Stability Analysis of Different Soilfil on Embankment Subgrade using Plaxis-2d

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Abstract– **Slope stability analysis is one of the most important topic in geotechnical engineering. For the construction of railways, embankments, canal, road Embankments, earth dams etc. we go for different slopes with different geometric conditions. If the slope is naturally made, the kind of problem is to check the sustainability of slope. If it is manmade type, the problem of choosing soils to build and other conditions which required for stable. The clear idea of this topic is to know the best suitability of locally available fill materials. For this particular analysis done in latest version of plaxis 2D. Evaluation of the stability analysis for road embankment is not only a problem but also a challenge or Geotechnical Engineering. In manmade slope, the problem of choosing soil is an important role for stability condition. The main purpose on this study is to determine the stability of road fill Embankment according to the factor of safety and deformation. In this study, the stability of slope was modelled in scenarios (different fills, different inclination and various level of water table). Finite Element Method by Plaxis 2D was used in numerical analysis of slope. The result of this study showed the suitability of fill soil in embankment construction according to the comparative study of deformations, factors of safety. In collected fill soils, Clayey sand is most suitable for road fill embankment.**

Keywords :- Stability, deformations, factor of safety, fill soils

I. INTRODUCTION

Embankment plays a major role in the durability of roads. Embankment refers to comprising of various soil blends to comprising of various soil blends resulting in settlement due to load transferred from traffic. The different soil blends are used in this research. Stability soil blends are used in this research. Stability analysis of soil helps in studying the behavior of embankment underloading. Stability analysis is an important role not only in the construction of transportation facilities, failure of slope can be caused by movements within the human created cut or a combination of both. Reason for failure is usage of poor material as fill. The present work is focused on investigation the behavior of locally fill material when it used in road fill embankment by using Plaxis program in slope stability analysis

II. LITRATURE REVIEW

Stability calculation is performed to assess the safe design of human made or natural slope like embankment and respectively the equilibrium conditions. The term stability analysis can be explained as the resistance of inclined surface to failure by sliding or collapsing analysis aims for a safe design in terms of stability of subgrade embankment. The failure mechanism plans an important role in this study. Finite element analysis is the best numerical method for determining the stability problem. Widely adopted numerical technique for analyzing geotechnical stability analysis on the soil based on plaxis 2D, Stability of soil based on plaxis 2D stability of slope needs a large attention for engineers in the field of construction as it is an important problem

III. OBJECTIVES

- To study the effective stresses, active pore pressure, excess pore pressure and total displacement of different soils using PLAXIS -2D software for wheel loads by comparing three embankment models.
- To study stability analysis of embankment constructed with different soil fill
- Effect of slope stability in embankment
- Effects of stress deformation in each models.
- Effects of total displacement in each models.
- To study active and excess pore pressure acting on each models.

IV. MATERIALS USED

Materials used for this study are

- Sand
- Peat
- clay

IV. PLAXIS -2D

A widely adopted technique, software was firstly developed by technical university of Delft in 1987. Plaxis 2D usually analysis stability of soft soils. It can be effectively used in investigation of soil settlement. The input procedures enable the enhanced output facilities provide a detailed presentation

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of computational results. Plaxis enables new users to work with the package after only a few hours of training

V. METHODOLOGY

A. Modeling of road embankment

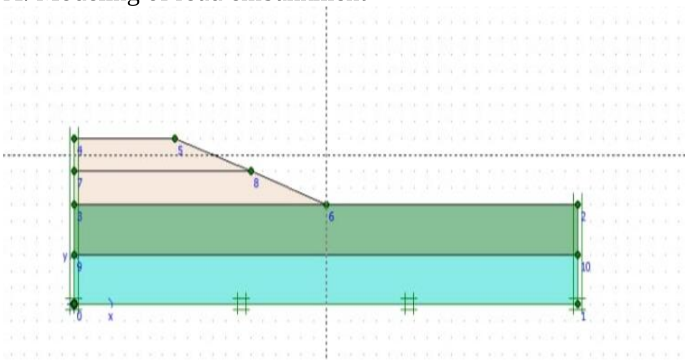

Fig.1 Modeling of road embankment

Total length: 40m
Total height: 10 m
Layer1 thickness: 3 m
Layer2 thickness: 3 m
Layer3 thickness: 2 m
Layer4 thickness: 2 m

B. Plaxis 2D working

- Data input is provided through the plaxis input module
- Plaxis input is provided as per the dimension, load conditions, and material properties.
- Material properties includes data on ground water table in case of analysis of soil structure if required.
- Soil embankment is modeled.
- For computation of wheel loads, a mesh is generated by clicking on mesh optionand then an output window will be generated.
- Computation considering the deformations of generated embankment by wheel loads is also checked.
- The output obtained inside the boundary of each soil element.

C. Plaxis inputs

Model 1 consist up of 4 layers. First 2 layer constructed using sand, next layer is peat. Bottom layer is clay
Fig. 2 showing the model 1
Model 2 consist up of 4 layers also first two layers constructed using peat. Next layer is sand and bottom layer is filled with clays similar to model 1. Fig. 3 shows the model 2
Model 3 also have 4 layers 1st 2 layers are constructed using clay and next layer is peat and bottom layer is filled with sand Fig 4 shows the model 3 .

TABLE 1: SHOWING SOIL PROPERTIES

Parameter	Peat	Sand	Clay
Material model	Mohr coulomb	Mohr coulomb	Mohr coulomb
Material type	Undrained	Drained	Undrained
General Properties V unsaturated V saturated	8.000KN/m^3 11.000KN/m^3	16.000KN/m^3 20.000KN/m^3	15.000KN/m^3 18.000KN/m^3
Permeability	Kx = 2.000E-0.3m/day Ky = 1.000E-0.3m/day	Kx = 1.000m/day Ky = 1.000m/day	Kx = 1.000E-0.4m/day Ky = 1.000E-0.4m/day

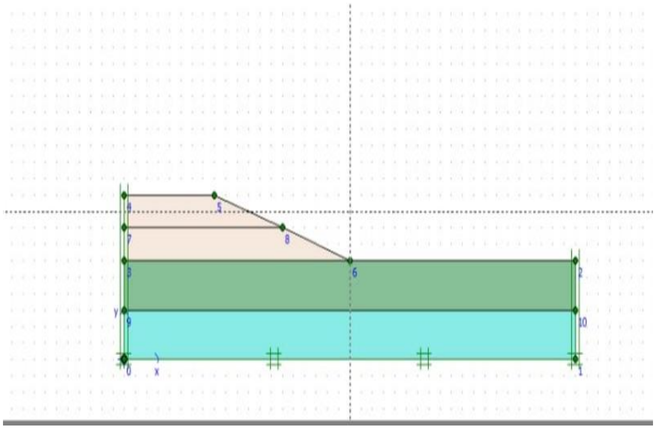

Fig.2 Model 1

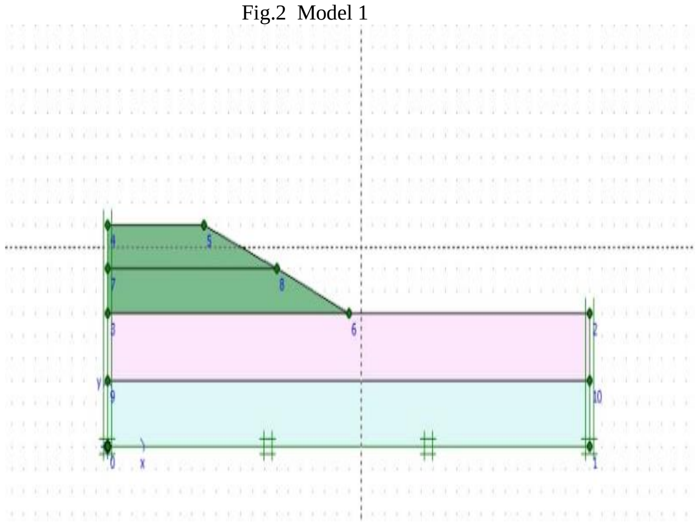

Fig. 3 Model 2

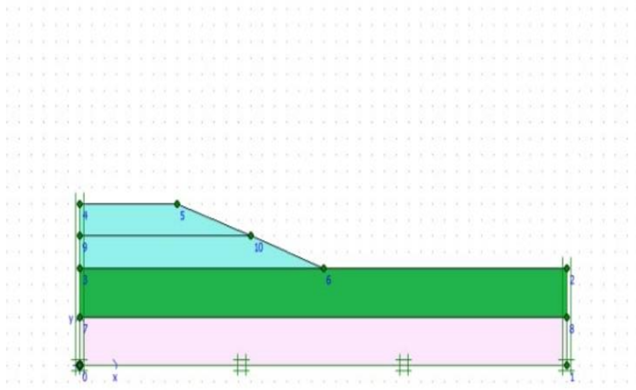

Fig.4 Model 3

VI.RESULTS

A. MODEL 1

- First and second phases get satisfied.
- In third phase, prescribed ultimate time not reached and soil body seems to collapse.
- In fourth phase, prescribed minimum pore pressure not reached and also soil body seems to collapse.
- In fifth phase, accuracy condition not reached in last step (maximum number of iterations reached).

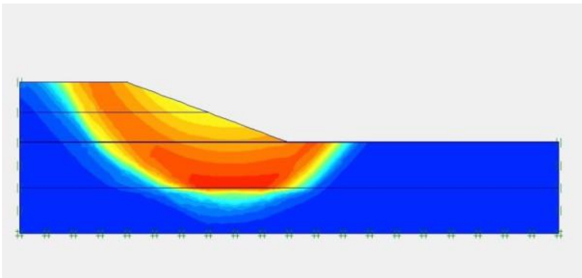

Fig 5Total Displacement of model 1

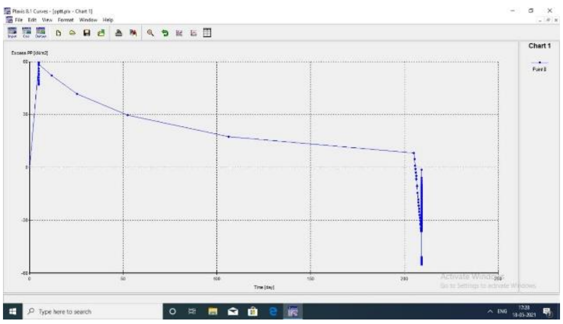

Fig. 6 Excess Pore pressure v/s Time

B .MODEL 2 AND MODEL 3

- All the phases get satisfied for the prescribed time and conditions

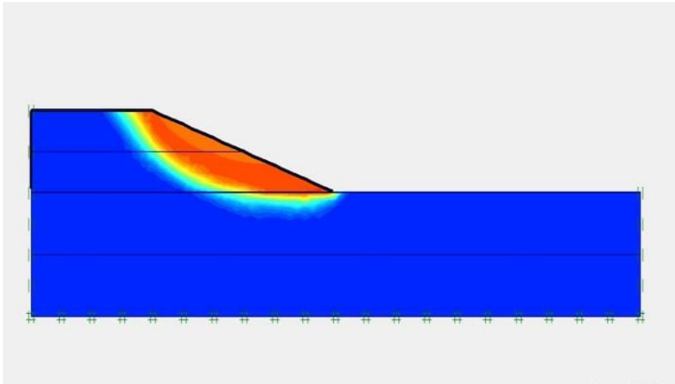

Fig. 7 Total Displacement of model 2

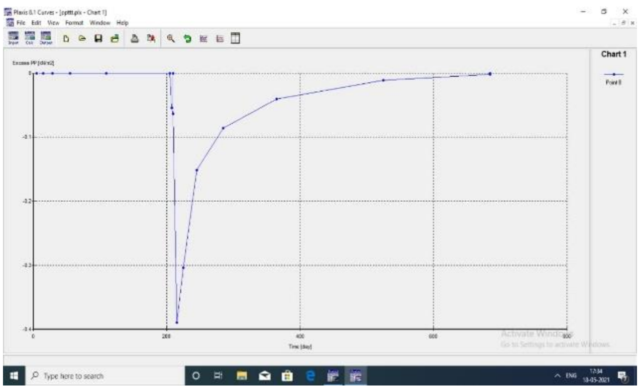

Fig. 8 Excess Pore pressure v/s Time

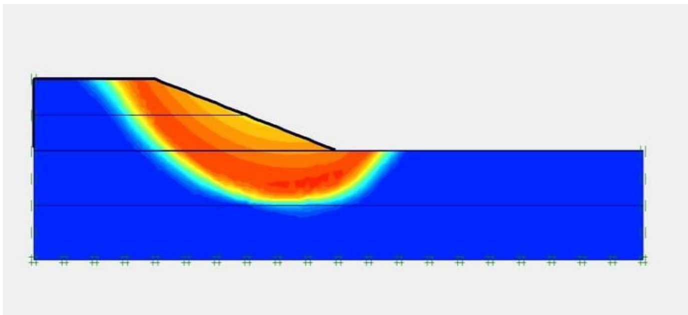

Fig. 9 Total Displacement of model 3

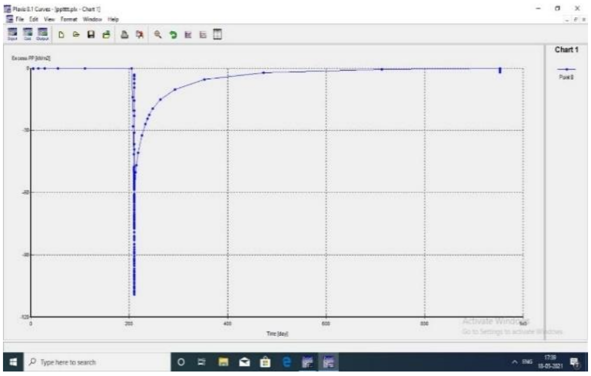

Fig 10 Excess Pore pressure v/s Time

TABLE.2 THE COMPARISON OF THREE MODELS

PARAMETER	RESULTED VALUE OF MODEL 1	RESULTED VALUE OF MODEL 2	RESULTED VALUE OF MODEL 3
Extreme active pore pressure	-59.20KN/m^2	-59.20KN/m^2	-59.20KN/m^2
Effective principal stresses	-26.36KN/m^2	-53.36KN/m^2	-32.20KN/m^2
Extreme active pore pressure	-122.87KN/m^2	-87.74KN/m^2	-60.00KN/m^2
Extreme active pore pressure	-147.82KN/m^2	-106.56KN/m^2	-59.20KN/m^2
Extreme excess pore pressure	-66.62KN/m^2	-28.86KN/m^2	-12.18KN/m^2
Total displacement	9.47*10^{3}m	1.86*10^{3}m	4.56*10^{3}m

VII. CONCLUSION

- Different Embankment models are studied to find the total displacement, vertical stress and pore pressure.
- Total displacement or deformation occurred in model 1 is high as compared to other two models.
- The volume and shear strength of soil will change due to increase in pore pressure when the de-saturated soil is wetter.
- The maximum excess pore pressure is occurred 5 days during construction.
- And then the value of excess pore pressure may leads to zero and it means that the soil is to be fully consolidated soil.
- Model 2 is most suitable because it has less displacement.
- Model 2 and model 3 are suitable as it satisfies
  The given condition.

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