

Study of Application of the Bored Pile Technology in Building Construction

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ABSTRACT Bored piles involve making pile holes in the site needing pile by mechanical drilling methods and other methods, then placing the pile made of reinforcing cage and pouring concrete inside the holes. Bored piles have smaller vibration and noise compared to sinking pile by hammer method, and are suitable for all kinds of foundations, thus getting the favour of construction enterprises in recent years and is widely used in construction engineering. However, during the process of borehole piling, the bearing capacity of the pile was severely affected by the quality of construction and it is difficult to control the quality of concrete. Hence, bored pile technology is very important. This study will mainly discuss bored pile technology in building construction.

KEYWORDS

Building construction
Bored pile technology
Mechanical drilling

1. Introduction

With the development of social economy and progress of the construction business in the construction of building engineering project, the selection and application of construction technology and construction methods have a great impact and role in enhancing competitiveness of the core construction enterprises and the long-term survival and development of enterprises. Construction technology of bored pile is a common technology of building engineering construction, its application advantages in the process of building construction and the requirements standards for the construction and technical personnel has a positive effect and influence on the development competition of construction enterprises and construction quality assurance.

2. Overview of bored pile technology

Bored pile involves making pile holes on construction foundation, then placing the pile in the hole and forming the foundation of building. According to the different digging methods, it can be divided into hand-dug pile, cast in

place by sinking pipe, and bored piles. Among them, the hand-dug piles have larger labor intensity, poor safety and slow speed of construction. Cast in place by sinking pipe is to cast pile by hammering method, which will produce a greater shock and noise, thus affecting the surrounding buildings. Hence, it is not suitable for urban construction projects and some cities have even banned the use of this method in the urban areas. While bored pile solves the defects of artificial pile and immersed tube piles, is a relatively superior pile method and is widely used in modern construction projects. However, there are also drawbacks in bored pile, as it is very difficult to control the quality of concrete and the construction quality will directly affect the affordability of pile. Therefore, bored pile technology is very important. Especially with the rapid development of economy, urban construction is becoming faster and the construction business booms. Thus, mastering advanced core technology has played a key role in the survival and development of construction enterprises in the highly competitive market. Here, the author will combine the domestic and foreign advanced technology and long-term accumulation experience and present some views on bored piles technology of building construction. This is to communicate and learn with peers, in order to make bored pile technology more specialized and standardized and provide some help to the development of construction enterprises [1].

3. Analysis on the bored pile technology of building construction

For the analysis of bored pile technology in construction of

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building engineering, the specific process steps, construction method and precautions of bored pile construction technology in building construction application are mainly analyzed and discussed.

3.1. Analysis on the drilling technology of building construction

Bored piles, as the name suggests, is a combination of two processes including drilling and grouting. Drilling is the first step, which is also a crucial step and bad treatment will directly affect later grouting pile. Therefore, when processing the construction, we must implement according to the strict operation procedures to ensure the hole quality. The first step is pre-construction preparation. Clean the building construction site. Arrange the article on the construction site, clean up the debris on the surface of pile foundation, ram and strengthen the construction site, and guarantee the compactness. The second step is to measure pile position and elevation. The determination of pile position affects the fastness of overall structure of the building, therefore, it is very important. Surveyors shall first conduct research and observe the plan of pile foundation and the actual site coordinates points of construction, then measure and put control points and pile position by theodolite and other measurement tools, while ensuring that the deviation is less than 10 mm. Finally, we need measure the ground elevation to determine the elevation of top of the pile and the pile deep. The third step is the laying of the casing. Casing is typically used to locate the position of the pile that needs to be drilled. Usually it is made of steel material. In order to prevent insufficient rigidity or deformation, usually a 4 ± 1 mm steel plate is used. When laying, consider the center position of pile as the center, and then draw the position of casing based on the radius of casing on the surface. Then, bury the casing after positioning. The inclination of casing was less than 1%, so we must check whether the casing is vertical in the embedding process, and if it is vertical, it should be corrected. The fourth step is the preparation and running of the rig. After the casing is buried, the rig should be placed on the scheduled hole position, keep the rig in vertical position and pad the base with sleeper. Line hammer and theodolite are used to bi-directionally control run, by adjusting the speed from slow to fast when running, while varying the intensity from small to large. Pay close attention to the drilling situation when drilling. If there is any tilt, displacement, subsidence or other situations, correction should be made immediately and the error should be less than 5 cm; we should also ensure that the rail is straight and solid. The fifth step is forming a hole. Generally a direct cycle drill of fluid circulation system is used to form hole. At the beginning, inject water to form slurry. When drilling, control the proportion of the mud, conduct regulated and professional operation, keep the hole wall stable and there must be no hole collapse phenomenon. The sixth step is placing the

drill and cleaning the hole. When the drill is apart from the hole bottom for 50-80 mm, start mud pumps. Then cycle rinse for 2 min and launch the rig. The drill speed should be controlled to meet the standard. Stop drilling when the rig reaches the preset position. Continuously idle within 50 to 80 mm between drill and hole bottom, then clear the hole by changing slurry method. The sediment concentration and the ratio of return of hole pulp slurry must be controlled well, sediment thickness of the hole bottom is not more than 10 cm. Make a record of clearing hole. The eighth step is the emission of mud. The outflow mud of drilling and clearing hole are discharged at an appropriate place. Do not pollute the surrounding environment [2].

3.2. Construction technology analysis of production installation of steel cage

Steel cage is pre-fabricated steel structure when drilling. It can confine the concrete of pile, making the force on it balanced thus playing the role of tension. First, the production of steel cage needs conduct site. The site used for steel cage must be flat, easy to access, rain-proof and moisture-proof. After selecting the site, build greenhouses and pull security power. Secondly, purchase of raw materials. Quality of raw materials largely determines the stability of the building. Therefore, when purchasing, the model, type and diameter of reinforcement should be considered. Purchase in strict accordance with drawing requirements and send samples to the relevant departments for testing. If qualified, it can be used for making steel cage and pay attention to the quality of welded steel rod. The enterprises that meet the requirement may purchase steel cage roll welder. Next, make steel cage. During welding, we should select the whole reinforcement as the main reinforcement of steel cage. If welding is really needed, it must be performed in strict accordance with the provisions. The ends of welding reinforcement must have no hook and the build length should be greater than 5 dm. The space, diameter and straightness should be well controlled with errors ≤ 20 mm. Also, control the straightness in the entire welding process. Bend the places which needs to be bent, pay attention to the weld seam thickness at the bent welding, pay attention to cutting off, rust and other aspects of quality problems. The prepared reinforcement cage should be stacked at a particular area after testing, in order to be qualified. Finally, install reinforcement cage. First, check the drilled hole with hole exploration equipment. This is to check whether there is debris on the hole wall, whether there is collapse and to ensure a smooth installation of reinforcement cage. When confronted with an obstacle, timely adopt positive and negative spin, or the gentle falling way to make it naturally fall. If not, we must immediately stop and investigate the cause. Do not forcibly install it, otherwise the reinforcement cage will collide with the hole wall, thus causing collapse [3].

3.3. Construction technical analysis of drilling concrete pouring

During pouring construction of drilling concrete, we should pay attention to the control of the quality of concrete preparation and conduct the materials strictly according to preparation ratio. During perfusion process of concrete material, we should use guide catheter. The distance between the catheter and the bottom of drilled hole during perfusion should be controlled within 300 mm to 500 mm. Before the pouring construction of concrete, the water in the drilled hole should be treated. When conducting underwater concrete perfusion, we should pay attention to the collapse of pouring concrete and control the time and speed of perfusion in perfusion process. Finally, after completion of pouring of concrete, the fixture in the steel cage should be removed, the concrete on the pile head should be cleaned and under certain conditions, it can be cleaned by hand chisel way [4].

4. Conclusion

In summary, the technical content of bored pile is high, and the whole process is very systematic and complex. However as an advanced technology, enterprise must master it in order to enhance market competitiveness and gain

access to development. Therefore, construction companies must place research priorities on these technologies. They should ensure specialization and standardization of bored pile technology, construction quality, thus ensuring the quality of the construction works and that the building is qualified. Construction companies must also ensure outstanding engineering building and lay good reputation for the enterprise, hence create more value, so that enterprises gain a foothold in the fierce market competition.

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