

Comparison and Selection of Supporting Schemes for Foundation Pit

Bo Li

School of Architecture Engineering, Binzhou University, Binzhou 256600, China

Abstract

Foundation pit engineering is an indispensable part of building construction. It mainly includes earthwork excavation, water stopping, drainage and foundation pit detection of foundation pit support. In order to ensure the safety of the buildings around the foundation pit and avoid damage after excavation, it is necessary for us to do a lot of investigation before excavation, and to be familiar with the surrounding environment and facilities. In a word, the foundation pit engineering is a comprehensive design problem. Foundation pit engineering has strict regional requirements, although it is the same kind of building, but because of the different environment, there will be great differences in design. For example, when the geological conditions are poor and there are more buildings around, it is necessary to make strict requirements on the excavation and support methods of foundation pit. But if the geological conditions are good, the standard can be lowered appropriately. So the foundation pit design will choose the appropriate construction method because of different engineering conditions..

Keywords

Foundation Pit Support; Support Scheme; Deep Foundation Pit; Scheme Comparison.

1. Introduction

Foundation pit engineering is an indispensable part of building construction. It mainly includes earthwork excavation, water stopping, drainage and foundation pit detection of foundation pit support. In order to ensure the safety of the buildings around the foundation pit and avoid damage after excavation, it is necessary for us to do a lot of investigation before excavation, and to be familiar with the surrounding environment and facilities. In a word, the foundation pit engineering is a comprehensive design problem.

Foundation pit engineering has strict regional requirements, although it is the same kind of building, but because of the different environment, there will be great differences in design. For example, when the geological conditions are poor and there are more buildings around, it is necessary to make strict requirements on the excavation and support methods of foundation pit. But if the geological conditions are good, the standard can be lowered appropriately. So the foundation pit design will choose the appropriate construction method because of different engineering conditions. Of course, in the pursuit of appropriate methods, we also need to pay attention to economic benefits to achieve efficient construction, so this requires us to strictly and carefully examine the advantages and disadvantages of each construction method, and strive to study scientific methods to bring benefits to the whole project. Foundation pit engineering includes supporting structure, supporting or anchoring system, excavation and reinforcement of soil, engineering detection, environmental protection and other sub-projects.

2. General situation of Engineering

The foundation pit is 30m in length from east to west, 70m in length from south to north, and 8.5m in the west of the proposed project is a highway. There is a six-storey building at 4.6m in the east of the foundation pit. The building is a dormitory building of a factory. The north side of the project is a car maintenance yard, and the south side is a people's park, because there are residents on the east side of the foundation pit. Building, so the excavation depth is 9m, compared with the west, because there is no building, only one highway, so the excavation depth of foundation pit is 10m. Through the comparison of supporting schemes, combined with the advantages and disadvantages of each scheme, the east side near the residential building is finally selected as bored pile and anchor support system, while the west side has highway. The principle of combining economic benefits is really achieved by choosing the support mode of soil nailing wall on one side rather than all of them. In the aspect of water stop and drainage, deep mixing pile is chosen as water stop, because there are residents around. In order not to disturb the normal life of residents, drainage ditches are chosen.

The proposed building is located in the plain area with relatively flat terrain, no hills, no mountains and no undulations. According to the investigation of groundwater burial, the groundwater level is high. At - 9m, the groundwater level at the foundation pit is closely related to the changes of the external environment. In rainy season, the water level rises because of the accumulation of rainwater, while in dry season, the water level falls because of the lack of rainwater, but overall, the annual change is not significant. There are residential buildings on the east side of the site, so there will be underground obstacles such as water pipes, cables and so on.

3. Design Principles and Requirements

The foundation pit support adheres to the design principles of safety, reliability and economy. The safety principle not only ensures the safety of the maintenance system itself, but also ensures the smooth progress of excavation of foundation pit and construction of underground structure, and ensures the safety and reliability of adjacent buildings and construction facilities. The economic principle refers to the project cost of maintaining the system. It is necessary to consider the construction period, whether excavation is convenient, whether safe storage is in place, and adopt comprehensive analysis method to ensure economy and rationality. Convenience of construction should also be the principle and idea of choice for maintenance system. The construction is convenient and the excavation cost can be reduced. The enclosure design should be selected according to the situation. According to the displacement adaptability of the buildings around the foundation pit to the enclosure system, the appropriate type of enclosure structure should be selected to design the enclosure structure.

In order to stabilize the slope around the foundation pit, it is necessary to ensure that the maintenance system of the foundation pit can play a role of retaining soil. The safety of surrounding buildings should not be involved during construction. In the area with groundwater, if the excavation is below the foundation pit, it can be constructed by water stopping method. If the excavation depth of the foundation pit is above the water area, it can be constructed by drainage, dewatering and water interception method. Ensure smooth progress. Supporting facilities must have certain strength and stiffness, so that when external impact occurs, there will be no breakage and other damage. The magnitude of horizontal movement and subsidence of foundation should not exceed the prescribed value.

4. Brief Introduction of Supporting Scheme for Deep Foundation Pit

With the rapid development of economy, the supporting methods of foundation pit are also rising rapidly, such as combined SWM, sheet pile, bored pile and so on. However, no matter how these methods change, the basic requirements and setting principles of foundation pit support will not change with time.

The setting principles of deep foundation pit support are as follows: advanced technology, clear structure, appropriate measures to local conditions, local materials; uniform force distribution can ensure that the foundation pit does not deform, maintain its stability, reduce the damage of buildings (structures) around the foundation pit, and protect themselves around the surrounding roads and underground facilities; However, the environment should ensure the safety of construction, and the economy should be reasonable to reduce unnecessary costs.

5. Comparison and Selection of Supporting Schemes for Foundation Pit

Because of the complex environment of the site, the design and construction process must be strictly in accordance with the regulations. Therefore, pile-anchor support and soil nailing wall support are adopted on the slopes of buildings and pipelines. The characteristics of various supporting methods are as follows:

The type of sheet pile can be divided into steel sheet pile and precast concrete sheet pile. The characteristics of steel sheet piles are that they are finished products with high strength, good quality, high joint precision and high reliability. Durability, repeated pullback, correction and use, still integrity, will not be destroyed. Combined with multi-channel rigid support, it is suitable for deep foundation pit support in soft soil area. The construction is convenient and the construction period is short. The joint construction should be waterproof to prevent groundwater erosion and collapse. Because of the small stiffness, there is obvious deformation after excavation. It also produces large vibration and noise during construction, which easily leads to soil movement and large settlement of surrounding foundations. Prefabricated concrete sheet pile is characterized by convenience, rapidity, low cost and short construction period. It can be combined with the main structure. Pile driving vibration and soil compaction have a great impact on the surrounding environment and should not be used in densely populated urban areas. The waterproof performance of the joint is poor. It is not suitable for construction in hard soil.

Sloping forms include soil nailing wall and natural sloping. Soil nailing wall is a kind of widely used soil with good soil condition, simple construction, no longer construction period and good economic effect. Natural sloping is suitable for slopes with good soil quality and large space. Good economic benefits. The column arrangement can be divided into bored pile and digging pile. The bored pile is characterized by no soil squeezing, high strength and rigidity, high stability, small deformation, easy construction, low cost and good pile quality. The construction conditions are poor.

Because the groundwater level of the foundation pit is high, and the side is close to the building, and the excavation depth of the east side of the foundation pit is 10m, the selection and design of the foundation pit support scheme should meet the requirements of earthwork excavation, foundation pit support structure and drainage structure, and meet the requirements of "ensuring safety, economic benefits, advanced technology and convenient construction". According to the different surroundings, the foundation pit is divided into two calculation sections (one section) and two sections. Because the east side is a residential building, the excavation depth is 9m, the second section uses the support system of bored cast-in-place pile and bolt to reduce the construction noise and cost. In addition, in order to avoid disturbing the normal life of residents, drainage ditches and deep mixing piles are chosen as waterproof curtains because of their close proximity to residential areas. In the first section, the soil nailing wall is adopted, because the advantages of soil nailing wall support are many and conform to the engineering characteristics.

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