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Construction Process of Basement Floor Slab in Building Engineering Construction

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Abstract: The basement was located at the bottom of the building, which not only affected the quality of the whole construction project but also had special requirements for construction technology and construction requirements. In modern times, with the increasing height of the building, the pressure on the ground has grown, and the demands for basements in construction projects have also steadily increased. With the development of modern technology, various construction techniques for basements emerged within the construction industry. Thus, this paper analyses the type of basement floor construction technologies, highlighting the application of these methods, and points out critical issues to consider. By examining frequent basement leakage problems, the paper proposed several measures to improve the quality if basement construction, aiming to better protect the service life of the building and further improve overall quality, and offering valuable insights for future projects.

Keywords: Construction engineering; Basement slab construction; Building life span

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1. Introduction

1.1. Background

In recent years, due to the shortage of urban land resources in China and to better utilize spatial resources, relevant departments have begun to expand buildings to higher altitudes and also to underground areas. Meanwhile, the construction technology of basement floor is becoming increasingly common [1]. However, there are still some obstacles in the field of basement engineering that may affect the quality and lifespan of the building, such as concrete floor cracking and groundwater leakage in the basement, which these may potentially affects the safety and quality of the basement and even the safety of the building. Therefore, it would be significance to conduct research on the construction technology of basement floor during the construction process of building engineering.

1.2. Overview of structural design difficulties in basement engineering

The difficulties in basement structure design can be divided into many aspects. For instance, when designing a

basement structure, technicians need to analyze its fire prevention and usage functions, as well as analyze it based on human factors. A brief analysis of a case study of a commercial complex basement in China reveals that the main difficulty lies in the fact that the complex is located in a bustling area with dense surrounding buildings and complex underground pipelines, which poses great challenges to the excavation and support of the basement. Therefore, designers need to accurately calculate soil pressure, choose appropriate support methods, and ensure the safety of surrounding buildings and pipelines. In addition, the waterproofing requirements for the basement are high, and the groundwater level in the area is relatively high. Once the waterproofing treatment is improper, it is easy to cause leakage and affect the functionality of the basement. Therefore, high-quality waterproof materials should be considered in the design, and waterproof structures should be designed reasonably. In addition, ventilation and lighting in the basement are also one of the difficulties. In order to meet the usage requirements, designers were required to arrange ventilation ducts and lighting wells effectively, while ensuring that the structural stability of the basement is not affected.

Overall, these design difficulties and issues can be summarized as: structural plane design, seismic design and exterior wall structure design, basement anti floating and anti-seepage design, etc. It can be said that the difficulty of basement structure design is quite complex, and relevant departments need to continuously optimize the construction technology of basement floor in order to effectively ensure the balance of basement construction and thus ensure the construction quality and service life of the entire building [2].

2. Basic procedures for bottom plate operations in basement structures

2.1. Carry out measurement and leveling work

The measurement and leveling work are conducted to ensure the accuracy and rationality of the bottom plate operation, which is the focus of the entire basement structure work. Technicians need to ensure the accuracy and precision of leveling and laying work through clear technical indicators and specific parameters, effectively avoiding omissions and defects. In the actual operation process, technicians must strictly follow the established technical indicators and parameters for the operation, and repeatedly check the measurement results. In the actual operation process, strictly follow the established technical indicators and parameters for the operation, and repeatedly check the measurement results. At the same time, technicians should establish an effective quality inspection mechanism to comprehensively inspect and supervise the leveling and laying work. Once problems are identified, timely rectification should be carried out to ensure the smooth progress of basement structure construction.

2.2. Foundation excavation

Excavation of the foundation is the key point in the construction process of the entire modern underground space structure system. Excavation of the foundation not only ensures the basic work quality and construction efficiency of the entire building, but also affects the safety of the entire underground space structure. Construction personnels are required to attach great importance to the entire process and operation procedures of foundation excavation, and integrate management with preliminary data, information materials, data mining, and basic operation procedures. Comprehensive attention should be paid to the problems in the entire foundation excavation process to ensure construction safety and quality [2].

2.3. Bottom plate brick masonry and pouring operation

The bottom brick masonry and pouring operation require technical personnel to rely on brick masonry construction technology to effectively clarify the entire operation process. During the concrete pouring process, it is necessary to form a pouring foundation pit structure and a sturdy bottom cushion layer to ensure the sequence of the entire construction process. The construction personnel should strictly follow the construction process, first excavating and cleaning the foundation pit to ensure that the size and depth of the pit meet the design requirements. Then, the bottom cushion layer was laied using high-quality materials to ensure the firmness and stability of the cushion layer. When pouring concrete, technicians need to pay attention to control the speed and sequence of pouring to ensure that the concrete can evenly fill the foundation pit and avoid voids and cracks. By ensuring the sequence of the entire construction process is accurately obey, the quality of the bottom brick masonry and pouring operations would be guaranteed, which lays a solid foundation for the smooth progress of the construction project [4].

2.4. Construction of waterproof layer structure

The construction of waterproof layer structure is a key point in the construction process of basement space. Technical personnels are required to clarify the construction process and procedures of waterproof layer structure. The density and strength of the bottom plate structure should be analyzed as important indicators. In the bottom plate operation, steel reinforcement structure should be used to improve the anti-seepage performance of the bottom plate structure. At the same time, relevant departments should also emphasize further optimization of the external wall construction process.

2.5. Timely carry out maintenance work

During the construction process of the bottom plate, maintenance work should be carried out by technicians in a timely manner, strengthen the analysis of the characteristics of the concrete structure itself, enhance the maintenance and curing operations of the structure, ensure the stability of the concrete performance, and at the same time, technicians need to improve the performance indicators and quality of the concrete structure to ensure the stability of the entire bottom plate construction process. At the same time, construction personnel should pay attention to the entire construction process, timely improve and optimize the maintenance management work, and ensure that various maintenance measures can be effectively implemented [5].

3. Countermeasures for improving the construction level of the bottom plate

3.1. Reasonable selection of waterproof materials

One of the keys to improving the construction level of the bottom plate is to choose waterproof materials reasonably. The quality of waterproof materials directly affects the waterproof performance of the basement floor, which in turn relates to the service life and safety of the entire building. When choosing waterproof materials, technicians should first fully consider the usage environment and engineering requirements of the basement. For example, in areas with high groundwater levels, waterproof materials with good impermeability properties should be selected. Polymer waterproofing membrane is a commonly used high-quality waterproofing material, which has advantages such as high tensile strength, corrosion resistance, and aging resistance. For example, in a large commercial complex project, due to its location in an area with a high groundwater level, the construction party conducted multiple investigations and comparisons, and ultimately chose polymer waterproofing membranes. During the construction process, the laying and welding were strictly carried out in accordance

with the specifications, ensuring a tight connection between the rolls and effectively preventing the infiltration of groundwater [6]. Meanwhile, waterproof coating is also an important waterproof material. Different types of waterproof coatings are suitable for different engineering situations. For example, cement-based permeable crystalline waterproof coatings forms crystals inside concrete, block capillary channels, and improve the impermeability of concrete. In the construction of the basement floor in a residential community, the construction party applied a layer of cement-based permeable crystalline waterproof coating before pouring the concrete, which not only improved the waterproof effect but also enhanced the durability of the concrete. In the process of basement floor work, leakage problems often occur due to the reverse selection method and serious quality problems of the materials themselves. For example, many waterproof materials cannot meet the requirements and construction standards of the basement waterproof layer structure, which can cause leakage problems. Relevant departments need to effectively select and test the performance of waterproof materials before the construction project, avoid the occurrence of unqualified materials, and effectively grasp the quality concept of materials.

At the same time, technical personnel should also pay special attention to the storage and maintenance of waterproof materials during the construction process, adopt scientific and reasonable protection and management measures, ensure the performance and quality of materials, maintain normal and stable states, and avoid interference from external adverse factors.

3.2. Carry out concrete waterproofing construction well

Concrete waterproofing construction refers to the process of requiring relevant departments to optimize the impermeability of waterproof concrete, control the amount of cement in concrete, and select appropriate cement dosage and standards. While ensuring the strength of concrete, the sand ratio should be controlled, and the index of phosphorus content in concrete sand should be effectively utilized to carry out waterproofing operations of construction joints. At the same time, scientific and reasonable pouring methods should be adopted to complete construction tasks and improve the waterproof performance of concrete structures [7].

3.3. Use polymer waterproof materials for construction

During the construction process of the basement floor in building engineering, technicians should use polymer waterproof materials for construction. At the same time, they should carefully clean the dust and debris on the base layer to ensure the use of polymer cement and waterproof bonding materials, and ensure that the bonding thickness is controlled within a certain range. In the construction of basement floor, technicians need to control the structural floor cushion layer well. For example, the concrete part can be fully bonded to carry out the construction of the roof and exterior walls, and the side walls can be constructed using various methods of connection to avoid sliding and leakage problems [8].

3.4. Strengthen the training of construction process personnel

During the entire basement floor construction process, the quality of construction affects the stability and safety of the entire building. Therefore, it is crucial to provide professional and effective training for construction personnel. Firstly, theoretical knowledge training should be provided to construction public welfare personnel, and experienced engineers or technical experts should be hired as lecturers to explain the process, technical points, and quality standards of basement floor construction. Through the presentation of illustrated courseware, it is ensured that construction personnel have a clear understanding of the bottom plate construction. At the same

time, basement waterproofing engineering should be explained, and the selection of waterproofing materials, construction methods, and common leakage problems should be analyzed and dealt with to help construction personnel effectively solve related problems in the construction of basement bottom plates in different projects. For example, relevant departments can analyze cases of bottom plate cracks caused by improper concrete pouring in a certain project, summarize experience and lessons, and ensure that construction personnel have a clear understanding of the importance of concrete pouring technology and maintenance methods. Secondly, technicians need to enhance their practical and technical skills. At the construction site, technicians can conduct practical demonstrations, demonstrating key operation methods and precautions such as the installation of steel bar binding templates and concrete pouring, to ensure that construction process personnel observe and learn up close. By asking questions and receiving answers, they can further shorten their time and operational level.

In addition, simulation exercises can also be used to effectively deal with basement floor construction problems and emergencies under different construction conditions, ensuring that construction personnel can handle emergency situations, such as power outages and equipment failures that occur during the simulated concrete pouring process, testing the construction personnel's ability to respond and team collaboration [9]. Finally, it is necessary to conduct regular assessments and evaluations for construction personnel. Professional performance evaluation systems and platforms can be introduced to encourage technical personnel to continuously improve themselves through analysis and statistical analysis of their work situation and quality. In addition, theoretical knowledge exams can also be conducted to test the mastery of basement floor construction technology by construction personnel. Through training on key technical points, quality standards, safety regulations, and other aspects of the process flow, construction personnel can be classified and managed in a timely manner. For those who achieve excellent results, rewards should be given; For personnel whose grades do not meet the standards, targeted coaching and retraining should be provided. The relevant departments need to regularly assess the actual operational ability of construction technology personnel, requiring them to complete operational tasks within the specified time. For example, by analyzing the situation of steel bar binding, formwork installation, and concrete pouring, the construction quality and efficiency of the assessment personnel should be scored in a timely manner, and salaries should be paid based on the scores. Construction personnel should be encouraged to make progress in a timely manner, and their specific abilities and comprehensive levels should be evaluated regularly [10].

4. Conclusion

In summary, as an important component of a building, the construction quality of the basement directly affects the quality and service life of the entire construction project. The construction technology of basement floor plays an important role in the construction industry. Through in-depth analysis, this article clarifies the precautions that need to be taken during the construction process, as well as multiple measures to deal with leakage problems. In the construction of basement floor, relevant departments should strictly follow the construction process requirements, from material selection, construction process control to quality inspection, and all aspects should be rigorous and meticulous. Attention should be paid to the training and management of construction technicians, improving their professional quality and sense of responsibility, and ensuring the standardized operation of the construction process. At the same time, it is necessary to continuously strengthen the research and application of modern construction technology, innovate construction methods and processes based on actual engineering situations, and improve the efficiency and quality of basement floor construction.

Disclosure statement

The author declares no conflict of interest.

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