

Technical analysis on deep foundation pit supporting in architectural engineering construction

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Abstract: In recent years, the construction industry shows a rapid development in China. The amount of high-rise buildings continually increases, and in the meanwhile, the technical requirements of construction gradually increase, especially in deep foundation pit support construction technology. At present, there exist a large number of high-rise buildings in China. The working face of foundation engineering is becoming smaller and smaller, while the foundation pit is getting deeper and deeper. In order to ensure the quality of construction projects, the deep foundation pit support construction technology should be continuously improved. This paper analyzes the current status of deep foundation pit support construction, and the past studies and researches about the supporting technology of deep foundation pit. The conclusion of this paper is expected to provide some help for the construction enterprises.

Keywords: architectural engineering, construction, deep foundation pit, support techniques

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1 Introduction

With the economic development of China, the process of urbanization is accelerating and the number of high-rise buildings is increasing. Underground engineering and underground space of buildings are also exploited. At this moment, the supporting technology of deep foundation pit is getting wider and wider. Deep foundation pit support construction should be strictly in accordance with the relevant provisions and the actual project, to improve the quality of deep foundation pit support construction, and promote the healthy and stable development of construction enterprises.

2 Technical meaning of deep foundation pit supporting

The construction technology of deep foundation pit mainly includes the excavation technology and support technology of deep foundation pit. The support technology refers to the protection measures for large-scale construction projects or for the safety of underground projects. The depth of more than 5 meters of basement project^[1]. According to different support methods, the deep foundation pit support technology can be divided into column perfusion pile, underground continuous wall, soil nailing wall and other support methods. Different support technologies are adopted under different conditions and environments. Deep foundation pit not only to scientifically handle the foundation, but also to improve the basic carrying capacity, increase the stability of the foundation, to extend the service life of the building.

Therefore, in the process of deep foundation pit construction, the construction process of each stage of environmental protection and supporting devices shall be fully considered, which will affect the construction quality and construction cost of the construction project. If there is a problem in the construction process, the construction of deep foundation pit surrounding buildings and ecological environment have adverse effects, construction enterprises should be based on the actual situation of the construction project, select the appropriate deep foundation pit support technology, strengthen construction technology management, improve construction quality.

3 Current status of deep foundation pit support construction

With economic development, urbanization progress is speeding, the requirement of living environment of people is also increasing, which leads to a decrease in land resources. of China and quantities of high-rise buildings gradually increase^[2]. The basis is the vital part of the whole architectural construction, which directly influence construction quality of the architectural project. Therefore, building enterprises should emphasize on deep foundation pit support techniques and improve the quality to guarantee basic construction quality. Construction techniques required to be used in every construction step and should be studied in details. Protective measures are required to make sure smooth completion of construction.

Foundation pit support does not only make sure normal

work of construction personnel, but also guarantee life safety of construction personnel. In recent years, many safety accidents occurred in China due to deep foundation pit issues, which lead to economic losses and casualties. There are still unstable earthwork issues of foundation pit high wall in the process of deep foundation pit excavation after excavation. The main reasons are that drainage facilities not in place and high wall support cannot meet construction requirements, etc.

4 Deep foundation pit support construction techniques

4.1 Preparation before construction

Preparation should be made before construction, responsibilities should be fulfilled by every department, every construction group should according to actual situation of architectural project, every department should enhance cooperation to improve construction speed^[3]. For example: construction personnel and technical personnel in charge of specifying work contents, have certain rights, and face to emergent problems during the process of construction. In addition, every department should enhance communication, realize sharing of construction information, learn about construction situation in real time, adjust work contents in time based on current status of construction, and guarantee smooth construction. Besides, every enterprise should also be organized to study construction drawings, master key points of construction, and learn about every step of construction. In order to make sure reasonable design of drawings, chief engineer should check the construction drawings, technical personnel should also inspect paving status of ground wires and pipelines of the construction site, and make research report. Based on the research report, effective measures should be adopted to protect pipelines to avoid damage of pipelines during construction.

4.2 Earthwork excavation

Construction enterprises should strictly conduct earthwork excavation according to construction plan to make sure scientific process of construction. In order to guarantee smooth earthwork excavation construction, preparatory work should be made before construct, mainly including install at the drainage facilities, electrical equipment and others. During the process of excavation, it should be ensured that the construction is stable, manual excavation and mechanical excavation should be reasonably combined to effectively improve speed of earthwork excavation construction. The dug earth should be transported to other places in time, and it should be guaranteed the certain distance between the foundation pit and transportation vehicles, lest the transportation vehicles impact stability of the foundation pit^[4]. For earthwork, the foundation pit needs to be backfilled, it should be placed around the foundation pit after excavation, and there should be also certain distance between the foundation pit

and the earthwork. In addition, after completion of deep foundation pit excavation, the construction site should be cleared up, meanwhile, drainage ditch and water collection well should also be build on both sides of the foundation trench to avoid the foundation pit ponding.

4.3 Foundation treatment

There are some special situations during the construction process of deep foundation pit project, for instance: there are some rocks, old walls and other substances in the foundation, and those should be cleared away during the process of deep foundation pit excavation construction, to avoid impact on stability of the foundation. Regarding to this condition, the geological and topographical features should be analyzed in detail, and targeted treatment measures should be adopted based on relevant materials before construct of deep foundation pit excavation. After clearing these barriers, some sand mixture should be backfilled, if the basic part is in the place of hard pan layer. Building blocks can be made on the soft layer, and rebars should be pre-embedd on the basis. If construct begins without foundation treatment, it will make subsidence of superstructures, in very severe cases, collapse may occur. Therefore, construction enterprises should emphasize on foundation treatment work.

4.4 Deep foundation pit support

4.4.1 Steel sheet piles support

This support technique is simple and the construction cost is low, it is widely used to deep foundation pit support construction^[5]. This kind of support technique is continuous, therefore, during the process of construct, it should be ensured that every construction step be closely combined. In addition, during foundation pit support construction, piling can be operated after confirm of positioning, it should be guaranteed that positioning of the pile of defence is scientific to improve construction quality.

4.4.2 Arrayed cast-in-place piles support

Structure of the support technique is mainly reinforced concrete piles and hole digging of reinforced concrete. Apply for the technique to support construction can not only ensure construction efficiency, but also effectively reduce construction costs. However, the gap among every support pile is large, hence coupling beams should be used to connect with these support piles, meanwhile, reinforce treatment.

4.4.3 Deep mixing soil-cement

Generally, the cement and aggregates are mixed, then firming agent is used to form the support structure. Construction techniques should be constantly improved to guarantee smooth support construction.

4.5 Dewatering and drainage construction

In the process of deep foundation pit excavation construction, if the lowest location of the foundation pit is below the underground waterline, the waterproof layer is broken leading the underground water enter into the foundation pit, dewatering and drainage construction of deep foundation pit should be conducted. Before deep foundation pit excavates, targeted technical measures should be adopted according to geological conditions to lower underground waterline, ensure that the underground water will not impact and the stabilization of the foundation. Currently, there are many dewatering and drainage methods used in deep foundation pit, for instance, construction of drainage pitch. In order to improve speed of dewatering and drainage construction, water distribution equipment can be installed if conditions permit. For some foundation pits with entering of small quantity of water, manual drainage can be used.

5 Conclusions

To sum up, with development of architectural industry in China, application of deep foundation pit support techniques is wider and wider, and it will directly impacts length of service and safety of the architectural projects. Therefore, building enterprises and construction enterprises should pay much attention to deep foundation pit support techniques, and conduct construction strictly according to practical situation and relevant stipulations of architectural projects, en-

hance construction management, constantly improve deep foundation pit support construction techniques, and facilitate healthy and stable development of architectural enterprises in China.

Conflict of Interest Declaration

No conflict of interest was reported by the authors.

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