

Foundation Pit Support Design of Binzhou Construction Building

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Abstract

Based on the actual engineering background, this paper mainly introduces the supporting design of deep foundation pit. Firstly, it introduces the engineering background, engineering geology and hydrology situation. Then, according to the national regulations and corresponding engineering experience data, it calculates the earth pressure stress, designs the pile-anchor supporting structure, the embedded depth of pile wall and supports. The design length of the retaining structure is compared with the existing supporting methods. Combining with the practical application of the project, the supporting methods are finally determined by using the software of righteousness calculation. They are natural slope hanging mesh shotcreting support and soil nailing wall hanging mesh shotcreting support, and a mission statement is issued. In order to ensure the safety of the project, the stability checking calculation of anti-overturning, anti-landslide, drainage design and construction, engineering monitoring and other design are carried out. Finally, we should not only ensure the stability of the slope around the foundation pit, make the foundation pit excavate smoothly, but also ensure that there is enough operation space in the construction site, so as to ensure the construction process, ensure the safety of other buildings around, and its design scheme also has technical economy.

Keywords

Deep Foundation Pit Engineering; Natural Sloping; Foundation Pit Support; Soil Nailing Wall.

1. Introduction

The supporting construction of deep foundation pit is a difficult geotechnical engineering problem involving many aspects. It includes not only the classical strength and stability problems in soil and soil mechanics, but also how to choose the supporting scheme according to the soil condition. Nowadays, with the development of economy, the supporting methods of deep foundation pit are becoming more and more complete and mature. Many new ways and methods of slope stabilization have been created in the world. In order to save engineering costs, achieve economic and efficient construction, and reduce the disturbance and influence of excavation earthwork on surrounding buildings, more and more construction parties are carrying out high-rise buildings. Vertical excavation has been adopted in building construction, which can be said to be a revolutionary progress.

2. General Situation of Engineering

The proposed site area is located in the eastern part of Binzhou, which is a plain area. The exploration site is located in a high place, and the construction site of the project has complex topography and large fluctuations, with high middle, low East and West sides.

The main component of Quaternary strata in the engineering site is the soil backfilled by manpower, such as clay, clay and broken soil. The drilling depth of the strata can be divided into six main layers and one sub-layer, and the top-down sub-layer.

Groundwater has not been detected in the depth range during the exploration. According to the investigation and visit to the surrounding area, the groundwater depth of the site is about 100 m.

The soil thickness is not uniform, the ground elevation is different and the fluctuation is large. The north side of the foundation pit is a planned road, 9.0m from the outer wall of the building; the middle of the East and west side is a municipal road-Gangjiu Road; the outer wall of the proposed building in the east side is about 6.0m from Gangjiu Road; the west side is far from Gangjiu Road; the south

side of the foundation pit is open land or agricultural land; and the pipeline around the foundation pit is far from the foundation pit.

3. Foundation Pit Support Scheme

Foundation pit support type: According to the relevant provisions of "Technical Regulations for Building Foundation Pit Support" (JGJ120-2012), considering the depth of foundation pit excavation, site stratum conditions and surrounding environmental conditions, it is determined that the safety grade of side wall of foundation pit with excavation depth less than 6m is three-level, the importance coefficient of foundation pit is 0.9, and the excavation depth of foundation pit is large. The safety grade of the side wall of the 6 m foundation pit is second, and the importance coefficient of the foundation pit is 1.0. Foundation pit support is a temporary project, designed and used for one year.

The depth of the foundation pit of this project ranges from 2.0 to 7.5m, all above the groundwater level. According to the stratum lithology, ground elevation, basement elevation and surrounding environment of the side wall of foundation pit, six supporting sections are divided. Natural slope hanging net shotcreting support and soil nailing wall hanging net shotcreting support are adopted. The specific design is as follows:

1-1 section: the excavation depth of foundation pit is 7.0m, the slope ratio is 1:0.3, three soil nails are set up, and the slope surface is sprayed with net.

2-2 section: the excavation depth of foundation pit is 3.0-7.0m, the slope ratio is 1:1, and the slope surface is sprayed with net.

3-3 section: the excavation depth of foundation pit is 2.0-4.0 m, the slope ratio is 1:1, and the slope surface is sprayed with net.

Section 4-4: Excavation depth of foundation pit is 6.0-7.5 m, slope ratio is 1:0.5, three soil nails are set, and the slope surface is sprayed with net.

Section 5-5: The side wall of this section belongs to the second grade slope, the upper part is the man-made slope of the built municipal road, the slope height is 3.5-5.0 m, the slope ratio is more than 1:1, and the natural vegetation has been built; the slope foot of the municipal road slope to the base is about 2.0 m, the slope ratio is 1:1, and the slope surface is sprayed with hanging net;

6-6 section: the excavation depth of foundation pit is about 7.6m, the slope ratio is 1:0.5, three soil nails are set up, and the slope surface is sprayed with net.

4. Control of Surface Water

(1) Control of Surface Water Cover

The foundation pit depth of this project is above the groundwater level, so dewatering construction can not be carried out before excavation. However, during the excavation and foundation construction of the foundation pit, the influence of atmospheric precipitation will occur. The catchment and open drainage measures with the excavation width of no less than 30 cm drainage ditch can be adopted. In order to avoid the adverse effect of surface water on the foundation pit, a brick retaining wall with a height of 30 cm should be set around the upper entrance of the foundation pit 2.0 m away. Drainage holes are set on the surface according to the actual needs, and the location can be moved appropriately according to the formation conditions, and placed as far as possible in the strata with strong permeability.

(2) Control of drainage outside pit

The west side of the foundation pit is high and the east side is low. Surface hardening treatment (outward slope is not less than 0.5%) is carried out around the foundation pit, not less than twice the depth of the foundation pit. The most important thing is that the converging area of the west side of the foundation pit is large and the requirement of flood discharge is high. Drainage measures should be set up to intercept surface runoff and drainage measures should be taken. Do it according to the site topography, so that the rainwater can be discharged smoothly.

5. Emergency Measures

Because the deep foundation pit support project is a construction project with high risk, various emergencies may occur in the construction process. In order to prevent accidents in the future, according to the characteristics of this project, the following emergency measures are formulated.

(1) Emergency measures for supporting structure system

If the local pit wall is excessively displaced in the excavation project and cracks appear at the edge of the pit, the excavation scope along the longitudinal direction of the pit should be suspended in time and measures should be taken to control the deformation; if the deformation develops rapidly, the soil should be backfilled immediately to prevent further deformation until the cause is determined and appropriate measures taken.

If the side wall of foundation pit slips locally, we should first find out the causes of the slip, find out and solve the factors affecting the collapse, and repair and reinforce the side wall of foundation pit. Generally, we can lay vertical anchor pipe at the mouth of the collapse, weld transverse reticulated bars, use soil bags or gravel bags to fill the outside of the pit wall, and spray concrete surface in time.

If the monitoring data of the supporting structure have reached the alarm value when the excavation reaches the base elevation of the foundation pit, the construction progress of cushion concrete and the base plate of the cubic structure should be accelerated, and the cushion and the bottom plate should be poured to the side of the supporting pile.

In the section with large deformation, the parking position of construction machinery should be reasonably arranged, and the material surcharge on the top of foundation pit should be removed in time, so as to strictly control the development of supporting structure deformation.

(2) Emergency Measures for Groundwater Treatment

When the amount of surface shallow water is large due to atmospheric precipitation or the rupture of upper and lower water pipes, the water source should be identified first, and the water source should be repaired, truncated, diverted or stopped. At the same time, drainage ditches should be set up at 1.0-1.50 places around the pit wall from the ground to drain other surface water away from the pit wall and on the top of the pit wall. Shotcrete is used to prevent the seepage of the pit side surface, and cement slurry should be used to seal the crack of the ground in time to prevent rainwater from seeping into it.

If local leakage occurs in the pit wall, drainage pipes of 1.5-2.0 m in length should be set at the leakage point, and the seepage water should be concentrated in the dewatering wells or drainage ditches in the pit, so that the water pressure of the pit wall and the wall of the pit can be maintained dry, so as to facilitate construction.

(3) Emergency measures for environmental protection

Before earthwork excavation, observation points should be set up in advance according to the requirements to observe the surrounding environment deformation and groundwater level, and pay close attention to the monitoring data of foundation pit in the construction process, so as to guide the construction with information technology.

When it is found that the subsidence of ground buildings has reached the early warning standard through subsidence monitoring, the specific causes of subsidence should be found out in time: if it is confirmed that the subsidence is caused by the precipitation in the pit, the recharge measures should be taken immediately; the concrete design of the recharge scheme should be determined according to the subsidence of the structure; and the deformation of the supporting structure of the foundation pit should cause the subsidence. At the same time, reinforcement measures such as compaction grouting should be taken according to the actual situation.

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