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Discussions and Replies Session 2

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DISCUSSIONS AND REPLIES

SESSION II

Discussion by Wu Yingwoei.

on
Time Prognosis of Landslide Based on Unstable Creep

Paper No.2.14

In p.380, eq.11. author mentioned parameters A B and t_c are easily determine from measure data. Two methods were presented to determine t_c . We can use graphic method to find the creep tending to accelerated stage, but the landslide is going to happen shortly. Can we use the graphic method to find the accelerated stage earlier? Or do we have time to stable the slope?

Discussion by Ming-Hung Chen
Graduate student of UMR

on
Case History of an Uplift Problem

Paper No. 2.19

In the western parts of Holland the ground level lies usually lower than the mean river level. For that reason the land is separated from the rivers by water retaining structure called dikes or levees. These dikes exists usually of impermeable heavy clay and which are constructed on a relatively impermeable and weak subsoil of peat and clay. This pore water pressure in the sand beneath this weak layer is related to the water level of the river. In the spring 1988, during an extreme high water period in the river Rhine, it was suddenly observed that pore water pressure measurements in the sand reached an ultimate value while the river level was still increasing. At that time it was recognized that the deformation problems were not caused by creep, but by uplift of the weak toplayer at the passive zone of the dike. Investigation showed that increase of horizontal deformation velocity with increasing water level of the river and decreasing horizontal deformation velocity with decreasing water level of river. Horizontal deformations of the weak toplayer behind the dike were caused by uplift and not by creep. A soil improvement was realized within the inner side of the dike in combination with a drainage system. This improvement make sure that there will be a limit stress increase and consequently a limit deformation of the weak toplayer. There must be had some other methods to control seepage under this situation. What are they?

Discussion by B.B. K. Huat
Universiti Pertanian Malaysia

on
Piled Embankment on Soft Clay : Comparison
Between Model and Field Performance

Paper No. 2.28

A trial embankment structure supported on concrete piles has been discussed in this paper. The trial section was built on an area with approximately 20 m of soft marine clay underlain by dense sand. Precast spun concrete piles, 400 mm in diameter, were driven to bear in the underlying sand layer at 21 m depth and were designed to carry the full weight of the 6 m high embankment which was assumed to be uniformly distributed. Each pile was provided with separate cap 1.8 x 1.8 m and was installed in a grid of 3.5 x 3.5 m. No piles were installed under the embankment slope, rather a berm 3 m thick and 15 m wide was used to maintain side stability. The fill was compacted lateritic soil.

Pile installation began in July 1987 after placement of 0.6 m working platform of sand and construction of the embankment took place between April 1988 and October 1988 with a pause period between May and September. Sixty four days from the start of filling, tension crack was observed at the junction between the unsupported and supported section of the embankment. Secondary surface cracks were also seen running parallel to the lines of piles along the embankment axis. Berm thickness was the full design height 3 m and the main section of fill was 4.3 m. Addition of more fill above the piles between September and October to a final level of 6.4 m triggered eventual collapse of the unsupported berm. Load cells mounted on top of the pile head indicated that less than 60% of the embankment weight was actually carried by the piles, in contrast to the value of unity assumed in the original design.

In this paper reference is also made to a parallel design study carried out using centrifuge modelling technique.

Discussion by Wu Yingwoei.

on
Full Scale Field Test on a Slope Progressive Failure

Paper No.2.29

1. In this paper, p.439, mentioned about the correlation between the pressuremeters data and conventional shear test results. How to compare those two methods to find C & phi values?
2. The fissure record : do we use the topographic and photogrametric marks to built the fissures record? But those two methods are major in surveying the displacement of slope surface.
3. How to get deformation modulus from lab? How to build the relationship between pressuremeter data and lab test data? In p.439, author said that the deformation modulus was significantly reduced with the applied pressure which is in accordance with the pressuremeter tests results?
4. In p.441, fig 7, how to determine the orizontal force between slice .
5. In the field test, the up-limit value of displacement obtained from inclinometer or we how to predict the slope is going to slide?

Discussion by Wade E. Cooper
Civil Engineer, Mine Safety & Health Admin.
Denver Safety and Health Technology Center
Mine Waste and Construction Division
Denver, CO

on

Seepage Through Mine Tailings Dams

Paper No. 2.35

The authors should be commended for their contribution on assessing the horizontal to vertical permeability of noncompacted coarse refuse embankments. In the paper, the authors contend that the permeability of the fine refuse slurry beach should, contrary to current common design practice, be considered during the design process of evaluating the maximum anticipated phreatic surface during the life of the impoundment. Designers should be careful to consider all possible construction, operating procedures, and circumstances which may occur during the life of the impoundment when deciding whether or not to incorporate the low permeability of the fine refuse into their maximum anticipated phreatic surface evaluation.

Designers should especially be aware of any procedures or circumstances which may result in the water surface level within the impoundment rising above the slurry beach for an extended period of time. This could result in a higher phreatic surface than anticipated. Some operational conditions, that are often overlooked, which could result in this situation include, but are certainly not limited to:

1) Impoundments which rely on pumping to maintain the water level below the slurry beach may be subject to extended periods of time of no pumping due to problems beyond the control of the designer. These problems may be the result of weakened coal markets (impoundment shutdown), worker strikes, or electrical power failures.

2) The uniform formation of the fine refuse beach across the entire embankment face is often beyond the control of the designer. Personnel that operate the impoundment may not be aware of the importance of maintaining a uniform fine refuse beach across the entire embankment face.

Suggested Permeability Ratio

The designers back calculated the average horizontal to vertical permeability ratio of six noncompacted coarse refuse embankments using a relative permeability assumption. This average ratio was reported to be 2.4:1 with a ratio range of 4.2:1 to 1:1. To account for coarse refuse compaction, the authors suggest an average ratio of 4:1. No information is provided in the paper to substantiate this suggested average ratio for compacted coal refuse embankments. Yet information is available to suggest that compaction can result in considerably higher ratios than suggested in the paper. Based on their presented results and suggested average ratio, the authors suggest using a ratio between 4:1 to 1:1 to design compacted coarse coal refuse embankments. In the design process, it must be realized that it is not prudent to use the average ratio because the maximum anticipated phreatic surface would be underestimated 50 percent of the time. Based on these facts, the suggested use of a 4:1 to 1:1 horizontal to vertical permeability ratio for designing compacted coarse coal refuse embankments does not appear to be a prudent engineering practice.

Replies by Wang Jianguo

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Nagoya University, Nagoya 464-01, JAPAN

on

Time Prognosis of Landslide Based on Unstable Creep

Paper No. 2.14 _____

Start your reply with no indentation. Type only in one column width as shown here.

Author first thanks Prof. Wu Yingwoei who put forward an interesting question. The answers includes three points: One is the judge of transition from stable creep to accelerated creep. From the pattern of measured data in site obtained in publications. The time Vs displacement behaves different shape at different creep stage (See Fig.2 and Fig.3). We can roughly judges whether the creep is stable or not on the basis of whether the curve is straight line or not. If the curve is straight line, the creep is stable. Otherwise, the creep enters the stage of accelerated creep. It is apparently shown in Xintan landslide in Fig.8. The second is how long it will last from beginning of accelerated creep to outburst of landslides. Zhang Zhuoyuan & Huang Runqiu(1988) found out a constant ratio of stage time in accelerated creep to stage time in stable creep. The examples shows that the lasted days are 4 days (Fig.6), 8 days (Fig.7), 30 days (Fig.8) respectively. The third is what engineering method should be taken. There are usual two methods to be used to treat potential landslides: One is stabilization, the other is retreating from slippage area. If prevention of landslides is impossible, immigration in landslides area is necessary. This may reduce the damage of life and properties. It should be pointed out that the causes induced to landslides are various. Many landslides are caused by torrential rain, it is difficult to predict because of shortage of systematic observation. When the landslide is discovered t_f will always come shortly, there is no time to stabilize it even though to escape from. Suggested method is just as one reference.

Replies by Professor Ioan Stanculescu

Associate Professor Anton Chirica
Civil Engineering Institute
Bucharest

on

"Full Scale Field Test on a Slope Progressive Failure"

Paper No. 2.29

1. The use of pressuremeter data for obtaining the shear strength parameters, was made referring to correlations proposed by Menard (1957) and Salencon (1966).
2. The topographic and photographic marks together with surface concrete markings were used in order to obtain information on the fissures positions, slope surface displacements, and on the fracture with steps or detachment lines during the excavation stages.
3. By using the elastic equilibrium conditions for a cavity with a pressure acting inside, and the pressuremeter data, it is possible to obtain the horizontal deformation moduli, E_h in the linear behavior domain, at different depths. In order to determine the mechanical characteristics of the red clays in horizontal direction,

pressuremeter tests were performed in 11 boreholes at every 0.5m (140 test levels). By using the graphical representation of the variation of E_h values, with depth, in the red structured clay stratum, a linear variation was obtained. The comparison between the laboratory and pressuremeter tests results was obtained as follows:

- the red clay samples tested in oedometer were taken from the same depths as those for the pressuremeter tests performed.
- the laboratory samples of red clay, for oedometric tests, was taken in horizontal direction from the sampler tubes.
- 5 series of samples were consolidated under the horizontal stresses in the field, and then unloaded.

4. The simulation, by computation, of the progressive yielding of slopes, in structured clays was made by using a computer program based on the method proposed by Athanaslu C. (1980). The equilibrium equation for each computing slice, with the corresponding boundary conditions, leads to a system having, as unknowns, the horizontal displacements of slices, which are considered rigid elements. The earth mass deformation as a consequence of the unbalance caused by excavation, consists mainly in the horizontal displacement of each slide. As a result, the lateral forces between slices are modified by horizontal decompression of the soil, respectively the shear stress modification on the slice base, due to the increase of the slice displacement. Establishing the zones with tension stresses, on the slope, one can find out the fissures zone position, corresponding for the considered excavation stage. For a given excavation stage it is possible to find out the fissured zone position as zone with tension stresses on the slope surface. By using this method it was possible to evaluate the horizontal forces between slices and locate the excavation stage.

5. We used the results of inclinometer measurements to establish the position of yielding surfaces in three profiles (Fig. 3 and Fig. 7). After the simulation of slope progressive yielding, by computation we compared the calculated with the inclinometer measured displacements. Obtaining finally good agreement between the results of theoretical approach and actual behavior of the soil masses in limit equilibrium.

Author's Reply to the Discussion by Wade E. Cooper on

Seepage Through Mine Tailings Dams

Paper No. 2.35

We appreciate the interest expressed by the discussor on our study and his valuable comments. We understand his concern about possible variation of operational conditions during the life of an impoundment. We agree with the discussor that not considering a slurry beach is a conservative approach, however, in most cases it is overly conservative. Certainly the approach should take into account any water which is impounded against the dam for extended periods of time for any reason. However, once the slurry deposition reaches appreciable height, the majority of the dam is covered with slurry which, in fact, does limit seepage because of its lower permeability. The Authors contend that ignoring all of the slurry is too conservative and a realistic amount of slurry deposited against the dam should be taken into account.

Suggested Permeability Ratio

This paper presented case histories of a number of structures which are relatively old and which were constructed with varying degrees of compactive effort. All of these case studies showed a low phreatic surface and indicate a relatively low ratio of horizontal to vertical permeability. As to whether this is valid for a "compacted" refuse embankment the discussor is referred to a paper "Performance of a Coal Refuse Embankment" 1988, by Cowherd et al. That paper discusses in-situ permeability tests performed in a compacted coarse coal refuse embankment which showed a horizontal to vertical permeability ratio of 2:1. The embankment in this study was compacted to an average density of 95% of standard Proctor. Horizontal permeability tests were performed by a double packer arrangement at 5 foot intervals for a total depth of about 110 feet in the dam. The average ratio of horizontal to vertical permeability was about 2:1. In addition, the piezometric level measurements of several 100 refuse dams would also support this conclusion.

Cowherd D., Perlea V., Coulson A., Performance of a Coal Refuse Embankment, Proceedings Second International Conference of Case Histories in Geotechnical Engineering, 1988 Paper 3.68.

First, I would like to congratulate and thank Dr. Les Harder for his excellent general report.

Following George Herbert "You must strike in measure, when there are many to strike on one anvil " I have selected a few points for discussion.

DAMS

Hydrodynamic effects induced by the impounded water on the response of a dam subjected to earthquake excitation

Nonlinear effective analysis modelling hysteretic cyclic stress-strain behaviour by using elasto-plastic constitutive equations for dynamic analysis of embankment dams

SLOPES

Evaluation of slope instability

- Rock or soil type
- Slope angle and surface conditions
- Nature of erosion
- Hydrological conditions
- Volume evaluation of sliding masses
- Failure mechanisms and sliding velocities prediction

EMBANKMENTS

For better predictions of embankment behaviour finite element analysis using elastoplastic constitutive models taking into account the consolidation shall be implemented.

Methods of quantitative analysis of embankment monitoring results consists in a functional relationship between observed effects and the corresponding actions.

The research related with this session should progress taking in mind the memorable words of Lao-Tsze, Maxim 64 (550 BC)

"The journey of a thousand miles begins with one step"

Last but not least I should like to express my sincere appreciation and deep gratitude to Prof. Samsher Prakash for this opportunity to share different experiences, to Prof. Jorge Troncoso, Chairman, to Dr. Les Harder, General Report, to the Co-Reporters Dr. Vlad Perlea and Dr. Nario Yasuda and to the participants on this session for their contribution.