

# Technical Treatment of Manual Digging Pile

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## Abstract

In recent years, the artificial dig-hole pile technology in urban construction with its construction to carry out the flexible, simple equipment, easy to guarantee quality, shorten the construction period, the advantage of relatively low cost to get the recognition of many design, construction units, and play an important role in the construction, but its also affected by many factors in construction process, in the artificial dig-hole pile construction of engineering practice, the needleSome experience has been accumulated in the treatment of several special problems, which can provide reference for similar engineering construction.

## Keywords

Artificial Excavated Pile; Wall Protection; Groundwater; Flow Sand.

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## 1. Introduction

In recent years, many parts of the country are used and gradually promote the artificial dig-hole pile, its characteristic Bearing capacity of some big advantage has won the acceptance of many design, construction units, is indeed a form the basis of economic applicable on soft ground, but there are some problem in the construction, we used by the artificial dig-hole pile foundation engineering practice, has accumulated some experience,Some special problems have been dealt with, and good results have been obtained.

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## 2. Project Summary

Our unit construction of the office building, this project planning a total of four complex buildings, namely building 1, 2, 3, the construction area of 11526m<sup>2</sup>, 10512m<sup>2</sup>, 8620m<sup>2</sup>, 8545m<sup>2</sup>, building levels are 5, 6, 5, 56 floors, there is a two-storey reception hall,The construction area is 4851m<sup>2</sup>, the total construction area is 44054m<sup>2</sup>, part of the structure form is reinforced concrete frame structure, part of the brick and concrete structure.This project uses a large number of artificial excavated pile foundation.

## 3. Groundwater

Groundwater is the most common problem in deep foundation construction, which brings a lot of difficulties to artificial excavation pile construction.When the water in the aquifer is excavated, its equilibrium state is destroyed and the surrounding static water is filled into the hole of the pile, thus affecting the normal construction of the manually dug pile. If the soil is constructed under dynamic water pressure, not only the excavation is difficult, but also the concrete soil of the retaining wall is easily eroded and penetrated by water pressure, resulting in the quality problem of the pile.In the case

of fine sand and silt soil layer, fluid sand and well leakage are also easily occurred under the action of pressure water.

### **3.1 When the Underground Water Quantity is Not Large**

Submersible pump can be selected to pump water, while pumping excavation, into the hole after the timely pouring of the corresponding section of concrete wall, and then continue the construction of the next section.

### **3.2 When the Water Quantity is Large**

When the water is pumped by the water pump of the construction hole itself, and it is not easy to open the excavation, the construction sequence should be considered, and the water is pumped at the same time to the surrounding pile hole to reduce the water inflow in the excavation hole, and the alternate cycle construction method is adopted. The organization and arrangement are reasonable, which can achieve good results.

### **3.3 For Excavated Piles Not Too Deep**

Light pipe Wells can be reasonably arranged around the site, and the number of rows of pipe Wells can also be increased when the base plane covers a large area, which can be generally solved.

### **3.4 Environmental Impact During Pumping**

Sometimes the construction surrounding environment is special, one is the surrounding environment, infrastructure and so on when the water is pumped out, the influence is more, do not allow unlimited pumping; Second, there are rivers, lakes, marshes, etc., so it is impossible to reach the water pumping head without limit. Therefore, reliable measures should be taken before pumping water. The most effective way to deal with this problem is to cut off the water supply and close off the waterways. When the pile hole is shallow, sheet pile can be used for sealing. When the pile hole is deep, the curtain of water retaining is formed by grouting under borehole pressure to ensure that normal excavation can be achieved during normal pumping [1].

## **4. Flow of Sand**

Manual digging in the excavation, such as in the case of fine sand, silt layer geology, coupled with the effect of groundwater, easy to form fluid sand, serious well leakage, resulting in quality accidents, because of this to take effective and reliable measures.

### **4.1 When the Flow Sand is Light**

The effective method is to shorten the excavation depth of this cycle by shortening the normal section of about 1 m to 0.5m, so as to reduce the exposure time of the hole wall of the excavated layer and carry out the concrete pouring of the retaining wall in time. When the hole wall collapses and the mud and sand flow into the pile hole, the textile bag soil can be used to gradually pile up to form the outer wall of the pile hole, and control to ensure that the inner wall meets the design requirements.

### **4.2 When the Flow Sand Condition is Serious**

The commonly used method is the steel sleeve. The steel sleeve is similar to the steel membrane plate used for the wall protection. With the outer diameter of the hole as the diameter, it can be divided into 4 ~ 6 segments of arc, coupled with the appropriate riblet, and connected with the screw bolt or steel bar ring. Insert the outer side of the upper concrete wall is not less than 0.5m, after the installation, the supporting mold is poured into the wall concrete, if the flow sand is still upwelling after the sleeve is put, the method of protruding out and then sealing the bottom of the hole with concrete can be adopted. After the concrete is set, the concrete in the hole center is cleared to form the pile hole. This method can also be used to drill the lowest section of the completed concrete wall, so that the hole is inclined beyond the lower wall, the slurry pipe is driven, the cement slurry is poured under pressure, so that the lower soil is harder, and the water impermeability of the surrounding and bottom soil is improved, so as to solve the flow sand phenomenon.

## 5. Silty Soil

The seepage of hole wall can not be ignored, because the pouring time of pile concrete is long, if the seepage is too much, it will affect the quality of concrete, reduce the strength of pile concrete, waterproof material can be used in the pile concrete pouring before sealing the leakage site. For holes with large water output, wooden wedges can be used to drive them, and waterproof materials can be used to seal them around, or the leaky part can be embedded into the drainage pipe, and a valve can be installed. When the pile hole is constructed, the valve can be opened to let the water flow out, and then closed when the pile concrete is poured. In this way, the problem affecting the quality of the pile concrete can be solved [2].

## 6. Reasonable Arrangement of Construction Sequence

Reasonable arrangement of the construction sequence of manually dug piles plays an important role in reducing the difficulty of construction. In the construction scheme, it is necessary to make careful overall planning and reasonable arrangement according to the actual situation. When possible, the construction of relatively shallow pile holes first, after the construction of some deep pile holes. Generally, the deeper the pile hole is, the more difficult it is. After the construction of the shallow pile hole, it will reinforce the stability of the upper soil layer and reduce the pressure during the construction of the deep hole.

## 7. Conclusion

Manual excavated pile plays an important role in geotechnical engineering construction because of its inherent characteristics. But in the construction, we must solve all kinds of problems encountered in the construction, strengthen technical measures and site management efforts, to ensure the safety of construction, so that the manual digging pile pile into the method of better service for us. Through the construction process, we can summarize the following points.(1) in the artificial digging construction, such as the problem of underground water. When the amount of water in the hole is small, it can be solved by using the method of pumping water directly, digging while pumping water and alternating cycle construction. When there is a large amount of water in the hole, we can use tube well dewatering to lower the water level below the bottom elevation of the hole before construction when it is allowed to dewatering. When the pipe well is not allowed to enter the water, the water stop curtain can be used to cut off the water source, so as to meet the construction requirements.(2) When the problem of quicksand is encountered in the construction, if the sand flow is slight, we can take the method of shortening the cycle digging depth and filling the wall concrete in time, or piling bags in the hole and laying the brick wall as the wall protection. If the sand flow is serious, we need to use the method of lowering the steel casing.(3) When the problem of silty soil is encountered in the construction, we can shorten the depth of circular excavation, timely enter the concrete pouring wall, or use wood square, wood template and other retaining methods to solve the problem.(4) When the problems of groundwater and floating sand are encountered in the construction, the pouring of pile concrete can be carried out by pumping out the water in the hole or laying dry mixed concrete material at the bottom of the hole to accelerate the pouring speed.(5) After the completion of the whole project, it is found that reasonable installation and arrangement of manual excavated pile construction sequence also plays an important role in reducing the construction difficulty. When possible, build shallow pile holes first, and then build deeper pile holes. When construction is carried out in aquifer or soil layer with dynamic water pressure, the pile holes in the periphery (or in the headwater) should be constructed first. After the completion of the concrete protection of this part of pile hole, a small number of pile holes can be retained as drainage Wells without pouring pile concrete to facilitate the construction of other hole locations. The construction speed and pore-forming quality of pile hole are guaranteed, which plays a very good role in the construction of the whole project.

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