Analysis of Factors Influencing the Safety of Foundation Pit Support Engineering

Qingling Wu[1], Xiaojia Ji[2]

[1]Architectural engineering Department, Wenzhou Polytechnic, Wenzhou 325035, China;

[2]Intelligent Safe Collaborative Innovation Center, Zhejiang College of Security Technology, Wenzhou 325016, China.

Abstract

When carrying out the construction of building foundation pit support, in order to ensure the safety of the project and avoid accidents such as collapse, it is necessary to find the factors that affect the safety of the building foundation pit support project, take appropriate support measures, analyze the existing safety problems in the current support, and formulate a work plan to ensure the quality and safety of construction.

Keywords

Foundation Pit Support Engineering; Safety; Dredger Fill.

1. Introduction

In the process of foundation pit construction, it is necessary to take timely support measures, combine support design and protection measures, master local geological conditions and hydrological conditions, etc., determine the excavation depth based on clear foundation pit types, ensure reasonable design, and strictly follow the construction design requirements to ensure the safety of construction.

2. The Significance of Foundation Pit Support Engineering to Improve Safety

With the rapid social and economic development, the number of buildings has increased significantly, and foundation pit support technology has gradually matured. The rational foundation pit support technology not only can ensure the safety of construction, but also avoid accidents such as collapse. In the process of support design and construction, it is necessary to start from the local geological conditions and hydrological conditions, conduct the comprehensive study for the types of foundation pit and the excavation speed, find out the influencing factors, and ensure the scientific nature and rationality of the design, ensure the economy and safety of construction based on the implementation of construction principles. With the continuous development of construction industry, the foundation pit support technology has entered a new stage of development to a certain extent.

But in fact, due to the continuous changes in the distance among urban buildings, the edge distance of foundation pits has changed greatly, which cause an adverse effect on the development of foundation construction. In addition, the traditional support structure and design theory have been unable to meet the requirements of foundation pit support at this stage, and a series of accidents have been caused, economic losses to continue to appear. Therefore, in the construction foundation pit support project, it is necessary to find out the influencing factors from the perspective of safety to ensure the smooth development of the construction foundation pit support project and solve the problems in the construction.

3. Problems in Building Foundation Pit Support

3.1 Unreasonable selection of parameters

Because foundation pit structure needs to bear the earth pressure, it is bound to have a certain impact on the safety of the building. First of all, in practice, due to the complexity and diversity of geological conditions, it directly affects the calculation effect of earth pressure, resulting in insufficient calculation accuracy, and ultimately affects the selection and determination of soil physical

parameters. Secondly, after the excavation of the foundation pit is completed, a series of changes will occur due to the water content, cohesion and other parameters, which will affect the stress of the supporting structure. Finally, once there are problems in the calculation of the physical and mechanical parameters in the design of the foundation pit support structure, it will inevitably directly affect the quality of the design.

3.2 One-sidedness of soil sampling

As far as the supporting structure of foundation pit is concerned, it is necessary to sample the soil layer of the foundation before designing to ensure the smooth development of the later analysis work; moreover, it is also necessary to improve the rationality of the support structure design according to the physical indicators of the soil. However, as far as the excavation area of the foundation pit is concerned, it is necessary to strictly follow my country's current regulations and measures, improve the quality of drilling and sampling work. Furthermore, it is necessary to control the number of drill holes and reduce the amount of exploration work based on reducing the project cost. However, affected by this work, the selection of soil samples is highly random. Due to the variability and complexity of the geological structure, the designed structural support also showed problems such as large deviations, the soil quality taken does not show the authenticity of the soil layer.

3.3 Insufficient consideration of excavation space effects

By analyzing the existing foundation pit excavation data, it can be seen that t the foundation pit is mainly horizontally displaced on the large middle and small sides, but it is also prone to instability and other problems, and this also proves that the excavation of foundation pit belongs to the category of space. As far as traditional foundation pit support structure design is concerned, it is mainly based on plane strain, and this assumption is mainly based on slender foundation pits, but once the foundation pit is mainly square or rectangular, there will inevitably be problems such as a big difference from the actual situation. If the space problem is not effectively dealt with in time in the design, but the plane strain assumption is adopted for processing, then the suitable supporting structure must be adopted to ensure the rationality of the handling.

3.4 There are differences between the calculated stress and actual stress

As far as the supporting structure of the foundation pit is concerned, the design and calculation are mainly based on the limit equilibrium theory, but in fact, the actual stress has a certain degree of complexity. According to the analysis of the project, it can be seen that some supporting structures are mainly based on the safety factor calculated by the limit equilibrium theory, although it is relatively safe from the theoretical point of view, in practice, Some supporting structures have relatively small safety factors, and there are even phenomena that have not yet met the specifications, but it can meet the relevant requirements in actual use.

4. Design Measures of Foundation Pit Support

4.1 Changing the design ideas

The traditional foundation pit support design ideas have been difficult to meet the development needs, therefore, under the influence of increasing construction projects, it is necessary to start from enriching the foundation pit support experience, on the basis of collecting relevant data and information, grasp the specific stress conditions of the support structure for geotechnical changes, make the development law clear, and explore suitable design schemes. However, it should also be clear that the current calculation method of foundation pit support structure design in our country is still in the stage of exploration and research, and this directly affects the accuracy of the calculation results, and there is no uniform standard in the design specifications of the supporting structure, and analyze the distribution of earth pressure. In the calculation of supporting piles, the equivalent beam method is mainly used, but it is also prone to problems such as inconsistency with the actual stress of the deep foundation pit supporting structure, and this method is bound to affect the safety of the building, especially in economy, it is difficult to meet actual requirements. Therefore, in the design of building foundation pit support structure, it is necessary to start from the transformation of

traditional design idea, do a good job of reform and innovation, formulate a complete information feedback dynamic design system, play the role of construction inspection, and show design advantages.

4.2 Adopt new design methods

In the current stage development, the design method used by designers is mainly based on the principle of limit equilibrium, and this principle has the characteristics of simple and convenient operation, and the calculated results are also of reference value. However, in actual use, this design method also has certain shortcomings, namely when using this method in the foundation pit supporting structure, it can only ensure the strength of the supporting structure, but it is difficult to guarantee the rigidity. Once the support structure has deformation and other problems, it will inevitably lead to a series of engineering accidents. Therefore, in allusion to this phenomenon, it is necessary to start from the evaluation of the support structure design plan, take the initiative to take the strength factors into consideration, moreover, analyze the impact of the environment, and make an accurate assessment of the deformation problems that have occurred. When formulating a new type of deformation control design method, it is necessary to start from the specific conditions of the construction project, conduct the comprehensive analysis of various factors, and make the adverse effects clear based on mastering the deformation control standards of the supporting structure.

4.3 Actively carry out supporting structure tests

In order to ensure the accuracy of the theory, it is necessary to start with experimental work, combine the specific conditions of building foundation pit support, and learn from advanced support experience, and increase research and analysis. However, in practice, because our country has not yet adopted scientific and systematic experimental research on the supporting structure of foundation pits, there are still certain shortcomings in related materials and information. Although the engineering quality of some building supporting structures is relatively high, designers don't know the reason for the success, and for the failure of some supporting structures, designers don't know the reason for the failure. In addition, in the construction process of some support projects, although abundant technical data and data have been accumulated, the test data has shown many problems, it is difficult to form scientific theories and data. At the current stage of development, although experimental research has been conducted on the building support structure and a certain amount of funds has been invested in auxiliary construction, however, since the construction of foundation pit support projects require relatively large funds, if the relevant tests can be carried out before the formal design, then many unnecessary problems can be reduced in the project, moreover, the goal of saving cost can be achieved.

4.4 Master the calculation method of the new supporting structure

With the rapid development of the times, building foundation pit support technology has also undergone significant changes, especially in the current stage of development, different types of support structures continue to appear, such as steel sheet piles, underground continuous walls, etc. But in fact, there are still many new problems in these new support structures, such as the establishment of calculation models, selection of schematic diagrams, and ensuring scientific design methods. Secondly, in order to adapt to more complex geological conditions, we must start from improving the quality of building foundation pit support engineering, make clear the development characteristics of deep foundation pit support structure, insist on starting from the perspective of comprehensive development, grasp the characteristics of stress structure and water structure, and give full play to the role and advantages of the temporary support structure and the permanent support structure. In order to show the advantages of the new supporting structure, it is necessary to start from the improvement of the calculation method of the supporting structure, solve the existing problems, and achieve the goal of construction and development.

4.5 Make the key points of foundation pit support design clear

First of all, we must actively carry out geological survey work. By analyzing local geology, topography, etc., based on mastering the characteristics of engineering geology, we can find the work

key point and make clear the geological stability. Therefore, in the survey, it is necessary to analyze the factors that may cause soil landslides, especially study the sections, strata and indicators that affect the stability and safety of the supporting structure, so ensure the safety of the construction work. In order to improve the quality of the design plan of the building support structure, it is necessary to start from ensuring its strength, analyze the surrounding environment, and find the work key point based on making clear the size of the deformation, and improve the reliability of work. Especially in the construction site, it is necessary to grasp the distribution of groundwater. Since most of the building foundation pit support accidents are affected by groundwater, it is necessary to increase research efforts and analyze the data that cannot meet the technical requirements. Second, improve quality management methods. Because the design of building foundation pit support is closely related to geological factors, hydrological environment, etc., it is necessary to recognize the importance of piling and dewatering construction in combination with local conditions, moreover, designers should combine their own work experience to choose a suitable design scheme.

4.6 Take appropriate control measures

First of all, in order to ensure the quality and safety of construction, since building foundation pit support work is mainly based on underground engineering, it has the characteristics of invisibility, once the project quality accident occurs, it will inevitably cause a greater impact. In addition, it is relatively difficult to correct and remedy some quality problems in the later stage, so the staff is required to grasp the specific situation and take appropriate control measures. For example, it is necessary to ensure the quality of the cement slurry when pouring the supporting piles to avoid problems such as loss, ensure that the strength of the piles and walls can meet the design requirements, problems such as honeycombs are strictly prohibited. Especially for the water stop pile tower, once cracks appear, it will inevitably affect the effect of water stop. In addition, designers must grasp the design intent to avoid random design changes. Only by continuously improving the awareness of quality and safety can we achieve effective management of the project and ensure the smooth development of various tasks. As for the staff, it is also necessary for them to continuously improve their basic quality, and improve the support quality on the basis of strengthening management. Second, we must increase scientific research to ensure that the technology used is scientific and reasonable. The quality of scientific research is often affected by the accuracy of experimental data, therefore, only grasping the actual measurement results can the quality of foundation pit support design be improved, and the design requirements can be met. Therefore, it is necessary to sum up work experience in time and design suitable construction technology to ensure the rationality and safety of support design.

5. Conclusion

(1) The soil quality of the dredger fill area is poor, and severe creeping effects are prone to occur under dynamic loads. Therefore, special attention should be paid to the impact of dynamic loads on the entire foundation pit project; heavy vehicles must keep a distance from the foundation pit, so prevent the foundation pit from collapsing.

(2) In order to effectively ensure the overall rigidity, control the displacement, and ensure the safety of the foundation pit, the embedded length and excavation depth of the retaining piles need to be increased, and the cross-sectional size of the crown beam and support beam should be increased, and Strengthen the reinforcement at the junction of the crown beam and the support beam.

(3) The support type of foundation pit in the dredger fill area should not be limited to a single concrete internal support; other reasonable support types can be boldly tried based on certain experience. Supporting types such as double-row piles and anchors and diagonal throwing anchors are flexible in arrangement, which can greatly shorten the construction period and save cost, it has obvious economic benefits and can be partially applied to the foundation pit support system.

The dredger fill area is different from the ordinary soft soil area, and it is more difficult to control the deformation of foundation pit excavation. When the monitored deformation value exceeds the

warning value, the design, design, construction, and monitoring need to be comprehensively analyzed based on the actual construction situation, timely and accurately grasp the three-dimensional development trend of the foundation pit deformation in the dredger fill area, and put forward practical countermeasures, thus comprehensively guiding the construction and ensure the safe and smooth progress of the project.

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