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Study on Hydrogeological Problems in Engineering Geological Investigation

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Abstract: *Before the formal construction of buildings, it is necessary to carry out effective investigation on the engineering geology, hydrogeology and other contents in the construction area. Investigation is not only an important link for the project management personnel to carry out the project construction in the early stage, but also an important link to ensure the safety in the project construction process and the stability in the building construction process. Therefore, in order to effectively avoid various geological risks during the construction process or after the completion of the building, the early engineering geological survey is of great significance. In the process of engineering geological investigation, hydrogeological problems are also important investigation items. This paper will discuss and study hydrogeological problems, and propose effective measures for engineering geological exploration by analyzing the hydraulic properties of rock and soil mass and the impact of hydrogeological problems on the project.*

Keywords: *Survey Project, Engineering Geological Survey, Hydrogeology, Investigation Measures*

1. Introduction

Engineering geological exploration is to judge the geological conditions of the construction site and its surrounding environment through detailed investigation of the geological conditions in the construction area and its surrounding environment through specific values and indicators, so as to predict various geological problems that may occur in the construction process based on the geological conditions, and propose corresponding solutions according to the problems. Therefore, the main purpose of engineering geological exploration is to solve the geological problems that may occur during the construction process before the construction, so as to ensure the scientificity and rationality of the construction process and make the project safe and orderly.

2. Water physical properties of rock and soil mass

The physical properties of rock and soil mass can be divided into physical and hydraulic properties. The hydraulic properties are the properties generated by the interaction between rock and soil mass and groundwater. Because the strength or properties of rock and soil mass will inevitably change when the local groundwater acts on the rock and soil mass, which will further affect the overall stability of the building, so it is necessary to investigate the hydraulic properties of rock and soil mass. To be specific, it is generally necessary to investigate the following water physical properties of rock and soil mass:

The first is water permeability. The more loose or porous the rock and soil mass, the stronger its water permeability, and the more permeable the rock and soil mass, the easier it is to leak or gush water.[1] In the process of actual engineering geological investigation, permeability coefficient is usually used to express the strength of water permeability, and the specific permeability coefficient is obtained through pumping test.

The second is disintegration. After rock and soil contact with water, they invade into the original rock and soil, which changes the internal structure and strength of rock and soil, and even causes disintegration. Therefore, the higher the disintegration of rock and soil, the greater the negative impact on buildings. There are many factors leading to the disintegration of rock and soil mass, such as particle structure, mineral composition, etc., which will have a direct impact on the disintegration of rock and soil mass. In addition, different rock and soil mass have different disintegration characteristics when disintegration occurs.

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The third is softening. When the rock and soil mass are soaked in water, the strength of the rock and soil mass will be significantly reduced and softening performance will occur. The softening coefficient is the main parameter to judge the water resistance and pressure resistance of the rock and soil mass. The softening coefficients of different rock and soil mass are also different. Generally, the clay layer, shale, mudstone and other rock and soil structures have higher softening coefficients.

The fourth is water supply. The so-called water supply property refers to the ability of rock and soil mass to permeate water through the pores after being saturated. The specific water supply capacity is measured by the water supply capacity, which is also a very important parameter in hydrogeology. The higher the hardness of rock and soil mass, the lower the water supply capacity, while the higher the water supply capacity of rock and soil mass, the higher the negative impact of buildings.

The fifth is expansion and contraction. Swelling and shrinking refers to that the volume of rock and soil will increase and change when the rock and soil are affected by water, while the volume of rock and soil will shrink again when the water inside the rock and soil is gradually lost. The appearance of this phenomenon will lead to cracks or protrusions in the rock and soil mass due to volume changes, which will directly lead to the deformation of the foundation or buildings, and have a greater impact on the stability of buildings.

3. Impact of hydrogeological problems on the project

3.1. Impact on building foundation pit

With the continuous development of the construction industry, the construction industry and land resources have formed a relatively tense conflict. In order to ease the tense land resources in China, high-rise buildings have become the main development trend of the construction industry. However, compared with multi-storey buildings, high-rise buildings have higher requirements for the stability and safety of buildings. Therefore, in order to further strengthen the stability and safety of buildings, it is necessary to deepen the excavation depth of foundation pits. Therefore, in the engineering geological exploration, the exploration personnel often take the foundation pit as the key point to make an objective assessment of the hydrogeology, so as to avoid the adverse impact on the stability of the building structure caused by the influence of the excavation depth of the foundation pit due to the hydrogeological problems.[2] If it is determined that the hydrogeological problems will indeed have a certain impact on the building foundation pit after the engineering geological survey, remedial work should be done well during the excavation of the engineering foundation pit to avoid the impact of groundwater on the construction quality or pollution of groundwater.

3.2. Impact caused by groundwater level change

The groundwater level is not unchanging. Due to seasonal changes and human factors, local groundwater level will rise and fall. Whether the groundwater level rises or falls, it will have a certain impact on geotechnical engineering. For example, when rainfall increases or more irrigation is carried out artificially, the groundwater level will rise. After the groundwater level rises, the following impacts may occur on rock and soil mass, such as: due to the rise of groundwater level, rock and soil mass on the river bank will collapse and slip, or under the influence of groundwater, soil will be swamped or salinized, or even silt will be saturated and liquefied, resulting in quicksand piping and other phenomena. In more serious cases, the rise of the groundwater level will submerge the underground caverns, causing the foundation pit of the building to float up and lose stability. On the other hand, if the groundwater level drops due to a large amount of groundwater pumping, it will also cause certain harm and impact on the construction project, specifically, geological disasters such as land subsidence and land collapse may occur, and at the same time, environmental problems such as the depletion of groundwater sources and the deterioration of groundwater quality will also occur. These problems not only have a greater impact on the stability of the building itself, and it will also pose a greater threat to the living environment of residents.

4. Measures for engineering geological survey

4.1. Drawing up a complete survey plan

Before the construction, in order to ensure the safety in the construction process and the effective

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progress of the construction progress, it is necessary to have a specific plan. Similarly, when conducting engineering geological survey, it is also necessary to formulate a perfect survey plan, so as to ensure the normal progress of the survey work in the actual geological survey process. In order to draw up a more perfect survey plan, first of all, the project leader of the project needs to divide different geological survey stages according to the actual situation of the site and the construction needs of the project, such as the survey stage, the preliminary survey stage and the detailed survey stage, so as to collect detailed, sufficient and perfect data on the geological and hydrogeological conditions in different survey stages. Secondly, the person in charge of the project also needs to define the survey responsibilities of the survey personnel in different posts in the survey plan, that is, to assign the responsibilities to the personnel, scientifically allocate the work content, ensure the rationality of the survey content and the scope of the survey, and form a specific management basis for the survey personnel, so as to ensure the reliability of the survey data and results.

4.2. Strengthening the supervision of the survey process

In the actual process of engineering geological investigation, investigators often use more advanced technology and equipment to complete geological investigation. Although technology and equipment have a great impact on the results of geological investigation, considering which technology to use and how to operate the equipment are all under human control, it is still human factors that fundamentally affect the quality of engineering geological investigation. Therefore, in order to avoid a large waste of time and errors in geological survey data caused by human factors in the process of engineering geological survey, it is necessary to strengthen the process supervision of survey work to avoid adverse effects on the whole project caused by poor implementation quality of survey work. Specifically, first of all, the project leader needs to strengthen his understanding of the geological survey work, so that he can accurately judge the objects and key points that need to be monitored during the survey process.[3] Secondly, the person in charge should also reasonably judge the implementation intensity of the geological survey according to the actual work situation, and take the intensity as the standard to conduct more reasonable supervision of the survey process.

4.3. Improve the construction of the geological survey systems and systems

Engineering geological survey is a key link in engineering construction, which is directly related to the construction quality and the use of later engineering. At present, because the engineering geological survey management system is not perfect, the efficiency and quality of the survey work can not be guaranteed. Moreover, in the actual process of the actual investigation work, explorers in dealing with emergencies, their own ability and level have a large lack, causing a lot of safety risks. In the process of investigation, some construction units do not pay enough attention to this work, failed to carry out a scientific investigation of the site, resulting in the generation of hydrogeological problems, so that the survey quality cannot be better improved. Therefore, we must strengthen the attention of the engineering geological survey work, and according to the actual construction conditions, targeted to improve the geological survey mechanism, in order to improve the construction efficiency. In the process of constructing the investigation system, each link and steps of the investigation must be standardized, so that the procedures of the investigation work are more standardized, so that the quality of the investigation work can be improved. At the same time, we should pay attention to improving their own technical level and quality, pay attention to the survey work, strictly in accordance with the relevant provisions, to ensure that the effective performance of the geological survey is enhanced.

4.4. Strengthen hydrogeological survey

In the engineering geological survey, the nature of groundwater, the rise of water level and other problems involve many problems. After the hydrogeological survey, the survey report should be prepared scientifically, to fully understand the potential dangers of groundwater and rock and soil, formulate the corresponding construction plans, improve the operability of the construction, and ensure that the groundwater will not affect the quality of the project. In addition, in the actual work, a comprehensive understanding of the geological conditions of the site to ensure that there will be no impact on the project.

In the engineering geological investigation, the collection and investigation of hydrological data should be strengthened to ensure the reasonable investigation and analysis of the surrounding environment, and the comprehensive understanding of the surrounding geological environment and water level and other conditions, so as to obtain accurate data and lay a solid foundation for the future work.

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At the same time, in the process of actual exploration, we should change our concept, and actively use modern surveying and mapping technology and means, to ensure the accurate access to hydrogeological data. With the continuous increase of project construction and the expansion of scale, the function of hydrogeological indicators is also gradually improving. Therefore, in order to improve the quality of engineering geological exploration work, it is necessary to strengthen the capital investment of water conservancy and geological work, and use various methods to determine the hydrogeological parameters, so as to provide accurate data for the future engineering construction.

4.5. Strengthen the application of the new survey technology

At present, China's economic development speed is very fast, and science and technology are also making continuous progress. Therefore, in the project construction, the new survey technology is gradually developing. In the construction of specific projects, the sharing of new survey technology and information resources can effectively promote the overall quality and level of hydrological survey work. At the same time, to ensure the smooth progress of the project, it is necessary to increase the research of hydrogeological survey technology, increase investment, the use of advanced measurement instruments and equipment, and establish a scientific data management system. With different hydrological conditions, various methods are adopted to ensure the quality of the whole hydrogeological survey. In order to effectively solve the hydrogeological problems in engineering geological exploration, it is necessary to scientifically apply the geophysical logging method to analyze the data of the strata, so as to effectively obtain the data of groundwater and karst development layer. For this method, you can achieve a very good effect, very practical value. Moreover, before data collection is used in this way, geophysical exploration must be conducted to ensure the safety of the workers. Then, the relevant resources obtained are used to investigate, analyze the problems, and lay the foundation for the subsequent project construction. In addition, according to the data, the preliminary geological environment forecast is made, and a preliminary model is established, and corrected according to the actual situation, and finally the real hydrogeological environment is obtained.

5. Conclusion

In general, after analyzing the hydraulic properties of rock and soil mass, it is found that the permeability, disintegration, softening, water supply, expansion and contraction and other hydraulic properties of rock and soil mass will have more or less impact on engineering buildings. Therefore, it is necessary to clarify the hydraulic properties of rock and soil mass through engineering geological survey to avoid adverse impact on foundation pit or groundwater caused by hydrogeological problems. At the same time, in order to improve the effectiveness of engineering geological survey, this paper also proposes measures to do a good job in engineering geological survey, including: drawing up engineering geological survey plan in advance, strengthening the process supervision of engineering geological survey, etc.

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