

# STUDY OF TENSION PILE FOR INCLINED PILE –A REVIEW

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## Abstract

The present work was focused on understanding the uplift capacity of vertical pile. A large scale experimental program using vertical pile in loam soil subjected to pull out load has been carried out in model tank of size 600mm×600mm×750mm. mild steel piles of varying diameter and shape are used as model piles. A loam soil has specific gravity  $G=2.3$  , It is inferred that net ultimate pullout capacity increases significantly with increase in length to diameter ratio. Pullout capacity also increases with increase in diameter. It is also found that for piles of varying shape but of constant volume, circular pile will resist more uplift force compared to square piles. The experimental values of net ultimate pullout capacities have been compared with predictions made by available theories.

## Key Words

Pullout capacity, displacement, Model piles, loam soil, single pile, circular pile, square piles

## 1.1 loam soil

loam refers to a soil mixture that consists of organic matter, sand, and clay. There are various types and textures of loam soils that are common among gardeners, such as sandy, clay, and silt. The mineral content in loam soil is usually around 40 per cent sand, 40 per cent silt, and 20 per cent clay by weight. However, these ratios can vary slightly, leading to three different types of loam soil. Loam is the ideal soil type:

## 1.Introduction

When structures are constructed below the ground water table or if they are constructed under water uplift forces are to be applied on the basement of structures. Also in the case of transmission line towers, mooring systems for ocean surface or submerged platforms, tall chimneys etc are usually subjected to overturning moments due to wind, wave pressure or ship impact etc. These overturning moments are transferred to structures foundation in the form of compression on some elements and pullout on others. The type of foundation usually recommended is a combination of vertical piles. In this paper the behaviour of vertical piles under pull out loads has been investigated. To study the effect of pile length, diameter, shape and pile tip properties on uplift capacity of piles, laboratory experimental investigation is carried out.

typically it's a combination of sand, silt and clay. It is dark in color and soft, dry and crumbly to the touch. Loam is great for supporting foundations because of its evenly balanced properties, especially how it maintains water at a balanced rate. Loam is a good soil for supporting a foundation, as long as no miscellaneous soils find their way onto the surface.

## 2. Literature Review

**Tanvi Singh, V.K. Arora (2012)** 66 pile where conduct on batter pile group under lateral load with batter pile inclined at 20, 25, 30, 35 degree. Pile capacity increase 20-25 degree and decrease beyond the 25 degree

**Verma, A.K. Joshi, Ronak K.(2012)** G.I. Pipe resists higher amount of uplift load than concrete pile and PVC pipe pile. PVC piles having least resistance against uplift due to smoother surface characteristics Based on the experimental results, behaviour of uplift capacity for different materials, effect of base enlargement, effect of grouping of piles are discussed in this paper.

**Weeraya Chim-oye and Narin Marumdee (2013)** from this study, we find that the ultimate uplift capacity in dense sand depends upon the properties of soil in each layer.

**T. W. Adejumo (2015)** From the analyzed results of the laboratory and field investigations carried out to study the effects of shape and installation technology on the bearing capacity of pile foundations in layered soil. maximum load carrying capacity except for driving by vibration. The bearing capacity of tapered conical piles is 1.5 – 2 times higher than prismatic (square) piles and 2-3 times higher than cylindrical piles.

**Neenu Johnsona, M.N.Sandeep(2015)**.The main objective of the present study is to investigate the effect of relative density of fill material, granular pile diameter on the pull capacity of the granular pile anchor and the comparison of encased and non-encased granular pile has been done. It was also revealed that the pull-out capacity of the granular pile anchor increased with increasing diameter of the granular pile anchor

**Ali Aminfar1, Hamid Ahmadi2\* and Mohammad Hossein Aminfar2 (2016)** they investigated the effect of the inclination angle on the maximum von Mises stress, maximum von Mises elastic strain, maximum displacement vector sum, maximum displacement in the

**Khaled E. Gaaver (2013)**.Experimental model test have been conducted on single pile and pile group embedded in cohesionless soil. The test were conduct on sand prepared at three relative densities 75, 85 and 95% .and find out more densities has greater uplift capacities

**Parthipan N, Dr. M. Kumar (2015)**. The study revealed that the behavior of single pile under uplift loading depends on embedment depth and soil properties and relative density of soil. The group efficiency under uplift loading improved slightly with an increase in the relative density of soil.

horizontal direction, and maximum displacement in the vertical direction. Results indicate that the pile's operationally optimal degree of inclination is approximately 5°

**Bipin A. Pindoriya1, Dr. Kalpana Maheshwari 2,(2016)** In this chapter, Single pile and Groups of pile is carried out using pile model of circular PVC pipe pile, circular Galvanised iron hollow pipe pile, circular solid concrete pile (M25) and circular solid timber pile. Results of further study is compare with previous paper and also know about the behaviour of piles and group of piles. Know about which material of pile is more economical and preferable for single pile and group of piles.

**K. Kimi Bose1 and A. Krishnan2(2016)** in this chapter he found that for piles of varying shape but of constant volume, circular pile will resist more uplift force compared to square or rectangular piles. The experimental values of net ultimate pullout capacities

have been compared with predictions made by available theories.

### 3. Conclusion

- The net ultimate uplift capacity of pile increase significantly with increasing in L/D ratio
- Circular pile will resist more uplift force compared to square pile
- Uplift capacity has more in dense sand as compare to loose sand
- Uplift capacity also increase with increase in diameter
- The uplift capacity varies with inclination of pile

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### References

- S.K GARG , geotech engineering
- Dr. B.c punamia , geotech engineering
- Shooshpasha1 I., Kiakojoori2 M., and Mirzagoltabar World Academy of Science, Engineering and Technology International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering Vol:3, No:10, 2009
- Chattopadhyay, B.C. And Pise, P.J. (1986): "Uplift capacity of piles in sand", journal OF GTE Div., ASCE, Vol. 112, No. 9, pp. 888-903
- Chattopadhyay, B.C. and Pise, P.J.(1986):"Axial Uplift Capacity of Inclined Piles", IGJ Vol.16,No.3,pp.198- 213
- Pise, P.J.(2003):"Pile Foundation Under Pullout Loads- An Overview", IGS Annual Lecture 2003, IGJ-2004, Vol.34, No.1,pp.1-63
- Rao, K.S. and Kumar, J. (1994) : "Vertical Uplift capacity of horizontal anchors", Journal of Geotechnical Engineering Division, ASCE, Vol. 120, no. 7, pp. 1134-1147