

Analysis of Highway Project Construction Technology Management

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Abstract: Highway engineering construction plays a pivotal role in driving urban economic development, in the face of modern urban transportation high-quality development. To achieve high-quality development in modern urban transportation, it is imperative to engage in effective management practices. This article analyzes the technology involved in highway engineering construction, delving into key aspects of highway construction technology, and examining measures for managing and controlling highway engineering construction technology effectively.

Keywords: Highway engineering; Construction technology; Technology management; Construction control

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1. Introduction

Highways are one of the crucial infrastructures in urban development, and their construction is not only related to the image and development of the city but also the travel and life of the citizens. However, various technical and quality problems are often encountered in highway construction, such as delayed construction progress, poor engineering quality, and safety accidents, which directly affect the service life and safety of the highway and also the sustainable development of the city.

2. The concept of highway construction technology

Highway construction technology encompasses the use of modern engineering methods and equipment in urban infrastructure construction. It involves working with key materials such as reinforced concrete, steel structures, prestressed concrete, and others. The application of advanced techniques and equipment is central to the successful implementation of highway construction projects. Highway construction technology has gone through many stages along with urbanization, from manual construction in the early days to mechanized construction, to now digital construction and intelligent construction. The continuous evolution of new materials, technologies, and information technology has propelled the development of highway construction technology. This progress has resulted in more reliable, efficient, and cost-effective construction methods.

Despite the current state of digital, intelligent, and efficient highway construction technology, ongoing exploration and research are essential, so as to adapt to the rapid development of urbanization and the future needs of highway construction.

3. Highway engineering construction technology

3.1. Roadbed construction technology

The quality of highway engineering construction is directly affected by the roadbed construction technology used. Therefore, in order to ensure the quality of highway engineering construction, relevant personnel should utilize roadbed construction technology wisely. In the actual construction process, it is essential to conduct preliminary base cleaning and organizational operations in accordance with construction requirements. This includes the removal of tree roots, debris, and surface soil. Subsequently, compaction treatment should be administered, and flatness checks should be conducted to ensure compliance with the established standards. The embankment base construction should be carried out according to relevant requirements. If the base construction is affected by groundwater, measures like interception and diversion should be employed to ensure the smooth progress of highway construction. Drainage points should be set up outside the basement, and anti-seepage reinforcement measures should be taken according to the site conditions to ensure that the construction is not affected by groundwater. If the highway project involves the widening or the renovation of the old embankment, it is imperative to conduct excavation in a step-by-step manner, adhering to the slope of the old embankment and inwardly inclining. Additionally, the selection of materials with robust water permeability is crucial to enhance construction quality control.

3.2. Pavement construction technology

Road pavement base treatment is a key step to ensure the smoothness and stability of the pavement. During road pavement base treatment, it is essential to remove debris and water from the road surface, leveling the road surface to ensure that its smoothness and roughness align with the requirements stipulated by relevant standards and specifications. Besides, the defects and broken parts in the pavement base should be repaired. Secondly, the choice of pavement materials is also an important factor in ensuring the quality of the pavement as it affects the durability and skid resistance of the pavement. Factors like durability, skid resistance, crack resistance, skid resistance, and other characteristics should be considered in the selection of materials with the requirements of the relevant while complying with relevant standards and specifications. The pavement material must be uniformly and densely laid to ensure that the road surface's smoothness meets the specified standards and specifications. After laying the pavement materials, compaction is essential. The compaction process should be tailored to the characteristics of the pavement material and construction environment, utilizing various compaction equipment and methods, such as vibratory rollers, wheel rollers, static rollers, etc. The final step involves pavement marking. Road markings and signs play a crucial role in ensuring driving safety, and they should be installed in accordance with relevant standards and specifications. The markings and signs should be clearly set, feature bright colors, adopt standardized fonts, and align with relevant standards.

3.3. Prestressed concrete construction technology

Prestressed concrete is concrete that is strengthened through prestressing. Prestressed concrete is crack-, bending-, and earthquake resistant. It is widely used in highway construction in the form of prestressed concrete beams, slabs, columns, piers, and box girders, with remarkable results. The application of prestressed concrete can not only improve the bearing capacity and safety performance of the highway, but also reduce construction

costs, shorten the construction period, and reduce maintenance costs. Its application in highways has evolved into a distinct technical discipline encompassing materials, structure, design, construction, and other domains, resulting in the formulation of its theoretical framework and practical expertise. However, there are still some problems in the application of prestressed concrete on highways, such as the lack of unified design standards and construction specifications, project quality supervision, etc.

3.4. Drainage construction technology

The drainage facilities should not be neglected in the process of urban highway construction. Poor drainage on highways can lead to significant safety issues in transportation and severe damage to the lifespan of the highway project, resulting in various engineering defects. Hence, it is essential to construct a drainage system along with the implementation of highway projects to prevent flood issues on the road. Highway drainage engineering construction primarily encompasses pipeline construction tasks, comprising highway drainage line design, pipe trench excavation, and backfilling. Given that highway drainage projects are typically situated beneath urban highways, adjustments or changes post-construction are challenging. Therefore, it is necessary to carefully design the drainage system prior to the project construction to ensure the rationality of the design and the smooth implementation of the pipeline construction.

4. Highway engineering construction technology management and control strategies

4.1. Strengthening the competency of construction personnel to improve the quality of management

To ensure the technical expertise and competency of construction personnel, construction companies should prioritize hiring individuals with high professional abilities. This measure helps in safeguarding the company's revenue. Nevertheless, specialized training should still be carried out for the internal staff, both management and technical personnel. In supervisory personnel training, emphasis should be placed on cultivating their professional qualities and strengthening their awareness of quality. Technical quality should be a key focus of effective training to cultivate the comprehensive qualities of quality supervision personnel. Secondly, enterprises can establish a reward-penalty to boost the enthusiasm and initiative of staff. This approach encourages employees to take a more serious approach to every detail of their work, minimizing the probability of problems during construction. Construction units also need to enhance equipment management by continually introducing various types of new equipment and expanding the variety and scale of available equipment. The equipment should also be upgraded regularly to avoid equipment problems, which will affect the quality of the project and construction progress. Moreover, highway construction projects are typically lengthy, with complex construction processes and technical methods, encompassing a substantial amount of work. This complexity is a key factor in the high quality standards set by the relevant departments overseeing highway project construction. Therefore, the construction company must ensure effective control over each construction process, maintaining orderly and smooth project operations. Only through meticulous control and coordination can the overall construction quality of the project meet the high standards and requirements.

4.2. Improving construction quality management

Construction units must strictly adhere to established standards and establish a systematic and comprehensive highway construction quality management system. Effective communication and cooperation among relevant construction departments, technical departments, and other involved parties is also important. By doing so,

personnel responsible for different departments clearly understand their roles and responsibilities, fostering a sense of accountability for the implementation of tasks in all aspects of construction. It is crucial to implement stringent cost control measures across all aspects of the project to minimize construction costs effectively. Besides, strict supervision of the quality of construction materials and equipment and adherence to national standards and industry norms are also important. Moreover, a comprehensive and systematic review of the quality of raw materials is essential to ensure that the highway construction aligns with the required quality standards. It is imperative to rigorously implement systematic acceptance and assessment procedures throughout the entire construction process, ensuring that the project is managed effectively. This involves utilizing sufficient authority within the system to oversee and evaluate the construction activities until the project is completed. Furthermore, it is crucial to address the loading concerns in highway projects diligently. This involves preventing stress reduction that may compromise the stability, durability, and safety of the highway. Implementing a systematic and comprehensive procurement system is essential. This includes strengthening the management and supervision of procurement personnel to ensure the quality of procurement and mitigate the risk of backroom operations in the procurement process.

4.3. Research on construction process control methods

The construction process can be made more efficient and cost-effective by adopting an appropriate construction sequence. The construction sequence is influenced by various factors, including construction technology, materials, equipment, and the environment. Different construction conditions require distinct optimization control strategies for the construction sequence. Common control methods include establishing the relationship between main and auxiliary processes, defining the construction cycle, determining the number and configuration of construction teams, and establishing the construction schedule and milestones. Continuous optimization and adjustment of the construction sequence are necessary during the construction process to align with actual progress and environmental changes. By optimizing the construction sequence, the construction efficiency and quality can be enhanced, the construction costs can be minimized, and the construction resources can be allocated appropriately. In addition, in the actual construction process, the use of new technologies and new materials can effectively improve construction efficiency and quality and reduce construction costs. It is important to be innovative in terms of construction technology and construction materials. The innovation of construction technology can be realized by optimizing the process, improving equipment and tools, adopting new construction methods, etc. For example, the use of prefabricated assembly components, robot construction, 3D printing, and other new technologies can greatly improve construction efficiency and quality. Innovation in construction materials can be realized through the development of new materials, improvement of traditional materials, etc. For example, the use of high-performance concrete, high-strength steel, and new anti-corrosion coatings can improve structural strength and durability and reduce maintenance costs.

5. Conclusion

In summary, urban roads as an important part of municipal engineering. Rigorous management and the judicious application of pertinent construction technology play a crucial role in enhancing the quality of road construction. This approach ensures the success of municipal engineering planning, the establishment of a robust management system, and the refinement of construction personnel's professionalism. By optimizing the control of construction technology, these measures contribute to the comprehensive development of the urban transportation industry, fostering improved outcomes in terms of construction quality and urban infrastructure.

Disclosure statement

The author declares no conflict of interest.

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