

# CONSTRUCTION PROCESS CONTROL AND MANAGEMENT OF GEOTECHNICAL ENGINEERING PROJECTS

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**Abstract:** With the development of society, China's geotechnical engineering construction has made rapid progress. But at the same time, in the construction management process of geotechnical engineering, there are common problems such as project quality problems and uneven quality of practitioners. The establishment of construction quality management and assurance system, construction process quality control and inspection are introduced in detail, hoping to provide some reference for the management of geotechnical engineering.

**Keywords:** Engineering projects; Construction process control; Management

## 1 CHARACTERISTICS OF GEOTECHNICAL ENGINEERING

With the development and progress of my country's engineering technology, geotechnical engineering has also experienced a qualitative leap. Various large-scale and ultra-large-scale geotechnical projects continue to set new records and become the development goals of construction companies.

Therefore, how to ensure project quality during the construction process, control construction costs at the same time, and strengthen the training of project management teams have become issues that every construction company must pay attention to.

The construction of geotechnical engineering is characterized by uncertainty, regional diversity and concealment. During the construction process, it will not only be affected by external conditions such as weather and government supervision, but also the rock and soil layers will be disturbed during the construction process, resulting in changes in the rock and soil properties and stress structures, which will lead to many emergencies such as collapse, sudden surge, etc.

Therefore, even if relatively complete geological survey data are obtained before construction, it is impossible to fully predict all risks that may occur during the construction process. This uncertainty places higher demands on the quality of construction personnel and at the same time limits the construction period and the preparation of construction plans. Our country has a vast territory and diverse geological conditions, resulting in great differences in the properties of rock and soil in various regions. For example, there are great differences between inland areas and coastal areas. It is necessary to focus on various aspects such as collapsible loess, bedrock, and soft foundation types of formations.

The concealment of geotechnical engineering construction is mainly reflected in the construction of concealed projects such as underground continuous walls and foundation anti-seepage treatment. It is precisely because they are hidden underground that they virtually increase the difficulty of construction. Secondly, during the construction process, various emergencies often occur due to stratum reasons, and relevant emergency measures can only be formulated based on the actual situation during the construction process.

## 2 SOME PROBLEMS IN GEOTECHNICAL ENGINEERING

### 2.1 Prominent Construction Safety Issues

There are generally many safety hazards in geotechnical engineering itself, coupled with the various adverse effects on the project caused by natural disasters such as typhoons, heavy rains, and flash floods, resulting in a high rate of safety accidents in geotechnical engineering. This puts forward higher requirements for project construction. If effective measures cannot be taken in time to prevent safety accidents, project safety will not be guaranteed.

### 2.2 Unreasonable Subcontracting System

Due to various reasons such as lax contract management and economic profits, a project often has multiple layers of subcontracting, forming a series or onion subcontract structure, resulting in various management instructions from the general contractor being unable to be communicated in a timely manner to the work team, seriously affecting the quality and safety of the project.

### 2.3 Chaos in Project Management

Project management is mainly reflected in the project construction process. According to the construction plan prepared by the project, the management personnel conduct all-round, whole-process and full-person management of the project

construction. Many quality and safety accidents currently occurring in projects are ultimately caused by chaotic project management. If the project management of the project does not have a sound management organization structure, managers with corresponding qualifications, and a complete management system, it is impossible to successfully achieve the various management objectives of the project.

## **2.4 Irregular Project Bidding**

According to relevant national laws and regulations, all engineering projects need to complete the bidding work through public bidding. However, in actual operation, many engineering projects cannot be carried out in full compliance with legal procedures.

Bid-rigging, bid-rigging, malicious low-price bidding, etc. occur from time to time, which not only affects the quality and safety of the project, but also prevents companies in the industry from achieving "survival of the fittest" and seriously affects the order of the construction market.

## **3 MANAGEMENT OF GEOTECHNICAL ENGINEERING**

### **3.1 Establish a Complete Quality Management System**

Enterprises or organizations must establish a complete quality management system based on the characteristics of various types of geotechnical engineering construction in accordance with national and industry norms and standards to ensure that the construction meets various requirements for project quality.

(1) In terms of project management organization, it is necessary to establish a project quality management system at three levels: project decision-making level, project management and operation team, so as to ensure the realization of project quality objectives in terms of organizational structure. The setup of each department of the project organization must be scientific and reasonable to avoid a vacuum between the work of each part and lay a good foundation for the effective operation of the quality management system.

(2) In terms of quality management personnel allocation, since the project manager is the first person responsible for project quality management, he must hold a practice certificate issued by the state and have high overall quality. This includes two aspects: construction technology and management. Deficiencies in either aspect may lead to a disconnect between technology and management during the construction process. Engineering and technical personnel work directly on the front line, and their professional abilities and qualities directly affect the quality of the project. Therefore, professional skills training needs to be carried out according to each person's position, and a certificate will be issued after passing the examination, so that everyone can work with a certificate to ensure the quality of the project.

(3) The project must establish a complete quality management system, including a technical disclosure system, a job responsibility system, a three-inspection quality inspection system, a weekly meeting system, and a reasonable reward and punishment system. Strengthen quality control on construction sites through a multi-faceted and multi-angle management system. Detailed and strict regulations should be made for all types of quality data, and all types of original records should be true, clear, and accurate. Continuously improve the operability of quality management documents through the PDCA cycle at work.

### **3.2 Process Control of Quality Management**

On the basis of establishing a complete quality management system, construction companies must continuously verify the operating status and effectiveness of the quality management system; and effective quality management requires a series of effective controls from the beginning of bidding to project completion.

#### **3.2.1 Bidding stage**

Before signing a contract, the contract should be reviewed and effective communication channels should be established with the owner on matters related to the contract to ensure that contract information is accurately communicated to the relevant functional departments of the company in a timely manner. In addition, during the geotechnical engineering construction process, there may be adjustments to the construction plan due to design changes, poor geological conditions, etc. Therefore, during the bidding stage, the bidding documents should be carefully studied, the surrounding environment of the project should be investigated in detail, and various factors should be fully considered. The impact of various risk factors on project quality, through the comparison and selection of multiple technical solutions, the construction plan is finally determined to prepare bidding documents.

#### **3.2.2 Construction stage**

When entering the construction stage, the project should first clarify the project quality management objectives, prepare a project quality management plan based on the characteristics of geotechnical engineering, classify various factors that affect project quality, and form a written record to communicate to each technical personnel.

On this basis, the project technical leader should, under the leadership of the project manager, prepare a detailed construction organization design plan based on the engineering contract, design documents, relevant national and industry standards, and the actual conditions on site. During the construction process, the quality of key parts of the project, hidden projects and key processes should be mainly considered from the allocation of technical solutions, construction equipment, construction personnel and other various resources of the project.

#### **3.2.3 Completion stage**

Due to the vast territory of our country, various places and industries have different standards and requirements for engineering archiving data. This requires that during the completion stage, the sorting and archiving of various completion materials must be completed in strict accordance with the predetermined project standards. At the same time, we will do a good job in finished product protection and project warranty work to ensure smooth acceptance of the project. Finally, construction summaries must be conducted in a timely manner, and experiences and lessons must be continuously summarized from a technical and management perspective, thereby improving the level of technical personnel.

### 3.3 Management of Key and Difficult Points

#### 3.3.1 Strengthen the control of key processes and hidden projects

Controlling the construction quality of key processes and hidden projects is an important link to ensure the quality of the entire project. During the construction process, it should be ensured that it is under control at all times. There are many factors that affect quality, including the performance of construction equipment, the quality of various raw materials and the level of construction personnel. This requires analysis and research on various influencing factors during the construction process, and strict implementation of the three-inspection system to continuously inspect the project quality, so that scientific and effective measures can be taken for timely control and avoid various quality accidents.

#### 3.3.2 Quality control of raw materials

All types of raw materials purchased for the project should be purchased strictly in accordance with the material procurement procedures. All types of materials entering the site should be submitted for inspection and necessary random inspections should be carried out. Their performance must comply with relevant national standards, specifications and engineering design quality requirements. Materials that fail the inspection should be sealed or removed from the site in a timely manner to prevent misuse. At the same time, the storage and labeling of various materials and supplies will be done well to create favorable conditions for subsequent construction.

#### 3.3.3 Technical briefing

Before the official start of the project, project technical personnel need to carefully study and understand the design drawings. Problems found in the drawings should be raised with the design unit during the drawing review process and a written record should be formed.

On the basis of fully understanding the design drawings, before construction, project technical personnel should make detailed technical explanations to each team and form written records based on the prepared construction organization design or work instructions to ensure that everyone in the team can understand clearly Respective operating points. This work has proven to be a very effective method of controlling engineering quality in practice.

#### 3.3.4 Cost control

Project cost control is always an important part of project management, and the quality of cost control directly affects the profitability of the project.

In order to achieve the goals of project cost management, project managers need to do a good job in cost planning, control, accounting, analysis and other tasks of project construction. Through strict contract management, material procurement costs are reduced; scientific and reasonable construction plans are adopted to implement various technical measures and improve the utilization rate of mechanical equipment, thereby accelerating the construction progress and ultimately achieving project cost control goals.

## COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

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