

Research on Common Problems and Countermeasures of Geotechnical Engineering Investigation and Design

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Abstract: Geotechnical engineering survey and design is the foundation of engineering construction, and its quality is directly related to the safety and service life of the building. However, in the actual work, due to the complexity of geological conditions, the limitations of technical means and the influence of human factors, geotechnical engineering survey and design often encounter various problems, if not handled properly, may bring serious engineering accidents and economic losses. This paper analyzes the common problems in geotechnical engineering survey and design from the aspects of inadequate investigation, defective design, poor communication and coordination, and puts forward the targeted countermeasures of strengthening the geological mapping, improving the design process and establishing the coordination mechanism, in order to provide reference for improving the quality of geotechnical engineering survey and design.

Keywords: Geotechnical Engineering; Survey and Design; Problem Analysis and Countermeasures

Introduction

With the acceleration of urbanization process and the expansion of engineering construction scale, geotechnical engineering has attracted increasing attention from all walks of life. As the foundation of engineering construction, geotechnical engineering survey and design plays an irreplaceable role in ensuring the safety of buildings, optimizing the engineering scheme and saving the engineering investment. However, in the actual work, due to the heterogeneity, concealment and uncertainty of rock and soil mass, coupled with the limitations of survey and design technology and the omission of management, the geotechnical engineering survey and design often face many difficulties and challenges. In order to better guide the engineering practice, it is necessary to deeply analyze the common problems in the geotechnical engineering survey and design, and explore the corresponding countermeasures to promote the healthy development of the geotechnical engineering industry.

1. Analysis of common problems in geotechnical engineering survey and design

1.1 There are shortcomings in the geotechnical engineering investigation work, and it is difficult to fully reflect the site conditions

Geotechnical engineering investigation is an important means to find out the site geological conditions and obtain the parameters required for the design. However, in the actual work, subject to the construction period, funds and other factors, some survey units often have problems such as insufficient survey density, insufficient exploration depth, and incomplete in-situ test projects. Especially in some areas with complex geological conditions and harsh environment, it is difficult for conventional exploration methods to fully reveal the underground situation, which makes a big discrepancy between the investigation report and the actual situation. In addition, individual investigators sense of responsibility is not strong, professional quality is not high, field recording is not serious, indoor test is not rigorous, also affected the reliability of the survey data, to the design and construction buried hidden dangers^[1].

1.2 The geotechnical engineering design depth is not enough, and the optimization space is limited

Geotechnical engineering design is the key link to transform the survey results into the engineering scheme. However, in design practice, design units often have problems such as insufficient research on survey data, insufficient comparison and selection of schemes, and poor calculation and analysis. Some designers lack the necessary knowledge of engineering geology and rock and soil mechanics, do not grasp the site conditions, insufficient to consider the adverse factors, copy the design scheme of others, lack of innovation consciousness and

optimization ability. For some difficult and dangerous projects, the design units still have insufficient demonstration depth and adopt conservative parameters, resulting in the design scheme is too simple, the space for optimization and adjustment is limited, and it is difficult to give full play to the maximum benefits of geotechnical engineering technology.

1.3 Department cooperation is not smooth, and information transmission is not smooth

Geotechnical engineering survey and design involves construction, survey, design, construction, supervision and other participating units, and the cooperation between departments is of great importance. But in the actual work, due to the management system is not perfect, the process is not close, information communication is not sufficient and other reasons, often appear the phenomenon of separate governance, prevarication. The survey unit and the construction unit do not understand the general situation of the site, the design unit and the requirements of the survey unit are not clear, the construction unit does not understand the design drawings, and the supervision unit has a unclear definition of the responsibilities of all parties, which will affect the orderly development of the survey and design work, and reduce the work efficiency and quality^[2].

2. Countermeasures for the common problems of geotechnical engineering survey and design

2.1 Improve the pertinency and reliability of geotechnical engineering investigation

In view of the deficiencies in geotechnical engineering investigation, the primary task is to change the concept of investigation and set up the working ideas of fine exploration and taking measures according to local conditions. According to the project grade and site conditions, optimize the layout of the exploration points, select the exploration methods reasonably, determine the investigation workload scientifically, and avoid unnecessary waste and omission. We will vigorously develop non-destructive detection technology represented by geophysical exploration, and improve the identification rate of hidden areas and weak links. Key processes such as drilling sampling, in-situ testing and indoor testing should be improved, and the system of on-site inspection, circulation review, traceability and accountability system of rock and soil samples and data should be established and improved, so as to ensure the representativeness and reliability of survey data from the source. At the same time, strengthen the construction of the survey team, improve the education and training and career development system of investigators, to build a professional, professional, innovative high-quality team. In addition, we should also pay attention to the innovation and application of investigation technology, and actively introduce advanced equipment and methods, such as three-dimensional geological modeling, geophysical exploration, etc., to improve the accuracy and efficiency of investigation. Strengthen the quality control of the survey process, establish the quality management system of the whole process, from the survey plan formulation, field operation, data processing to report preparation and other links to strictly check^[3]. Pay attention to the applied research of survey results, deeply analyze the guiding significance of survey data to engineering design and construction, and put forward targeted solutions to engineering geological problems.

2.2 Strengthen the scientific nature and advanced nature of geotechnical engineering design

To solve the problems existing in geotechnical engineering design, the key is to adhere to the basic principles of science first and innovation first. The design unit should fully absorb and digest the survey results, use the theoretical knowledge of geomechanics and geotechnical dynamics, combine the experience and lessons of similar projects, conduct detailed analysis and judgment of the site conditions, and find the focal point and breakthrough of the design. It is necessary to establish the design concept of multiple scheme comparison and multi-professional demonstration, learn from the masses, and repeatedly demonstrate and optimize different schemes from the perspectives of safety, economy and applicability, in order to get the best design. It is necessary to actively introduce modern design technology, establish three-dimensional rock and soil model, simulate the interaction between building and foundation, optimize the design parameters, and improve the refinement level of design. At the same time, we should strengthen academic exchanges and technical cooperation, draw on advanced experience at home and abroad, explore design ideas, and promote the development of the industry. In addition, the risk management of the design process should be strengthened, the design risk assessment mechanism should be established and improved, the potential geological disasters and construction difficulty and other factors should be comprehensively analyzed and evaluated, and the corresponding prevention and con-

control measures should be formulated. Pay attention to the economy and implementation of the design scheme, under the premise of ensuring the quality and safety of the project, the project cost should be reduced as far as possible and improve the efficiency of resource utilization. Strengthen the design standardization and modularization research, establish a perfect design specification and standard system, and improve the design efficiency and quality.

2.3 To improve the organization and management mode of geotechnical engineering survey and design

In response to the problems of poor coordination between departments and processes in geotechnical engineering survey and design, it is necessary to establish and improve a scientific and standardized organization and management system with clear rights and responsibilities. Unified technical standards and work norms should be formulated, the division of tasks and quality requirements of survey, design, construction and supervision should be clarified, and top-level design and overall coordination should be strengthened. It is necessary to establish smooth information communication channels, and actively adopt information and visual management means to realize the interconnection and real-time sharing of survey and design data. It is necessary to improve the working mechanism of key nodes, such as design disclosure, drawing review and design change, to ensure that the design intention is accurately conveyed and the change process can be controllable and traceable. It is necessary to improve the quality responsibility system and performance appraisal system, link the quality of survey and design results with the professional title evaluation and salary distribution of relevant units and personnel, and mobilize the enthusiasm and creativity of all parties to. In addition, a management mechanism for the whole life cycle of the project should be established, and the whole process management should be implemented in all stages, from project approval, feasibility study, survey and design, construction supervision, operation and maintenance. Strengthen the qualification management and market access of survey and design units, establish a fair and just tendering and bidding system, and select high-quality survey and design units. Establish and improve the risk management system of geotechnical engineering survey and design, formulate emergency plans for emergencies, and improve the ability to deal with complex geological conditions and engineering problems. Strengthen the industry self-discipline, establish the geotechnical engineering survey and design credit evaluation system, and form a market mechanism of survival of the fittest.

Conclusion

Geotechnical engineering survey and design is a complex system engineering, and the improvement of its quality cannot be separated from the full cooperation and joint efforts of survey, design, construction, supervision and other parties. Facing the new period construction of the new challenges and new requirements, we want to problem oriented, around to improve engineering quality, optimize the investment efficiency, ensure production safety, promote social harmony, further intensify key technology research, improve the legal standard system, innovation management mode, optimize talent structure, to realize the high quality of geotechnical engineering survey and design development provide solid support, for the construction of beautiful home, realize Chinas dream contribution wisdom and strength.

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