

## International Journal of Innovative Research in Science, Engineering and Technology

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# Behaviour of Soil with Geotextile Reinforcement under Dynamic Loading

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**ABSTRACT:** The increasing use of geotextile-reinforced soil systems for important earth structures requires proper understanding of their behaviour and validation of the assumption in their design .Use of reinforcing intrusions is of great use in construction industry today .Geotextiles are commonly used to improve soils over which roads , embankments ,pipelines and earth retaining structures are built .Here in this experimental study non-woven geotextiles were used .The experimental study conducted on soil with reinforcing intrusions and vertical footing subjected to static and dynamic loadings under various soil saturations .The pre-stress on the geotextile is varied from 1KN to 1.5KN.The frequency of the dynamic load is varied from 10HZ and 20HZ .The percentage of water content is varied from 10% to 20% .Based on the observed results graphical conclusions is obtained regarding the behavior of soil.

**KEYWORDS:** Red Soil,Non -woven Geotextile, Dynamic loading, The behaviour Soil .

### I.INTRODUCTION

The scarcity of suitable land for construction has forced civil engineers to improve sites containing weak soil ,to make it fit for safe and stable construction and to avoid high cost involved in deep foundations .The replacement of these problematic soils with strong soil like dense sand layer on top is a soil improvement technique ,which is widely used .Now -a-days ,geosynthetics are being used extensively as reinforcement in soils .Providing reinforcement in soils causes an improvement in the bearing capacity and settlement behaviour of soil.The procedures available for estimating the shallow foundation on red soil deposits .In transportation related construction ,many situations occur in which shallow foundations may be used to support structural loads.A common example is the support of dry crossings located at bridges.The use of shallow footings in deep foundation systems provides a much more economical system ,and can result in substantial cost savings for a project .Unfortunately ,the uncertainty involved in the estimation of settlement of shallow footings on red soil deposits .The subject of calculating behaviour of granular soils has received considerable attention in the past 40 years .The variables affecting the deformation behaviour of red soils.

### II.SOIL STRUCTURE INTERACTION

Most of the civil engineering structures involve the some variety of structures part with direct contact with ground .When the external forces, like earth quakes act on these system neither the structural displacement nor the to the ground displacements, are independent at each other. The process during which the response of the soil influence the motion of the structure and the motion of the structure influence the response of the soil is termed soil structure interaction (SSI).

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## SSI EFFECTS:

- Alter the natural frequency of the structure.
- Add damping .
- Through the soil interaction effects.
- Travelling wave effects.

## III.GEOTEXTILES

Geotextiles square measure pervious materials that ,when utilized in association with soil ,have the flexibleness to separate ,filter ,reinforce ,protect ,or drain .Typically made of plastic or **polyester** ,geotextile materials come in three basic forms .**Woven** (resembling mail bag sacking),**Needle punched** (resembling felt) ,or **Non -woven** (resembling ironed felt).

Geotextile composites are introduced the products like **geogrids** and meshes are developed .Geotextiles are able to withstand many things such as, durable and able to soften a fall if someone falls down.

## IV.EXPERIMENTAL INVESTIGATION

- Well graded soil in the fabricated steel tank is reinforced with a layer of reinforced intrusion ,applied with a known intensity of prestress.
- Scaled down model footing on the upper contour of soil surface is subjected to axial loading.
- Horizontal dynamic push load (broad band excitation) is applied to the soil at the point of contact as shown in schematic diagram of the test set up.
- Propagation potential of acceleration at various levels in soil mass and surface profile at the upper contour of soil and settlement of footing are measured.

The above program is repeated for,

- Different subsurface saturations of soil
- Different intensity of pre-stress in soil reinforcement layer.

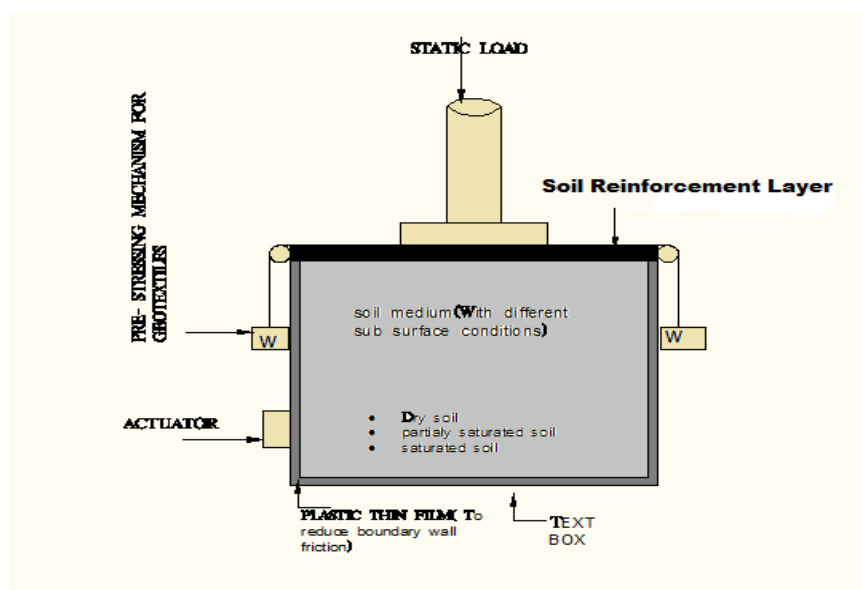


Fig:1 Schematics of the experimental setup

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## 1.MATERIALS REQUIRED :

Volume of red soil=0.5442m<sup>3</sup>  
Geotextile(non-woven)=12m  
Steel footing=65x2x1.5cm  
Soil density=1420kg/m<sup>3</sup>  
Soil density=mass/volume  
Mass=soil densityxvolume  
M=1420x0.5442  
M=772.80kg.  
Moisture content 10% and 20%.  
10%=77litre.  
20%=144 litre

## 2.TESTING OF RED SOIL:

Specific gravity(G)=2.076  
Plastic limit(W<sub>p</sub>)=40%  
Liquid limit(W<sub>l</sub>)=80%  
Shrinkage limit(W<sub>s</sub>)=18%  
Moisture content(W)=0  
Sieve analysis of co-efficient of curvature(C<sub>c</sub>)=1.12%  
Sieve analysis of co-efficient uniformity(C<sub>u</sub>)=18%.

## 3.EXPERIMENTAL WORK:

### TRIAL:I

Vertical load(v)=constant(k)  
V=5KN  
Moisture content(W<sub>1</sub>)=10%  
Amplitude=5mm  
Pull load =1KN,1.5KN  
Frequency=10HZ,20HZ  
Number of cycles=500 cycles.

### TRIAL:II

Vertical load(v)=constant(k)  
V=5KN  
Moisture content(W<sub>1</sub>)=20%  
Amplitude=5mm  
Pull load =1KN,1.5KN  
Frequency=10HZ,20HZ  
Number of cycles=500 cycles.

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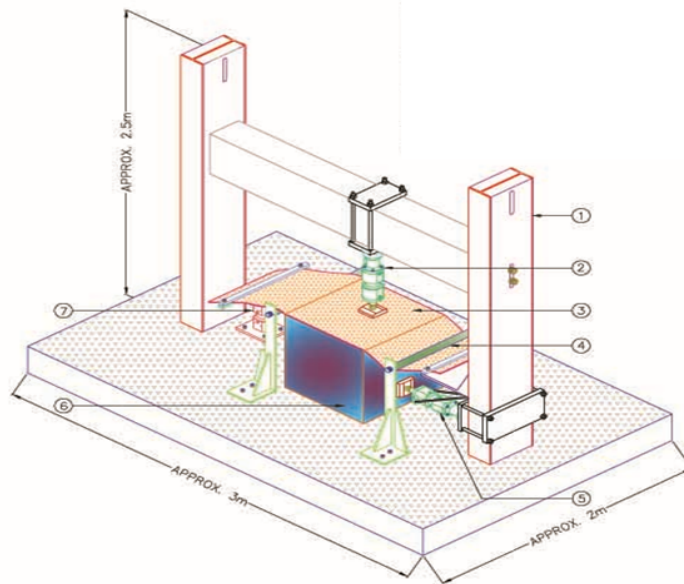


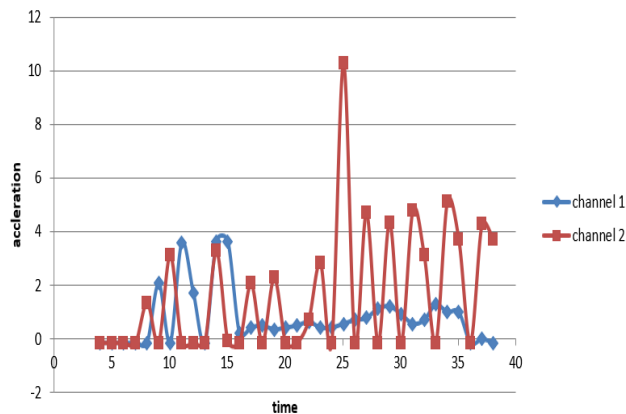
Fig:2 Experimental programme.

- 1.Servo collected test rig with portal frame.
- 2.Hydraulic actuator-1 with load cell (10KN+50MM).
- 3.Two cylindrical rollers.
- 4.Hydraulic press.
- 5.Hydraulic actuator -2 with load cell (5KN+50MM).
- 6.Power pack.
- 7.Control unit.

## V.TEST RESULTS AND DISCUSSION

### A)10% of Moisture Content and 1KN Prestress:

#### 10% of moisture content .compare p1 and p2



Channel 1=p1 and channel 2=p2.

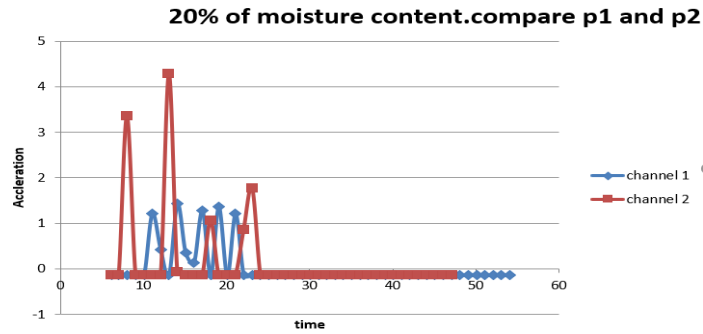
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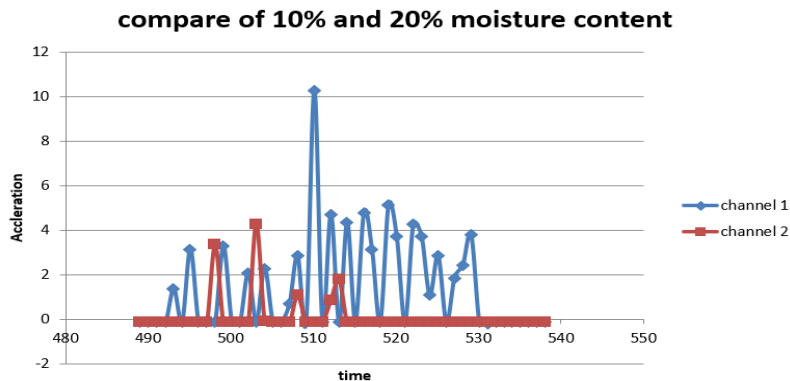
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## B) 20% of Moisture Content and 1KN Prestress:



channel 1=p1 and channel 2=p2.

## C)COMPARISION OF BEHAVIOUR OF SOIL 10% AND 20% MOISTURE CONTENT:



Channel 1=w1 and channel 2=w2.

## VI.CONCLUSSION

From graph- 1 with various subsurface of saturation soil 10% of moisture content of soil .prestress in pull load  $p_1=1kn$  is increased when compared to  $p_2=1.5kn$  of prestress.(i.e.)  $p_1 > p_2$ . Therefore behavior of soil is diverging.

From graph -2 with various subsurface of saturation soil 20% of moisture content of soil. Prestress in pull load  $p_1=1kn$  is decreased when compared to  $p_2=1.5kn$  of prestress.(i.e.) $p_1 < p_2$ .Therefore behavior of soil is converging.

From graph-3 with various subsurface of saturation soil prestress  $p_1=1kn$  is constant.10% of moisture content of soil is decreased when compared to 20% of moisture content.(i.e.)  $w_1 < w_2$ .Therefore behavior of soil is converging.

## VII. ACKNOWLEDGEMENT

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