



## REVIEW

# Hydrogeological Hazards and Control Measures in Engineering Geological Exploration

**Pengna Zhou**

No.801 Hydrogeological Engineering Geology Brigade of Shandong Bureau of Geology and Mineral Resources (Institute of Geology and Mineral Resources of Shandong Province). Jinan, Shandong, 250000, China

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### ABSTRACT

For engineering geological investigation, hydrographic surveys are particularly important. By operating the equipment, relevant technicians analyze hydrogeological data around the project. A series of corresponding measures were taken to ensure the smooth completion of the project. However, due to the inadequate completion of hydrogeological survey work, it has great harm to the later stage of engineering work, and even will lead to the final failure of the project. Based on this, this paper explores the hazards and prevention measures of hydrogeology in engineering surveys.

## 1. Introduction

In recent years, more and more attention and resources have been paid to construction projects in China. On the one hand, this is a corresponding economic stimulus for the construction sector, which promotes its rapid development; on the other hand, security issues are becoming more and more important. Therefore, the challenges in the construction field will also become bigger, and geological exploration work is of great significance. In addition to subjective human factors, the natural factors such as weather, water, temperature, etc., will also pose a great threat to construction projects. This is the work content of hydrogeology in the engineering geological

investigation work. How to prevent these hydrogeological hazards and take certain measures is a key and difficult point of geological exploration<sup>[1]</sup>.

## 2. Hydrogeological Hazards in Engineering Geological Investigation

### 2.1 Damage of Phreatic Rise to Engineering

There are numerous phenomena in which engineering quality is greatly endangered by various factors. However, in the final analysis, it can be roughly divided into human subjective factors and natural objective factors. Hydrogeological hazards can be classified into the latter category in

*\*Corresponding Author:*

Pengna Zhou,

No.801 Hydrogeological Engineering Geology Brigade of Shandong Bureau of Geology and Mineral Resources (Institute of Geology and Mineral Resources of Shandong Province), No. 13632, Jingshi Road, Jinan, Shandong, 250000 China;

E-mail: 1002488664@qq.com.

most cases.

Phreatic rise, that is, in the engineering planning stage or the project implementation stage, the water level in the underground layer begins to rise rapidly in the construction field, and it has certain harm to the quality of the project. There are many factors inducing this situation. In addition to the inevitable subjective human factors, it also includes the effects of the natural environment, such as temperature and geological movements.

The phreatic rise has extremely serious consequences. After the problems of geological and hydrological factors, the phreatic rise will cause certain damage to the soil layer occupied by the building. Seriously speaking, it will cause the collapse of soil within a certain range, and even cause the occurrence of flowing desertification.

At this time, the foundation of the soil layer is unstable, and the relevant data requirements cannot be met in the building load-bearing basic units. Then, after the concrete construction of the construction project, it is extremely prone to the problem that the construction project collapses due to the collapse of the geological layer.

## **2.2 The Harm of Decline of Water Table to Rock Engineering**

There are many factors that lead to the decrease of underground water level. In addition to the natural factors mentioned above, it is also a common phenomenon that man-made subjective factors lead to hazards.

The reasons why the decline of water table is harmful to human subjective factors are mainly reflected in the following aspects: First of all, the use of water resources is not reasonable. Especially for the use of underground water resources, the unreasonable use of resources will cause considerable harm. The second is the use of upstream and downstream water sources. For example, for the upstream part of the groundwater layer, the corresponding huge reservoir was built, and certain engineering projects were established at the downstream. The excessive release of water from the upstream reservoir or the sudden release of excessive water resources will have a huge impact on the downstream water table. Therefore, the decline of the water table caused by human factors will cause certain harm. Especially for rock engineering, the damage is even greater<sup>[2]</sup>.

## **2.3 The Harm of Groundwater Dynamic Pressure to Rock Engineering**

The first is a conceptual problem that has led many people to misunderstand the groundwater level, that is, the groundwater level is always at rest.

The perception of this concept is wrong. The groundwater layer is always in a dynamic process. Essentially, this is caused by the fluidity of the water stream. However, this dynamic movement state is also a relatively static state, that is, in the process of water flow at the groundwater level, the scope of its flow and fluctuation is very small, and it will not produce large fluctuations and cause a concrete performance. Therefore, this will not cause any harm to the construction project.

However, the movement of the aquifer is in a state of small categories, which requires a constant premise that such a small category should be within the natural environment, except for the influence of subjective factors. However, in the real world, there have been many times of fluctuations in groundwater hydrodynamic pressure due to human action factors.

In many cases, some of the activities of people are unscientific. The consequence is that there is a wide range of fluctuations in the groundwater layer. Therefore, the state of movement of water resources in the groundwater layer does not meet the data required by the engineering construction. In severe cases, there will also be serious accidents such as collapses in engineering construction projects due to large fluctuations in the groundwater layer.

## **3. Prevention and Control Measures for Hydrogeological Hazards in Engineering Geological Investigation**

### **3.1 Construction of Relevant Mechanisms for Geological Exploration**

For the accurate grasp of the geological exploration project, the first step is to prepare for the preparatory stage of the preliminary geological exploration work. The most important and most negligent thing to accomplish this step, as well as the contempt, is to fundamentally focus on the mechanism of geological exploration (hydrogeology). This plays a vital role and significance for the smooth progress of construction projects.

A scientific and effective geological exploration (hydrological geological survey) system was established and applied to the actual construction project. The investigation situation and the actual situation of the site construction were effectively combined to make the whole construction engineering mechanism work, and the geological exploration work proceeded smoothly. This really provides convenience and assistance for construction projects.

The composition of the geological prospecting team shall not be decided hastily. For the technical personnel involved in geological exploration, it is necessary to have extremely strict assessment requirements, and it is not

allowed to conduct random selection in order to catch up with the progress of the project. Geological survey personnel need to have the capability of surveying, including a certain understanding of the natural environment data of the construction project, especially for the calculation of speculation. Geological survey is not only for static geological survey. It also includes the effects and timing of subsequent geological movements and trends in water levels. For each part of the development stage, it is possible to write a survey and inspection plan that is feasible and realistic <sup>[3]</sup>.

Based on the above various needs, relevant construction engineering enterprises need to pay attention to the construction of geological exploration teams and related mechanisms of geological exploration, which is the greatest guarantee for the safety of construction projects. If the loss is caused by geology, the amount of loss will be doubled.

### **3.2 Professional Geological and Hydrological Survey Team**

For the strict requirements of the personnel of the geological and hydrological survey team, especially the important hydrogeological aspects (especially for some projects with great impact), the preliminary assessment of the personnel of the geological and hydrological survey team needs to be considered comprehensively. The carefulness and practical ability of the geological and hydrological survey personnel are emphasized. This is an inevitable requirement for the personnel of the geological and hydrological survey team. It is not too much effort to establish a reasonable geological and hydrological survey team, and it is relatively important.

The construction of the geological hydrographic survey team has greatly helped the survey work. In particular, it is a great decisive role for the mentality of the geological and hydrological survey team. The enthusiasm of employees is fully mobilized to ensure that they can maximize efficiency.

The construction of the geological and hydrological survey team is not a solid state, but a dynamic process. This dynamic development is mainly reflected in the cultivation of personnel learning for the geological hydrographic survey team. At present, some teams in the survey field have begun to attach importance to the introduction of some professional survey courses (experienced professional knowledge) into the survey team, which is of great help to the development of the survey team. However, in the long run, this is a very inadequate place.

The most important point is the calculation of the input cost of construction projects. According to incomplete sta-

tistics (in Jinan as an example), the first stage of the study of universal professional knowledge lectures costs about 10,000 yuan, and the cost is not very expensive. Therefore, the input cost can also be within the scope of control. A dedicated geological hydrographic survey team was established. The resources in the relevant fields of geological and hydrological surveys were once again introduced into the survey team, which saved a great sum of money for the construction of the survey team. The construction of this method is a long-term investment and has a strong construction significance <sup>[4]</sup>.

### **3.3 Strong Support for the Political Work Team**

The development of the geological hydrographic survey team includes the following two aspects: The first is the geological hydrological survey team in the whole engineering environment in the rigid technological innovation, that is, the professional ability factor. There is no doubt that without professional ability, dangerous factors can never be killed in the cradle in advance in the aspect of building engineering, which requires high safety coefficient. Many geological survey teams work on the experience of relevant technical personnel. The correct order should be the technical personnel to carry out the corresponding treatment according to the geological and hydrological survey site conditions. Another aspect is the application of the means of the geological and hydrological survey team in specific work. The former is the cause and the latter is the fruit.

The construction and specific work of the geological hydrographic survey team is to use professional capabilities to deal with problems related to construction engineering (mainly hydrogeological problems). Therefore, certain training for relevant personnel is often required for this work. After all, the hydrology of geological survey personnel (which is the most important aspect of geological exploration work) has greatly tested the knowledge reserve and practical application ability of relevant personnel.

The construction of the geological hydrographic survey team will introduce new people every year. The important point of support is the training of talents. In the training of the new geological and hydrological survey team, the most critical thing is that the theory and practice can be combined in the practical work of dealing with problems and put into practice. Basically, the newly introduced talents can't immediately grasp the work that should be done by the government's political workers (not familiar with the company). Even if they have certain professional ability, they may not be able to do practical application work. Therefore, it is not a professional ability training to

carry out corresponding training in this aspect. Concretely speaking, the field operation training is to help the geological and hydrological survey team to understand the enterprise, improve the level of consciousness, and provide strong support for it.

### 3.4 Perfection of Survey Report

A construction project mainly focuses on the following aspects: preliminary survey and forecast work, budget cost work, construction phase, and completion phase.

Among these work categories, the most important, and also the decisive factor for the entire project, is the preliminary survey and forecast work. The data conclusion of this kind of work will seriously affect whether the project is necessary to carry out and become one of the prediction data standards for the later safety. The content of the geological survey research report needs to be enriched.

By carefully dissecting the entire contents of the geological exploration work, it can be roughly divided into two major aspects. One aspect is the field survey stage for geological surveys, which occurs during the draft phase of the construction plan. If the relevant building units perform construction projects for a certain area, the first thing that needs to be done is geological exploration, especially for hydrogeology. If the stability of this region is not enough due to factors such as the underground water layer, the huge reservoir upstream will affect the water layer structure in the later period, leading to large-scale changes and instability of the soil layer. This project will be terminated when there is no way to solve it. Therefore, the work of geological exploration has great operational rights for the project.

Generally speaking, the final closing work of the geological survey requires relevant investigators to establish certain research reports. According to the rules of the industry, the geological survey team only needs to collect the data obtained from the survey and display it on the research report. However, in order to ensure the safety of the project and to improve the entire geological survey, certain speculative work was carried out.

According to the existing data report, the possible changes in the geological layer (water level) and the impact on the construction project are speculated in a certain time. Because geological formations, especially hydrogeology, are in a relatively dynamic process, survey work cannot always be carried out. The investigation of a time node in a certain static state does not mean that the data is maintained until the construction stage or even within the time scope after the completion of the construction project.

The improvement of the research report is a highly responsible performance for geological exploration work. In order to carry out this work smoothly, it must be based on the following premise: The first is the requirements for the equipment. The survey equipment determines the accuracy of the survey data in some aspects. The second is to ensure the professionalism of the relevant survey personnel and ensure the accuracy of the data in the data research report. Finally, there are geographically relevant materials. This will allow the surveyor to change the geological and water quality layers for the next time period based on the natural conditions (or human conditions).

### 5. Conclusion

Geological exploration and detection work, especially related work in hydrogeological exploration, will determine whether the construction of a project is reasonable, and its significance is self-evident. At present, the hazards in this area include the natural environment and human influence. The geological and water-related conditions in the natural environment only need to be detected by relevant technical personnel and a certain equipment basis. The artificial situation is a difficult factor to control (for example, the completion of the project has been completed, and the establishment of a huge reservoir upstream of the engineering geological water layer will cause problems in the water quality layer and affect the safety of the completed construction project). Therefore, relevant government departments need to do some supervision in this respect, and relevant construction enterprises must pay enough attention to geological exploration work to ensure the safety of construction projects.

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