



A Review On Comparison Of Pile, Raft And Piled Raft Foundation

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Abstract : As the world's population grows, the available land for construction becomes scarier and scarier, and the cost of land rises accordingly. As a result, the popularity of tall forms is growing by the day in order to withstand the load of these structures. A proper stiff foundation should be used in conjunction with a pile or raft foundation, which includes a static assessment of the pile foundation or raft foundation. In this paper, an attempt was made to test the unique varieties of soils in conjunction with clays with unique consistency, sand with unique density, and sand with unique internal friction with layers of sand and clay. It also includes unique pile cap parameters such as form (triangular, square, and rectangular), length, pile spacing in agencies, and pile pattern. With the concept of Buoyancy Raft, the use of raft basis has a bent to lessen the opportunities of distinction soil as well as allow elevated the stress at the base degree to be communicated. The effect of soil, which enables the form, is typically ignored in conventional analysis and format of raft basis through.

IndexTerms - Pile foundation, raft foundation, Static Analysis, Soil Displacement, Flexible Method

I. INTRODUCTION

A combined piled foundation is a novice medium-rise foundation houses in situations in which the functionality a raft by itself does not suffice meet the format requirements. The performed the load has been transferred through the use the existence of a load-sharing mechanism between the which is a pile and a raft frequently generated by the interaction of the pile, soil, and raft. In contrast to the traditional foundation made of piles format, wherein the piles are designed to bear the piled foundation bears the majority of the load, format makes use of the load-bearing functionality of each raft and pilings. Many piled raft foundations include piles to act as settlement reducers. In this case, the raft could also be designed to face the maximum amount because the vital hundreds, and the piles could also be designed for the greater hundreds, resulting in settlement that is excessive. Raft foundations are used commonly used when the soil at a shallow depth, stratum is prone and excessive pressure is utilised with the resource of superstructures to soil. Because of its large size, the raft can withstand excessive strain on the superstructure. The settlement of rafts is frequently added to the inner permissible boundaries if supported by the resource of the usage of piles of different configurations. The primary benefits utilising a piled foundation are a uniform and differential settlements are reduced, an increase foundation normal stability, a decrease in pile type as in comparison to traditional and a pile foundation, a decrease in bending pressure in relation to the raft Furthermore, it is appropriate for stiff clays in addition mild clays. Every previous model study had been conducted on Soil can be sandy or clayey. There are only a few results from layered soils modelling studies. Because the real Soils that can be used as a foundation medium are layered, an effort is made in this paper to examine foundation behaviour during a multi-layered profile.

II. LITERATURE REVIEW ON COMBINED PILE RAFT FOUNDATION (CPRF)

J.E Bowles [1] A modern concept based entirely on the transferring fee of heaps and thus the agreement fee in terms of surrounding soils has been used proposed as well as observation of terrible pores and pores and skin friction. Negative pores and When the settlement occurs, skin friction occurs fee of the soils in the vicinity exceeds that of the heaps Some comparative equations were discovered to specify the dreadful friction region a collection of piles Negative pores and The amount of skin friction varies with the passage of time problem and thus the degree to which the soil mass has been consolidated and may be insignificant once the soil mass has been consolidated.

P.C. Varghese [2] supported a case study of the Raja Lawn Flyover in Delhi by developing a pile cap layout the pile cap design was completed using the bending principle and a truss analogy technique. Various load combinations, such as seismic, longitudinal, and transverse masses, are taken into account. Each technique comes with its own set of reinforcement data. The load mixes considered for pile cap arrangement were the entire vertical load, overall longitudinal second, and overall transverse second. The load on the pile cap was calculated using data from the most common case, seismic longitudinal case, and seismic transverse case. Throughout this study, the assessment was carried out utilising the bending principle and thus the refore the truss analogy methodology for the various pile caps beneath the flyover, and the maximum place of metals was computed utilising both methods.

S. C. Gupta [3] During this study, work on the evaluation technique for determining the bending second of piles and the ramifications of it is validated by finite detail assessment on computers. The majority of the heap evaluation strategies found in well-known books and Indian codes are for single piles. Standards or rules no longer define the behaviour of piles subjected to mixed axial and lateral loads. The majority of layout engineers designed piles to support the duration of fixity tables as specified Part 1 of IS 2911. Furthermore, The work contains the disadvantages for quick computation at the pile in accordance with the Other than the I.S. code, formulations which the code has been derived advised the approach. To demonstrate the issue, a pile institution model was created using finite detail and STAAD Pro software. The standard code-recommended approach for estimating the length of fixity became the first focus of this investigation. The author suggested a method for performing a second computation on a single pile, as well as possible assessments for the evaluation were also provided. The heaps produced by the recommended not only were there methods less expensive, However, it is also safer. To demonstrate this assertion, a case study of a true bridge plan was investigated, which had previously supported the results of a fixity calculation in accordance with IS: 2911 and had been cross-checked using the recommended method. According to the findings of this study, the recommended strategy not only saves the planning quite 30 percent in terms of flexural reinforcement, but it also shortens the pile's overall lifespan.

Tridibesh Indu [4] Had completed the evaluation work for various types of pile tops with various types of heaps beneath them. In appreciation of the usability and scope of truss technology, this principle was applied to various types of caps, and an example for a four pile square cap beneath a biaxially eccentric column load was created. During this work, the approach for evaluating 3 pile organisation, hexagonal pile organisation, and square pile organisation is discussed. Because there are few documents based on the use of the truss approach in order to design pile caps, this text was compiled and provided. The study concludes that, while the approach offers conceptually appealing solutions for triangular, hexagonal, and square pile organisation, the beam technique should still be used as a safe and traditional procedure.

Imam, Md. Hasan. [5] In this study, deviation was investigated for several parameters on a specific portion of the Raft foundation. The chosen element is centred on the raft, in the raft's niche, and halfway up the interior panel. The alternates subgrade are subgrade in parameter - response, column distance column length over placing element, and L/ B rate of the panel The investigation was carried out utilising the Finite Element Method (FEM). He discovered that raft smash consistency decreased deviation at the mat centre and mat niche. The opposite trend has been observed when adding raft consistency at the mid-element of the raft interior panel. When column distance smash on raft, the deviation of the raft smash on the ra toes middle part is also visible, while the rear fashion is visible at the innards panel. A crimp sample of deviation is displayed when the column length on the raft smash is increased. When the raft's overhanging element smashes, the middle and outside panels slightly smash, and the mat nook sprucely deflects lower. When they use any other parameter in the subgrade response, the deviation is lower with smash in the subgrade response. As a result, he discovered that various parameters influence raft dereliction. The mat consistence variant denotes a graph in an exceptional region. That deviation is lower at the mat's middle and mat's corner with raft consistency. When the column distance smashes on the raft, the deviation of the raft smash on the raft middle element is still visible at the outdoors panel. Based on those performances, it's been discovered that formerly deviation within the mat isn't always significantly stimulated by overhanging element, but it's country miles sprucely affected at mat corners.

D. Thangaraj. Dr K. Ilamparuthi[6] The essential parameters of raft basis, such as raft stiffness and Superstructure stiffness, have been taken into account in this observation. During the analysis and design of the raft basis, the the raft's stiffness and the stiffness of the superstructure were omitted. This critical parameter has been discussed briefly in this paper. The investigation was completed using the The Finite Element Method is a technique for calculating the number of elements in the rigidity. Krs represents the raft, and the stiffness of the raft is denoted by superstructure is denoted by Krb. They discovered that the superstructure's stiffness value (Ksb) boom, column rotation, in particular nook has a column the greatest reduction. They are also discovered that the Ksb's influence at the touch stress is nil. The second in stop span is boom, with a rise in Ksb and Krb prices, as well as a rise in the second under column and the second inside the indoors panel. They determined that agreement is best for the soil that is non-linear scenario regardless of The krs and ksb values As ksb rises, the excellence within the agreement decreases on the centre as well as therefore the refore the nook of the raft, as well as the distinction becomes For higher values of ksb (100) and krs, the effect is almost negligible (0.01). They discovered that lower within the distinction agreement is in the range of 63 to 80 percent for ksb values between 15 and 100. The width of the raft has no bearing on the overall agreement. However, within the differential agreement, the thickness of the raft has a few effects. They discovered that at the time within the first set of columns ground degree decreased ksb increases for krs values of 0.001 and 0.01.

Nirmal John Joy, Hashifa Hassan et. al. [7] stated which combined pile raft foundations offer a low-cost basis alternative for situations where the raft foundation can be installed meet the situation ability but fails to keep the distinction as well as most agreement beneath the most that can be tolerated. It was discovered that increasing capabilities for example, raft thickness, pile period, and so on has reduced raft agreement, whereas reducing pile spacing/depth' has increased raft agreement. Throughout this piece of paper, permuted pile association was used rather than consistent preparations; such a progressed overall performance of the CPRF machine could also be envisioned. CPRF is investigated in this paper PLAXIS Finite Element Software is used three-D with permutations pile association. Three exceptional Dimensions of the piles and their Combinations were modelled and evaluated. STAAD was used to analyse a ten-story building supported by Medium Dense Sand. After resolving the dimensions of the raft and agreeing on the evaluation of the raft, the PLAXIS three-D painting the programme was created. rafts with various pile combinations have been modelled and analysed. Based on the evaluation of outcomes, It has happened determined It has occurred. excessive ability piles in locations with the greatest load attention as well as reinforcing the relief of the raft using medium ability the most are in piles significant impact on a large scale lowering most agreement and thus the distinction agreement. For the duration of this investigation, a couple of popular developments with inside the behaviour of piled rafts were studied. Thus, based on our research on the agreement traits of blended pile raft basis supported sand with various pile preparations the usage of Plaxis-three-D, the following factors can also be concluded: based on the outcomes obtained, it's miles recommended to supply piles with greater diameter when compared to equal diameter regardless irrespective of soil type; viable diameters, it's miles fine to supply large piles with different diameters with inside the indoors location to lessen the primary agreement. The pile configurations in the most are on the raft significant impact on a large scale lowering most agreement and thus the distinction agreement, primarily by grouping the piles with inside the raft's centre. As a result of cautiously combining those elements, the most economic system could also be achieved; store for the choice got to be executed in such a way that the most economic system could also be attained That is correct. entirely dependent on the materials and labour availability costs, time, the settlement amount discount required, and so on. Those instances are subject to the style dressmaker's engineering judgement, which includes understanding of geotechnical and structural issues elements of the Foundation based on Combined Pile. As a result, We can assert that the the Combined Pile foundation is more durable potential for all studies and programmes with within the sector. This paper will discuss provide designers and practitioners with an idea about the advantages of using exclusive aggregate a number of piles rafts.

Dinachandra Thoidingjam, Dr. D S V Prasad , Dr. K. Rambha Devi et. al. [8] said that natural clay is frequently encountered within the substrata of the soil in the valley location of IMPHAL in Manipur, causing problems in the construction process These are the soils. distinguished by their low girth potential as well as high compressibility A raft-pile foundation could also be used to mitigate settlements caused by concentrated construction loads. This investigation is specifically designed to look into the effect of pile The effect of raft spacing and raft width on pile raft behaviour basis in natural clay. The tests are performed rafting with dimensions size 100x100mm and size 200x200mm and a thickness of 2mm. The heaps are numerous at 1, 4, and 9, and based on the outcomes, the last bearing potential of Piles may be extended and thus the agreement of Pile is decreased as the Pile's diameter expands It has been discovered the fact that agreement with inside the pile institution status on my own are quick in settling with inside the starting with and decreasing after a couple of however, loading only in the rafting case on my own sluggish agreement is decided. For a couple of tender clay, It has happened. determined that the piled raft basis The concept has numerous advantages over plain basis. Because the diameter of the Pile increases, the last bearing potential of the Pile may be extended, and thus the agreement of the Pile decreases. It has been discovered that the agreement with inside the pile institution status on my own are quick in settling with inside the beginning and decreasing after a couple of however, loading only in the rafting case on my own sluggish agreement is decided. On the preliminary level of loading, the piles take a significant portion of the overall load; however, following yielding, a significant a part of the overall The load is moved by way of the raft. The raft agreement is dependent based on raft thickness; as the raft thickness increases, the agreement discount may be noticed. A piled raft's agreement discount ratio (immediate) decreases as pile to raft ratio increases location pile ratio and pile slenderness ratio. This evaluation is frequently beneficial in the pile structure design rafts in tender consolidating, natural, Soil that is clayey The agreement decreases as s/d is the slenderness ratio decreases. An rise in pile quantity during a piled raft basis causes an increase last bearing potential as well as a drop in agreement.

Jaymin D Patil, Sandeep A Vasanwala, Chandresh H Solanki et. al. [9] said that natural clay is frequently encountered within the substrata of the soil in the valley location of IMPHAL in Manipur, causing problems Throughout the building process These are the soils. distinguished by their low bearing potential as well as high compressibility A raft-pile foundation could also be used to decrease settlements induced by concentrated construction loads. This investigation is specifically designed to look into the effect of pile The effect of raft spacing and raft width on pile raft behaviour basis in natural clay. The tests are performed on rafts with dimensions size 100x100mm and size 200x200mm and a thickness of 2mm. The heaps are numerous at 1, 4, and 9, and based on the outcomes, the last bearing potential of Piles may be extended and thus the agreement of Pile is decreased as the diameter of the Pile grows It has been discovered that the agreement with inside the pile institution status on my own are quick in settling with inside the starting and reducing after a couple of nonetheless, loading only in the rafting case on my own sluggish agreement is decided. For a couple of tender clay, it has been determined that the piled raft basis concept has significant advantages over plain basis. Because the diameter of the Pile increases, the last bearing potential of the Pile may be extended, and thus the agreement of the Pile decreases. It has been discovered that the agreement with inside the pile institution status on my own are quick in settling with inside the beginning and reduced after a couple of loading, but only in the case of raft on my own sluggish agreement is decided. On the preliminary level of loading, the piles take a significant portion of the overall load; however, following yielding, a significant portion of the overall The load has been transferred by way of the raft. The raft agreement is dependent on raft thickness; as the raft thickness increases, the agreement discount may be noticed. A piled raft's agreement discount ratio (immediate) drops as the pile to raft location ratio and pile slenderness ratio grow. This evaluation is frequently useful in the piling structure design rafts in tender consolidating, natural, clayey soil. The agreement decreases as s/d is the slenderness ratio. decreases. An rise in pile quantity during a piled raft basis causes an increase in last bearing potential and a decrease in agreement.

S.J. Shukla, Dr.A.K.Desai, Dr. C.H.Solanki et. al.[10] The usage of stacked raft foundations has increased grown in popularity in recent times, because the merged movement The raft and piles' bearing capacity can be increased, decrease agreement, and therefore the piles are capable also be organised in an attempt in order to decrease differential deflection with within the raft A piled raft foundation is a type of foundation novel idea in which the entire The strain from the superstructure is only partially absorbed shared with the aid of the raft via soil make contact with and thus the ultimate The load is divided with the aid of piles via pores and skin friction. A piled raft basis is less expensive than a pile basis. Because piles no longer need to permeate the entire the depth of the coating of clay, they will be discontinued at higher altitudes. This type of piled raft basis requires more agreement than a pile basis and far less agreement than a raft basis. Throughout the author of this work investigated various parameters such as raft length, raft thickness, pile diameter, pile period, pile configuration, pile stiffness, raft and pile stiffness, and so on, all of which have an effect on the behaviour of stacked raft foundations. Its interdependence is also examined. This examination is beneficial in determining the many characteristics that are essential within the layout rafts stacked up basis. According to a review of the literature, piled rafts settlements must be reduced, differential settlements, and thus bending second proportionally in tall buildings when compared to shallow (raft) foundations. to reduce the differential agreement, and second, the piles must be strategically placed utilising a couple of trial and error or the use of parametric testing. Furthermore, the soil shape interplay of piled raft basis plays an important Tall people's behaviour is influenced by buildings based on a heaped raft foundation. The difficulty could also be investigated using the limited detail approach, in which suitable shell factors could be used to model the raft. Beam factors could also be used to create pile models. The soil across the stacked raft device can also be easily spring-like model factors.

III. CONCLUSION

According to the academic papers on piled raft base listed below, extensive research has been conducted on the geste of piled raft base, either experimentally or conceptually. Significant progress has been made in understanding the unique properties of piled raft foundations. These models' maturity is based on time-consuming logical and numerical methodologies. The plate-on-spring method, 2D finite detail analysis, and cold-blooded approach are all ineffective for analysing torsion geste and fabric change in the 1/3 axis. As a result, the 3-D finite detail fashion is the best at deceiving the complex geste of piled raft bases. According to a literature review, finite exploration has been concentrated to suit simple assessment patterns and layout procedures. A number of 3-D numerical models have been built, but no attempt has been made to conform logical approaches solely based on numerical methods. Analytical strategies have been reported to be the most useful for gaining access to the piled raft base agreement, but predicting discriminational agreement and ultimate bearing capability has yet to be completed. As a result, additional research is required to deviate from simple assessment and layout methodologies. Cargo sharing between piles and raft must be predicted during the initial configuration stage of the piled raft contrivance. Many people working in this field have recognised the need for simple assessment and planning models for piled raft foundations. Piles of varying compasses and sizes are particularly effective in reducing overall and agreement.

REFERENCES

- [1] COMPARATIVE STUDY OF PILED RAFT FOUNDATION by Nitin Nandwani, Prof P.J.Salunke, Prof N.G.Gore(Department of civil engineering, MGM's College of Engineering & Technology, India), November, 2015.
- [2] 1G MODEL STUDY ON THE BEHAVIOUR OF PILED RAFT FOUNDATION by Aleena Tom(M. Tech. Student Department of Civil Engineering, Saintgits College of Engineering, Kottayam, Kerala, India), Sindhu A R(Assistant Professor Department of Civil Engineering Saintgits College of Engineering, Kottayam, Kerala, India), 02 | August 2016.
- [3] A STUDY ON PILED RAFT FOUNDATION: STATE OF ART by Jaymin. D. Patil (Research Scholar, Applied Mechanics Department, SVNIT, Surat-395007), Prof. S. A.Vasanvala(Professor of Applied Mechanics Department, SVNIT, Surat-395007), Prof. C. H. Solanki(Professor of Applied Mechanics Department, SVNIT, Surat-395007, 8, August – 2013.
- [4] A DYNAMIC BEHAVIORAL STUDY OF STRUCTURE WITH PILED RAFT FOUNDATION BY TIME HISTORIES FINITE ELEMENT MODEL by Shukla S.J., Desai A.K., Solanki C.H.(Professor, Applied Mechanics Department, Sardar Vallabh Bhai National Institute of Technology, Surat, Gujarat, (India)), 3, March 2014.
- [5] A DYNAMIC BEHAVIOURAL STUDY OF 25 STOREY BUILDING WITH PILED RAFT FOUNDATION WITH VARIABLE SUBSOILS by Shukla S J, Desai A K, and Solanki C H, 1, February 2013.
- [6] BEHAVIOUR OF COMBINED PILE-RAFT FOUNDATION (CPRF) UNDER STATIC AND PSEUDO-STATIC CONDITIONS USING PLAXIS3D by A. Kumar, D. Choudhury, R. Katzenbach, 1-4 November 2015.
- [7] STUDY ON SETTLEMENT CHARACTERISTICS OF COMBINED PILE RAFT FOUNDATION FOUNDED ON SAND WITH VARIOUS ARRANGEMENTS OF PILES USING PLAXIS-3D by Nirmal John Joy(PG Student, Saintgits College of Engineering, Kottayam, Kerala, India), Hashifa Hassan(Guide, Assistant Professor, Department of Civil Engineering, Saintgits College of Engineering, Kottayam, Kerala, India), 10, October 2014.
- [8] EFFECT OF NUMBER OF PILE IN PILE-RAFT SYSTEM IN ORGANIC CLAY by Dinachandra Thoidingjam(PG Student, Department of Civil Engineering, BVC Engineering College, Odalarevu, Andhra Pradesh, India), Dr.D S V Prasad(Professor &Principal, Dept. of Civil Engg., BVC Engineering College, Odalarevu, Andhra Pradesh, India), Dr. K.Rambha Devi(Professor, Dept. of Civil Engineering, Manipur Institute of Technology Takyelpat, Imphal, India), Jul. - Aug. 2016.
- [9] An experimental investigation on behavior of piled raft foundation by Jaymin D Patil, Sandeep A Vasanwala, Chandresh H Solanki (Applied Mechanics Department, S.V National Institute of Technology, Surat-395007, India), November 2014.
- [10] BEHAVIOURAL STUDY OF PILED RAFT FOUNDATION IN LAYERED SOIL DEPOSITS by S.J. Shukla(Assistant Proffesor, Applied Mechanics Department, SVNIT, Surat, Gujarat, India), Dr.A.K.Desai, Dr.