

Comparative study of load carrying capacity of under-reamed, bored compaction and friction pile for Muzaffarpur soil

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Abstract

For the strong level of research and development in civil engineering the techniques of determining the load carrying capacity of under-reamed, bored compaction and friction piles is very much concern for the development of structures under factor of safety. Therefore, in present endeavor the motivation is to predict the load carrying capacity of piles in different soil conditions, for the safe construction of structures under any desire conditions for Bela area of Muzaffarpur city. The work has been performed to determine the safe load bearing capacity for Bela area of muzaffarpur city such that it can resist against any condition. Since the city is situated at the bank of river Gandak and it also faced the problem of flood in previous years so it is duty of foundation engineers to determine the safe bearing capacity of the soils so that it can stand in any discussed condition, and recently the city face the earthquake and according to researchers the city is now in earthquake zone. So now it is the duty of engineers to make earthquake resisting structures to save life and this could happen only by gathering information about the soil and its bearing capacity against loads. In my research work the sample of soils from Bela has been collected and lab tests are performed over it and the by the help of results collected from test is implemented on mathematical equation and the safe bearing load for under-reamed, bored compaction and friction piles for Bela area is determined.

1. INTRODUCTION

The city of Muzaffarpur, situated on the bank of river Gandak, constitutes a glorious chapter of our heritage on account of being the center of literature and art. It is called the heart of North Bihar as it the center of trade. The location is such that all the towns of Bihar are nearly equally distance from this place. It is the center of learning art contains the educational institution like engineering colleges, medical colleges, a number of Degree and P.G colleges.

The main economical source of Muzaffarpur district is agriculture and it is famous for production of Litchi. Litchi is an evergreen subtropical fruit for its delicious, flavored and juicy aril, highly nutritive and refreshing taste. It contributes significantly to the growers' economy in Bihar, Uttarakhand and West Bengal states of India. Currently, Bihar contributes 45% of total Litchi production and occupies nearly 40% of the area under Litchi plantation in the country. So government established National Research Centre on Litchi in Muzaffarpur Recently the government of India has selected Muzaffarpur in smart city list.

With the installation of the thermal power at kanti, only 12km from here, and Indian drug and pharmaceuticals

ltd. and other industries estate at bela within the town itself, the city is emerging as an industrial area.

Because of the fact that the city is well connected with the cities like Delhi(NCR), Kolkata, Mumbai, Chennai and other important towns of the country with direct rail communication, the market potential is increasing day by day and there is an ample scope of development. Following proposal of construction of high rise building industrial network, ware house, communication complex, the duty of a foundation engineer has increased considerably.

It is the duty of a foundation engineer to provide solution of a foundation design problem involving soil characteristics by reason of his experience and training. A foundation engineer has to equip with techniques to apply the principals of soil mechanics together with engineering judgment to solve the problem connected with foundation. A foundation engineers also must therefore be versed with the suitable economical foundation and the characteristics of soil on which he has to design.

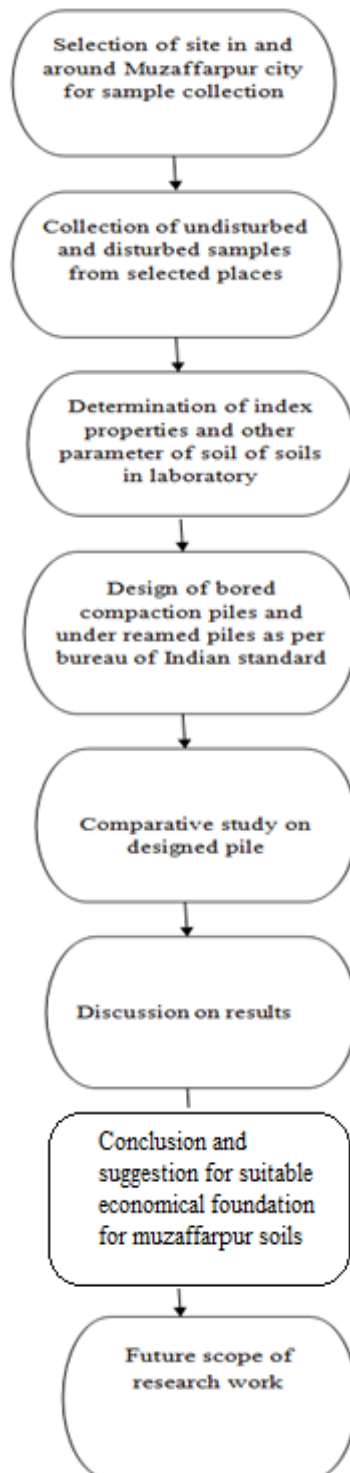
OBJECTIVE OF WORK

1. To find the characteristics of the existing soil of Muzaffarpur.

2. To design, under reamed pile, bored compaction pile for different depth and different diameter on the basis of soil properties.
3. To make the comparative study of designed under reamed and bored compaction piles for different diameters.
4. To suggest suitable economical foundation on the basis of comparative study.

WORK METHODOLOGY

The research work has been performed in many stages for determining the safe load bearing capacity of under-reamed, bored compaction and friction piles for Muzaffarpur soil and each work is properly analyze to obtain the effective results of research work. The flow chart of research work is given below.



NEED OF RESEARCH WORK

The various public as well as private sector organizations will need detailed soil investigation of Muzaffarpur in order to get authentic data for design of foundation for various constructions, soil engineers are in great need to have knowledge of behavior and shear strength characteristics of soil found in and around the city of Muzaffarpur.

In proposed investigation, attempted has been made to make a detailed analysis of various type of soil found in and around the city of Muzaffarpur. The characteristics of soil and the shear strength may present a guideline to the practicing engineers to recommend an economical and suitable design of foundation of various structures.

RESULTS & DISCUSSION

The following are the expected results they are as follows:

1. The percentage of clay varies from 2% to 5% in representative samples of soils, percentage of silt varies 71% to 74% sand varies between 22% to 25% respectively.
2. The water table is generally met with at depth ranging 6m (during rainy season) below existing ground level.
3. The optimum moisture content of the soils of this city varies between 18% to 19.7% while maximum dry density varies between 1.63gm/cc to 1.66gm/cc.
4. The value of cohesion as found from undrained triaxial test ranges between 0.28kg/cm sq. to 0.35kg/cm sq. for muzaffarpur soils
5. The value of the angle of internal friction 25 degree to 28 degree. The specific gravity of soil of muzaffarpur varies between 2.62 to 2.635.

6. The California bearing ratio(CBR) values for muzaffarpur soils is unsoaked condition ranges between 7.1% to 7.7% for 2.5mm penetration while its range between 5.6% to 6.9% for 5mm penetration.

7. The CBR value in soaked condition after 96hour soaking has, however reduced for both the penetration it ranges between 6.1% to 6.8% for 2.5mm penetration while it range between 5.8% to 6.5% for 5mm penetration.

8. These data indicate that the soil of the city of muzaffarpur inherit good strength are normally suitable for foundation of structures and also for pavement.

9. In case of each collected sample of soil safe load carrying capacity of single under reamed pile of different diameter as mention above, on the basis of minimum depth condition has been worked out and found to be varies from 9.56tone to 31.65tone(t) for bela soils respectively.

10. The safe load carrying capacity of these piles for stem diameter 25, 30, 37.5, 40, 45, & 50cm have been considered for determining safe load carrying capacity of piles in the case of muzaffarpur soil. It has been found that safe load carrying capacity varies from 15.76t to 51.23t for bela soil.

11. In case of friction pile having same length as obtained in the case of single under reamed pile for different stem diameter on the bases of minimum length consideration and found to be 5.3t to 29.8t for 3.5m stem diameter (25, 30, 37.5, 40, and 45) cm and 3.5m for 50cm stem diameter respectively.

12. The load carrying capacity factor table is tabulated below

Table 1:

1	Bored compaction pile	1.92 × single under-reamed pile
2	Bored compaction pile	1.45 × double under-reamed pile
3	Single under-reamed pile	2.81 × friction pile
4	Double under-reamed pile	2.74 × friction pile
5	Bored compaction pile	5.29 × friction pile
6	Bored compaction pile	3.84 × friction pile

RECOMENDATIONS

Due to constraints of time and resource only few sample have been considered for analysis. The result can be generalized by collecting more number of samples from in and around the city of muzaffarpur. In this research work, the load carrying capacity has been calculated theoretically on the basis of soil properties for different types of piles. To know the accuracy of work, pile load test should be conducted for each type of piles at least at one site and result should be compared with results found theoretically.

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