



Summary of Design Scheme of Foundation Pit Support

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Abstract: Foundation pit support is a hot and difficult problem in practical engineering. Its safety and reliability have a long-term impact on the progress and safety of the whole project. Foundation pit engineering is a highly comprehensive subject, including foundation pit support, foundation engineering, foundation management and soil mechanics. Foundation pit engineering, as a key project in the whole construction project, has a high degree of difficulty and risk. Foundation pit engineering is a key project with many construction, difficulties and risks in the world. Therefore, it is of great significance to improve the management problems in the construction process, reduce the safety problems in the construction projects, and prevent and solve potential safety risks in advance for the foundation pit engineering.

Keywords: Foundation Pit Engineering; Foundation Pit Support; Design Scheme; Design Principles.

1. Introduction

Foundation pit support is a hot and difficult problem in practical engineering. Its safety and reliability have a long-term impact on the progress and safety of the whole project. Foundation pit engineering is a highly comprehensive subject, including foundation pit support, foundation engineering, foundation management and soil mechanics. Foundation pit engineering, as a key project in the whole construction project, has a high degree of difficulty and risk. Foundation pit engineering is a key project with many construction, difficulties and risks in the world. Therefore, it is of great significance to improve the management problems in the construction process, reduce the safety problems in the construction projects, and prevent and solve potential safety risks in advance for the foundation pit engineering.

2. Research meaning

With the rapid development of China's economy and the increasing level of urbanization, land resources are becoming increasingly scarce. It is particularly

important to use and develop land resources to the maximum extent reasonably. Therefore, with the development of the times, a variety of super high-rise buildings have emerged, and the development of underground engineering is also increasing. In China, the height of buildings has been greatly improved and developed. For example, the central building in Shanghai has 118 stories, with a total height of 632 meters. Completed in 2014, the total height of the 112 floors above ground reached 530 meters. With the increasing height of buildings, the design of supporting forms becomes more and more difficult. As a comprehensive high-level project, it is necessary to consider the foundation pit support engineering in many aspects.

As the surrounding environment of the city becomes more and more complex and support becomes more and more difficult, it is particularly important to choose a safe, reliable, technologically reasonable and easy-to-build form of support. In the design of foundation pit support, on the premise of ensuring the safety of foundation pit construction, it is also necessary to ensure that there are no obvious settlement and cracks in the buildings around the foundation pit, and to ensure the support of underground foundation pit. The allowable deformation of the buildings near the foundation pit and the safe production environment limits the design of supporting forms and the actual operation of the project, and even determines the success or failure of the foundation pit support. Only by doing a good job of deep foundation pit support, can we lay a good foundation for future construction safety. In recent years, more and more attention has been paid to the establishment of foundation pit engineering informatization. In order to ensure the safety of foundation pit engineering, it is particularly necessary to carry out real-time monitoring in the process of foundation pit excavation and construction. It can reflect the problem in time, find it early, solve the safety problem of foundation pit and ensure the safety of foundation pit.

3. Support scheme

Generally speaking, the foundation pit supporting system can be divided into two categories: one is the support system, the other is the dewatering and drainage system. At present, the application of support forms in engineering has been relatively mature. According to different construction methods, it can be divided into excavation slope, soil nailing wall support, bored cast-in-place pile support and underground diaphragm wall. Three basic principles of foundation pit retaining system are as follows: (1) Ensure the stability of foundation pit and large enough construction site. The main condition of foundation pit supporting system is that it has maintenance function, which is very important for earthwork excavation construction. (2) Ensure that there are no obvious settlement or cracks in adjacent buildings and

that underground pipelines cannot be excavated or damaged. Therefore, in order to ensure that the settlement height and displacement distance of the foundation pit near the ground are within the allowable range in the construction process, it is necessary to effectively and reasonably control the soil deformation in the construction process.

(3) Ensure that the working face of foundation pit is always higher than the groundwater level. Or meet the above requirements after drainage of precipitation. In the construction process, three basic principles can be adjusted appropriately according to the actual working conditions. The first and third basic principles are the primary conditions for various foundation pit retaining systems. The second basic principle depends on the adjacent structures and underground pipeline lines. At the same time, the ability to resist deformation and the results of damage should be considered comprehensively. The design of enclosure system must meet the requirements of laws and regulations of deformation.

4. Design Characteristics and Principles of Foundation Pit Support

As a temporary project, the foundation pit supporting system needs to be dismantled after the completion of the construction task. Foundation pit engineering includes not only the support design of foundation pit, but also the construction of foundation pit. It is a highly comprehensive project that needs many considerations. Its characteristics include the following aspects:

(1) In practical engineering, because the foundation pit support is often a temporary construction measure, usually, after the main part of the basement construction, the foundation pit support system has completed its mission. At the same time, as a comprehensive and high-level design, the design of foundation pit support needs a very high requirement for the knowledge reserve and practical experience of designers. However, in actual projects, the owner units of Party A will often put forward design requirements that violate the norms due to reducing expenditure and other reasons. The possibility of accidents in the design of foundation pit support is greatly increased. Therefore, safety monitoring of foundation pit is needed in the construction process. The safety reserve of foundation pit is strengthened, and the ability to resist accidents will be greatly improved.

(2) In the design of foundation pit support, not only the influence of engineering geological conditions should be fully considered, but also the preliminary investigation and investigation of underground pipelines and adjacent buildings should be carried out. Avoid adverse effects on supporting structures and damage to underground pipelines and surrounding buildings. If the above conditions are not taken into account at the beginning of the design, it will bring great hidden dangers to the safety of the

design. In the foundation pit design, it is necessary to flexibly use relevant knowledge and analyze specific conditions to meet the convenience requirements of the foundation pit project on the premise of meeting the safety requirements.

(3) As an underground engineering, foundation pit engineering is located in complex geological conditions, and there are many influencing factors. Coulomb earth pressure theory or empirical values are often used in design, and then modified according to the designer's own experience. When discussing the influence of groundwater on earth pressure, which calculation is more realistic. The space-time effect is also applicable to the foundation pit engineering and has an impact on it. The plane shape and depth of foundation pit are always related to the stability of foundation pit support system. In addition, the creep of soil varies according to different degrees of earth pressure and stability. Because of the calculation theory of foundation pit, the design scheme of foundation pit is uncertain, so it should be matched with the monitoring of foundation pit.

(4) In the design of foundation pit engineering, we usually follow the following principles:

(a) Safety. First of all, in order to make the stability of foundation pit slope meet the requirements of national standards, it is necessary to meet the stability and deformation, but also to ensure the safety of the building near the foundation pit, underground pipeline construction in the foundation pit technology is not damaged or damaged.

(b) Economy. From the construction period, personnel costs and environmental protection, to ensure that the solution is stable and reliable, while having economic design.

(c) Convenient construction. Under the solid and reliable foundation pit standard, it is convenient to realize the maximum construction.

(d) Sustainability. The design of foundation pit requires reasonable and effective control of energy saving and environmental impact.

(e) On the premise of ensuring safety and economy, the support of reinforced concrete should be minimized. In support of construction, unnecessary noise pollution to nearby residents is reduced, and unreasonable use and discarding of materials are reduced.

(f) Limit state of bearing capacity. When the supporting structure reaches its maximum bearing capacity, excessive deformation is no longer applicable to the continuous bearing or sliding instability of the supporting structure and soil, or to the leakage of groundwater, leading to soil infiltration damage.

(g) Normal use limit state. The deformation of supporting structure affects the normal structure of underground structure. Groundwater leakage or water level decline will cause damage to the surrounding environment or affect normal use. In addition, we

should spare enough welding machines, cranes, excavators and other equipment related to emergency rescue of foundation pits.

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References

- [1] Wang Z. Analysis of Common Problems in Foundation Pit Support Design [M]. Residence, 2018, (32): 96.
- [2] Fu L J. Application of row piles in supporting design of deep foundation pit [J]. Science and Technology Economic Market , 2018, (10): 20-21.
- [3] He L H. Analysis of Design Scheme of Deep Foundation Pit Support [J]. Housing and Real Estate , 2017, (18): 110.
- [4] Chen B. Discussion on Design Scheme and Construction Scheme of Deep Foundation Pit Support [J], Innovation and Application of Science and Technology, 2016, (23) :88-89.
- [5] Geng C. Design optimization of deep foundation pit support for super high-rise building [J], Engineering and Construction, 2016 , (03) :384-386.