

Comparative Stress Analysis of Soil In Landslide Prone Area Of Posare Village in Ratnagiri District Of Western Ghat

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Abstract - The objective of this study is to make a comparative study of stresses generated in embankment as well as layers in the road pavement during heavy rains in western ghats with the efficient use geo-web in sub base and base course. Western ghat is one of the most sensitive area which is highly under the landslide prone zone during every rainy season. In this study we tried to identify different soil requirements in western ghat also analyzed the various research papers related to construction in western ghat whether it is related to road construction or whether any other construction.

As a study goes deeper multiple research paper indicates that pavement with geo-web in it has the more capacity to withhold large lateral flood pressure than the normal traditional pavements designs in Western Ghats. As a material concerning with the improvement of strength the Basalt fiber geomat is also a good option as we have seen in report of first paper mentioned here. This gives us clear ideas that there is a huge gap in stress analysis if we compare the base layers of standard pavements and pavements whose base layers are inclusive of geo web materials.

IndexTerms - Geo-web, Geomat, Western Ghat, Embankment, Subbase, Subgrade, lateral flood pressure.

I. INTRODUCTION (HEADING 1)

The Western Ghats contains the ranges of mountains faulted and eroded edge of the Deccan Plateau. It is a connected mountain range that covers an area of 160,000 km². Which is parallel to the western coast of the Indian peninsula passing through the states like Karnataka, Goa, Maharashtra, Gujarat, Kerala, and Tamil Nadu. It is considered as UNESCO World Heritage Site and is one of the eight biodiversity hotspots in the world. To evaluate soil type and rock pattern in specified portion of western ghat, Maharashtra, also to identify load bearing capacity of soil present in landslide prone area, the Posare village, Ratnagiri, Maharashtra selected for study and evaluation of load applied by pavement on soil below it. Also feasibility analysis of geo-web in pavement is to be checked with the help of various papers published.

For this purpose, the soil samples will be collected from Posare village present in Ratnagiri district of Maharashtra state in Western ghats. There was a landslide in month of July in year 2021. Different testing's to be done on collected soil sample and the behavioral study is to be done accordingly. This could give us the results like

1. Comparative study of results obtained between standard pavement and pavement with geo-web.
2. Comparative analysis of economical overview of normal flexible pavement and pavement with geo-web.



Fig1 : landslide in Posare village in July 2021

The Geo-web geocell cellular confinement system or geomats or geosynthetic materials are one of the most advanced soil stabilisation technologies out there. On the initial days it was developed by “Presto Geosystems” together with the “US Army Corp of Engineers” to allow heavy vehicles to travel over soft ground. In this the polyethylene strips shall be added with a multitude of rhomboidal i.e. diamond shape plates. It is observed from various previous papers and reports that the use of geoweb in road pavement will be an effective solution to increase the resistivity of road pavement against flood pressure.



Fig.2. Reinforcement of the slope with three-dimensional geogrids

II. LITERATURE SURVEY

Andrii Bieliatynskiy et. al^[1], This article is related to technology which works for reinforcing embankment slopes with some type of geosynthetic material i.e. BV – I geomat which is made up of basalt fibers. As we have seen multiple times that failure of soil slope can be harmful to cover this issue the author of this paper installed geomat in the interlayer of sloping section of embankment. Existing geosynthetic materials used for slope reinforcement are studied carefully and then the type of the geomat selected is scientifically tested. Classification of existing products has been developed and experimental studies have been conducted to determine the geomats properties for reinforcing the embankment slopes made of polymeric materials and basalt fibers. The advantages of reinforcing the embankment slopes with BV-I basalt fiber geomat are mentioned in given paper. It states that, it is possible to achieve the required level of highway reliability with the help of these geomats and extend the service life of individual elements such as different materials used in base layers of pavements etc. By increasing the period between the subgrade and road pavement repairs, it is possible to gain a significant economic effect also.

Aanand Jain^[2], Geosynthetics are light in weight and flexible and also possess a high tensile strength. They are also extensible during application of loads. When soil and Geosynthetics reinforcement are combined with each other coherent reinforced soil mass developed which possess both high compressive and tensile strength which is similar in principle with the reinforced concrete. Geosynthetics is a generic term used to locate family of various flexible polymer materials used in geotechnical engineering and materials related to In addition to the application of Geosynthetics in road construction, they can be used for number of others applications like, steep slope stabilization, filter and/or drainage control in embankment and dam, lands reclamation, canal lining, strengthening of weak foundation soil for railway embankment, reducing the ballast thickness for railway etc. Geosynthetics products can be used effectively in building construction related activities for the alternative of conventional techniques. Few examples by addition of Geosynthetics in soil mass are: Improvement of bearing capacity for the foundation where it needs improvement Construction of internal roads with less maintenance cost within any township by controlling various damages in the road, Construction cost of effective internal roads by reducing the thickness of natural base materials required, Strengthening of sub grade for development of various internal roads also the construction of Reinforced soil walls (RSW) for development of various outdoor sports complex with sitting arrangements etc.

III. CONCLUDING REMARK OF LITERATURE

After considering various papers related to soil stability, stress analysis, pavements in landslide prone area it is observed that geosynthetic material came in as a great material to increase overall performance of each element. With the help of various on site test and laboratory test, results shows that soil has more withhold capacity to against flood and landslide like situation when it is introduced to geo-web with the use geo web in pavement design the bearing capacity of soil increases. Pavement with geoweb in it, can resist landslide upto a certain extent which is on a higher side than that of standard pavement given in IS code. Also it is observed that damage to the pavement having geomats in it is less as compare to normal pavement.

IV. GAP IN LITERATURE

From the above mentioned papers we can say that there is more scope to find the quantity optimization of geo-web for particular soil, cost comparison and comparative study of various vertical stresses. The numerical study of concrete block pavement and comparison of its settlement with geoweb pavement can be done by various methods such as Ansys model simulation, LVDT & Strain Gauges which we have seen in above mentioned papers for our selected site known as “Posare Village”.

V. METHODOLOGY

- A. Selection of particular landslide prone region in western ghat.
- B. Evaluate the soil conditions in the region and collection of soil samples in related region selected.
- C. Calculate the shear strength of soil also the stability of slopes with different tests in lab.
- D. Comparative study of results obtained between previous pavement and pavement with geo-web.
- E. Comparative analysis of economical overview of normal flexible pavement and pavement with geo-web.

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