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Static Analysis of Pile Foundation on Slope Terrain

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Abstract - *A good soil should possess high bearing capacity, avoid settlement, prevent lateral displacement and should absorb less water to withstand the structure. Buildings constructed on good soil will have less chance of settlement and deformation. But when soil stratum loses its strength due to structural load, there is a high chance of structure to collapse. Thus the soil stratum should be studied through model for geotechnical properties before the construction. In this study, new software called PLAXIS is used to analyze the load bearing capacity and other finite elements of soil. The case study is proposed for Shri Saibaba temple at Yedapalli, Coonoor, The Nilgiris. The temple is analyzed in PLAXIS software by applying ultimate load and failure patterns of the soil stratum are studied.*

Key Words: **Landslide, Geotechnical properties, Finite element, Deformation, Pile, Modelling**

1. INTRODUCTION

The analysis of geotechnical structures and their static behaviour in a slope has a particular importance regarding the theoretical and empirical methods. The analyses were performed by plaxis software. In our site, height difference between ground level and building located area is found to be 30 feet. The result of test shows that the site has loose soil.

Since our soil has rock at deeper depth, we are adopting end bearing pile. The soil-pile system is modelled using the Elasto-Plastic Mohr-Columb Model for the soil and the Elastic model for pile. Therefore pile foundation has been used. Deformation of a soil stabilized by reinforced concrete piles is studied using finite element modelling. Deformation and properties of soil was found using plaxis software. STAAD pro was used to analysis the building. Hence plaxis software was used for analyzing and allowed smooth workflow and proved to be cost efficient and time saving.

The geo-technical properties were analysed using plaxis software. The defects of the building is known earlier itself and damage was prevented. Pile foundation is effective in slope and for stabilizing landslides. Result show that the horizontal displacement of the soil is close to that measured in situ. Additionally, the deliberate dislodging uncovered that the strategy for support by heaps utilized as a part of a few zones of the investigation is compelling in balancing out avalanches and for nobody else.

1.1 Objective

In the study soil stabilization of a Shri Saibaba temple and the height difference between 30 feet on a slope terrain analysis by PLAXIS software. The main objectives of the study are as follows:

- To analyze the soil investigation report and slope of site where the building is proposed to be constructed.
- To analyze the structural load using STAAD pro.
- To determine the load carrying capacity of pile and design the structures.
- To estimate the soil deformation surrounding the implanted piles using finite element analysis.
- To run a model of pile in plaxis for static analysis of pile in slope. The soil-pile system is modeled.

1.2 Scope

- To carry out deformation of a soil stabilized by reinforced concrete piles is studied using finite element modelling.
- To ensure that the structure is safe against land sliding and geometric changes. (Unloading, reshaping and substitution).
- The deformation and stability of slope may be assessed for various pile arrangements and stiffness.
- Getting familiar with structural software's Auto CAD, STAAD- pro and PLAXIS.

2. SITE INVESTIGATION

Proposed construction of Shri Saibaba temple at Yedapalli, Coonoor, the Nilgiris

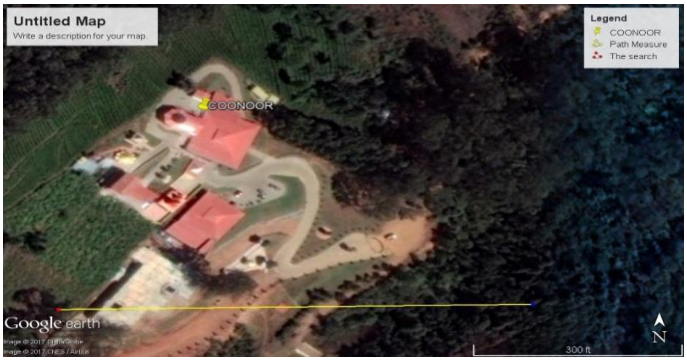

Fig-1: Site location

Table -1: Bore hole-1

S.no	Depth (below G.L) in m	Type of soil	Thickness in m
1	0.3	Top soil	0.3
2	4.5	Silty clay	4.2
3	11	Sandy clay	6.5
4	14.5	Soft disintegrated rock	3.5

Table -2: Bore hole-2

S.no	Depth (below G.L) in m	Type of soil	Thickness in m
1	0.3	Top soil	0.3
2	4.5	Clayey gravel	4.2
3	6.9	Sandy gravel	2.4
4	10	Sandy soil	3.1

3. BUILDING PLAN AND DIMENSION

3.1 Dimension

Number of floors: 1 (basement + ground floor)
Building height: 48 m
Plot area:1606 sq.m
Area of the building: 57.6x27.8 m

3.2 Plan

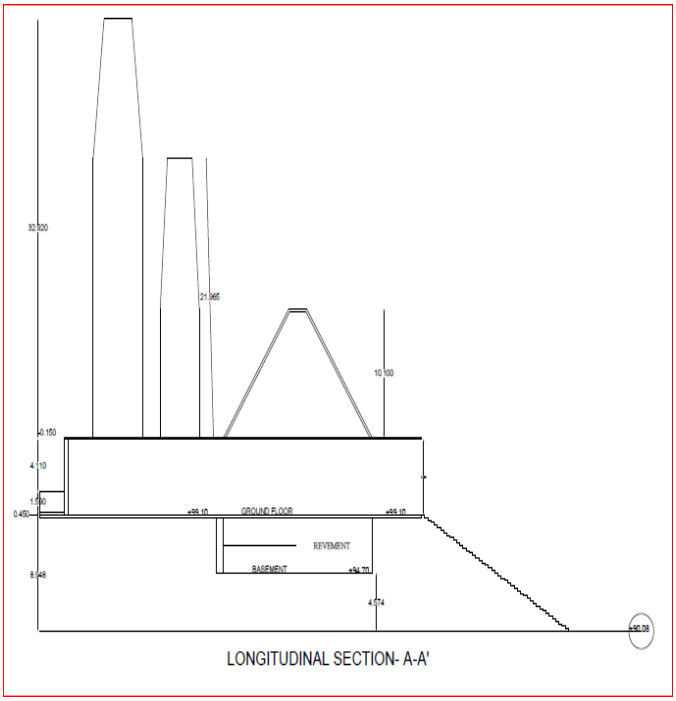

Fig -2: longitudinal section

4. FOUNDATION RECCOMENTATION

The Engineering properties of soil and SPT N value are to be considered for the foundation recommendation for PROPOSED CONSTRUCTION OF SHRI SAIBABA TEMPLE AT YEDAPALLI, COONOOR, THE NILGIRIS. The borehole investigation was conducted and SBC was determined.

Table -3 : The Temple tower is rest on ground surface (RL : 99.10)

DESCRIPTION	BUILDING (Mandabam)	TOWER (Gopuram)
Maximum Borehole Depth	14.5m	14.5 m
Type of foundation	ISOLATED FOOTING	PILE FOUNDATION (cast in situ)
Depth of foundation	RL 91.70	12.00m from Natural ground level. **RL 87.10**
Dia of pile in m	-	0.75m
Size of footing in m	2.00 x 2.00	-
SBC	40.00 T/m^2	-

5. PLAXIS ANALYSIS

There are different methods to analyze the soil by PLAXIS software. We use Mohr – coulomb model since our soil is normally consolidated soft soil, soft disintegrated rock and also for very stiff, very dense or highly over-consolidated. This Mohr - Coulomb model represents a "first order" approximation of soil or rock behaviour.

Table – 4:

Material	Model	Properties	
Piles	Elastic	Unit weight (kN/m^3)	24
		Passion's ratio	0.15
		Flexural rigidity(kN.m^3/m)	2.54E6
		Normal stiffness (kN/m)	2.11E7
		Diameter (m)	1.2
		Length (m)	3.5

5.1 Analysis procedures

The PLAXIS analysis is completed in following steps:

1. Define the limits for soil contour
2. Creating boreholes and assigned the material parameters
3. Create the surface and embedded beams
4. Loads are assigned
5. Generate the mesh
6. Performing calculation
7. Settlement and stress are obtained.

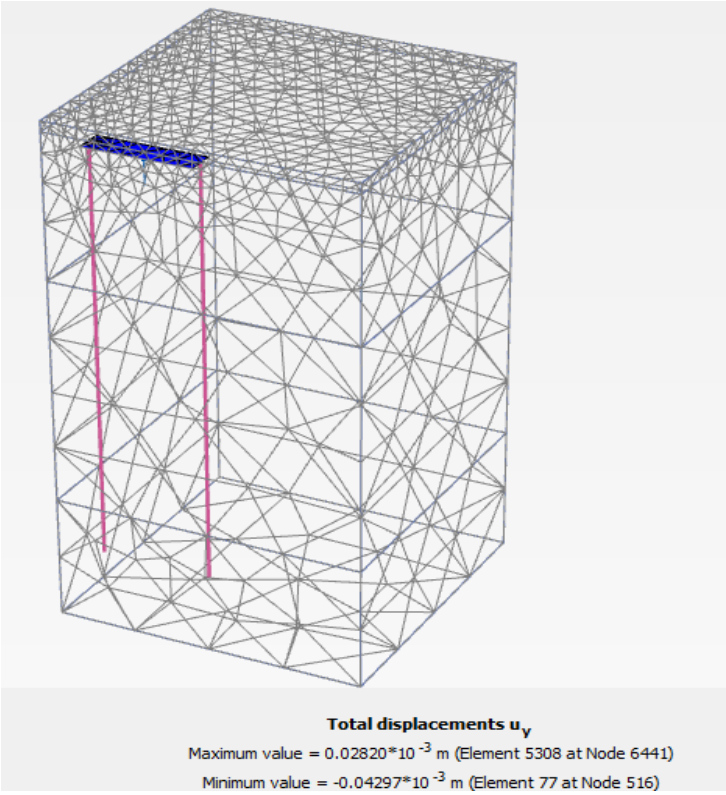

Fig – 3: Total displacement with out soil

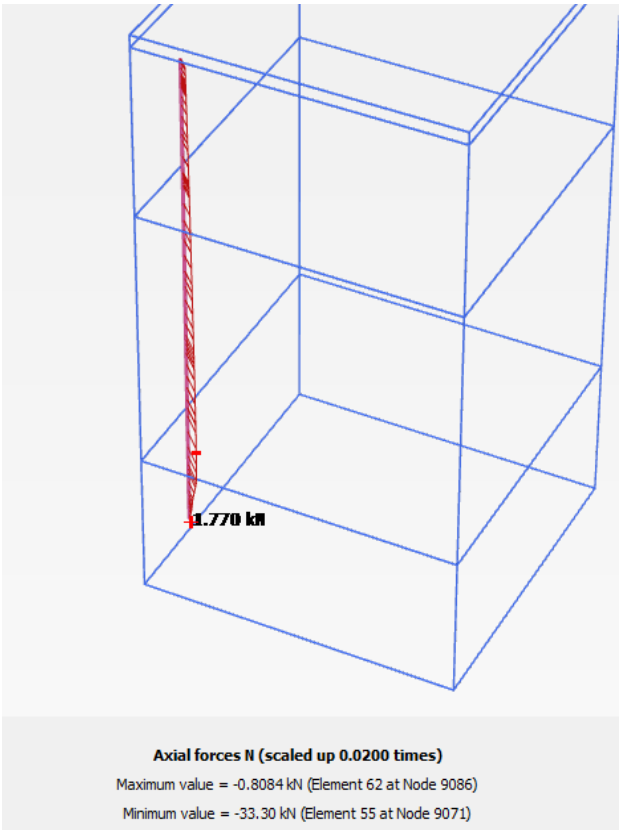

Fig – 5: Axial force

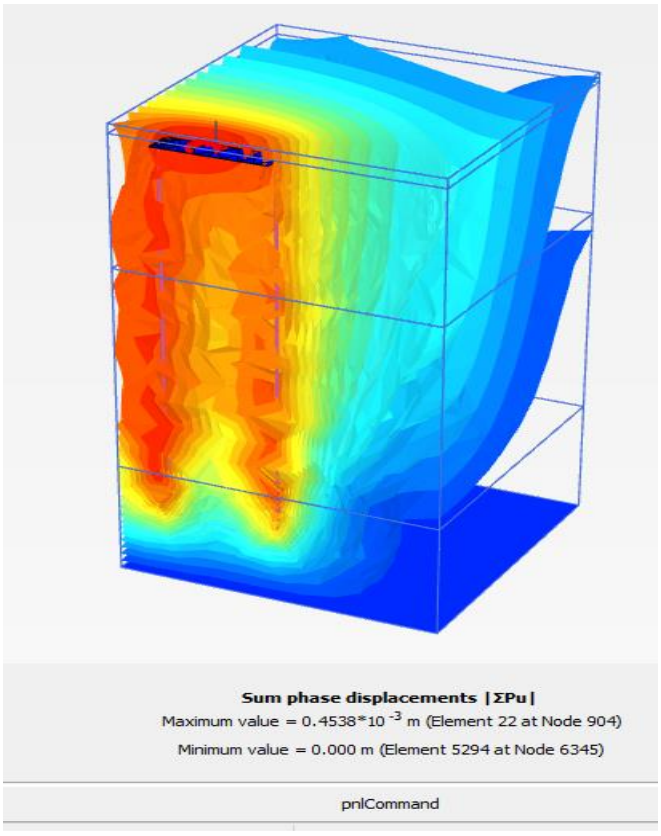

Fig – 4: Total displacement with soil

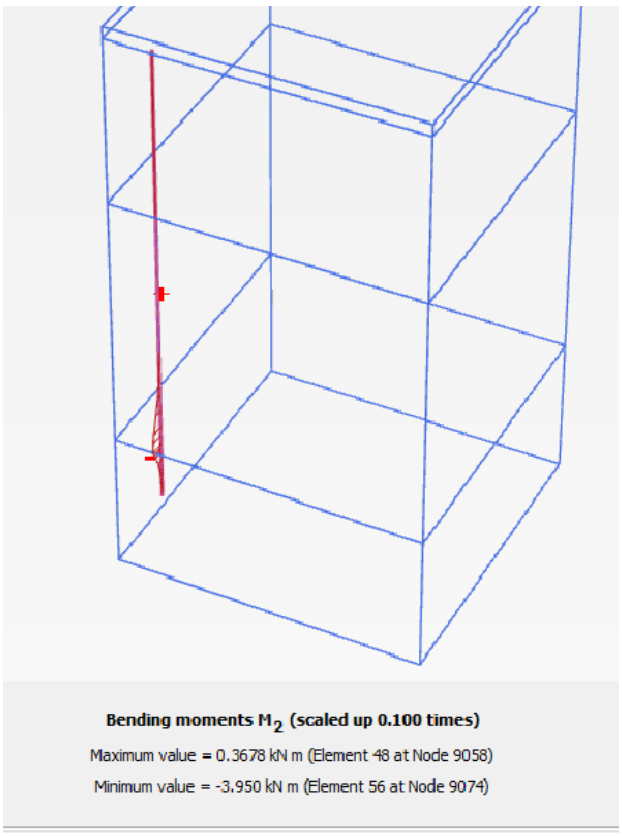

Fig – 6: Bending moment at bottom

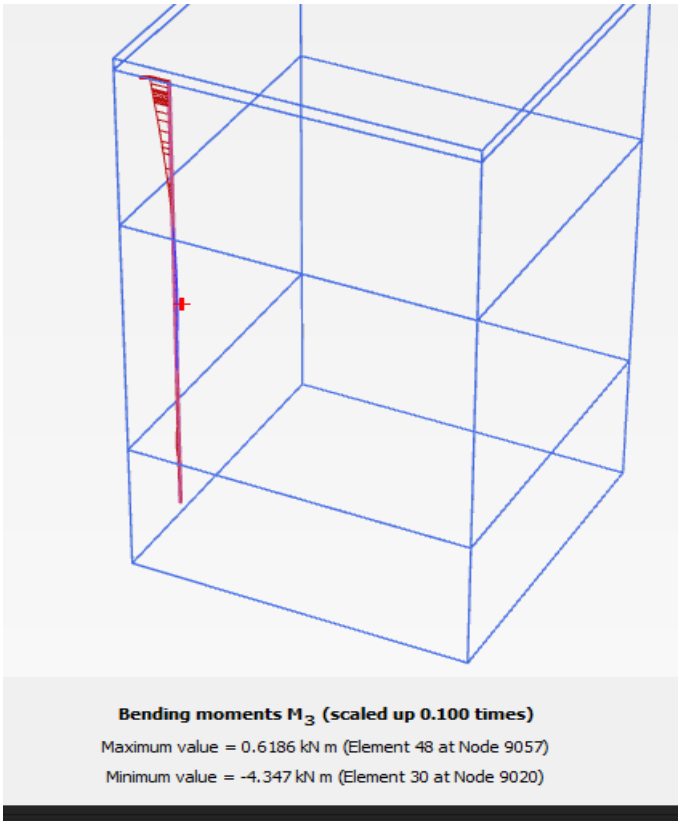

Fig – 7: Bending moment at top

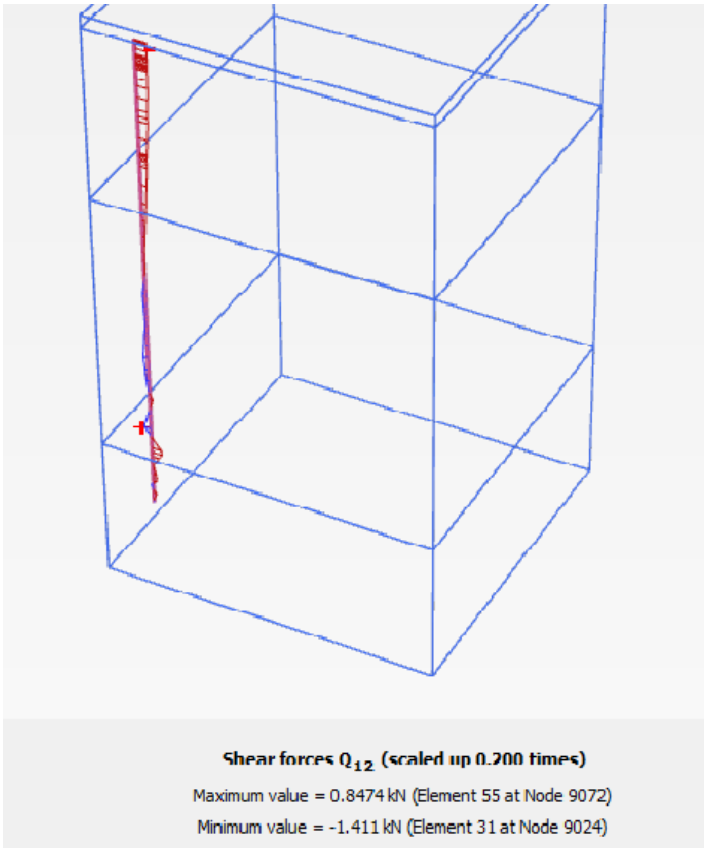

Fig – 8: Shear force

6. CONCLUSION

The structural behaviour of the end bearing pile has been analyzed and its shear strength and bending moment values have been found using PLAXIS software. The load acting on the soil has been distributed throughout the pile, and resulting settlement has been found. Thus, the software can be efficiently used to find the geotechnical problems prior to the beginning of the onsite construction. Proper soil improvement techniques can be adopted and implemented cost effectively. Further, more analysis should be performed on stabilizing the soil based on the demanded bearing capacity.

REFERENCES

[1] Kasinathan Muthukkumaran, Ranganathan Sundaravadivelu, Sailesh Rajinikanth Gandhi," Effect of Sloping Ground on Single Pile Load Deflection Behaviour Under Lateral Soil Movement" 13th World Conference on Earthquake Engineering, Vancouver, B.C., Canada, August 1-6, 2004, Paper No. 2147

[2] I. Bellezza and E. Pasqualini, "Parametric study of the stability of slopes reinforced with piles Etude paramétrique de la stabilité de pentes renforcées par pieux", © 2005–2006 Millpress Science Publishers/IOS Press.doi:10.3233/978-1-61499-656-9-1319

[3] Ahmed Bouajaj1, Lahcen Bahi1, Latifa Ouadif1, Houssine Ejjaouani2 and Mohamed Awa1," Study of the Displacement of a Soil Stabilized by Piles",Using Finite Elements Method" VOL. 11, NO. 3, FEBRUARY 2016 ISSN 1819-6608, ARPN Journal of Engineering and Applied Sciences.

[4] R.K. R OWE and H.G. POULOS,"A Method For Predicting The Effect Of Piles On Slope Behaviour,