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Safety and Quality Control Management Strategy for Urban Railway Engineering Construction

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Abstract: The safety management of urban railway engineering construction involves many different aspects and a wide scope, playing an important role in guaranteeing the safety of construction projects. Management agencies have more stringent requirements on the quality of railway construction. The overall quality of a construction project should meet the construction requirements before the project can be carried out. In this article, the problems in the actual work of the entire life cycle of safety management are explained, and the lessons and experience pertaining to the safety and quality of urban railway construction projects are discussed. The purpose of this paper is to provide references for the management of urban railway construction.

Keywords: Urban railway; Safety; Quality management

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1. Introduction

China has made great progress in the railway industry, and its economy is growing at a relatively fast pace. The construction of railways has provided a strong momentum for economic development. Therefore, it is necessary to strengthen the safety and quality control of urban railway engineering construction to ensure sound economic development. Urban railway construction projects generally take a long time to complete, the construction scale of these projects is often large, and there are many factors that may affect safety. Moreover, these projects often require large amounts of construction funds and extensive coordination and may also have large social impact. Therefore, although safety management needs to be implemented effectively in such projects, it is not an easy task. With all responsible parties involved, good safety and quality management will play a certain role in promoting risk management and control, project efficiency, the design of high-quality projects, and the continuous reinforcement of project management.

2. Importance of quality management in railway engineering construction

Project quality is defined in accordance with relevant project management standards. It is necessary to ensure that the project standards meet the requirements of the construction industry and to implement the relevant requirements in the construction contract. Engineering construction projects generally concern durability, functionality, and safety, all of which reflect the overall strength of a construction project. An engineering project is considered good when the project complies with the construction regulations and the effect meets the expected purpose of the engineering. In order to manage engineering projects, it is necessary to ensure that the daily construction management is done well, fully grasp all the links and contents in the construction, as well as check the construction details so as to ensure that the quality of the

final engineering project meets the requirements. Railway engineering construction plays a very important role in transportation as a whole and in the development of many industries [1]. It also has a strong correlation with the lives of people. Some construction directors and units responsible for the management of railway engineering projects have relatively weak understanding of legal concepts; they are unaware of the importance of "quality" in engineering construction and rarely carry out construction in strict accordance with the requirements of construction projects. As many operators have low skill levels, the construction method used is often wrong, and in an attempt to save construction materials, some hidden hazards may also arise in the construction; thus, the overall quality of the railway project may not meet the requirements. Therefore, in railway engineering construction projects, it is necessary to continuously strengthen the management of engineering projects, promote the overall quality of the construction, and ensure that the management level and effect are up to a certain standard. These are some of the key tasks in the field of railway construction [2].

3. Problems existing in the safety and quality management of urban railway engineering construction

3.1. Lack of professional management personnel and insufficient project management experience

In order to ensure the safety of construction projects, the personnel responsible for project safety management are the crux, and the personnel responsible for project quality management should have solid professional skills and the ability to utilize the strength of employees so as to improve the safety of urban railway construction. Often, many municipal railway construction projects are carried out simultaneously in cities; however, due to insufficient experienced construction units, investment units, and supervisory units in railway construction, those who are involved in safety management at the project site are generally younger in age, which may affect the overall level of safety management [3].

3.2. Insufficient risk assessment in the survey and design stage

Urban railway projects are linear projects. The geological conditions along these projects are relatively complex; the underground and above-ground pipelines are vertical and horizontal. There are also many factors that affect the construction quality of a project. However, in the survey and design stage, there may be situations where the assessment of risks and hidden dangers is not carried out thoroughly and the investigation and design work lack theoretical depth [4]. Certain safety hazards have been buried, and the number of construction accidents caused by this is relatively large.

3.3. Bidding over management and insufficient resource allocation

Urban railway projects are closely related to people's livelihood, and governments tend to invest a large sum of money into these projects. Generally, construction projects can be divided into sections and majors with different types of construction commencing at the same time. Many units participate in these constructions; the general construction unit attaches great importance to a project during the bidding stage but often abandons the project after winning the bid. In specific engineering practice, many project leaders who are responsible for bidding do not visit the site personally, and the initial personnel involved is often replaced in the later stage. There are still many problems, such as the ill-timed allocation of manpower and construction resources required in engineering construction projects.

3.4. Flawed management system and insufficient on-site supervision

Other problems include the flawed system in urban railway construction projects. Incomplete systems related to railway engineering construction will affect the construction quality of engineering projects and will also have an impact on costs, which is not conducive to the management of employees. The project supervision unit is a unit that exercises supervision and management on behalf of the construction unit.

However, due to the joint influence of many factors, its role in project supervision cannot be fully exerted. Many supervisors have a weak sense of responsibility and are unable to perform their duties well, resulting in insufficient supervision of inspections, side stations, and other works [5]. At the project construction site, it is impossible to dynamically understand the actual project, resulting in many quality problems and potential safety hazards at the project construction site.

4. Safety and quality management strategies for urban railway engineering construction

4.1. Compliance with laws and regulations, planning ahead, and reducing risks

The purpose of implementing urban railway construction projects is to promote more convenient urban transportation. Therefore, the safety and quality management of projects should be integrated with the concept of life-cycle management, focusing on problem governance, controlling problems from the source, and preventing them in advance. Construction units should strengthen the management of engineering projects, encapsulate the experience of previous engineering projects, determine the possible risks and hidden dangers in advance, as well as formulate a reasonable safety management system for engineering projects. They must be able to conduct detailed research, openly listen to the opinions of experts in the industry, and carry out detailed discussions so as to formulate suitable project bidding plans and ensure the safety of such projects [6]. Managers should also carry out a detailed decomposition of hidden risks, rationally allocate resources, strengthen the risk response, formulate reward and punishment management methods and reflect them in bidding documents, standardize the construction-related behavior of other participating units, and clarify their responsibilities in ensuring the quality and safety in engineering construction projects so as to prevent a breach in contract, which would affect the quality of engineering projects.

4.2. Focusing on training and improving quality

The key to urban railway engineering construction safety and quality management is reflected in the construction unit. The construction unit has good safety management skills; its management strength and measures are substantial, focusing on a deeper level of management. Through organizational research and analysis of construction projects, it is possible to grasp the construction details in advance, determine the safety and quality risks, formulate management plans for safety management work, as well as determine the staffing and assessment plans. The involvement of relevant departments and personnel in the completion of a project will also affect its safety management level, thereby affecting the quality of the construction project and its future operating capabilities [7]. Since most of the personnel involved in safety management are relatively young and lack experience in project management, experts and scholars with rich engineering experience in the industry should be invited to conduct training for these personnel. Young safety management personnel should be assisted so that they can broaden their working knowledge, strengthen their engineering practice, and improve their skills as management personnel. In that way, the management of engineering projects can be strengthened.

4.3. Paying equal attention to risk control and hidden danger investigation and treatment and reinforcing the review of construction plans

A third-party safety and quality risk consulting unit can be introduced to supervise and regulate the entire project. A safety risk assessment report should also be written. This report is the evidence that best reflects the responsibilities of all parties participating in the construction in terms of safety management. It is necessary to reinforce the analysis of safety and quality risks and the formulation of relevant risk response measures, improve prior management, focus on strengthening safety supervision at key locations and of key construction procedures, carry out exclusive reviews on safety requirements in geological survey

reports and design documents, optimize the safety construction plan, establish a construction safety and quality management plan, reinforce the construction of an emergency command system, establish a safety and quality risk management system through "Internet +" and "Internet of Things + technology," fully implement visualization and informatization inspection, as well as strengthen the intelligent safety supervision at construction sites so as to ensure that the results can be strictly assessed and accessed electronically and the relevant data can be automatically analyzed. Through this, the hidden danger investigation and management work can be carried out comprehensively [8]. Differentiated and targeted governance should also be implemented in the management of hidden dangers in order to ensure a closed-loop management of hidden danger investigations and strengthen the quality of construction projects.

The act of reviewing the construction plan of urban railway construction projects plays a very important role in improving the project quality. Therefore, construction units must ensure that the reviews are done well, and other qualified units can be entrusted to help them complete the reviews. Construction units should carry out the review work in strict accordance with the requirements and check the railway construction project plans more often to prevent other construction problems from occurring in the later stage due to unreasonable plans. In order to ensure that project construction plans are reviewed or approved and prevent the issue of rash construction caused by incomplete and strict review systems from occurring, it is necessary to strengthen the review of construction plans. Errors in construction should be rectified in a timely manner. If there are design problems in the overall structure of the railway or there are certain functions that need to be rectified, the design unit should resubmit the design plan for review. Any plan that has not been reviewed or approved cannot be used in railway construction projects [9]. When rectifying the design plan, it is necessary to ensure the rationality and scientificity of the design plan so as to warrant good construction results.

4.4. Coordinating risk prevention and risk control through self-inspection with the help of an expert team

The construction unit is the main unit in the construction of a project. The quality of the construction unit plays a huge role in determining the end quality of the construction project. Therefore, when carrying out a railway construction project, it is necessary to ensure that the construction unit understands its own responsibilities and continues to carry out self-inspection to ensure that the construction work progresses smoothly. At the same time, the construction unit can divide the construction work according to the scope of work that the construction personnel are responsible for, from the front-line construction personnel to the management personnel, so as to ensure mutual supervision among personnel and thus improve the quality of the construction project. The construction unit can also strive to achieve effective communication with the supervision unit, assist the supervision unit in monitoring the project, and ensure that all small details in the project are controlled. Beginning from the most basic problem, staff at every level should review one's own behavior so as to ensure that the quality of railway engineering projects meets the requirements [10].

The construction unit can also seek help from universities, research institutes, third-party consulting service organizations, and experienced experts; carry out open recruitment; and set up an expert team so as to ensure the safety of construction projects and promote risk management and control. Experts need to carry out on-site inspections during the construction process or organize seminars that focus on reviewing problems, address the problems encountered in construction projects, write up inspection and consultation reports, ensure effective risk prevention and control in construction projects, and gradually improve the safety and quality management level.

4.5. Forming multi-level linkage to create joint forces and prevent risks

The main features of railway projects are long construction lines and many construction links. The above reasons make it impossible to carry out centralized control and management during railway construction projects. The construction unit must ensure that the management role of relevant institutions can be availed, while ensuring that these institutions have sufficient room for development and mobilizing the enthusiasm of the supervisory personnel. In the construction phase, the different regulatory departments must understand their scope of work, build an information management and transmission system, and link the departments involved to achieve efficient information transmission. In order to reinforce construction supervision, we must strengthen source management. The construction unit should rely on the management of government departments based on the various norms of the construction industry, actively explore the means to establish a management system, which includes performance credit evaluation and point evaluation warning, and discuss with the person-in-charge. It is necessary to integrate the market, enterprise, project, and site management and form linkage between the upper and lower levels in order to establish an all-round and multi-angle safety and quality management system and counter the quality management risks faced in engineering construction projects. Moreover, the supervision unit's safety management content should be introduced into the construction unit's own safety management structure to form a safety management situation that enables the supervision of the construction and the formation of an alliance to assess and evaluate the work of the construction unit. In that way, it is possible to fully utilize the potential of supervisory units or other supervisory consulting service units.

5. Conclusion

There are various reasons affecting the safety of urban railway projects. In safety management, the actual situation and the principle of dynamic management must be considered, and the safety-related responsibilities of government supervision agencies and other participating units should be effectively carried out. Engineering enterprises need to take into account of the entire life cycle of construction projects to address certain problems, improve the safety management level of engineering construction, sum up the various experiences in practice, and provide sufficient references for future railway engineering construction.

Disclosure statement

The author declares no conflict of interest.

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