Research on Hydrogeological Issues in Engineering Geological Survey

Yunxian Wang

Lanzhou University of Resources and Environment, Lanzhou 730021, China.

Abstract: Before the formal construction of a building, it is necessary to conduct an effective survey of the engineering geology, hydrogeology, and other contents within the construction area. The survey work is not only an important part of the early stage of engineering construction for engineering management personnel, but also an important factor in ensuring safety and stability during the construction process. Therefore, in order to effectively avoid various geological risks during the construction process or after the completion of the building, the preliminary engineering geological survey work is of great significance. In the process of engineering geological exploration, hydrogeological issues are also important exploration projects. This article will explore and study hydrogeological issues, analyze the water physical properties of rock and soil, and the impact of hydrogeological issues on the project, and then propose effective measures to do well in engineering geological exploration.

Keywords: Survey Project; Engineering Geological Survey; Hydrogeology; Survey Measures

Introduction

Conducting engineering geological exploration is to conduct a detailed investigation of the geological conditions within the construction area and its surrounding environment, determine the geological conditions of the construction site and surrounding environment through specific numerical values and indicators, and predict various geological problems that may occur during the construction process based on the geological conditions, and propose corresponding solutions according to the problems. So the main purpose of conducting engineering geological exploration is to prepare solutions to geological problems that may arise during the construction process before construction, ensuring the scientificity and rationality of the construction process, and enabling the safe and orderly progress of the project.

1. Hydrophysical properties of rock and soil mass

The physical properties of rock and soil can be divided into two types: physical and water properties. Water properties refer to the various properties generated by the interaction between rock and soil and groundwater. When local groundwater acts on rock and soil, it will inevitably cause changes in the strength or properties of the rock and soil, and thus affect the overall stability of the building. Therefore, it is necessary to investigate the water properties of rock and soil. Specifically, it is generally necessary to investigate the following hydraulic properties of rock and soil:

The first type is water permeability. The looser or more porous the rock and soil, the stronger its permeability, and the more permeable the rock and soil are, the more likely they are to experience leakage or water gushing. In the actual process of engineering geological exploration, permeability coefficient is usually used to express the strength of permeability, and the specific permeability coefficient needs to be obtained through pumping tests.

The second type is disintegration. After the rock and soil come into contact with water, it invades the internal structure and strength of the original rock and soil, causing changes in the structure and strength of the rock and soil, and even causing collapse and disintegration. Therefore, the higher the disintegration of the rock and soil, the greater the negative impact on the building. There are many factors that can lead to the disintegration of rock and soil, such as particle structure, mineral composition, etc., which directly affect the disintegration of rock and soil. In addition, different rock and soil masses exhibit different characteristics of disintegration when it occurs.

The third type is softening. When the rock and soil are soaked in water, the strength of the rock and soil will significantly decrease, leading to softening performance. The softening coefficient is the main parameter for judging the water resistance and pressure resistance of the rock and soil, and the softening coefficient varies among different rock and soil structures. Generally, clay layers, shale, mud stone, and other rock and soil structures have higher softening coefficients.

The fourth type is water supply. The so-called water permeability refers to the ability of rock and soil to penetrate through pores and cracks after being saturated with water. The specific water supply is measured by the degree of water supply, which is also a very important parameter in hydrogeology. The higher the hardness of rock and soil, the lower the water supply, and the higher the water supply, the higher the negative impact of the building on the rock and soil.

The fifth type is expansion and contraction. Swelling and shrinkage refer to the phenomenon where the volume of rock and soil increases and changes when it is subjected to the action of water. However, as the water inside the rock and soil gradually loses, the volume of the rock and soil decreases. The occurrence of this phenomenon can lead to cracks or protrusions in the rock and soil due to changes in volume, directly causing deformation of the foundation or building, which has a significant impact on the stability of the building.

2. The impact of hydrogeological issues on engineering

2.1 Impact on building foundation pits

With the continuous development of the construction industry, there has been a tense conflict between the construction industry and land resources. In order to alleviate the tense land resources in China, high-rise buildings have become the main development trend of the construction industry. However, compared to multi-story buildings, high-rise buildings have higher requirements for stability and safety. Therefore, in order to further strengthen the stability and safety of buildings, it is necessary to deepen the excavation depth of the foundation pit. Therefore, in the engineering geological exploration, the exploration personnel often take the foundation pit as the key point to make an objective assessment of hydrogeology, so as to avoid the adverse impact on the structural stability of the building due to the impact of the excavation depth of the foundation pit caused by hydrogeological problems. If it is determined through engineering geological survey that hydrogeological problems will indeed have a certain impact on the construction foundation pit, then during the excavation process of the engineering foundation pit, remedial work needs to be done to avoid problems such as groundwater affecting construction quality or polluting groundwater.

2.2 The impact of changes in groundwater level

The groundwater level is not fixed, and due to seasonal changes and human factors, it can cause local groundwater levels to rise or 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, it can lead to an increase in groundwater level. After the groundwater level rises, it may have the following effects on the rock and soil, such as: the adverse geological phenomenon of collapse and sliding of the rock and soil on the riverbank due to the increase in groundwater level, or under the influence of groundwater, the soil may become swampy or salinized, and even cause saturated liquefaction of silt, quicksand Phenomena such as piping. In more severe cases, an increase in groundwater level can submerge underground caverns, causing the foundation pit of the building to float and lose stability. On the contrary, if the groundwater level drops due to excessive human extraction of groundwater, it will also cause certain harm and impact on construction projects, specifically manifested as the possibility of geological disasters such as ground subsidence and subsidence, as well as environmental problems such as depletion of groundwater sources and deterioration of groundwater quality. These problems not only have a significant impact on the stability of the building itself, It also poses a significant threat to the living environment of residents.

3. Measures for conducting engineering geological surveys

3.1 Develop a comprehensive survey plan

Before construction, in order to ensure safety during the construction process and effectively advance the construction progress, it is necessary to have a specific plan. Similarly, when conducting engineering geological surveys, it is also necessary to develop a comprehensive survey plan in order to ensure the normal progress of the survey work in the actual geological survey process. So in

order to develop a more comprehensive survey plan, the project leader of the project needs to divide different geological survey stages based on the actual situation on site and the construction needs of the project, such as the survey stage, preliminary survey stage, and detailed survey stage, in order to collect detailed, sufficient, and comprehensive data on geological and hydrogeological conditions in different survey stages. Secondly, the project leader also needs to clarify the survey responsibilities that the survey personnel in different positions need to shoulder in the survey plan, that is, to implement the responsibilities to the personnel, scientifically allocate the work content, ensure the rationality of the survey content and scope, and also form a specific management basis for the survey personnel, ensuring the reliability of the survey data and results.

3.2 Strengthen the supervision of the survey work process

In the actual process of engineering geological survey, surveyors often use a lot of advanced technology and equipment to complete the geological survey. Although technology and equipment have a significant impact on the geological survey results, considering which technology is used and how the equipment is operated, it is still human factors that fundamentally affect the quality of engineering geological survey. Therefore, in order to avoid a significant waste of time caused by human factors and errors in geological survey data during the engineering geological survey process, it is necessary to strengthen the supervision of the survey work process to avoid adverse effects on the entire project caused by poor implementation quality of the survey work.

4. Conclusion

In general, after analyzing the hydraulic properties of rock and soil, it is found that the hydraulic properties of rock and soil, such as permeability, collapse, softening, water supply, and expansion and contraction, can have a greater or lesser impact on engineering buildings. Therefore, it is necessary to clarify the hydraulic properties of rock and soil through engineering geological surveys to avoid adverse effects on foundation pits or groundwater caused by hydrogeological problems. At the same time, in order to improve the effectiveness of engineering geological survey work, this article also proposes measures to do a good job in engineering geological survey, including: preparing an engineering geological survey plan in advance, strengthening the process supervision of engineering geological survey work, etc.

References

[1] Li Z. Analysis of hydrogeological issues in engineering geological exploration [J]. North China Natural Resources 2022; (05): 23-25.

Fund Project: Horizontal Project from Lanzhou Resources and Environment Vocational and Technical University: Application of Urban and Rural Geological Data Survey Technology in the Era of Big Data (HX2020-5).