ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

STABILITY OF RETAINING WALL UNDER SEISMIC LOAD: A REVIEW

B.S. Tasildar*

*Principal, SIT, Yadrav, India

ABSTRACT

It is necessary to check the relevance & suitability of such type of retaining wall in the field, the economy of the wall, selection of suitable method for computation of active earth pressure, number of relief shelves to be used, the amount of reduction in the section of wall. Therefore, it is necessary to study the theoretical & practical aspects & model studies in this area of field. Under special circumstances where base width of a retaining wall is to be restricted, a relief shelf can be used to reduce base width. Construction of very tall retaining walls with smaller base widths is possible by providing no. of relief shelves to the cantilever wall. In this paper stability of retaining wall is studied for retaining earth and water.

Keywords: Retaining Wall, Seismic Load, Stability

INTRODUCTION

A wall designed to maintain a difference in the elevations of the ground surfaces on either side of the wall is called a retaining wall. It is a very common civil engineering structure and is extensively used in railways, bridges, canals and other engineering works. A gravity retaining wall utilizes entirely its own weight to produce the necessary stability.

Provision of a horizontal relief shelf projecting from the stem of retaining wall into backfill is known to reduce the total active earth pressure acting on the wall .This results in a reduction in the overturning moment and consequent economy in the design of the stem and slab base. An attempt is made herein to explain the behavior of retaining wall with relieving shelves and a design procedure is presented. The position of shelves where it is located for economical conditions and certain formulaes are derived, which will be helpful fro any height of retaining wall. The economics of such proposition have also been studied.

RELEVANCE

Conventionally, retaining walls are broadly classified as gravity, semi-gravity, and cantilever, counter fort and buttressed retaining walls. A gravity retaining wall utilizes entirely its own weight to produce the necessary stability. Cantilever and counter fort retaining walls utilize the weight of the soil itself to produce stability. Semi-gravity retaining walls are intermediate between the cantilever and gravity type walls. Among the concrete retaining walls, the cantilever wall is most widely used as it is economical. These walls utilize the weight of the soil itself to produce stability. Cantilever retaining walls are used in basement of buildings, as abutments for bridges, as flood walls in irrigation works as well as for retaining ores, minerals and other granular materials. Therefore, considering the importance of cantilever retaining structures, the estimation of earth pressure is found to be essential for the safe design of retaining wall under both static and seismic conditions. A number of investigations have been performed by several researchers to determine the seismic active and passive earth pressures on a rigid retaining wall due to earthquake loading.

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

LITERATURE REVIEW

A continuous investigation and the study is going on the various types of retaining walls for achieving the optimum economy, developing the speedy and easy construction processes, reducing the section sizes of wall components and ultimately to get the wall of maximum strength and durability. This is possible only by reducing the earth pressure behind the wall. Various techniques have been developed for reducing the earth pressure behind the wall.
Tie walls, Reinforced soil walls, Anchored walls, Geo-grid reinforced soil wall, Geo-textile reinforced clay retaining wall, Braced walls, etc. are some of the special types of retaining walls used and constructed with both some advantages and disadvantages. Lots of investigations have been carried out related these walls. Various model studies have also been carried out so far. In the literature of "International correspondence schools" , it was mentioned that masonry might sometimes be saved in retaining walls by the use of relieving arches. Also the great expense of these arches may be reduced due to the saving of the material. They may occasionally be advantageously employed for high walls.

Dr. Ray Chaudhari (1974), In the design of retaining wall earth pressure is a predominant actuating force. Substantial reduction in this force could be made by providing relief shelf to the retaining wall. Jumiksi had suggested a method to evaluate the effect of shelf on earth pressure. Dr.Ray Chaudhari also independently evaluated the effect of relief shelves on earth pressure by assuming that soil mass above the relief shelf , which is contained in the failure wedge, does not contribute to the weight of failure wedge & that relief shelf supports this mass. This method has been further developed by considering the shift of centre of gravity of the failure wedge that occurs because of reduction in weight of failure wedge, due to relief shelf.

Basha and Babu (2008), adopted seismic analysis to compute the passive earth pressure coefficients of bridge abutment gravity retaining wall by using composite failure mechanism in the frame work of limit equilibrium method when subjected to seismic loads. In this paper, authors studied the approach for reliability-based design optimization of a reinforced cantilever retaining wall of concrete.They conducted a parametric study to investigate the effect of uncertainties in design parameters on the failure probability of cantilever retaining walls. In this work total ten failure modes are considered and with results different charts are formed for design reliability.

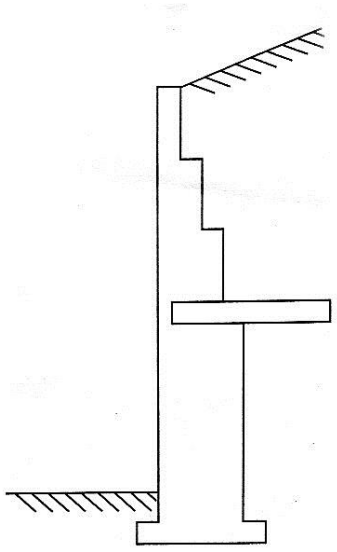

Fig. 1 Gravi-Loft Retaining Wall

ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785
(ISRA), Impact Factor: 2.114

Steedman and Zeng (1990), it predicts the seismic active earth pressure behind a vertical cantilever retaining wall taking into account a finite shear wave velocity in the backfill. It was found that the phase change has a marked effect on the distribution of the dynamic increment of pressure. The effect of non-uniform shear modulus distribution and amplification of acceleration on the magnitude of active earth pressure was also discussed.

Choudhary et al (2006) compared thePseudo-Static and Pseudo-Dynamic Methods for Seismic Earth Pressure on Retaining Wall. The analysis and comparison in between these two methos shows that the time dependent non-linear behaviour of the pressure distribution obtained in the pseudodynamic method results more realistic design values of earth pressures under earthquake condition

Tafrehi and Nouri (2008) studied the seudo-static methods for the evaluating the thrust of soil on retaining wall under seismic condition. They established a new approach which concludes that The main difference with respect to the traditional solutions is that the presence of the wall is considered in the equilibrium equations. This approach allows the required maximum total geosynthetic force and the associated critical inclination of the failure plane angle for a given reinforced soil-wall system to be determined directly.

CONCLUSIONS

It is observed stability of retaining wall is a very crucial matter. There are number of failure modes for the retaining walls. Horizontal shelves on on the vertical wall (stem) of retaining wall can be proved to be useful parameter for stability of wall. By offering number of changes stability of retaining wall can be enhanced.

REFERENCES

[1] Babu, G. L. S., and Basha, B. M. _2008a_. "Optimum design of cantilever retaining walls using target reliability approach." *Int. J. Geomech.*,8_4_, 240–252., 15: 846-851. PMID: 6514157Psillaki
[2] Steedman R S , X Zeng, 1990, The influence of phase on the calculation of pseudostatic earth pressure on retaining wall Geotechnique 103-112
[3] Deepankar Choudhury, Sanjay S. Nimbalkar and J.N.Mandal, Comparison of Pseudo-Static and Pseudo-Dynamic Methods for Seismic Earth Pressure on Retaining Wall, Journal of Indian Geophysics Union (October 2006) Vol.10, No.4, pp.263-271
[4] S.N. Moghaddas Tafreshi and T. Nouri. A, Seismic Stability Of Reinforced Retaining Wall, The 14 th World Conference on Earthquake Engineering October 12-17, 2008, Beijing, China