand @ 15cm fall (g/cc)	1.540
Density of sand @ 20cm fall (g/cc)	1.595
Angle of internal friction (γd= 1.519 g/cc)	27^0
Angle of internal friction (γd= 1.540 g/cc)	28^0
Angle of internal friction (γd= 1.595 g/cc)	29^0

IV. EQUIPMENTS USED

A. Screw Jack
A screw jack is used.The maximum lifting capacity of jacks is frequently specified (1.5 tonnes or 3 tons).

B. Proving Ring
During the experimental procedure, a 50kN proving ring is employed to calculate the imposed the foundation's weight .The movable shaft of the static loading unit is coupled to the top of the proving ring, the base is in touch with ball made of metal lying on the footing. The load is transmitted from the proving ring to the footing via this ball made of metal when load is applied.

C. Dial Gauge
During the experimental operation, two dial gauges were applied, each capable of detecting settlement up to 25millimetres with a count of 0.01millimetres. The dial gauge's needle is situated on the footing's two diagonally detracts.

D. Sample Footing
A Footing of thickness 10mm made up of steel of a mild nature is used for work that is exploratory. A 1 cm grove that is deep and circular is made to hold the ball made of metal on one of the face of the footing at center.

E. Placement of Sand

The test container's internal dimensions are measured, as well as the weight of sand required to fill it to the desired height. A number of tests are now being conducted to determine the height of sand fall by permitting sand to fall from various heights until the container is filled to the appropriate height. The volume of sand placed in the container for a number of trials is once the container is filled to the appropriate height using the raining methodology. For sample preparation, a height of fall with a volume equal to that of the working volume is used. After determining the height of fall, the weight of sand required for a 2.5cm thick layer to maintain the working volume is evaluated and poured into the container using the sand raining technique from the set height of fall. Each layer is levelled with a level plate to see if the density is being maintained correctly. After levelling the area to make it horizontal, geogrid is set at the necessary depth from the bottom of the footing to prepare the reinforced sand sample.

F. Installation of Geogrid

To maximise the bearing capacity of reinforced sand, it is critical to be determined. Following a review of the literature, it was discovered that (u/b) for strip foundations ranges from 0.25 to 0.5, (b/B)cris 8 and 4.5 for strip and square footing, respectively, and (h/B)cr is 0.25 to 0.4.The factors for this test are (u/B) = 0.35, (b/B) = 4.5, and (h/B) = 0.25.

Because the width of footing B in this test is 10cm, the width of geogrid B is 4.5cm. The distance between each successive layer h is 2.5cm, and the of the 1st coating u from the bottom of the footing is 3.5cm. As during sample preparation, a 4.5cm square geogrid was obtained and placed below the footing, with the 1st coating at a depth of 3.5cm and subsequent layers separated by 2.5cm.

G. Equipment Setup

Footing is placed on the above of sand bed in such a way that it is parallel to the test container's wall after the reinforced or unreinforced sample has been prepared. The cylindrical shaft of the static loading unit is coupled to a proving ring of the necessary capacity, which is brought into contact with the footing through a ball of metal between the shaft and the footing. Make sure the shaft is vertical before making contact with the footing. At the diagonally opposite corner of the footing, two dial gauges of the same specification are installed.

Equipment setup

H. Process for a Sample Test

The stress level of a test is managed.; the load evaluated in one step is used to the footing, and the Measurement of the relevant settlement by taking a value from a instrument installed at the footing's corner. Following the readings on the proving ring and dial gauge, By multiplying the number of divisions on the proving ring by its least count, i.e. 0.01, the load applied is computed. The similar settlement is estimated by measuring the dial gauge reading by its lowest count, i.e. 0.01. The experimental bearing capacity is determined using the double tangent method once the load settling curve is created.

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I. Achieving Density by Sand Raining Method

Achieving density by sand raining method

Placing of reinforcement layer

Pouring sand on reinforcement layer

Placing of footing

Setting of proving ring and dial gauge

J. From A Plate Load Test Determine The Soil Bearing Capacity

Following the gathering of data obtained, The curve for load-settlement is drawn. The applied load is represented on the X-axis, while settlement is represented on the Y-axis. The ultimate load for the plate may be estimated from the graph, which is the corresponding load for one-fifth of the plate width settlement.

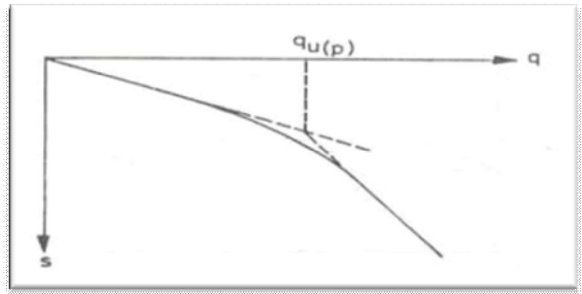


Figure: Load vs Settlement Graph

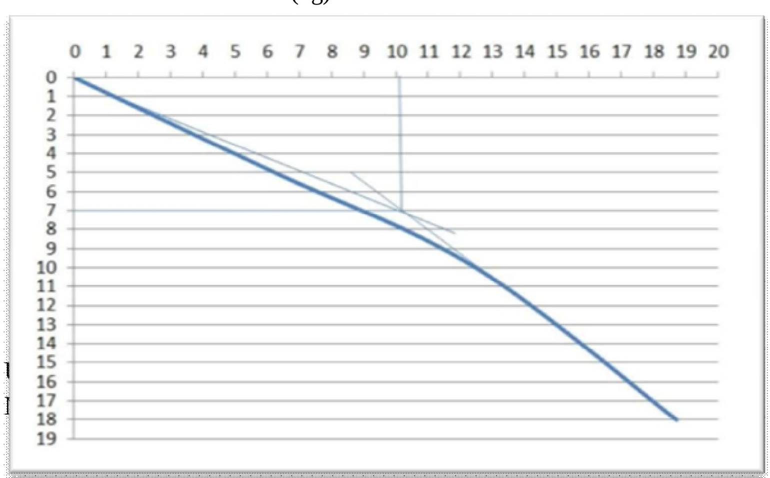
The curve is broken at one point when the points are plotted on the graph. The bearing capacity on the plate is equal to the standard load to that breakpoint. The bearing capacity of the plate can be estimated using the bearing capacity. To establish the safe bearing capacity of soil from the foundation, divide the ultimate bearing capacity by a reasonable factor of safety.

V. RESULTS AND DISCUSSIOS

As shown in graph below, a pressure-versus-settlement curve is plotted,Qu is determined using the technique of the back tangent.
Density = γd= 1.595 g/cc

Load (kg)

Settlement (mm)



1) From terzaghi's formula

Maximum Bearing Capacity =Qu= C*Nc*Sc+*D*Nq*Sq+0.5*B**N*S

=0.5*10*1.595*17.7*0.8

= <u>112.9 grm/cm²</u>

Ultimate bearing capacity from test is <u>110.00 grm/cm²</u>

It has been concluded that the bearing capacity from test and Terzaghi's assumption is same

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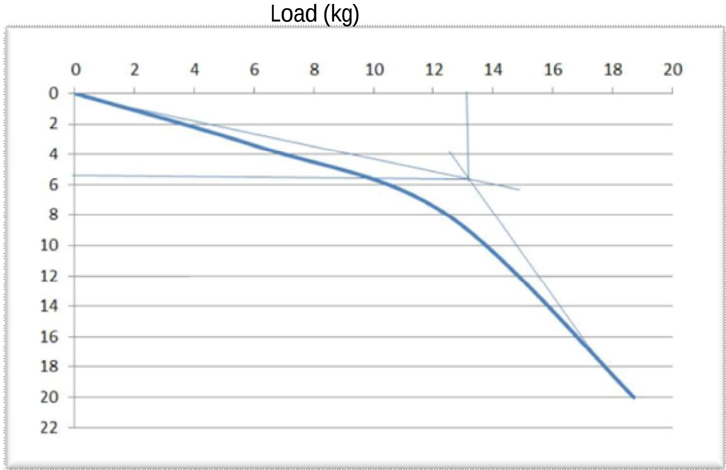
2) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.3*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.595g/cc &u/b ratio 0.3

Ultimate load= Pu = 14.50kg, Settlement = 5.5mm

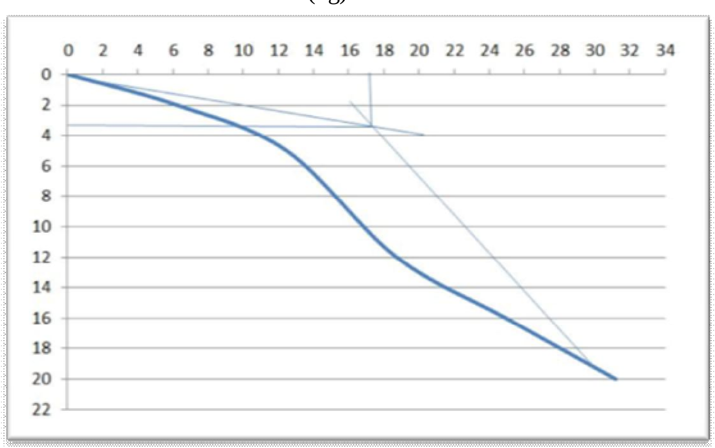
Ultimate bearing capacity= qu = 14.50*1000/100 = 145.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 24%

3) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.35*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.595g/cc &u/b ratio 0.35

Ultimate load= Pu = 17.00kg, Settlement = 3.5

Ultimate bearing capacity = q_u = 17 *1000/100 = 170.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 36%

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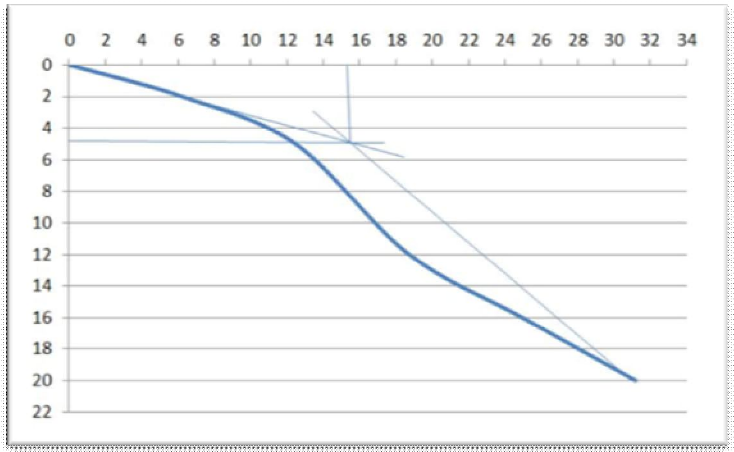
4) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.4*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.595g/cc &u/b ratio 0.4

Ultimate load= Pu = 15.9kg, Settlement = 4.5

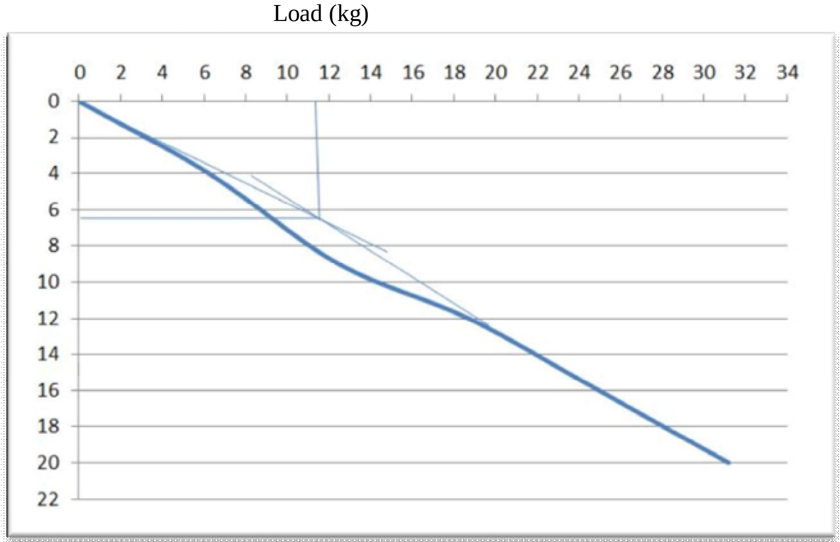
Ultimate bearing capacity = q_u = 15.9*1000/100 = 159.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 31%

5) *Reinforced sand with γd= 1.540g/cc with u/b ratio 0.3*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.540g/cc &u/b ratio 0.3

Ultimate load= Pu = 11.70kg, Settlement = 6.5mm

Ultimate bearing capacity = q_u = 11.7*1000/100 = 117.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 24%

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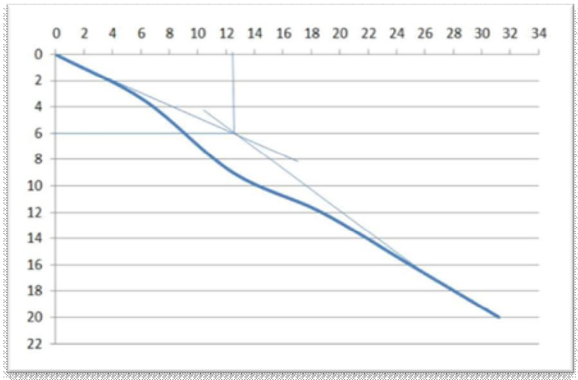
6) Reinforced sand with γd= 1.540g/cc with u/b ratio 0.4

Load (kg)

Settlement (mm)



PLT graph for γd= 1.540g/cc &u/b ratio 0.4

Ultimate load= Pu = 12.90kg, Settlement = 6mm.

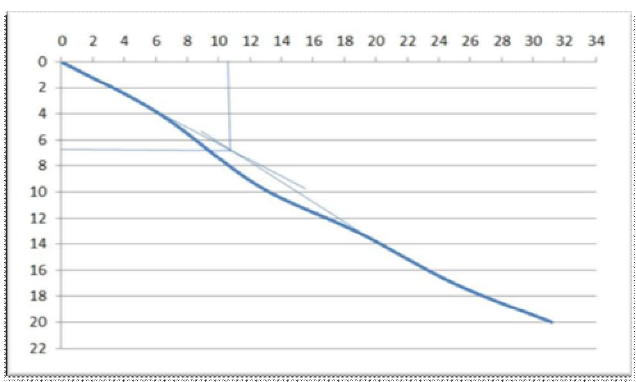
Ultimate bearing capacity = q_u = 12.9*1000/100 = 129.00grm/cm².

Percentage increase in the bearing capacity compare to unreinforced sand is 31%

7) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.3

Load (kg)

Settlement (mm)



PLT graph for γd= 1.519g/cc &u/b ratio 0.3

Ultimate load= Pu = 10.90kg, Settlement = 6.6

Ultimate bearing capacity = q_u = 10.9*1000/100 = 109.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 23%

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8) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.35

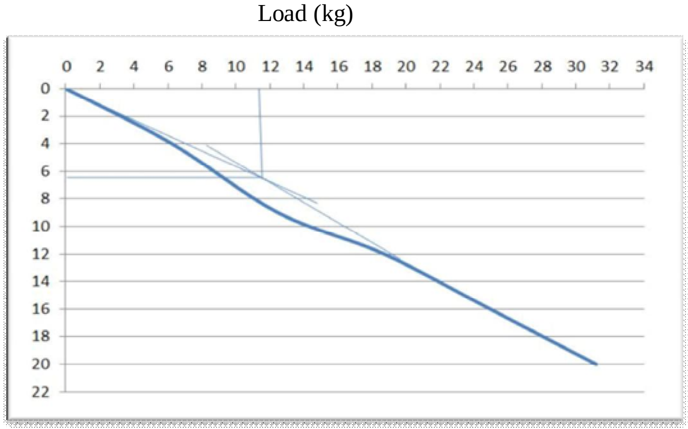
PLT graph for γd= 1.519g/cc &u/b ratio 0.35

Ultimate load= Pu = 12.50kg, Settlement = 6mm.

Ultimate bearing capacity = q_u = 12.5*1000/100 = 125.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 33%

9) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.4



PLT graph for γd= 1.519g/cc &u/b ratio 0.4

Ultimate load= Pu = 11.90kg, Settlement = 6.5mm

Ultimate bearing capacity = q_u = 11.90*1000/100 = 119.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 29%

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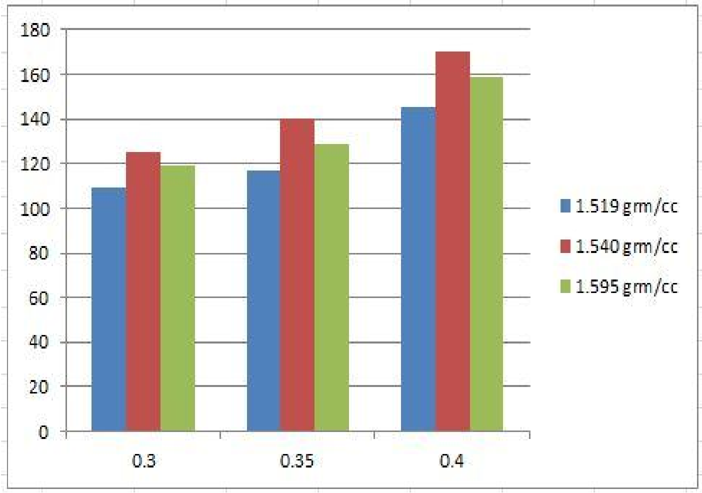
Tabular column:
For single layer of reinforcement

u/b ratio	maximum bearing capacityin gm/cm² For the densities of		
	1.519 gm/cc	1.540 gm/cc	1.595 gm/cc
0.3	109.00	117.00	145.00
0.35	125.00	140.00	170.00
0.4	119.00	129.00	159.00

Bar Chart
For single layer of reinforcement



It has been concluded that the optimum u/b ratio is 0.35

10) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.3 & 0.35

Load (kg)

Settlement (mm)

PLT graph for γd= 1.519g/cc &u/b ratio 0.3 & 0.35

Ultimate load= Pu = 12.00kg, Settlement = 6.2mm.

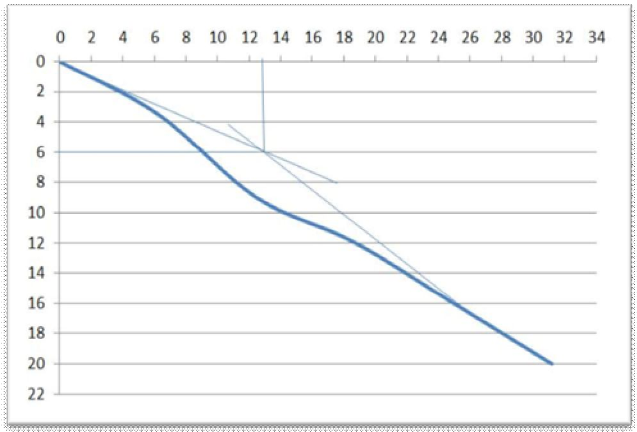
Ultimate bearing capacity = q_u = 12 *1000/100 = 120.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 31%

11) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.3 & 0.4

Load (kg)

Settlement (mm)



PLT graph for γd= 1.519g/cc &u/b ratio 0.3 & 0.34

Ultimate load= Pu = 12.7 kg, Settlement = 6mm.

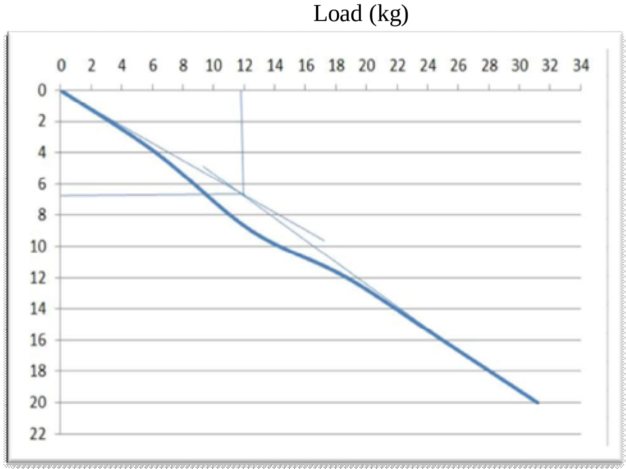
Ultimate bearing capacity = q_u = 12.7*1000/100 = 127.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 35%

12) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.35 & 0.4

Load (kg)

Settlement (mm)



PLT graph for γd= 1.519g/cc &u/b ratio 0.35 & 0.4

Ultimate load= Pu = 11.8 kg, Settlement = 6.7mm.

Ultimate bearing capacity = q_u = 11.8*1000/100 = 118.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 30%

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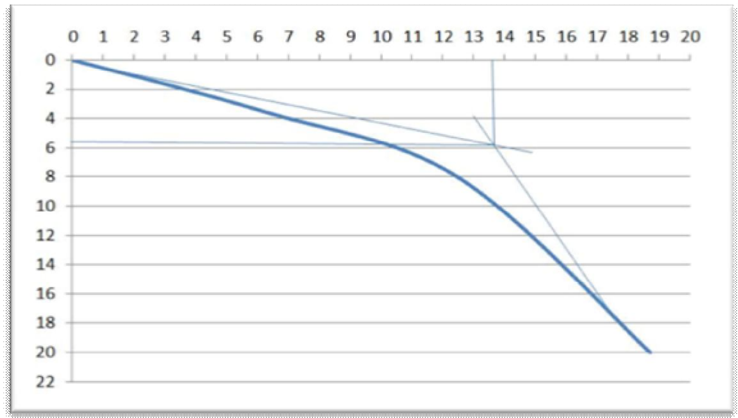
13) *Reinforced sand with γd= 1.540g/cc with u/b ratio 0.3 & 0.35*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.540g/cc &u/b ratio 0.3 & 0.35

Ultimate load= Pu = 14.00kg, Settlement = 5.3mm.

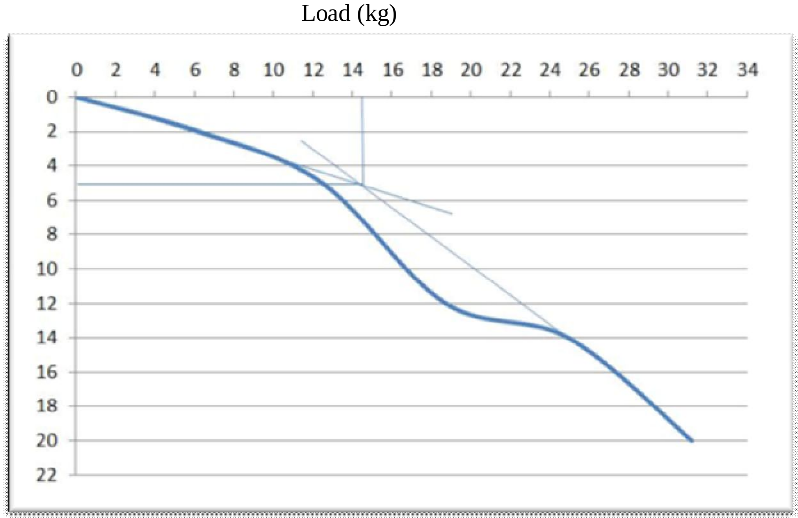
Ultimate bearing capacity = q_u = 14*1000/100 = 140.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 37%

14) *Reinforced sand with γd= 1.540g/cc with u/b ratio 0.3 & 0.4*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.540g/cc &u/b ratio 0.3 & 0.4

Ultimate load=Pu = 14.6kg, Settlement = 5mm.

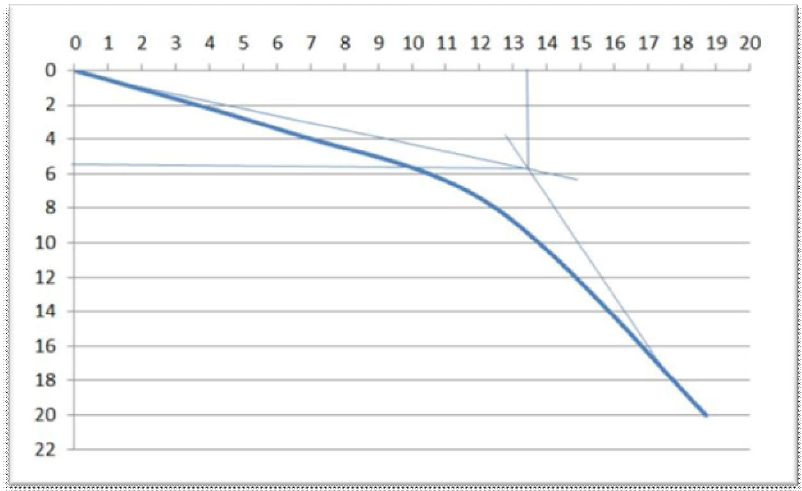
Ultimate bearing capacity = q_u = 14.664*1000/100 = 146.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 40%

15) *Reinforced sand with γd= 1.540g/cc with u/b ratio 0.35 & 0.4*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.540g/cc &u/b ratio 0.35 & 0.4

Ultimate load= Pu = 13.9kg, , Settlement = 5.5mm

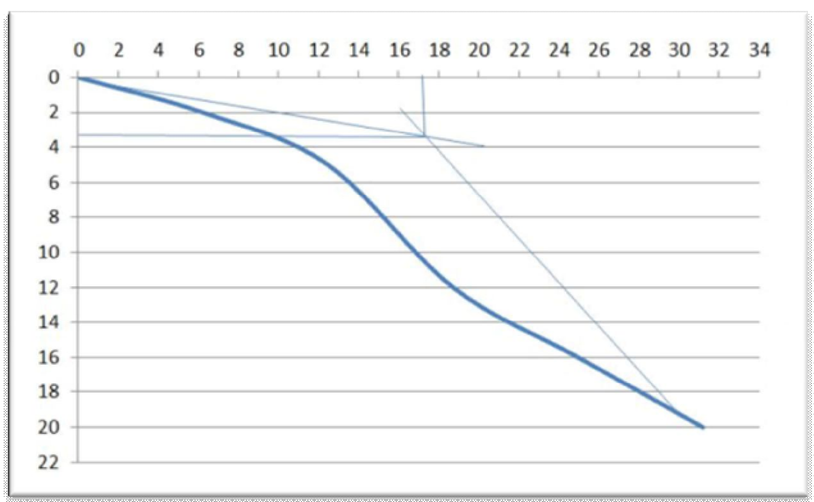
Ultimate bearing capacity = q_u = 13.9*1000/100 = 139.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 36%

16) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.3 & 0.35*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.595g/cc &u/b ratio 0.3 & 0.35

Ultimate load= Pu = 17.5 kg, Settlement = 3.5mm

Ultimate bearing capacity = q_u = 17.5*1000/100 =175.00 grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 41%

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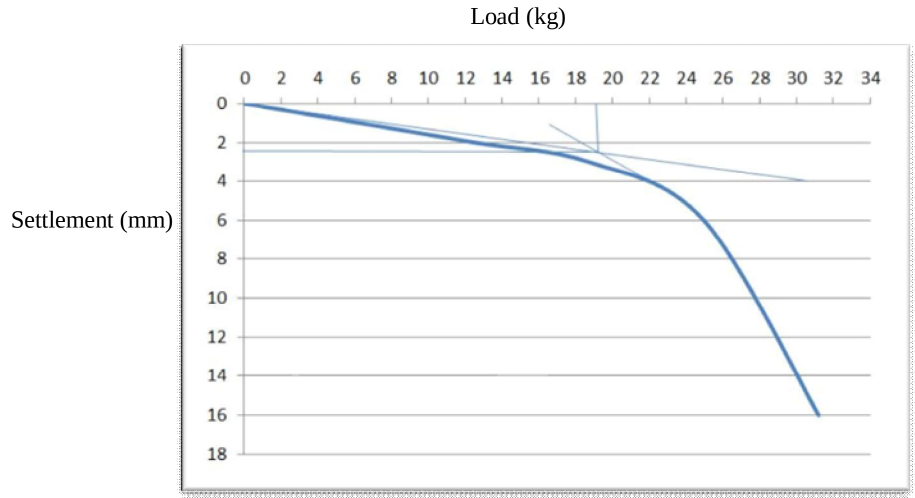
17) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.3 & 0.4*



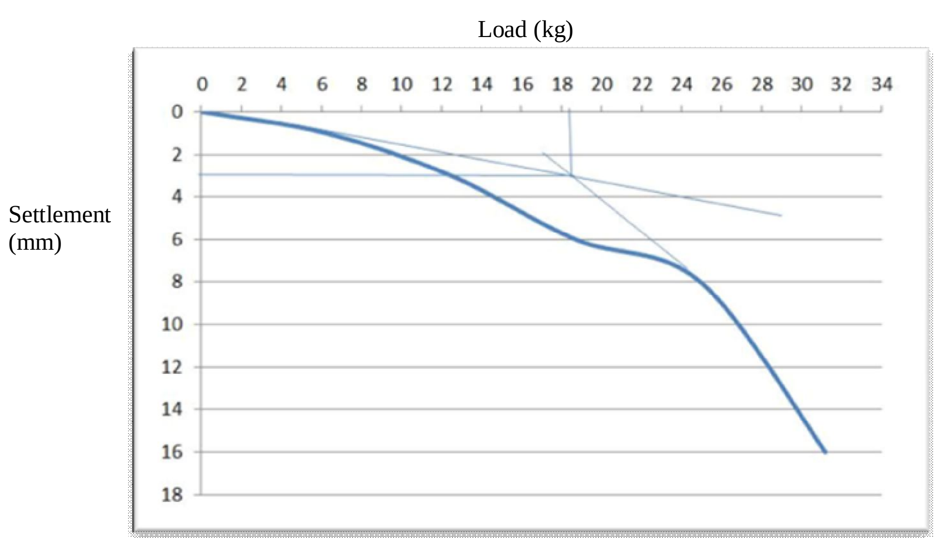
PLT graph for γd= 1.595g/cc &u/b ratio 0.3 & 0.4

Ultimate load= Pu = 20.1kg, Settlement = 2.5mm

Ultimate bearing capacity = q_u = 20.1*1000/100 = 201.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 49%

18) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.35 & 0.4*



PLT graph for γd= 1.595g/cc &u/b ratio 0.35 & 0.4

Ultimate load= Pu = 18.4kg, Settlement = 3mm

Ultimate bearing capacity = q_u = 18.4*1000/100 = 184.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 44%

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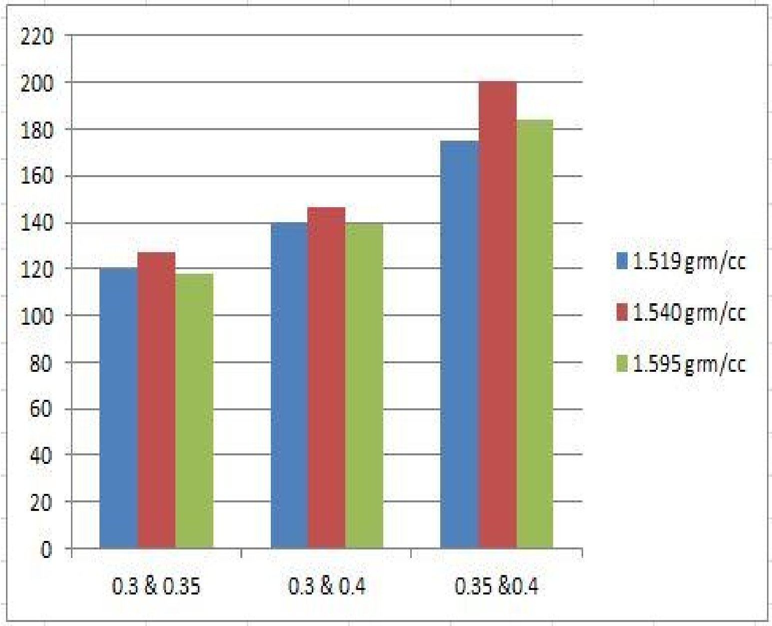
Tabular column:
For double layer of reinforcement

u/b ratio	maximum bearing capacity in grm/cm² For the densities of		
	1.519 grm/cc	1.540 grm/cc	1.595 grm/cc
0.3 & 0.35	120.00	140.00	175.00
0.3 & 0.4	127.00	146.00	201.00
0.35 & 0.4	118.00	139.00	184.00

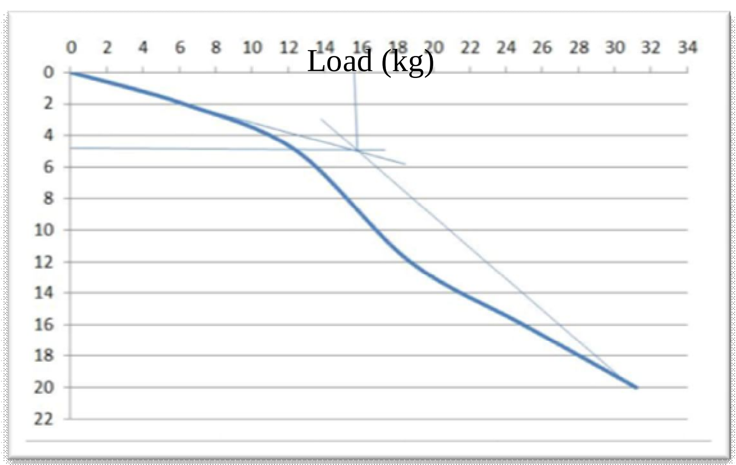
Bar Chart
For double layer of reinforcement



It has been concluded that the optimum u/b ratio is 0.3 & 0.4

19) Reinforced sand with γd= 1.519g/cc with u/b ratio 0.3, 0.35 & 0.4

Settle
ment
(mm)



PLT graph for γd= 1.519g/cc &u/b ratio 0.3, 0.35 & 0.4

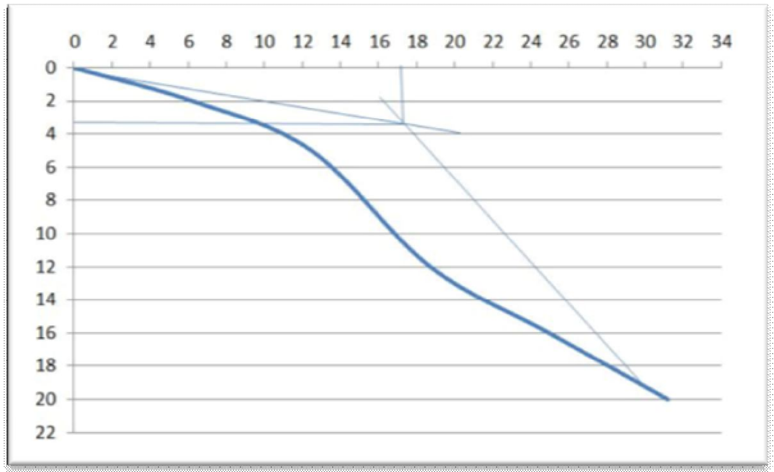
Ultimate load= Pu = 15.8 kg, Settlement = 4.5mm

Ultimate bearing capacity = q_u = 15.8*1000/100 = 158.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 47%

20) *Reinforced sand with γd= 1.540g/cc with u/b ratio 0.3, 0.35 & 0.4*

Settlement (mm)



PLT graph for γd= 1.540g/cc &u/b ratio 0.3, 0.35 & 0.4

Ultimate load=Pu = 18.00 kg, Settlement = 3.5mm

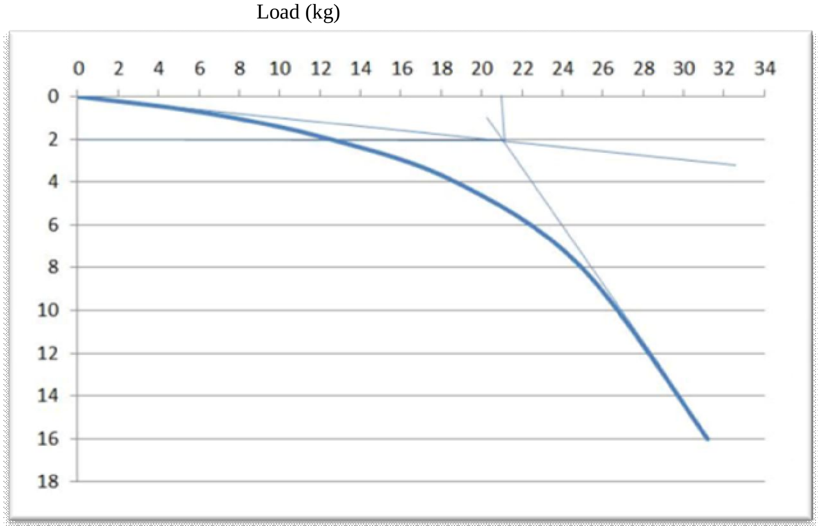
Ultimate bearing capacity = q_u = 18*1000/100 = 180.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 51%

21) *Reinforced sand with γd= 1.595g/cc with u/b ratio 0.3, 0.35 & 0.4*

Load (kg)

Settlement (mm)



PLT graph for γd= 1.595g/cc &u/b ratio 0.3, 0.35 & 0.4

Ultimate load= Pu = 22.00 kg, Settlement = 2mm

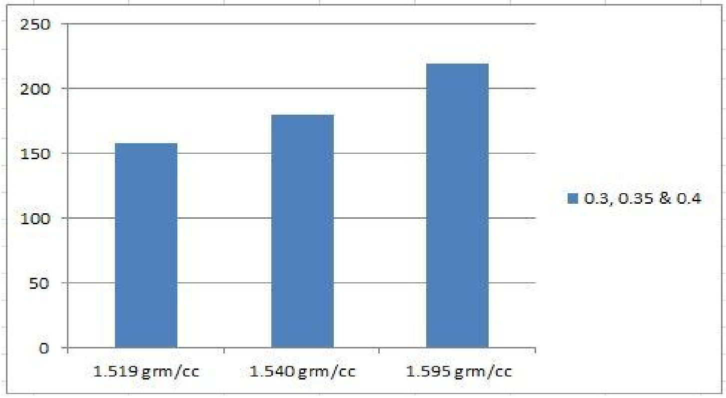
Ultimate bearing capacity = q_u = 22*1000/100 = 220.00grm/cm²

Percentage increase in the bearing capacity compare to unreinforced sand is 54%

Tabular column:
For three layer of reinforcement

u/b ratio	Ultimate bearing capacity in grm/cm²For the densities of		
	1.519 grm/cc	1.540 grm/cc	1.595 grm/cc
3, 3.5 & 4	158.00	180.00	220.00

Bar Chart
For three layer of reinforcement



VI. CONCLUSION

A. In the lab, the ultimate load bearing capability may be determined.
B. In the case of unreinforced sand, the load carrying capacity (qu) of the square footing rises as the density of the soil medium rises, and it rises even more when geo-grid reinforcement is added.
C. For a single layer of reinforcement, the values of load bearing capacity qu grow until the u/b ratio reaches0.35, then decline.
D. For a double layer of reinforcement, the appropriate u/b ratio is 0.3 – 0.4.
E. The use of geo-grid reinforcement results in greater performance in terms of both qu and settlement reduction.
F. Reinforced sand has a higher ultimate bearing capacity than unreinforced sand.

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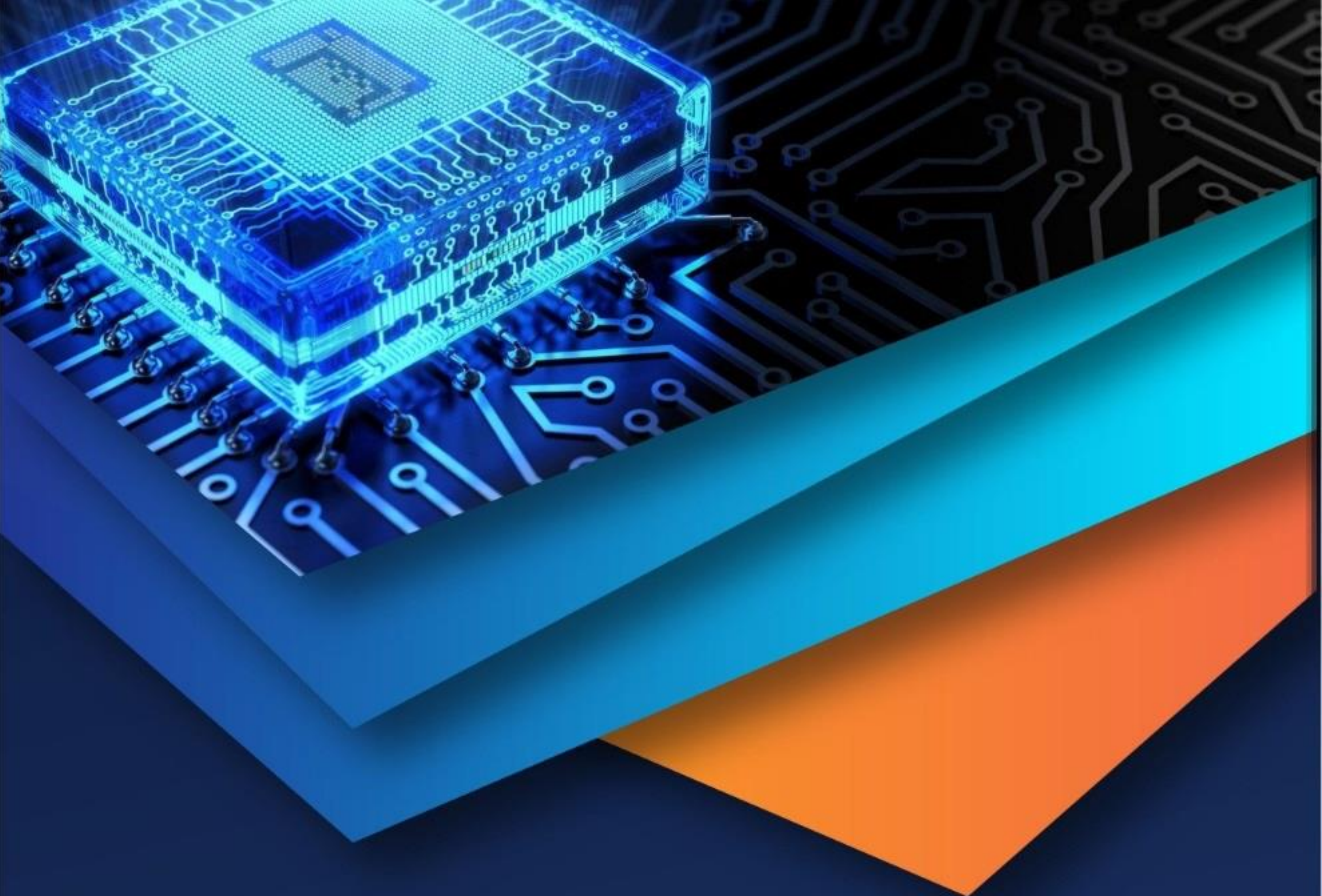

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