A Study of Strategies for Countering Major Problems Related to Pile Foundations

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Abstract **- Building foundation, as an interface structural part between the building and the supporting ground, play out the significant capacity of transmitting the building loads including the wind and earthquake impacts to the supporting soil strata without its shear disappointment or over the top settlements. The determination of appropriate foundation frameworks for multi-storeyed buildings are represented by a few elements like; building loads, wind and earthquake impacts, ground profile and water table conditions, synthetically forceful ground conditions, admissible bearing pressure of soils at various profundities, arrangement of storm cellar storeyes, vicinity to bordering buildings and other task explicit necessities. Pile foundations are utilized widely for the help of buildings, spans, and different structures to securely move structural loads to the ground and to keep away from abundance settlement or parallel development. They are extremely viable in moving structural loads through feeble or compressible soil layers into the more skilled soils and shakes underneath. Generally, piles have been utilized widely for the help of structures in Boston, MA. A "driven pile foundation" is a particular sort of pile foundation where structural components are driven into the ground utilizing an enormous sledge. They are ordinarily constructed of timber, precast pre-stressed concrete (PPC), and steel (H-areas and pipes). This Research Study is an attempt to overview the problems that are related to Pile Foundations and the Strategies to overcome them.**

Index Terms **- Pile Foundation, Constructions, Buildings, Soil and Rocks, Earthquakes etc.**

I.INTRODUCTION

Piles are columnar components in foundations that have the capacity of moving loads from structures through weak, compressible (soft) strata onto equipped strata or rock. Ground improvement is the upgrade of the properties of weak compressible strata so as to render them skilled to convey loads from structures. Penetrative ground improvement techniques include the improvement of vertical annuli of weak compressible soils by their penetration, compaction and expansion of material to expand their thickness locally. The piles essentially move the loads of the structure to the ground when they function as structure foundation components.

Likewise, one next to the other piles are additionally reinforced with stays when important and utilized as a holding structure. Moreover, malleable powers or parallel loads may likewise be conveyed by piles. They may likewise assume a functioning job in packing the ground. Piling has been utilized in foundation engineering in any event since Roman occasions and stays an essential technique for foundation engineering in soft ground. Penetrative ground improvement is a later advancement of the twentieth century and has gotten generally received for the help of gently loaded structures. The two strategies are usually utilized in the urban condition, especially where past advancement has brought about a thickness of falsely filled or "made" ground of poor or variable load bearing capacity.

The Piles Foundations are basically used when:

- To Prevent Uplift Forces
- To Reduce Excessive Settlement
- Inadequate Bearing Capacity of Shallow Foundations

II. TYPES OF PILES

There are multiple pile types. The classification is done on the basis of the construction scope and the type of the soil.

Concrete piles

The concrete piles that are precast could either be the prestressed or the reinforced concrete piles.
It is seen that the concrete piles can be adapted for a range of piles and it's types. The above can be used as in form of precast in the driven piles or as the units of insertion in the bore piles. The concrete piles that are dense and well compacted with a good quality is seen capable of withstanding the hand driving and also has resistance to attack using substances that are found to be aggressive in ground, underwater or soil.
But the concrete piles are expected to damage in the condition that is hand driven. Also the honeycombed and the weak in cast and the in situ piles are liable to the disintegration when the substance that is aggressive could be traced in the ground water and the soil.

Cast in place concrete piles
The tubular section of the close hollow concrete's or the steel that has earlier been driven into the soil and then filled in the concrete of the in situ. The cast in place piles along with their mandrel shell driven are basically 50 - 80 ft long and can be used for the variety of loads. The range of loads that these kinds of piles can effectively carry nearabout 50-120 Kip's considering the fact that the maximum strength in the concrete does not exceed 33% from the total strength on 28 days.

Precast concrete piles
The concrete piles that are precast have been manufactured amidst the range of 250mm to 450mm. Also, the length of the section can go to a maximum of 20m. Plethora of shapes is available for the pile sections (eg. As the H shape, the triangular shape, or the hexagonal in shape, etc).
The construction of the pre-cast piles of the concrete can be attained either by the in-situ or the factory. Both the production and the construction process majorly affect the pile quality.

Drilled shafts
The Drilled shafts also have the name as “caissons” or “piers” or “bored piles”. This can be regarded as the cost-effective solution that is induced worldwide. It is one of the most widely used deep foundation type. Drilled Shafts are mainly utilized in the bridge construction along with the large buildings. The above technique is in use in the areas of construction where the large loads and the lateral resistance are one of the key factors.

Steel piles
The above are expensive as compared to the timber or the concrete. But the said flaw is surpassed by the handling ease of the steel pipes, the capability to cope the hand driving, bending strength and the resilience, and also their ability to carry heavy load. These pipes can be carried in extremely large loads and has little displacement of the ground. These are liable to the corrosion above the line of the soil and also in the disturbed ground. Also, they need to have tong line cathodic protection as desirable in the structure of the marines. However, the steel piles that have a slender section might suffer damage due to buckling if by chance they deviate while driving from the required alignment.

H-piles
H-Piles are the form of the steel piles. These are sections wide flanged and also made from the steel. The prime advantage being its shift of soil is considerably less as compared to the several other methods practiced worldwide. These fall under the category of the small displacement. The major disadvantages include exposure to corrosion, and so these are not advised as the friction piles in soils granular tend to force the pile to bend on the axis that is weak during the process of the pile driving. This leads to increased chances of curvature that might lead to a deeper depth while driving piles.

Cylindrical
Cylindrical piles are seen to have high axial compressive strength that has bearing capacity extremely highs greater moment of inertia and so are capable of serving both as a foundation pile and also the column understand both lateral and vertical loads.

Timber piles
The timber piles that remain untreated might be used as fenders, temporary construction, or revetments, and several other similar works. They are also used for permanent construction when the pile evaluation cutoff is less than the water table that is permanent and at places where piles are not evident to the marine borers. These are sometimes used for the construction

of the trestle yet the ones preferred are the treated piles.

Composite piles

You can use the materials in several combinations in the piles and the one that is the most common is using both steel and concrete. This can be done by using the various driven steel casings that is filled with concrete structural core or an externally protected steel pile where the latter is only feasible for the piles exposed lengths as encountered in any jetty structure.

Use of piles in construction.

There exist two pile types used basically for construction:

- Non-Displacement Piles
- Displacement Piles

Displacement pile

The displacement pile is rammed to ground, stays in soil, displaces both downwards and sideways. Here, the soil gets displaced while installation is being done as such driving, vibration, jacking etc. Few examples include timber, prestressed concrete, precast concrete, close ended steel pipe, and tapered and fluted steel tube piles.

Non-displacement pile

The non-displacement piles will not replace the soil at the time of the installation. First the soil is removed by boring process and then prefabricating and piling the cast in place in the hole, an equal soil volume is removed. Placing of the soil has little or no effect in the stress of the lateral ground and so this kind would produce lesser shaft friction as compared to the displacement piles having the same size. Method used to pile includes grabbing, augering, etc. The common non displacement piles are either cast in place or boring.

III. PROBLEMS AND SOLUTION MEASURES RELATED TO PILE FOUNDATIONS

There are a few issues that might be experienced during pile foundation development. These problems will cause deficiency in the capacity of the pile except if they handled appropriately.

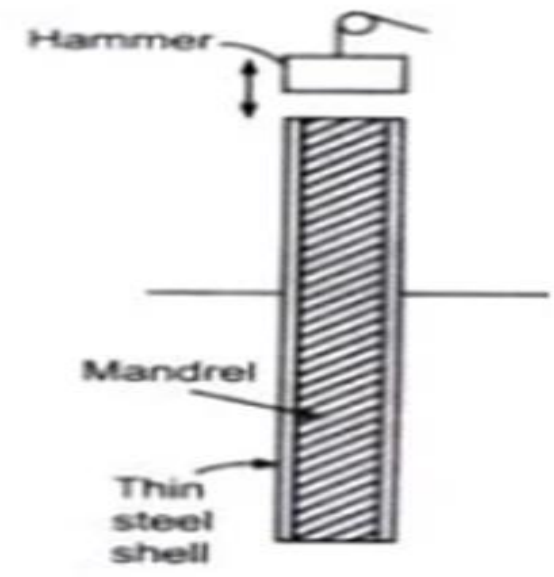
Issues and Strategical Solutions related to Concrete Faults

Pile construction problems due to concrete faults involve:

- Voids in Concrete Pile: Voids might be shaped because of inappropriate compaction of concrete in piles with no packaging or with housings that is not pulled up after development is finished. For this situation, the construction will be observed appropriately to guarantee adequate compaction of concrete utilizing reasonable systems. Besides, in the event that casings are pulled back, at that point the withdrawal of packaging may prompt make voids in concrete. Voids can be avoided for this situation by cleaning casings and assurance that adequate concrete volume is poured.
- Insufficient Concrete Strength: Lacking strength is because of poor blend structure or cementing activity. Normally, cylinder or cubic concrete examples are taken from each blend and tested to discover concrete strength. This issue is illuminated through legitimate blend structure in with proper functionality and practice great quality control during cementing.

Issues and Strategical Solutions related to Formation Problems

- Pile Sides Collapse: In the event that casing is not given, pile sides would fall in soft and loose soil. This problem can be detected and solved supervisor. The solution is to install casing.
- Deterioration of Permanent Steel Casing or Concrete: Concrete or permanent steel casing might be harmed because of driving piles powerfully over check or driven mandrel is out of plumb. Another problem that concrete or permanent steel casing may experience the ill effects of is their underlying abandonment. This problem can be anticipated by administering casing establishment and assess the work before concrete situation. At long last, if this problem happens, the pile ought to be pulled back and reinstall it appropriately.



Driven of Shell and Mandrel

Uplift of Adjacent Pile and Lateral Movement While Pile Casings are driven: It is brought about by relocation and hurl around pile establishment area. Such developments can be seen through checking plan position and level of neighboring piles. Designer will choose the method used to illuminate parallel development and uplift of adjacent piles.

Excessive Water in Pile: Groundwater flow into the construction site is the reason for over-the-top water in pile. Usage of steel casing or bentonite would wipe out this problem.

Adjacent Ground or Adjacent Structures Settlement: Adjacent settlement is brought about by vibrations in sandy soil during driving piles. Sinking holes of drilled piles in soft dirt of water bearing sand is another reason for adjacent settlement of buildings. Such problem can be seen by checking level of buildings or ground previously and during pile construction. Ultimately adjacent ground or structural settlement might be declined or limited by keeping head of water in the casing during boring piles. Added to that, site architect may choose reasonable solution for the problem.

Issues and Strategical Solutions related to Working Load Faults

Piles may endure harms because of testing loads or permanent working loads. In the accompanying areas, working load flaws will be classified dependent on the sort of construction techniques utilized.

- Working load faults in bored piles
- Working load faults in mechanically augured piles
- Driven pile working load faults

Working Load Faults in Bored Piles: Variables that lead to bored pile harms under working load incorporate weakening of ground around the pile because of wrong pile boring system, lacking concrete spread because of steel confine relocation, poor execution of concrete arrangement, and deficient depth as for the soil or rock properties experienced. To guarantee that adequate depth is given, it is required to check the consistency of spoil. Furthermore, it is required to rehearse incredible cautions during boring and concrete arrangement to forestall undesired results of these tasks.

Working Load Faults in Mechanically Augured Piles: Elements that may prompt mechanically augured pile disappointment under working load incorporate:

- In satisfactory profundity as to experienced soil properties. it is prescribed to screen ruin during boring
- Ground around shaft or underneath base weakened because of ill-advised boring method
- In sufficient depth with respect to experienced soil properties. it is prescribed to screen ruin during boring
- Insufficient concrete spread
- Using ill-advised procedure for concrete placement

Driven Pile Working Load Faults: There are number of elements that make the driven pile to endure decay and damages under working loads. For instance, inappropriate concrete situation technique that utilized for concrete in the center of driven shaft, lifting of pile because of ground hurl, deficient concrete in bulb for bulb ended; bored; and driven pile, wrong space utilized, and inadequate driven resistance. These adverse components might be disposed of by checking volume of concrete put, hammer drop and blows per miter, assigned spacer type, and clear strategy for construction.

Issues and Strategical Solutions related to Reinforcement Installation

Steel bars are probably going to move horizontally or being hauled down during compaction. There are number of reasons that prompted reinforcement disposition for instance ill-advised position of spacers, reckless strategies, and imperfect anchorage of steels in some pile types. It is required to check steel confine during fabrication as per particulars and screen installation procedure to anticipate such issue. Finally, pile steel confines will be bolstered solidly at the base and spacers should be provided as per appropriate codes.

IV. CONCLUSION

Texts managing geotechnical and ground engineering methods order piles in various manners. Pile foundations are the piece of a structure used to convey and move the load of the structure to the bearing ground situated at some depth subterranean surface. Pile foundations have been utilized as load conveying and load transferring systems for a long time. All the more as of late, the developing requirement for housing and construction has forced authorities and advancement organizations to abuse lands with poor soil attributes. This has prompted the advancement and improved piles and pile driving systems. Today there are many propelled procedures of pile installation. The mechanical transformation achieved significant changes to pile driving framework through the innovation of steam and diesel driven machines. This article mention some problems that are related to application of Piles Foundations that are usually faced and we have stated some of the Strategic solutions that can help overcome these problems and issues to a great extent. It is believed that in near future there will be remarkably lessened problems faced and the concept research will also be able to be taken to a next level.

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