A Review of slope stability study analysis with varying slope angle with slope height using Plaxis Software

Devendra Kochak[1], Prof. Mohit Verma[2]

Department of Civil Engineering,
Jabalpur Engineering College, Jabalpur (M.P.)

***Abstract*: Slope stability is one of the most important areas to be addressed in the Geo-technical engineering field. Slope stability analysis was performed here with the Finite Element Method using PLAXIS-2D. In this study different types of modeling in sequence were performed here. In order to reduce the level of slope instability, various slope stabilization methods should be adopted through slope analysis using appropriate methods. This paper provides a brief overview of the causes of the landslides that occurred. The focus of this paper on Numerical Modeling is based on estimates from a series of consecutive ground set sets and monitored by the Finite Element PLAXIS-2D system used here to predict volume performance.**

***Keywords*: Finite element method, Factor of safety, Slope stability.**

1 INTRODUCTION

Here in this study no inclusion of any type of soil consolidation is considered. In recent years it has become apparent that with increasing cargo arriving at a slower pace. In this case the Geo-technical engineers face a specific problem such as large settlements and slope instability. For the purpose of future research the contents of this paper will assist in determining the safe slope angle and the safe slope length of any embankment or construction of any reinforced earth wall. The purpose of this study was to determine the valid Factor of Safety for displacement by stability analysis performed in the form of Finite Element using PLAXIS -2D.

2 LITERATURE REVIEW

Mixed soils with a length of 25m, width = 50m and slope height = 7m, 12m, 17m respectively as shown in the figure below, were investigated in this study. Here the water level was at the same level or considered unchanged throughout the ever-changing ground slope. The filling and all the soil is built like Mohr-coulomb. In the past, problem areas were often overlooked as there were many areas that included good quality soil. But nowadays, rapid urbanization and industry are encouraging people to take advantage of these problematic areas. The background soil is characterized by loss of shear strength over time and is highly eroded. Slopes excavated in such lateral formations cause significant erosion and slope stabilization problems, mainly due to the pressure of standing water at the top. This study was basically done to analyze the slopes- both the failed slopes and the existing slopes. A slope failure or recent landslide investigation will be conducted, and the causes of the failure and proposed remedial action will be suggested. Similarly, a rigidity test for existing slopes will be performed and the safety factor and the slope of failure failure will be calculated using plaxis (2D) [1]. Slopes are natural or man-made. Slope stability problems have been encountered throughout history whenever the soft natural balance is disturbed by any type of internal or external force. Natural energy such as heavy rainfall leading to erosion and erosion is an important example of internal disruption while external energy especially human activities such as excavation and filling slopes have also caused slipperiness. The scope of this study is to analyze slope stabilization problems at separated slope angles. Unexpected landslides in densely populated areas can cause great loss of life and property. For existing slopes, the safety factor will be calculated and thus a slope stability test is performed. Also, an area that may fail under predictable loading conditions can be found. If the slope is found to be unstable under various rainfall conditions or loading conditions, appropriate remedial measures such as plant cover, geogrid use, anchoring etc. may be proposed [2].

In geotechnical engineering, no commonly accepted definition of security factor (FoS) is available. In many volume load problems, FOS is often defined on the basis of the final load carrying capacity. However, in analyzing slope stability, it is very common that FoS is related to soil strength characteristics. Limit measurement methods suggested by Janbu (1954), Bishop (1955) and Morgenstern and Price (1965) are based on a fragmentary approach and have a broad tradition in analyzing slope stability. Despite the experience In geotechnical engineering and transportation, especially road construction in cutting and depth excavation problems are solved using various supporting digging methods. Soil consolidation is preferred for ease of use and economy. In this study, the behavior of the supported slopes with geotextiles and geogrids was analyzed by experiments on laboratory slope models. In the tests, vertical loading was used to determine the failure and damage in each case. Additionally, the slopes are designed using the Plaxis system. At the end of the study, the experimental and analytical models were compared and the behavior of the models was presented. The latter buildings are constructed on almost every highway, highway and railway line and are used against slopes and hills. The retaining structures are divided into two main groups. These are durable structures such as retaining walls, reinforced earth structures, solid walls and temporary structures such as piles of sheets and solid cuts [3] [4].

The development of transportation encourages people to make better use of the existing environment, such as in hilly and sloping areas, where their appearance varies. Slope rigidity analysis is required from the planning or design phase in order to create a safe, comfortable, and durable construction in the slope area. The study area is Meulaboh-Geumpang road, which often causes soil erosion due to the environment and is caused by rainfall. A landslide on Wednesday (10/5/2017) at around 11.00pm caused a

disturbance on the Meulaboh-Geumpang national road, which was hit by a landslide and collapse. The natural factors that cause landslides are topography or slope, rock conditions and slope slopes, as well as water conditions or groundwater conditions on slopes [5]. Slope failure is a major risk that requires great care to be taken care of. Whether man-made or natural, their stability should be noted in all potential threats. The slope earthquake response, therefore, has always been an important concern for geotechnical engineers. Two common analytical methods used in geotechnical engineering to design and predict slope behavior are common boundary measurements and limitation material methods. The main advantage of limiting asset analysis over the limit measurement method is that the failure mode or failure area does not need to be predetermined. Also, stress, pore pressure, deformation and failure under the seepage can be easily calculated here [6].

The use of limitations in the calculation of stability should overcome the weakness of traditional methods. Stability analysis was applied to slopes, intricate geometry, consisting of alternating sandstones and marls using finite elements and limited measurement methods. The various calculations show the benefits that can be gained by modeling behavior in the form of finite elements. In the analysis of finite elements, the shape of the local transformation of the slope is almost circular and confirms the failure of the failure line that includes the basic assumptions of the analytical methods. In this paper the Factor of Safety value is calculated consistently and compared with different soil types with different slopes, but with a two-dimensional model. The major limitations of this approach are found in this comparative study [7]. To enable you to successfully diagnose slope stability problems, various machine learning algorithms have been proposed recently. However, these advances are limited to the analysis of the stability of a two-sided slope (speculation of a plane type), although the results of both sides can be very conservative. In this study, neural processing networks are adopted and trained to predict the stability of the three-dimensional slope and system, SlopeLab developed with a user graphic interface. In order to reduce the number of variables, flawless parameter groups to display slope stability on older solid charts are adopted to form neural network Architecture. The model is equipped with a database from the stability slopes of fully integrated and cohesive soil slopes. In addition, the impact of the concave bending curve on the slope stability usually obtained by the drilling process is investigated by introducing a non-Dimensionless parameter, a related bending radius. Slope rigidity analysis was performed with numerical calculations

Numerical simulations were performed to assess the impact of holes in the stability of global dam slopes using finite-element-based PLAXIS 2D software. The main objective of the present study was to measure the effect of the horizontal and vertical holes in the analysis of slope stability. A statistical study was conducted in advance to measure the effect of the pits on the stability of the slopes of the earth dam under the condition of rapid drainage. The results of the statistical analysis showed that the presence of holes in the base of the earth's dam significantly reduced the stability of the slope upstream, where the safety factor was less than the required value for rapid gravity [9]. Landslides are the movement of slopes beneath many rocks, debris and soil under the influence of gravity. Landslides can be caused by one or more combinations of elements. Some of the major causes of soil erosion are increased unit weight by soil moisture, heavy rainfall, sloping slopes by erosion or erosion, earthquakes, additional external loads, shocks, ice and melting points, compression pits, soil drills & anthropogenic activities. These landslides not only cause structural damage but also cause loss of life [10].

3 MATERIALS AND METHODS

The project work is broadly divided into two phases. The first phase was the testing phase where soil samples from selected areas were collected. Five different routes were analyzed. Tests were performed to determine. engineering features such as aggregation, internal collision angle, Young's modulus etc. Other input parameters for numerical analysis such as slope angle and geometry of the area were determined by theodolite examination. The second phase was a numerical analysis phase, performed using FEM-based software, Plaxis (2D). The slope and safety feature of the existing slopes were detected. In the case of failed slopes, re-analysis using geogrids, anchors etc.

4 METHOD OF ANALYSIS

Soil slope stability analysis was performed in the form of Finite Element using PLAXIS-2D. The Mohr-Coulomb model has been used as an analysis of the hypothetical problem. Here are the differences in slope length and slope angle and your combination of both considered here where we found Displacement and Security Feature and the relationship between these two important features of the entire dynamic data set.

5 APPLICATIONS WITH GEOTEXTILE

In this case, 1.6 cm thick geotextiles were used. After conducting theoretical calculations, the length and space of the geotextiles were determined according to the magnitude of the mass of the earth. First, laboratory tests were performed and model analysis was performed using the Plaxis system. The maximum load was 2600 kg. The maximum pressure of slopes with geotextile reinforcements was approximately 6.6 kg / cm2. The stress level showed that the slope with geotextile reinforcement did not carry that load. And the slope with geotextile reinforcement has provided flexibility in the exact direction. The dimensions of the vertical and horizontal curvature of the slope were 28 mm and 9.0 mm, respectively.

CONCLUSIONS

It is very important to analyze the causes of landslides and to take appropriate measures to reduce them. Several authors have conducted pricing tests using a variety of software available. Among them, SLOPE and PLAXIS software are highly reliable and provide accurate slide security feature results. Slope firmness analysis can be done using the standard feature method and the limit measurement method. In terms of results, the safety factor obtained using the standard feature method is higher than the limit measurement method.

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