

Analysis and Comparative Study of V Shaped Folded Plate Type Foundation for Retaining Wall

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ABSTRACT: Footing is an important part of structure. The footing is an architectural element attached to ground and also transfer loads of structure to ground. The purpose of footing is to support structure and also prevent instability of structure. A structure's foundation is connector between part of structure and footing. Footing secures foundation by gaining actual strength of structure. This paper gives an information about Analysis and Comparative study of folded plate foundation for retaining wall with varying geometric parameters. This paper also helps to find out economical structure with prevention of sliding and also gaining high strength to whole structure.

The objective of this paper is to determine maximum deflection occurred due to varying angles between plates and plate length for study of V shaped folded plate type foundation for retaining wall with varying geometric parameters.

KEYWORDS: Footing, Folded Plate, Retaining Wall.

I. INTRODUCTION

The term folded structure defines the folded form of a construction, including constructions made of boards and structures made of sticks with their mutual relation in the form of folded shape. a relatively newly developed concept which consists of folded plate system has been promoted as a cost-effective alternative for the design and construction for roofs, bridges, walls etc. The structural shape of the folded plate consists of many shapes such as trapezoidal, vee-type and prismatic. These shapes can be easily constructed using slip form techniques. The aim of this paper is to achieve an ideal V shaped plate foundation for retaining wall which covers up to 27m length. Using the principle of FEM with several models to analyse the geometric parameter i.e. length and internal angle. Folded plate provided in foundation for retaining wall. Elastic mat is provided as foundation for retaining wall. The STAAD Pro models have been made for the internal angle of 45, 60, 75, 90, 105, 120 degrees with change in length as 1m, 1.5m, 2m. the following references are the main research articles which comprises the base for the study.

In this study the data is being collected and then the analysis work is being done for the folded plate foundation for retaining wall. STAAD Pro models made for V shaped folded plate foundation for retaining wall with varying geometric parameters like internal angle of plate and also length of each plate at foundation.

II. RETAINING WALLS AS FOLDED STRUCTURE

Retaining walls have a function to receive a horizontal force of the impact of the ground. Great rigidity, which vertical folded structures have, influenced their use for reinforced concrete retaining walls. Building a folded wall leads to more economical solution for the retaining wall and lower consumption of material - reinforced concrete.

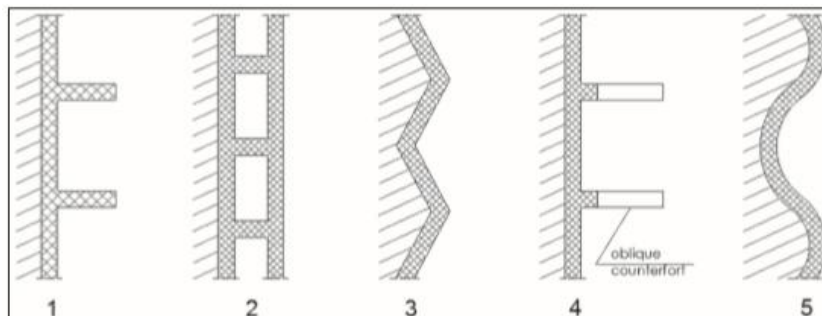


Fig.1.Possible forms of reinforced concrete retaining walls



III. EFFECT OF FOLDING ANGLE ON SOIL SETTLEMENTS

The measured load settlement curve for different cases of folding angles for different cases of folding angle. It shows the measured and computed settlements versus the folding angle as obtained from the experimental and numerical studies respectively. The experimental and numerical results show that increasing the applied pressure till failure resulted in a noticeable increase in the underlying soil settlement for both the folded and flat isolated footings. Slight differences are noticed between folding angles of 20 to 40 degrees, with folded isolated footings giving lower settlement values than the flat ones. This is mainly attributed to the fact that settlements are mostly dependent upon the applied load and consequently stress. On the other hand, the stresses under the footings are dependent to some degree on the bottom of footing shape. The rate of increase in the settlement values is more pronounced in flat isolated footing and with folding angle equals 10 degrees. Both the experimental and numerical results showed the same trend, assuring the numerical model capability of reproducing the experimental study results. The measured and computed total settlements showed that increasing the folding angle more than 30 is not that effective in reducing the stresses and consequently the total settlements.

Effect of Folding Angle on Footing Stresses

It shows the tensile and compressive stresses versus folding angle for the experimental and numerical cases. Results indicate that increasing the applied pressure resulted in a noticeable increase in the footing body stresses at the compression edge for both the folded and flat isolated footings. However, there is a noticeable decrease in the tensile stresses along the steel bars for both the folded and flat isolated footings. Tensile stresses for folded isolated footings with folding angle 30 degrees decreases by about 46% when compared with flat ones, at the same loading values. Moreover, there is a slight increase in the footing body stresses due to increasing the stress levels for folding angles from 0 till 40 degrees, assuring the effectiveness of the folding angle in reducing stresses within the soil body underneath it. It shows the failure load versus folding angle for both the experimental and numerical results. Results also show that folded footings have more load carrying capacity than the flat ones. Thus, the load carrying capacity of the 30° folded angle footing is approximately equal to 2.0 times of the flat isolated footing having the same dimensions. Initial cracks and total failure are noticed in both flat and folded isolated footings with different folding angles. The figures showed complete failure at the top and bottom for every footing. Failure is mainly due to punching effect and in the radial direction. Results indicate that the folded footing needs increasing the concrete section under the column to resist the punching failure in addition to using ring beams at the folded isolated footing edges to hinder the induced cracks in these zones.

IV. EXPERIMENTAL RESULTS

In present study analysis of v shaped folded plate foundation for retaining wall of varying internal angle 45, 60, 75, 90, 105, 120 with varying length of 1m, 1.5m, 2m respectively carried out. Like this total 18 models of foundation are analysed and absolute displacement, joint displacement for every model are find out. Comparison of maximum deflection for all models is done. The aim of this paper is to achieve an ideal V shaped plate foundation for retaining wall which covers up to 27m length. Using the principle of FEM with several models to analyse the geometric parameter i.e. length and internal angle. Folded plate provided in foundation for retaining wall. Analysis of Folded plate done by STAAD.Pro V8i software using loads acting on them. Joint displacements of all nodes are calculated. Load combination for maximum forces is found out. Maximum deflection of every model is calculated. Load combinations are also taken under consideration for maximum deflection of model.

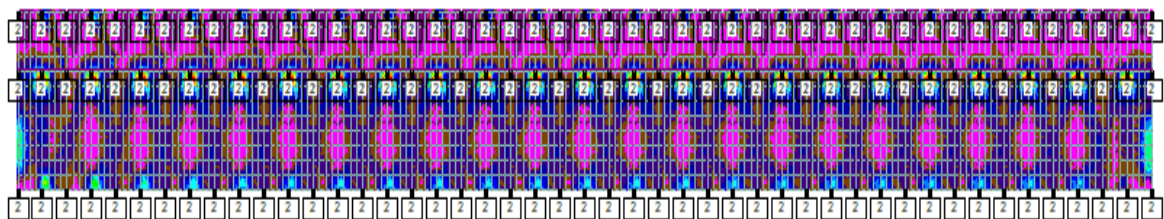
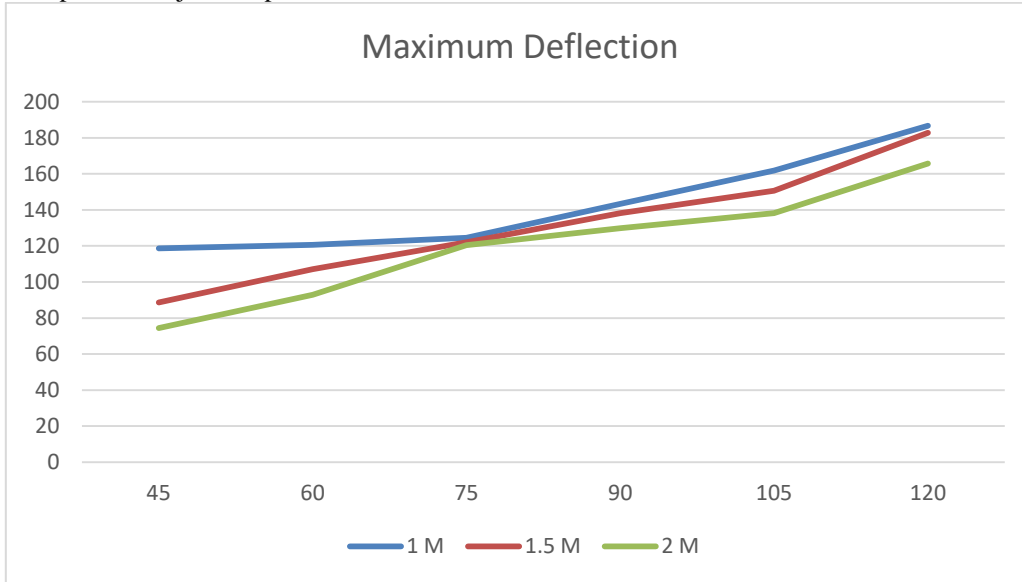


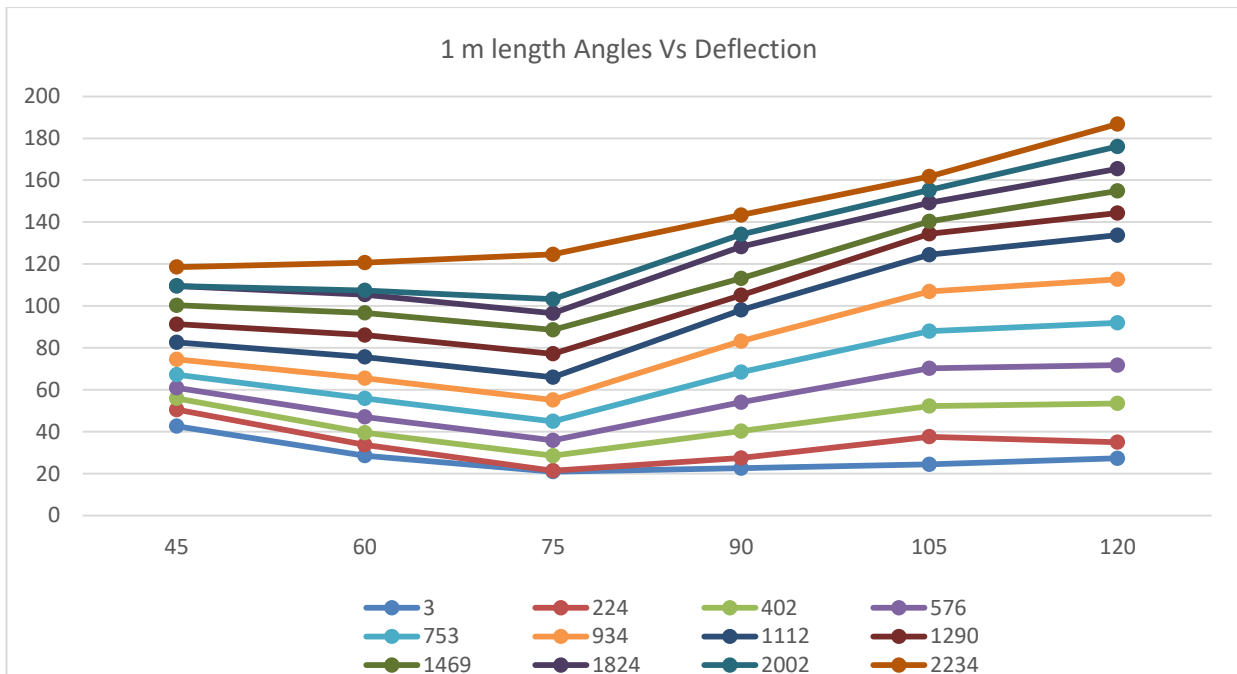
Fig. 2 Absolute Displacement for footing



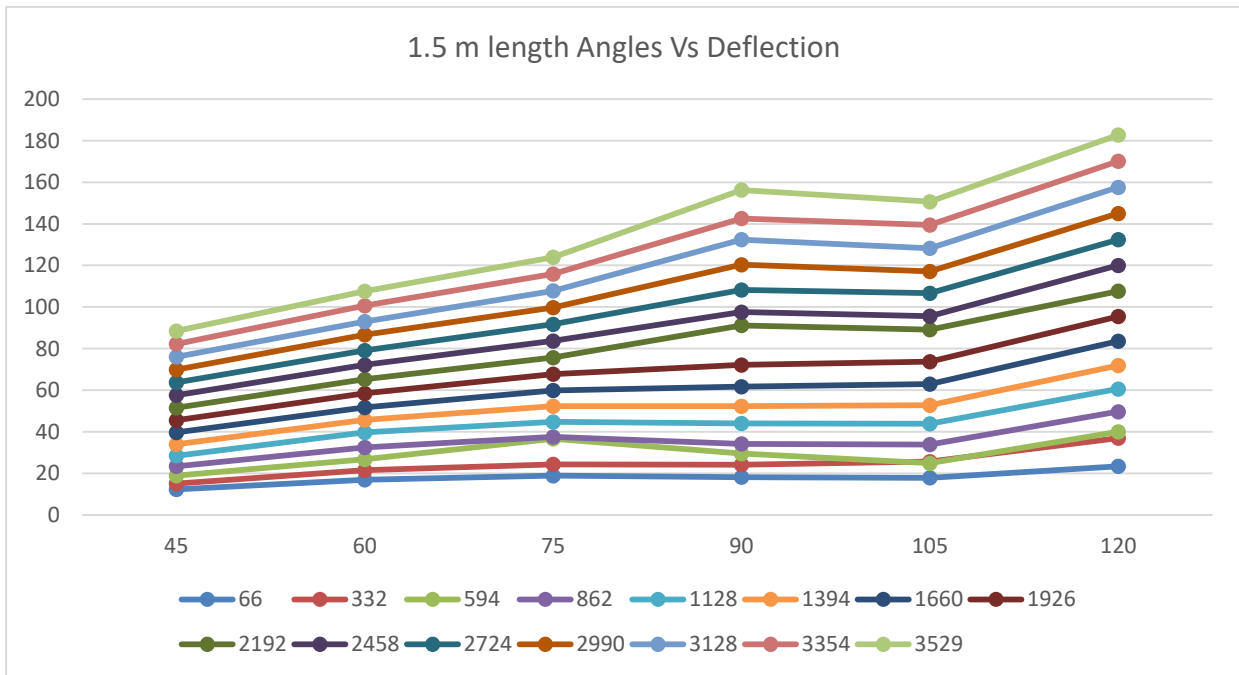
After analysis of 18 models of folded plate foundation for retaining wall with varying internal angle and length of each plate, results are plotted for joint displacement and maximum deflection for structure.



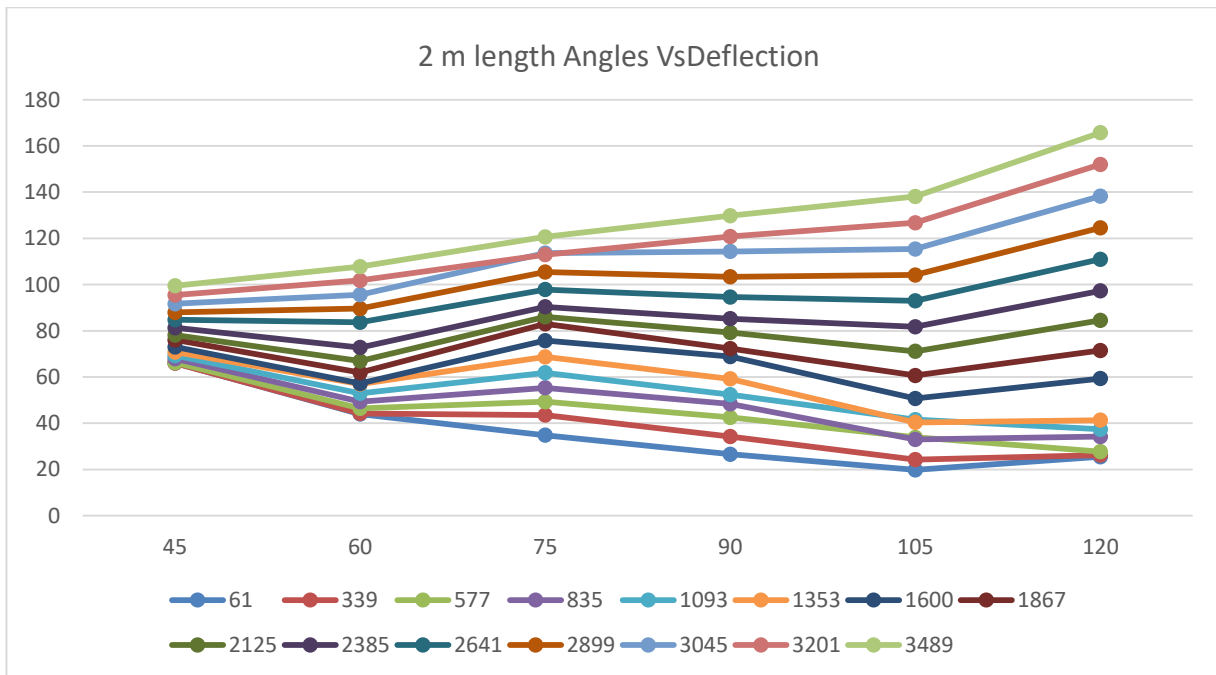
Graph 1 Absolute Displacement for footing



Graph 2 Angles Vs Displacement at Nodes



Graph 3 Angles Vs Displacement at Nodes



Graph 4 Angles Vs Displacement at Nodes

V. CONCLUSION

Few literatures are available on this work. Present work began with analytical and comparative study of V shaped foundation for retaining wall. The analytical study used to understand the behaviour of varying internal angle and length of plate on foundation for retaining wall. Total 18 models have been studied under this research work for same loading and size of retaining wall.



For Folded plate as a foundation, on the basis of present study, V shaped folded plate foundation for retaining wall can be used instead of simple foundation provided for retaining wall. The conclusion of this paper as per STAAD Pro models are as follows:

- As the internal angle between each plate increase, deflection of structure also decreases.
- As the length of folded plate increases, deflection of structure also decreases.

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