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Utilization of Geotextile in Civil Engineering Work's

[1]Aparna V. Kose, [2]Mohini N. Sonone, [3]Mayuri D. Meshram, [4]Somu S. Gondule, [5]Vaibhav S. Zade, [6]Aniket N. Tajane, [7]Prof. Shrikant R. Nagoshe

[1,2,3,4,5,6]Department of Civil Engineering, SSPACE, Wardha, Maharashtra, India

[7]Department of Civil Engineering, SSPACE, Wardha, Maharashtra, India

[1]aparnav.kose.99@gmail.com, [2]mohonis1698@gmail.com, [3]meshrammayuri37@gmail.com, [4]gondulesomu@gmail.com, [5]vaibhavzade123456@gmail.com, [6]Tajanea724@gmail.com, [7]shrikantnagoshe@gmail.com om

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ABSTRACT

Geotextiles from part of a geosynthetic materials use in civil, environmental, agriculture engineering geotextile materials have four main functional applications that include: separation, filtration, drainage, and reinforcement. Technical textiles have diverse products which will lead the future world market and researchers from various fields of science and engineering will work together for the development of these textile materials. There is also a need for awareness about other areas where geotextiles can function one of such areas is the prevention of moisture evaporation from the soil in agriculture.

1. INTRODUCTION

Geotextiles are permeable fabrics that when used in association with soil has the ability to separate filter, reinforce, protect or drain typically made from polypropylene or polyester geotextiles fabrics come in a three basic woven (resembling male back sacking) needle punched (resembling felt) or heat bonded (resembling ironed felt)

Geotextile composites have been introduced and products such as geogrids and meshes have been developed Geotextiles are durable and are able to soften a fall in a someone falls down overall this material is referred to as a geosynthetic and each configuration geo nets geosynthetic clay liners geo grid geotextiles tubes and others can yield benefits in a geotechnical and environmental engineering design the most popular geosynthetics use are the geotextiles and the geomembrane the (ASTM 1994) defines geotextiles are permeable textiles material use in a contact with soil, rock, earth or any other geotechnical related material as an integral part of civil engineering project structure, or system. Geomembrane is essential in preamble membrane in the form of a manufactured sheet used widely as cutoffs and liner.

Geotextiles and related products have many applications and currently support many civil engineering applications including road airfields, railroads, embankments retaining structure reservoirs, canals, dams, bank protection coastal engineering, and a construction site silt fence. usually, geotextile is placed at the tension surface to strengthen the soil geotextile are also used for sand dune armoring to protect a plant coastal property from storm surge wave action and flooding.

A. Need of the Study

Geotextiles are synthetics and permeable materials used in civil construction projects to improve soil characteristics. Geotextiles make poor soils more suitable for construction since they have the ability to separate, filter, reinforce, protect and drain soils.

Geotextiles are useful in many infrastructure works such as roads, landfills, drainage structures, and other civil engineering projects.

B. Scope of Geotextiles

Geotextiles are used in a wide range are applications, which continue to grow as new forms of geotextiles are developed. The main applications are erosion control, soil filtration, road sub-base separators, reinforcing soils in embankments and retaining walls, and protection of geomembranes.

C. Advantages Of Geotextiles

1. They are lighter in weight which makes it easier to handle and lay on site.

2. Transport and labor costs are less in real terms.

3. Knitted geotextiles have a high tear strength.

4. It increases the construction speed on the site.

5. It improves qualities.

D. Types Of Geotextiles

1. Woven geotextile

Woven geotextiles are made by weaving individual yarns on a loom to create a uniform length. Different materials such as silt films, fibrillated yarn, and monofilaments can be used, but the weaving technique is constant regardless of the material used.

Woven were first to be developed from synthetic fibers. The type accounts for about There are a large number of geosynthetics produced which can be sub- 25% of the geotextiles market in terms of volume. As their names imply, they are manufactured by adopting techniques similar to weaving clothing textiles. This type has the characteristics appearance of two sets of parallel threads or yarns. The yarn running along the length is known as a warp and the one perpendicular to it is called a waft.

Subtypes of woven geotextiles

i. Plane weave
ii. Satin weave
iii. Twill weave

2. Non-woven geotextiles

Non-woven geotextiles are a type of geotextiles that are manufactured in the form of sheets or webs of directionally or randomly oriented fibers produced by mechanical and thermal and chemical bonding. Non-woven geotextiles have high permeability and high elongation characteristics.

Whether staple fiber or continuous fiber is used has very little influence on the properties of the non-woven geosynthetics. The thermally-bonded non-woven contains a wide range of opening sizes than is found in woven geosynthetics and are relatively thin with a typical thickness of about 0.5 to 1mm.

The subtypes of non-woven geotextiles

i. Spun bound
ii. Air laid
iii. Dry laid
iv. Wet laid

3. Knitted geotextile

The knitted geotextiles are made by interlocking a series of loops of yarns together. All the knitted geosynthetics are made using a knitted technique in conjunction with some other method of geosynthetics manufacturer, like weaving.

Apart from the geotextile explained above, other geosynthetics include geonets, geogrids, geo-cells, geomembranes, geo-composites, etc

Each of them has its features, uses, and applications.

A subtype of knitted geotextiles

i. Weft knitting
ii. Warp knitting

2. Methodology

California Bearing Ratio (CBR) Test Machine.

This test method is used to evaluate the potential strength of subgrade, sub-base, and base course material

A. *Procedure*

1. The test material should pass a 19 mm IS sieve and be retained on a 4.75 mm IS sieve. The water content used for compaction shall be the optimum water content or the field moisture as the case may be.

2. A representative sample of the soil weighing approximately 4.5 kg or more for fine-grained soil and 5.5 kg or more for granular soil shall be taken and mixed thoroughly with water. If the soil is to be compacted to the maximum dry density at the optimum moisture content, the exact mass of the soil required shall be taken and the necessary quantity of water added so that the water content of the soil sample is equal to the determined optimum moisture content.

3. Fix the extension collar and the base plate to the mold. Insert the spacer and discover the base. Place the filter paper on the top of the spacer disc.

4. Apply lubricating oil to the inner side of the mold. Compact the mixed soil in the mold using heavy compaction.

5. Remove the extension collar and trim the compacted soil carefully at the level of the top of the mold, by means of a straight edge. Any holes developed on the surface of the compacted soil by removal of the coarse material shall be patched with the smaller size material. Remove the perforated base plate, Spacer disc, and filter paper and record the mass of the mold and compacted soil specimen.

6. Place a filter paper over the specimen and place a perforated plate on the compacted soil specimen in the mold. Put annular weights to produce a surcharge equal to the weight of base material and pavement, to the nearest 2.5 kg.

7. Immerse the mold assembly and weights in a tank of water and soak it for 96 hours. Mount the tripod for the expansion measuring device on the edge of the mold and record the initial dial gauge reading.

8. At the end of the soaking period, note down the final reading of the dial gauge and take the mold out of the water tank.

9. Remove the free water collected in the mold and allow the specimen to drain for 15 minutes. Remove the perforated plate and the top filter paper. Weigh the soaked soil sample and record the weight.

3. Result Analysis

Table 1: wet density and dry density

Weight of mould	3890 gm
Weight of soil	5093 gm
Weight of soil + Mould	8983 gm
Volume of mould	2244.27 cm.cu
Wet density	2.28 gm/ cm.cu
Moisture Contain	8.2 %
Dry density	2.088 gm/cm.cu

Table 2: Results without geotextile addition in Soil sample

PENETRATION (mm)	LOAD (kg)	UNIT LOAD (kg/cm sq)
0	0	0
0.5	95	4.83
1	175	8.91
1.5	280	14.26
2	375	19.10
2.5	450	22.92
3	585	29.8
4	625	31.82
5	770	39.22
7.5	855	43.55
10	960	48.9
12.5	999	50.89

CBR value at 100 % = 32.74 %

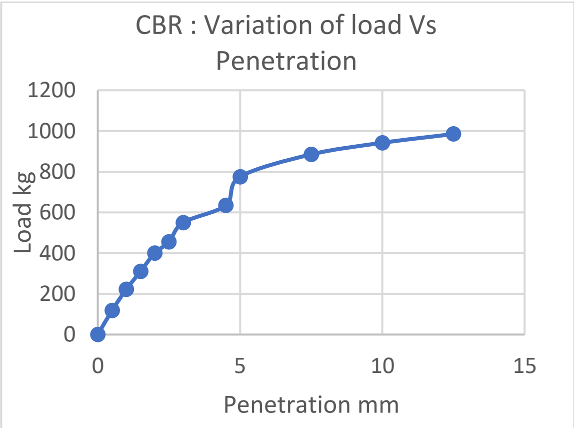

Figure 1: load (kg) vs penetration (mm)

Table 3: Results of Soil sample with the addition of geotextile

Penetration (mm)	load (kg) Sample 1	Sample 2	Sample 3
0	0	0	0
0.5	135	120	130
1.0	205	200	205
1.5	315	290	300
2	395	350	395
2.5	485	410	445
3	550	520	525
4.5	645	600	600
5	750	690	720
7.5	835	755	850
10	905	800	935
12.5	995	920	985

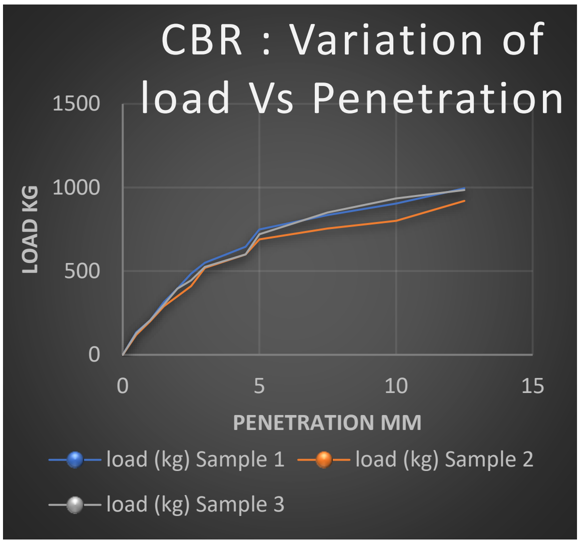

Figure 2: Sample Load Vs Penetration

CBR value for

- Sample 1 = 42.67 %
- Sample 2 = 43.17 %
- Sample 3 = 42.93 %
- Average CBR = 42.92 %

Conclusion

From the above result when we compared three samples of geotextile namely woven, non-woven, and knitted types with each other then we conclude that the knitted type of geotextile gives more strength than the two others. It gives about 53 % more compressive strength to the pavement. Hence, we use a knitted type of geotextile in our project. Efficient and effective method.
Economic method.
Solving the major problems in the construction. Another advantage of using fibers for geotextile is related to their ability to be engineered chemically, physically, and mechanically to suit particular geotechnical engineering applications.
The revolution in civil engineering is geotextile, geotextiles are being used extensively in various civil engineering projects. This material is used in roads, river erosion control, drainage, separation, filtration, river canals, and coastal works. Like other technical textiles, the demand for geotextiles in the world market has increased. As a result, new possibilities have emerged.

Conflict Of Interest

The authors declare that they have no conflict of interest.

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