Application of supporting construction technology for deep foundation pit in Building Foundation Engineering

ZHUAN ZHANG*, SHENG ZHANG†, SIMING LU†

1Jiangxi Vocational College of Applied Technology, Ganzhou Jiangxi, 341000
zzlove513@163.com

Abstract: This paper discusses and analyzes the Construction Technology of deep foundation pit support in foundation engineering. This paper is based on a residential district project in southern Jiangxi Province, this paper expounds the theoretical definition, basic requirements, construction standards, several common construction techniques of deep foundation pit support and the suggestions and ideas of foundation engineering construction. This paper tries to provide a theoretical reference for the enterprises and workers involved in the construction of foundation engineering.

1. Introduction
With the rapid development of social economy and the continuous progress of science and technology, the development speed of housing construction industry is accelerating and the construction level is improving. Foundation Engineering Construction is an important link of building construction, and its construction quality will directly or indirectly affect the overall quality of the building. Therefore, in order to further improve the comprehensive quality of housing construction, we must pay attention to the construction of foundation engineering, do a good job in construction site management, and lay a solid foundation for the long-term and sustainable development of the construction industry.

2. Engineering overview
A residential district in southern Jiangxi Province for both commercial and residential purposes. The project is located in the suburb of the city. The main building has 32 floors and the basement has 2 floors. During the construction of deep foundation pit, row of piles, Diaphragm Wall and anchor-pull retaining structure are adopted to support the foundation pit. The elevation at the bottom of the foundation pit is 12.00 m below the water level, and the perimeter of the foundation pit is 180 M. On the South side of the foundation pit, there are many pipelines and some resettlement houses.

As the depth of the foundation pit exceeds 5M, the foundation pit is a deep one. The special complexity and construction difficulty of deep foundation pit, together with the existence of pipelines around the pit and relocation houses, will increase the cost of foundation pit support and the incidence of safety accidents.

3. The complexity and problems of the project
The supporting technology of deep foundation pit is a method to ensure the safety of the environment and buildings around the foundation pit in the construction of underground structure[1]. It mainly strengthens the construction quality of the underground building and the foundation pit by strengthening the side wall of the deep foundation pit and the surrounding environment, ensuring the stability of the building and the construction safety. In the process of supporting construction of deep
foundation pit, safety accidents often occur. This will not only affect the progress of construction control, but also bring about the loss of personal property. In this project, the underground hydrological condition is quite complex, there are many pipelines and resettlement houses around. In the process of supporting deep foundation pit, because the project is located in the suburb, the supporting design reference materials are not much, most of the supporting design in the early stage of the project is based on experience, therefore, in the actual construction found that there are major problems in support design, may lead to greater safety accidents. During the preliminary construction of the project, during the construction of the diaphragm wall guide wall, a lot of mud flows out of the project caused a large amount of mud to accumulate on the road surface inside the project and the public road surface around the project, which affected people's walking and city appearance, and received the relevant administrative penalty. In this project support process, each construction technical personnel safety consciousness is not strong, always holds the lucky psychology. The frequent accidents in the construction of deep foundation pit support are mainly caused by the failure of the construction scheme and safety measures, and the poor safety consciousness of the construction personnel. Therefore, in order to reduce or even eliminate the occurrence of safety accidents in the construction of deep foundation pits, it is necessary for every construction technician to implement them in accordance with the requirements of the relevant codes and strictly follow the construction plan and the safety measures for construction, so that we can really achieve safe construction[2].

4. Several common supporting construction techniques for deep foundation pit and their application in this project

4.1. Steel sheet pile support
Steel sheet pile is a common supporting technology for deep foundation pit. It carries the steel plate column to the designated area by the vibration to carry on the construction[3]. The steel sheet pile support construction has higher professional requirements, and needs to arrange professional personnel to construct. In addition, these steel sheet piles can be pulled out and reused. Steel sheet pile support construction technology can be built in the underground continuous steel sheet wall, steel sheet wall to effectively block the underground soil layer, supporting effect is very good. Of course, the steel sheet pile support construction technology also has major shortcomings, that is, large economic costs, poor soil adaptability.

4.2. Row Pile support
The row pile support construction needs to give priority to the construction area to carry out the drilling construction, after the drilling construction is completed, the reinforcement cage is laid and the concrete is poured. After the cast-in-place pile is formed, the pile is sorted according to the corresponding order. In order to ensure the support effect of row pile support construction technology, attention should be paid to the distance between two adjacent piles in the concrete construction process, which must be reasonably arranged according to the design standard. This distance should be well controlled to avoid over-long or over-short distance, which is beneficial to strengthen the quality of the whole row pile support construction, thus further ensuring the support effect of deep foundation pit. When construction is carried out around different deep foundation pits, the safety level is different because of the different related conditions. It is necessary to know the relative relationship between the foundation of the surrounding buildings and the foundation pit when internal bracing is usually used in foundation pit support. In general, the relationship between the two can be visualized in a diagram, as shown in figure 1, the relationship between the foundation of the existing building and the location of the pit. In Fig. 1, “a” represents the horizontal distance from the outer edge of the base surface to the top of the foundation pit, “b” represents the length of the base surface, “c” represents the vertical distance from the base surface to the bottom of the foundation pit, and “d” represents the vertical distance from the base surface to the top of the foundation pit ; “h” represents the thickness of the foundation; “β” is the Slope Angle of the foundation pit.
4.3. Anchor retaining structure
The construction technology of anchor-pull retaining structure mainly blocks the soil near deep foundation pit by anchor Rod and retaining component, which often refers to retaining pile. This kind of retaining structure is used in the area where the construction requirements of deep foundation pit support are strict or the soil quality is poor. In the actual construction process, the setting of the anchor rod is not easily affected by the surrounding underground buildings, so the anchoring force of the surrounding land can be obviously enhanced, and the supporting effect will be correspondingly greatly enhanced. In the anchor-pull retaining structure, the prestressed anchor may be used sometimes. The length of prestressed anchor should be reasonable, not the longer the better[4]. If the length of anchor rod is only increased and the bond strength between anchor Rod and soil around foundation pit is not increased, the load will be reduced, which may threaten the safety of Engineering Construction.

4.4. Diaphragm Wall
Diaphragm Wall is a popular support technology at present. For Deep Foundation pit construction, the advantages of diaphragm wall construction technology, such as better water quality and greater stiffness, can be fully reflected to enhance its load-bearing capacity and anti-permeability, effectively play the role of retaining and supporting. At the same time, the diaphragm wall in the construction of the surrounding environment less, conducive to the central area of the city construction, which is conducive to enhance the construction efficiency and reduce the difficulty of construction.

In the construction of the underground continuous wall, the first step is to deal with the construction site, ensure the site's flatness, do a good job in the measurement and positioning of the guide wall. The depth of the guide wall is generally 1.2 to 1.5 meters, and the top of the guide wall should be about 20 centimeters above the ground, this acts as a barrier to surface water from entering the trough. After the completion of the guide wall, the construction of the diaphragm wall is completed by slurry retaining, wall-slotting, underwater concrete-wall with conduit method and segment joint treatment.

4.5. The supporting technology adopted in this project
Due to the particularity and complexity of the surrounding environment and the project itself, and taking into account the large economic cost of the steel sheet pile support and the poor adaptability of the soil, therefore, in this project, the diaphragm wall support and row pile support, which have less
influence on the surrounding environment, are mainly chosen, at the same time, the anchor-pull retaining structure which is not easily influenced by the underground buildings and pipelines is adopted in the place where the support construction is strict or the soil quality is poor.

5. Advice and management philosophy

5.1. According to the characteristics of construction, the suitable supporting method for deep foundation pit is selected
In the construction process of building foundation engineering, the supporting methods of deep foundation pit are various, and the foundation engineering also has its own characteristics[3]. Therefore, the effect of different supporting technology for deep foundation pit will be different. If we want to give full play to all the functions of deep foundation pit support technology, we should take the initiative to give full play to the advantages of support technology, and judge the characteristics of the project in detail according to the construction requirements and the characteristics of the building itself, and then choose the supporting method which is suitable for it. The analysis of the surrounding environment and the hydrogeological condition should be taken as the key points in the analysis of the characteristics of the project, and the support mode of deep foundation pit should be adapted to the surrounding environment and hydrogeological condition.

5.2. Strengthen the consciousness of safety management and pay attention to the protection of construction environment
In the construction of building foundation engineering, the construction of deep foundation pit support technology should pay attention to the impact on the surrounding environment and protect the surrounding environment and buildings. In order to ensure the construction quality and reduce the impact on the surrounding environment, it is necessary to analyze and establish the supervision and management mechanism from all aspects, pay attention to the surrounding environment dust pollution and noise pollution management, to avoid the people around the adverse impact of production and life. During the construction of the foundation pit, the treatment of soil residue and mud is the most important to protect the environment. Therefore, the foundation pit project combined with the field construction, in the foundation pit next to the setting of the mud treatment pool[5]. This not only contributes to the rational use of mud, but also plays a good role in the protection of the environment around the pit. During the construction of Building Foundation Engineering, we should strengthen the consciousness of safety management, set up the idea of safety management, strengthen the propaganda work of safety management, reduce the occurrence of construction safety accident as far as possible.

6. Conclusion
In the foundation engineering construction process, the deep foundation pit support construction technology is an essential part. The supporting methods of deep foundation pit mainly include Diaphragm Wall, anchor-pull retaining structure, steel sheet pile, row of piles. In the construction process of these support methods, in order to ensure the construction quality, attention should be paid to the construction according to the corresponding specifications and standards of the construction technology of the support methods, and the support design work should be done well, according to support design and site to determine a comprehensive concrete construction program, strict control of construction quality[5]. In order to carry out the construction work of foundation engineering construction well, it is necessary to strengthen the consciousness of safety management and pay attention to the protection of construction environment. In the process of construction design, according to the actual project and the characteristics of the project, a reasonable method of deep foundation pit support is worked out and selected, so as to ensure the quality of the project and reduce the accidents.
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