Study on Different Types and Shapes of Footing and Effect of Load on Soil-A Review

MD Sarafraz Akhter[1] Prof.Rachana M Bajaj[2] Prof.Kapil Soni[3]
[1]M.Tech Scholar [2]Associate Professor [3]Professor & HOD
[1,2,3]Department of Civil Engineering
[1,2,3]Rabindranath Tagore University, Bhopal, India

Abstract— The lowest part of a structure which transfers its load to the soil underneath is foundation. It is the component of a structure which associates it to the ground and moves loads from the structure to the ground. These are commonly viewed as either shallow or profound. The strength of a structure for the most part relies upon the performance of foundation. Its plan ought to be done appropriately, thinking about its significance. With the assistance of bearing capacity a ultimate load of soil is recognized. Two parameter which is required for the structure of shallow establishment are Bearing capacity and settlement. In the present study, different codes of practice adopted in different countries and the progress made by various researchers has been reviewed. STAAD Pro software are generally used with finite level model and its validation can be done using experimental data. Recommendations were given to simplify the soil-foundation structure interaction analysis of seismic loading. Different shaped footing for same loading condition can be compared. The best suitable and stale type of footing which can transfer load can also be determined using soil bearing capacity and by using analysis tool Staad pro. Cost analysis for different shapes and foundation can also be determined to find the economical section. From the various literature review carried out it can be concluded that STAAD Pro software can be effectively used for the comparative study on different types and shapes of footings.

Keywords: Building; Economical; Footing; Pile; Seismic; Staad Pro

I. INTRODUCTION

The lowest part of a structure which transfers its load to the soil underneath is foundation. It is the component of a structure which associates it to the ground and moves loads from the structure to the ground. These are commonly viewed as either shallow or profound. The strength of a structure for the most part relies upon the performance of foundation. Its plan ought to be done appropriately, thinking about its significance. With the assistance of bearing capacity a ultimate load of soil is recognized. Two parameter which is required for the structure of shallow establishment are Bearing capacity and settlement. It is basic for specialists to estimate the foundation's bearing capacity subjected to vertical loads. Settlement of foundation under load due to the movement of soil particle horizontally and vertically below the footing. Tilt of the footing brought about by unconventional stacking which results to non-uniform pressure circulation and inconsistent settlement beneath the footing. Various physical phenomena, for example, structural or fluid conduct, thermal transport, wave engendering, the development of natural cells, and so on is comprehended and evaluate by utilizing mathematical calculation.

A. Types of Foundation

There are various kinds of foundation for building development and their uses relies upon soil condition and masses from the structure. It's prudent to know nature of each sort of foundation before making any choice for their decision in any construction venture.

1) Spread footings and wall footings

A spread footing is a very unbending component in this way, the applied soil stresses are practically direct and if there should arise an occurrence of a symmetric (concerning the platform) balance, they are orthogonal. The more extensive base of this balance type spreads the weight from the structure over more region and gives better steadiness.

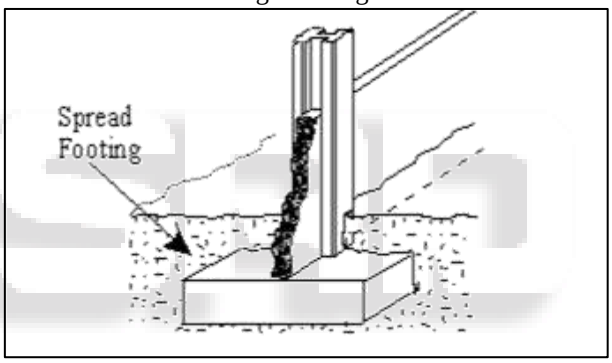

Fig. 1.1: Spread Footing

The plan and format of spread footings is constrained by a few variables, first is the load of the structure it must support, penetration of delicate close surface layers, and penetration through close surface layers prone to change volume because of frost heave or shrink-swell. These foundations are basic in private development that incorporates a basement, and in numerous business structures. Be that as it may, for elevated structures they are not adequate. A spread footing that changes rise in a progression of vertical steps with the goal that it follows the forms of a slanting site or accommodates changes in soil strata, is known as a stepped footing.

2) Mat Foundations

Mat or Raft foundations are the kinds of establishment which are spread over the whole territory of the structure to help overwhelming auxiliary loads from sections and walls. The Mat slab foundations convey substantial segment and divider stacks over the whole structure zone, to bring down the contact pressure compared with traditional spread footings. Mat-slab foundations can be built close to the ground surface, or at the base of storm cellars. In elevated structures, tangle chunk establishments can be a few meters thick, with broad strengthening to guarantee moderately uniform burden move.

Fig. 1.2: Mat Foundation

It is reasonable for far reaching soils whose bearing limit is less for appropriateness of spread footings and divider footings. This kind of balance is prudent by and large when one-half region of the structure is secured with singular footings and divider footings is given. These foundations ought not be utilized where the ground water table is over the bearing surface of the soil. Utilization of establishment in such conditions may prompt scour and liquefaction.

3) Pile Foundations

Pile foundation is a sort of deep foundation which is utilized to move overwhelming burdens from the structure to a hard rock stratum much far beneath the ground level.

Pile foundation, a sort of profound establishment, is really a slim segment or long chamber made of materials, for example, cement or steel which are utilized to help the structure and move the heap at wanted profundity either by end bearing or skin friction. This kind of foundation is additionally used to prevent uplift of structure because of parallel loads, for example, earthquake and wind forces. Pile foundations are profound establishments. They are shaped by long, slim, columnar components regularly produced using steel or strengthened cement, or now and then timber. A foundation is depicted as 'piled' when its profundity is multiple occasions its broadness.

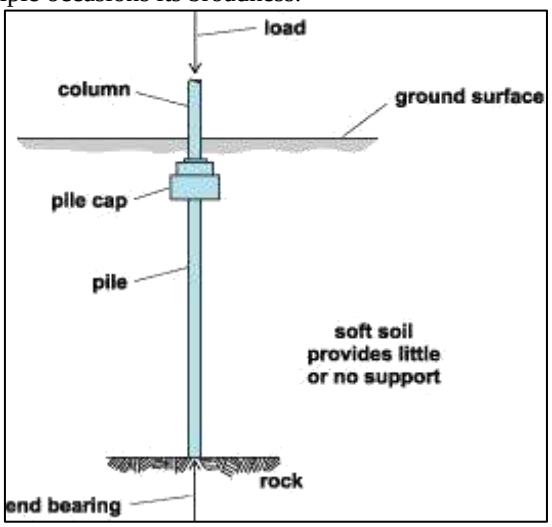

Fig. 1.3: Pile Foundation

4) Drilled Shafts

Bored shafts, likewise, alluded to as drilled piers, caissons or bored piles, are deep foundation arrangements used to help structures with enormous pivotal and sidelong loads by excavating cylindrical shafts into the ground and filling them with concrete. Wood screw is utilized to build bored shaft. This foundation can move section loads bigger than heap establishments. It is utilized where profundity of hard strata subterranean level is area inside 10m to 100m (25 feet to 300 feet). Bored shafts or caisson foundation isn't appropriate when profound stores of delicate muds and free, water-bearing granular soils exists. It is additionally not reasonable for soils where buckling developments are hard to balance out, soils made up of rocks, artesian spring exists.

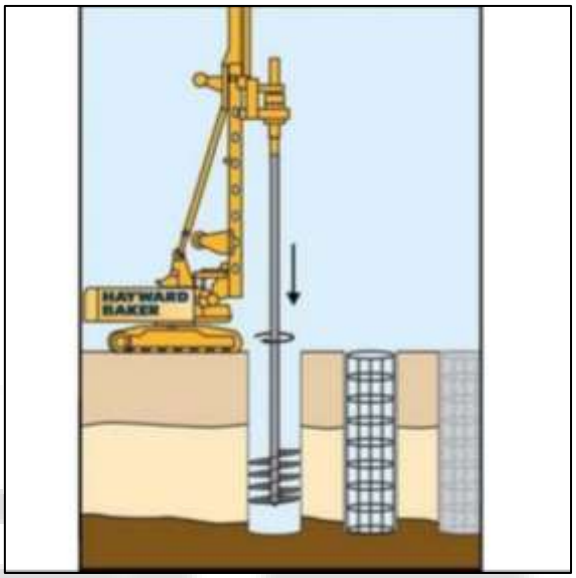

Fig 1.4 Drilled Shafts or Caisson Foundation (Source: Hayward Baker)

B. Foundation Design:

Ideally, a properly designed and constructed residential foundation is designed to accommodate the weight of the structure, as well as the load bearing characteristics of the soils below. It should also be laid on undisturbed, native soil.

Continuous or "spread" footings should be cast along the base of walls when soils have low load bearing capacity. These work like "snowshoes" and spread the weight of the building out over a larger area of soil (see Figure #1 below). This can reduce soil stress to levels that are acceptable for the given soil, and thereby reduce chances of settlement.

II. LITERATURE REVIEW

To give a detailed review of the literature identified with slanting ground, footing geometry, dynamic examination and soil properties completely would be hard to address here. in spite of the fact that there has been a great deal of work displayed on inclining ground - none give top to bottom comprehension of the seismic reaction (dynamic examination) of reinforced concrete structures commitments related with soil information and balance geometry additionally identified with tall structures and past

endeavors most firmly identified with the necessities of the present work. A short survey on balance adaptability and code arrangement of past investigations is introduced here. This literature review centers around inclining ground, horizontal powers in fortified solid structures, soil information usage in a structure establishment and some code arrangements will be tended to by area.

Meyerhof (1974) the investigation was upheld the final word bearing limit of round and strip balance laying on sub-soils having 2 layers of different instances of thick sand on delicate mud and free sand on firm mud. Bearing ability quantitative connection of earth to sand, rubbing point, structure Associate in Nursingd profundity of establishment region unit the most factors that have an impact over sand layer thickness underneath the balance. For roundabout balance higher breaking points of Sg= 0.6 and Sq=1.

Taiebat and Carter (2002) this paper depicted Finite component displaying of the matter of the bearing capacity of strip and roundabout footings beneath vertical burden and minute. The footings lay on the uniform and homogenous soil surface that belowgoes misshapening under undrained condition. The dirt fuses a uniform undrained Young's modulus and an institutionalized undrained shear quality (Su), Eu = 300Su .A Poisson's proportion of μ=0.5. The Young's modulus for the establishments was set as Ef=1000Eu that's, the establishments zone unit a great deal of stiffer than the dirt, thus they'll be thought of as viably unbending. The contact between the footings and furthermore the dirt can't support pressure.

Dhiraj Raj and Bharathi M. (2014) Were inferred that "The various techniques for examination of definite bearing ability of the shallow establishment on slant or near the slant have its own presumptions and confinements. the technique which gives the base last bearing capacity for shallow establishment on prime of slant is considered for traditionalist style. each system relies on many issue worried in assessing the last word bearing capacity of the shallow establishment on the most elevated of slant, thus it's hard to spot one divisor commanding the last word bearing ability."

Swami Saran et al., (20006) were assessed that the system of study presented by Binquet and Lee (1975a, b) and Kumar and thermoplastic (2003b), for disengaged strip footings has been stretched out to unusually and at a slant stacked sq. also, rectangular footings on fortified sand. Exploratory outcomes coordinate fine with the arranged investigation. The calculation of customary power on the support space and furthermore the estimation of surface obstruction at entirely unexpected layer levels territory unit 2 fundamental strides inside the calculation of weight greatness connection. the technique has been improved by exhibiting proper graphs in non-dimensional sort which will be straightforwardly utilized for indistinguishable reason. partner rough procedure has been anticipated the assurance of conclusive bearing ability of fortified soil. Hence, the sq. furthermore, rectangular footings exposed to erratic and slanted hundreds are regularly planned fulfilling each shear disappointment and settlement criteria. this investigation needs the weight settlement estimations of unreinforced soil as pre-essential, which may be acquired exploitation any strategy"

III. Conclusion

The dynamic analysis of RCC building shows that dynamic analysis gives better understanding of the structural behavior. Cost analysis for different shapes and foundation can also be determined to find the economical section. From the various literature review carried out it can be concluded that STAAD Pro software can be effectively used for the comparative study on different types and shapes of footings.

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