The Frontiers of Society, Science and Technology

ISSN 2616-7433 Vol. 1, Issue 3: 86-90, DOI: 10.25236/FSST.20190313

Design And Analysis Of Deep Foundation Pit Support Scheme

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ABSTRACT. *The excavation of deep foundation pit will inevitably cause the deformation of the supporting structure, but most of the projects involving deep foundation pit are located in the downtown area, which is relatively prosperous. The safety factors of deep foundation pit and surrounding environment must be guaranteed in an all-round way. Therefore, the analysis and research on the design and excavation of the support system of deep foundation pit has extremely important practical influence and practical significance.*

KEYWORDS: *Deep foundation pit; support scheme; safety monitoring*

1. Introduction

Many of the deep foundation pit engineering is mostly focused on urban complex areas, and deep foundation pit engineering in the process of design and related hydrological and geological conditions such as usually is multifarious, plus is restricted by the surrounding environment factors, his exploration of the engineering geological will have certain discrete. Therefore, it is difficult to guarantee the accuracy of its data in terms of its calculation parameters, and it is also difficult to obtain necessary guarantee for the distributed excavation of deep foundation pits, which leads to the frequent occurrence of deep foundation pit engineering accidents. Therefore, in the aspect of deep foundation pit engineering, the construction requirements become more and more high, the technical difficulty also gradually increases, the key problems to be solved also become more and more[1]. Certain funds can be invested to ensure the safety and reliability of the support structure, but the waste of resources and manpower should be reduced. In future studies, the rationality and safety of the structure of deep foundation pit engineering support should be continuously explored to solve more problems.

2. Project Overview

About A project with A total construction area of 60000 m2, covers an area of

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44000 m^2, its construction and underground construction area of 14000 m2, and its structure is A frame shear wall structure, the building of 15 to 33 layer, layer number is building height of 61 m to 100 m, engineering foundation forms for pile foundation, the pit for the soil types of clay powder, excavation depth of 5.85 m to 6.95 m, group building for the basement layer, 4 #, 5 # floor 15 layers, garbage room layer. Now according to the complexity of the foundation, building scale and the characteristic of the use function, and because of geotechnical engineering and project leads to damage or affect normal use of the consequences of this for the proposed site belongs to medium and complex field, and the proposed foundation is to belong to medium and complex foundation, the building is important is the secondary grade, the level of the engineering project of geotechnical investigation is class b.

According to A project engineering geological report shows at the time of earthwork excavation and transport found no massive mudslide, lava, and the ground subsidence and deformation of bad geological conditions, but in the field of deep foundation pit soil layer is thick, and is large, the thickness of it is about one meter to the ten o 'clock, the silt soft soil foundation pit engineering itself high sensitivity, thixotropy, void ratio, to the compression of high strength, so must be noticed in the process of deep foundation pit construction, nip in the bud, bulletproof.

A project site geological conditions and situation of groundwater are mostly upper groundwater of deep foundation pit construction site, most of his upside is composed of pore water seepage, stability of underground water level from 0.6 to 3.8 meters, because is affected by the surrounding environment rainfall began to underground water cycle, the change rate of the annual average rainfall of his is about 0.9 meters to 1.9 meters, the influence, the excavation and supporting of deep foundation pit engineering effect is small, depends on the precipitation of water content in the cracks of the rock, the underground water level is stable throughout the year, other water content, are not as the basis, although the region, water, But water is scarce in the soil. The height of confined water head is about -8.00 ~ -11.00 in absolute elevation, which has little influence on foundation pit construction and excavation. The fissure water of bedrock mainly occurs in the weathering fissure of bedrock. The control and monitoring of the groundwater level must follow the progress of deep foundation pit excavation.

A foundation pit project is equivalent to the yellow sea elevation of 5.70 m, 0.00 mm after site formation and earthwork transport, construction site on the west side of its height reached, the average of the yellow sea elevation 5.1 meters, so is relative elevation 0.6 meters, the direction of the other elevation 0.9 meters, the road smooth and flat has entered the stage of completion, deep foundation pit engineering can also carry out the next step of construction process. According to the site layout and through the layout of the construction site, in order to better solve the requirements of deep foundation pit basement construction, we should fully consider the principles of each work, including the weight of building materials and building components and transportation requirements. Easy to install and remove, stress on the structure of deep foundation pit of tower crane should meet, meet the

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requirement of stress, and to conduct a comprehensive operation, project itself now need four sets of tower crane, one for each building, each tower crane for number, convenient disposal and transportation, the first flush to the bottom of the tower crane, and then set the tower crane in the foundation pit, fixed and tests, take stand vertical pile and concrete pile, the method of combining the construction of tower crane is more safe, stagger the unfavorable factors[2].

3. Foundation Pit Enclosure Design Overview.

The foundation pit enclosure of the project mainly adopts the form of double row pile or natural slope. Retaining piles with bored piles, Φ 700 or 800, Φ C30 concrete and effective pile length of 11.25 m to 15.25 m, foundation pit in the east, south and pit pit pit walls are set Φ 600 cement mixing piles. Both the east and south crown beams of the foundation pit are GL1 with a surface elevation of -2.3m and a crown beam size of 1100*800 (height).A drainage ditch of 300*300 shall be set on the four sides of the foundation pit, and a collecting well shall be set every 30m on the outer four sides of the foundation pit.The d-23 ~ d-28 axes on the south side of the foundation pit were sloped at -0.8m ~ -2.3m with a slope of 1:1, that is, the elevation of the crown beam surface was -2.3m, and the slope was protected by 50 thick C15 shotcrete.

Candy line on foundation pit lateral set dip hole 10, hole depth of 18.5 m, excavation depth of 18.5 meters, at the same time to monitor the displacement of the soil if the warning value reached the deep soil and his level for a few days more than 3 mm, and added up to more than 40 mm, at the same time to test the ten water level monitoring hole, hole depth of each hole is eight meters, when the water level warning value of 500 mm, or add up to more than 1200 mm, it should be all around the deep foundation pit of settlement observation point set, if the ground settlement around deep excavation for three consecutive days more than 3 mm, Or add up to achieve 40 millimeter accumulatively, this is about to cause take seriously. The observation points of the top settlement and horizontal displacement of the retaining pile are arranged every 20 meters. The warning value: the horizontal displacement of the top of the retaining pile (slope) exceeds 3mm for three consecutive days, or up to 45mm accumulatively. The top settlement of the retaining pile (slope) exceeds 2mm for three consecutive days, or accumulatively reaches 30mm.

The water stop curtain around the foundation pit is to take Φ 600 single head of cement mixing piles. Up to now, cement mixing piles are pair-bonded with water piles of 150, and pit wall piles are pair-bonded with 100.The foundation pit is surrounded by 300x300 brick drainage ditch to intercept (drain) the surface water except the pit. Around the four deep foundation pits, red bricks are used for the laying of drainage ditch to discharge the rainwater and soil water outside the pit. In addition, centralized water collecting Wells are set around the four deep foundation pits, one is set every 20 meters, and the surface excavation and underground drainage are used to discharge the water in the pit, through municipal pipelines, and into the sewer for treatment[3].

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4. General Construction Plan Of Foundation Pit.

Construction of advanced entrance together to floor level to 0.9 meters, and then start positioning monitoring and direction analysis, start piling of deep foundation pit engineering after everything is ready, when more than half of the engineering pile into the next phase of the cement mixing pile construction, cement mixing pile, and bored piles construction together, the whole can greatly shorten the time limit, the original plan for 60 days or so, as long as 50 days now. To the project brought a huge Gospel, earthwork excavation is divided into two layers for excavation.

The first layer of soil is from -0.8m to -2m, the depth of the first layer of soil is from 0.9 m to -2.1 m, and the thickness of the soil layer is about 1.2 m. Starting from the second layer of soil, for example, from -2.1 m to -4.2 m, the thickness is about 2.4m.

When - 4.2 meters of earthwork excavation is completed, began laying support cushion layer and the concrete cushion for support, to ensure that the next working procedure smoothly, when he made from one area to the next area, start from west to east, from south to north to soil, will have a flat earth and join the support cushion layer, the junction to subtle link and the clean up of concrete, to ensure that new and old concrete pouring together, form a whole, and then on to the next step excavation, from all around the inside the excavation, when excavation to 3.2 meters, the natural slope protection began with earthwork excavation,Asked him to have to meet the requirements of the strength of the design and construction, the foundation pit, is composed of mechanical excavation and artificial excavation simultaneously, each skin soil, after artificial invisible and mechanical oscillation, deep foundation pit of the pile caps have small excavators with artificial excavation, to ensure that the size and strength of the pile caps is in conformity with the requirements, to the next step of construction, and design the elevation of the body should meet the requirements, the final will be more than the inside of the foundation soil removal, for the construction of next working procedure, to be able for the construction of the deep foundation pit engineering lay a good foundation.

The foundation pit excavation of the project involves that the soil layer is 1 large layer of miscellaneous filling soil, 2 layers of clay and 3 layers of silty clay, and the soil layer at the bottom of the pit is 3 layers of silty silty clay. The excavation of foundation pit has a certain depth, and the phenomenon of collapse and sliding of soil layer of pit wall is easy to occur during the construction. Because the three directions of the construction site to the east and west and north are the city's municipal traffic artery, it is not possible to carry out the large slope of the conditions for slope, and the north side of the plot has been expropriated by the second phase of the project, can only use half slope excavation and combined with soil nail wall structure for support, support and maintenance design for deep foundation pit.According to the geological conditions, environment and construction conditions of the site project, it should be suggested that the excavation and support method of the deep foundation pit of the project is as follows:

A. Pile row scheme: namely, cantilever pile row support is adopted, and

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cantilever pile row consists of single row or multiple rows of bored piles.The diameter and length of the bored pile can be determined according to the anti-overturning force. If necessary, internal support can be set in the foundation pit to minimize the impact on the surrounding buildings and the environment.

B. Gravity retaining wall, namely, the supporting method of gravity retaining wall composed of multiple rows of cement mixing piles, can also be combined with multiple soil nails to form compound soil nails.

C. Soil nail wall (shotcrete net) foundation pit support can be adopted. Technical specifications for shotcrete support with anchor rod and geotechnical engineering survey specifications can be adopted.

To sum up, in the process of the deep foundation pit construction, the support scheme from many choose one to choose, such as the underground continuous wall, bolt support, supporting, gravity retaining wall and hubizhuang support, etc., because the deep foundation pit engineering has a larger slope space and in order to ensure the safety of foundation pit and surrounding buildings, so the deep foundation pit with soil nailing.

5. Conclusions.

Bolt support is a safe and economical support method, which has been widely used in the construction of various underground projects in China. In the long run, the anchor technology has the advantages of light structure, safe and reliable, the characteristics of strong adaptability, to achieve rapid drivage, reduce the production cost, has an important meaning to ensure safety, has been rapid promotion in many engineering, its structure forms in the unceasing innovation, and this kind of structure also has less quantity, the better economic benefit, the advantages of convenient construction, is a kind of advanced technology is worth promoting.

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