EFFECT OF SOME CONSTRUCTION FACTORS ON FABRICS USED IN WALLS AND STEEP SIDED EMBANKMENTS

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Abstract

Geotextiles in walls and steep sided embankments

Surface erosion due to rain and wind cause loss of huge amount of top soil walls , hill slopes , and embankment slopes Besides this there was problems with short –term instability in the form of deepseated rotational slippage or transverse spreading of the embankment.

The main constituents of a reinforced soil wall and slopes are soil and reinforcement, as the name suggest. Since soil is weak in tension, the reinforcing elements are generally required to resist the tensile forces developed within the structure. As geotextiles are high tensile strength materials , therefore they are ideal materials to increase soil quality and thus to increase soil structural stability.

Unlike embankments on soft ground , walls (particularly if it is very high)and steep sided embankments need support from the geotextile or geogrid for their entire design life . Therefore, durability of the reinforcement is very important, as geotextile improves the mechanical behavior of an earth structure leading to the improvement of the stability of the wall or embankment itself .

The essence of construction is very simple , comprising the placing of selected fill incorporating horizontal layers of geotextile or geogrid reinforcement.(wrap – around method) .(7) As one lift of fill is completed , the reinforcement is rolled over the surface of the fill , ensuring that it runs far enough back from the face to ensure adequate bond length , as the free length of geotextile is left at the face sufficient to wrap around the next layer to extend back over it to ensure adequate anchorage.

As the base to a wall or an embankment, the geotextile may be acting as a tensioned membrane (reinforcement.) , as a separator , and as a drain and filter facilitating the dewatering and consolidation of the soil or embankment.

The experimental work

Nonwoven technique ,using cross-laid fiber orientation ,was used for producing all samples in the research .Two kinds of textile materials were used ,polyester and polypropylene of denier 6 and two kinds of bonding technique ,needle punching and calendering .Three fabric weights were produced 350,600,850 g/m2 , 700 beats /min and three penetration depths were used 6 ,12 and 18 mm.

Results and Discussion

Results of experimental tests carried out on the produced samples are presented in the following tables and graphs . Results were also statistically analyzed for the data listed and relationships between variables were obtained.

Water permittivity and water permeability

It obvious from tables and figures that polyester fabrics had the highest rates of water permeability and permittivity compared to polypropylene fabrics .This is due to that moisture absorption of polyester fiber is 0.4 % which means it helps, a little bit, in the transport of water through the fabric, whereas moisture absorption of polypropylene is zero.

Also it can be noticed that there is an inverse relationship between fabric weight and its water permeability and permittivity .I can report that the increase in fabric weight increases the probability of number of fibers per unit area which delay the flow of water through the fabric, in both direction ,leading to the decrease in its permeability and permittivity .

It is clear from tables and figures that there is an inverse relationship between needles penetration depth and fabric water permeability and permittivity .I can report that the increase in penetration depth cause fabrics to be more compacted leading to a decrease in fabric permeability and permittivity.

From tables and figures, it can be seen that needle punched samples had the highest rates of water permeability and permittivity than calendared samples. This is due to needle punching technique cause fibers to reorient making baths which permit the passage of water .

Tensile strength and elongation

It can be seen from tables and figures that polyester samples have recorded the highest rates of tensile strength and the lowest rates of elongation, but the differences were insignificant .This is due to that polyester fibers a have high breaking tenacity compared to polypropylene fibers .

It is clear from figures that there is a direct relationship between fabric weight and tensile strength, and an inverse relationship between fabric weight and its elongation properties .This is mainly because of that the increase of fabric weight means an increase in the number of fibers per unit area and so the contact areas between fibers will be increased and its resistance to slippage will also be increased leading to the increase in fabric strength and the decrease in its elongation

Also from the results obtained in tables and figures, it was found that the tensile strength values in machine direction are higher than values of cross direction, and the opposite for elongation values, for all cases but the differences are insignificant

From the results in tables it can be seen that, with the increase of puncture depth, the tensile strength increases, but its elongation at break decreases .This is mainly because of that, the increase in puncture depths increases the contact points between fibers and decreasing its ability to slippage which increases fabric strength and decreases its elongation.

It is also clear from figures that needle punched samples had a highest tensile strength and lower elongation compared to calendared samples .this is mainly due to that punching effect cause fibers to follow a curved path in the thickness from the top to the bottom surface of the fabric leading to the increase of contact points between horizontal and vertical levels of structure and decrease the ability of fibers slippage leading to the increases of fabric strength and the decrease in its elongation .

From tables and figures, it can be seen that needle punched samples had lower thickness than calendared samples. This is due to needle punching technique cause fibers to reorient and spaces between them are decreased, leading to a decrease in fabric thickness.