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Analysis Of Geotextile In Road Embankment Using Plaxis 2d

Ankit Atkole, Tanmay Gharat, Ajit Agale, Bhavesh Adkar

(Civil, Viva Institute of Technology/Mumbai University, India)
(Civil, Viva Institute of Technology/Mumbai University, India)
(Civil, Viva Institute of Technology/Mumbai University, India)

Abstract*: displacement. The stability analysis of the road embankment has been done by finite element method using PLAXIS 2D. In this study, two types of sequence modeling were conducted. First, the stability of road embankment without any reinforcement was analyzed. Second, the stability of road Geotextiles have been increasingly applied as reinforcement in road embankments on soft soil. The purpose of this study is to determine the optimum tensile strength of geotextile as the reinforcement in road embankment considering the allowable factor of safety and embankment without any reinforcement was analyzed.*

Keywords: Embankment, Factor of safety, Geotextile, Plaxis 2d, Polymer.

1. INTRODUCTION

Geosynthetics are an established family of geomaterials used in a wide variety of civil engineering applications. Many polymers (plastics) common to everyday life are found in geosynthetics. The most common are polyolefins and polyester; although rubber, fiberglass, and natural materials are sometimes used. Geosynthetics may be used to function as a separator, filter, planar drain, reinforcement, cushion/protection, and/or as a liquid and gas barrier.

The various types of geosynthetics available, along with their specific applications, in that we are using geotextile in our project.

Geotextile
Geotextiles are permeable fabrics which, when used in association with soil, have the ability to separate, filter, reinforce, protect, or drain. There are two principal geotextile types, or structures: wovens and nonwovens.

Nonwovens: Nonwoven geotextiles are manufactured from either staple fibers (staple fibers are short, usually 1 to 4 inches in length) or continuous filaments randomly distributed in layers onto a moving belt to form a felt-like "web". The web then passes through a needle loom and/or other bonding machine interlocking the fibers/filaments. Nonwoven geotextiles are highly desirable for subsurface drainage and erosion control applications as well as for road stabilization over wet moisture sensitive soils.

Wovens: Weaving is a process of interlacing yarns to make a fabric. Woven geotextiles are made from weaving monofilament, multifilament, or slit film yarns. Slit film yarns can be further subdivided into flat tapes and fibrillated (or spider web-like) yarns. There are two steps in this process of making a woven geotextile: first, manufacture of the filaments or slitting the film to create yarns; and second, weaving the yarns to form the geotextile. Slit film fabrics are commonly used for sediment control, i.e. silt fence, and road stabilization applications but are poor choices for subsurface drainage and erosion control applications.

1.1 Introduction of Software

Perform two-dimensional finite element analysis of deformation and stability in geotechnical engineering and rock mechanics with PLAXIS 2D. Engineering companies and institutions in the civil and geotechnical engineering industry rely on PLAXIS 2D for a variety of projects, including excavations, embankments, and foundations to tunneling, oil and gas, mining, and reservoir geomechanics.

1.2 Problem Statement

We all know the clayey soil holds a lot of water in it so the roads in the area where it has clayey soil the life of the road is lesser. So, to avoid that issue we are testing geotextile as a layer in that soil so the factor of safety of the road embankment may increase and the life span of the road embankment will also increase with the factor of safety.

1.3 Previous Work

Firstly, we have studied about our software (plaxis 2d) that is it possible to do the work, studied all the commands in it. Then for the testing purpose we have to do various tests on soil such as dry weight, wet weight, permeability test, tri-axial test etc. So, we are done with dry and wet test and permeability of soil and left with some of the test and then the analysis in the software.

1.4 Objectives

➢ To study the properties of geotextile material.

➢ To determine the factor of safety and displacement of road embankment with geotextile layer.

➢ To determine the factor of safety and displacement of road embankment with out geotextile layer.

II. METHODOLOGY

1.Selection of site:

We have selected a site from saphale ,we found the soil that have properties of clayey soil.

Particle Size : Clay has the smallest particle size of any soil type, with individual particles being so small that they can only be viewed by an electron microscope

Structure: Because of the small particle size of clay soils, the structure of clay-heavy soil tends to be very dense. The particles typically bond together, creating a mass of clay that can be hard for plant roots to penetrate

Organic Content : Mineral-heavy clay soils may be alkaline in nature, resulting in the need for additional amendments to balance the soil's pH before planting anything that prefers a neutral pH. It's important to test clay-heavy soil before planting to determine both the soil's pH and whether it lacks important nutrients such as nitrogen, phosphorus and potassium.

Permeablity and Water-Holding Capacity**:** One of the problems with clay soil is its slow permeability resulting in a very large water-holding capacity. Because the soil particles are small and close together, it takes water much longer to move through clay soil than it does with other soil types.

2. Collecting the values from various tests .

We have performed tests on soil which we have collected from our selected site
Following tests are :
-Dry weight
-Wet weight
-Permeability

-Cohesion
-Poisson's ratio

Dry weight (©unsaturated) :

Volume of solid : 0.564m3
©unsaturated = weight of dry solids / volume of solid
= 24.16KN/m3

Wet weight (©saturated) :

©saturated = weight of solids / volume of solid
= 21.03 KN/m3

Permeability (K) :

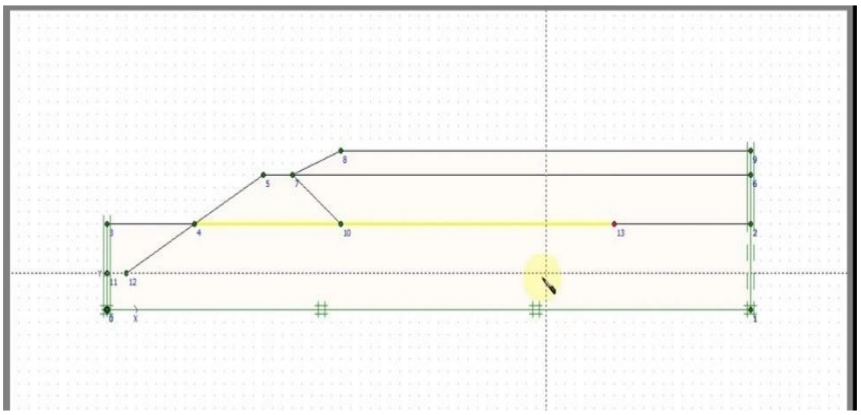
Manometer dia	20	10	6
(h1)	60	60	60
(h2)	50	50	50
Time(s)	92	55	38
Temperature	25	25	25
(k),mm2	0.0091	0.0038	0.0024
K20,m/d	8e-3	3e-3	2e-3

K= 2.2 . a . L ./A.T* log h1/h2
K20= k.kt
So, we have taken an average of 4e-3

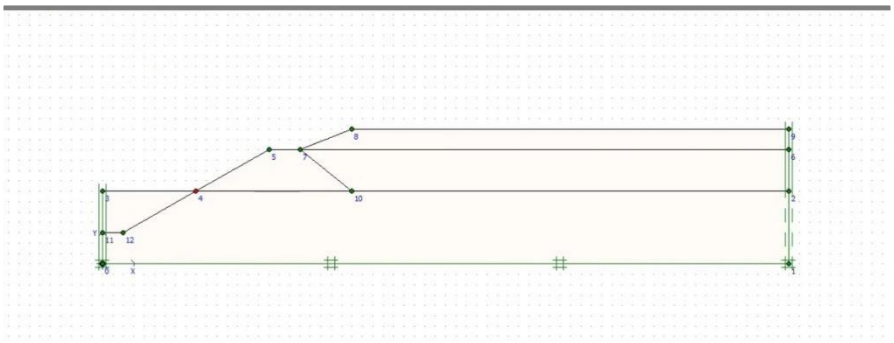
3.Designing a road embankment in plaxis 2d.

Firstly, after giving the name to the model we are going to design,
-Select the model as plane strain and set the elements to 15 node.
-In the geometric dimension from right take it as 33m and from top take it as 8m.
-In the grid section we have taken spacing of 0.5m and number of snap intervals 1.

4.Installation of geotextile layer in the model



5. Not Installation of geotextile layer in the model



III. CONCLUSION

3.1 Advantages

- The factor of safety of the road embankment with geotextile layer might be greater than other.
- The life span of the road might increase.
- It could be a cost efficient as well due to the life span of the road.

3.2 Limitations:

- It may only be applicable in clayey type soils.

3.3 Applications:

- To study the properties of geotextile material.
- To determine the factor of safety and displacement of road embankment with geotextile layer.
- To determine the factor of safety and displacement of road embankment with out geotextile layer.

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