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Common quality problems and countermeasures in road construction technology

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Abstract: *With the steady development of economy and society, significant achievements have been made in the construction of supporting infrastructure in recent years. As one of the most important infrastructure, the construction of roads is also increasing, which plays a very important role in promoting regional economic development and improving the lives of residents. However, during road construction, many quality issues have gradually emerged, causing widespread concern in society. Based on this, this article will focus on in-depth summary and analysis of common problems in road construction quality management, and propose targeted construction quality management countermeasures, hoping to provide effective reference and suggestions for road construction.*

Keywords: *Road construction; Construction technology; Problems; Countermeasure*

1. Introduction

Roads are of great significance for regional development and residents' lives, and the government has always attached great importance to them. In recent years, various regions have invested a large amount of resources in road construction, and have achieved significant achievements. However, with the continuous expansion of construction scale and acceleration of construction speed, some problems in road construction quality management are gradually emerging. Highway construction itself has the characteristics of high comprehensiveness and complexity, coupled with its own characteristics and difficulties, which also makes it easy to encounter construction quality management problems during the construction process [1]. How to effectively overcome difficulties and do a good job in construction quality management is a problem that must be highly valued in road construction.

2. Characteristics of roads

The so-called roads include primary and secondary roads in cities, roads from counties to towns and villages, and highways (as shown in Figure 1). Some roads are relatively far away from national and provincial highways, with a wide distribution area. The geographical environment along the line is complex and diverse, and the amount of work during the construction process is small, mainly in the form of simple highways. The prominent characteristics of township roads are mainly reflected in the following aspects. First, the geographical conditions are poor. During the construction process, roads are greatly constrained by natural conditions such as topography and landforms, and because they connect various towns and villages, not only are there many curves on the roads, but also many roads are quite steep, and the road drainage facilities are often not perfect, so it is easy to encounter the problem of insufficient road drainage capacity [2]. The second is the lack of safety facilities. For highways, safety facilities play a very important role as an important guarantee of traffic safety. However, many roads have insufficient safety facilities, especially the lack of subgrade protection facilities and road traffic service facilities, which also leads to certain safety hazards on roads to a certain extent. The third is the low level of road technology [3]. Due to relatively small traffic volume on township roads and financial constraints, rural roads are of low grade, many of which are Class III, Class IV, or even simple highways, so the technical requirements for road construction are relatively low. Due to the high design and construction standards of highways, quality control is often better. Urban roads need to handle the coordination of municipal supporting projects along the way.

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Figure 1: Road Construction

3. The significance of road construction quality management

3.1 Helping to control costs

Due to the relatively fixed budget funds for road construction, it is even more necessary to give full play to the value of funds and spend every penny on the cutting edge. Good construction quality management is a very important aspect of cost control. During the construction process, in strict accordance with the relevant requirements of road design and construction, combined with the actual situation of the construction site, using appropriate construction techniques to fully guarantee the construction quality can effectively avoid rework caused by construction quality issues, thereby reducing the cost of road construction and ensuring the comprehensive benefits of the road. Moreover, good construction quality management can not only effectively control highway construction costs, but also be very important for reducing highway maintenance costs. After putting into use, roads that meet quality requirements will have fewer problems and lower costs for road maintenance and repair. Therefore, good construction quality management is an important means of controlling costs.

3.2 Helping to ensure construction progress

The time required for road construction is relatively long, and there are usually strict construction period requirements. In order to ensure the timely completion of the project, the construction unit usually formulates a strict construction schedule. The key to ensuring the effective implementation of the construction schedule is to properly manage the quality during the construction process, ensure that each link of the construction meets the quality requirements, and through strict construction quality supervision, promptly identify and solve potential problems. Once the quality control is inadequate during the construction process, the occurrence of quality problems will inevitably delay the construction period, which will lead to damage to the benefits of the entire project.

3.3 Helping to extend the service life of highways

Roads have a very important impact on regional economic development. In recent years, China has vigorously constructed roads, laying a solid foundation for regional economic revitalization and creation. If transportation is the artery of the economy, then roads are indispensable capillaries for social development. Quality management in road construction and ensuring that the quality of the road meets relevant standards are prerequisites for ensuring the life of the road [4-5]. Highway construction is not a project that can be adjusted at any time anywhere, and will be used for a long time after completion. Only in quality management, by selecting qualified construction materials, using reliable construction techniques, supplemented by a sound quality management model, and strictly implementing quality

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standards, can a long-term highway project be truly built.

4. Common problems in road construction quality management

4.1 Poor quality awareness of management personnel

Roads are relatively small in scale, with small quantities, and relatively small social impact. This also leads to insufficient attention paid by highway construction units to a certain extent. This lack of attention is mainly reflected in the quality management of highway construction. Due to the insufficient attention paid by relevant units, construction managers often pay more attention to construction costs and project duration during the road construction process. Because cost directly determines the benefits of highway engineering, once the construction period is delayed, it is easy to identify, and it is more likely to suffer losses. Relatively speaking, highway quality issues are not so easy to detect and identify, especially many potential hazards that must be invested before they become apparent. Therefore, in road construction, it is easy to blindly pursue the construction period, while excessively compressing costs, while ignoring or even disregarding quality [6].

4.2 Poor quality of construction design scheme

Before construction of highway engineering, a scientific construction design scheme should be formulated, which is a fundamental document guiding construction. The quality of the design directly determines the construction quality. However, in road construction, it often occurs that the construction design scheme is not scientific, and even some road construction projects do not have a complete construction design scheme at all. The quality of the construction design scheme cannot be guaranteed, which means that there is a lack of scientific basis during the construction process, resulting in unreasonable application of technology during the construction process, frequent engineering changes, and strong randomness in construction. These can become important reasons for construction quality issues [7]. In addition, a good construction design plan requires comprehensive investigation and analysis of the construction site, especially due to the complex geographical conditions of the roads. Effective investigation is also needed to ensure the scientificity and rationality of the construction design plan. However, during construction, on-site investigation often cannot be fully guaranteed, which is also an important reason for the poor quality of the construction design plan.

4.3 Nonconforming construction materials

Construction materials are the material foundation of highway construction. Only by first ensuring that construction materials meet quality requirements can it be possible to build highway projects that meet quality standards. However, in road construction, unqualified materials often occur, which is also an important reason for affecting construction quality management. When selecting and purchasing construction materials, some construction units blindly focus on cost factors to ensure construction efficiency, selecting the lowest cost materials, and even selecting some materials with significantly substandard quality, resulting in potential highway quality hazards. Or the lack of effective monitoring of material quality during construction leads to some unqualified materials being used for construction. In addition, the relatively poor natural conditions of road construction can easily lead to deterioration of materials during storage, which cannot meet the project quality requirements, but they are still used for construction. Therefore, to do a good job in construction quality management, it is necessary to do a good job in material quality management.

4.4 Inadequate construction preparation

Adequate preparation before construction is the foundation and prerequisite for ensuring smooth construction, as well as an important condition for ensuring construction quality. In road construction, although the construction party basically has a preliminary understanding of the project before starting construction, there are often many omissions in related preparations. Some construction units believe that the road requirements are low and the impact is small, so they do not pay enough attention to such projects. They often make careless preparations in the early stage, lack sufficient understanding of the construction site, and do not conduct a detailed evaluation of the equipment and technology required for construction. This also leads to the discovery of insufficient preparation once the construction starts, or the possibility of encountering various unexpected situations, which may lead to construction delays or

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even stoppages, causing significant losses, or the construction unit may adopt alternative methods for construction, thereby laying hidden dangers for the quality of highway construction.

4.5 Incomplete quality management system

The quality management of highway engineering construction needs to establish a complete system, which is the fundamental guarantee for good quality management. However, according to the actual situation of many road construction projects, there is no scientific quality management system. No complete quality control standards and systems have been established for highway quality, no dedicated quality management personnel have been set up, and no responsibility mechanism for quality control has been established. This also leads to a lack of scientific mechanisms for road construction quality management. Although there are supervision units and relevant competent departments to supervise the project quality, due to manpower constraints, it is difficult for project supervisors to effectively supervise all quality issues in road construction, and the relevant competent units are often beyond their reach. Therefore, the imperfect quality management system is an important reason that affects road quality management.

5. Countermeasures for road construction quality management

5.1 Strengthen the importance of quality

In order to truly do a good job in road construction quality management, we must first attach great importance to highway quality ideologically. Firstly, when selecting a construction unit, it is important to propose clear quality standards as an important content of subsequent acceptance and payment. During the construction process, relevant competent units should earnestly fulfill their responsibilities, play a regulatory role, and maintain supervision over the quality of highway construction. Construction management personnel should focus on quality as the key point of construction management, clarify the quality standards and requirements during the construction process, and set up a dedicated quality management responsible person. Strengthen the publicity of quality awareness for construction personnel, conduct special quality training before construction, improve the importance of construction personnel on quality, and fully implement the awareness and concept of quality management into actual construction.

5.2 Prepare construction design scheme

The construction unit undertaking road construction must attach great importance to the production of construction design schemes. On the one hand, before preparing a construction design plan, it is necessary to conduct a comprehensive survey of the construction route and construction site, understand the geographical environment and geological conditions along the highway, formulate reasonable countermeasures for possible difficulties and problems during construction, and ensure the pertinence and completeness of the construction organization plan. On the other hand, when preparing a construction design plan, it is necessary to refine the construction content as much as possible, clarify the technical points and difficulties of each construction section, clarify the construction quality requirements, especially pay attention to the reasonable connection between each section, and ensure that the construction design plan can provide a reliable basis for construction management.

5.3 Strictly control the quality of construction materials

For the construction materials used in road construction, it is important to do a good job in quality control. Firstly, when selecting materials, it is necessary to strictly follow the road construction specifications, select corresponding materials, and select materials provided by reputable and powerful manufacturers to ensure that the quality and specifications of materials meet the construction requirements. Secondly, before materials enter the construction site, scientific quality monitoring must be conducted, and materials must be subject to sampling or full inspection in strict accordance with relevant monitoring standards. Materials that do not meet the quality requirements should be returned, and unqualified materials must not be allowed to enter the construction area. Once again, it is necessary to properly manage materials on the construction site. Materials entering the construction area should be properly stored to avoid damage to the quality of materials due to poor management, or the occurrence of useless or mixed use during the use process. Ensure that the materials used for construction are all

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materials with specified quality, thereby laying a good material foundation for ensuring the quality of the highway.

5.4 Properly prepare for construction

Before road construction, it is necessary to properly prepare for construction. Good preparation is a prerequisite for ensuring smooth construction. Firstly, it is necessary to effectively investigate the construction site, understand the actual situation of the construction site, including the geological conditions along the line, the climatic conditions during construction, material transportation routes, etc., and formulate a reasonable construction plan based on the construction content. Secondly, it is necessary to effectively review the design drawings, and propose modifications to the contents of the design that are inconsistent with reality as soon as possible to avoid any impact on the construction. Thirdly, it is necessary to effectively conduct technical disclosure, continue to clearly explain the difficulties and key points in construction to the construction personnel, and propose effective countermeasures to ensure that there are no problems in the construction process and construction quality. Finally, it is necessary to ensure the rationality of construction equipment and personnel investment, and provide sufficient guarantee for construction.

5.5 Establish a sound quality management system

Firstly, it is necessary to establish a clear quality management responsibility mechanism, and find specific responsible persons for the construction content in various regions, sections, and links during construction. Ensure that the responsible persons are clear about their own quality responsibilities and understand the quality requirements for the construction content they are responsible for. Secondly, it is necessary to establish a reward and punishment mechanism that provides a quality management responsibility mechanism. The relevant responsible person for quality problems should be punished in accordance with relevant regulations, and those with excellent construction quality should be rewarded accordingly. Thirdly, it is necessary to establish a sound quality inspection mechanism. Set up special quality inspection personnel to be responsible for quality inspection of the construction content during the construction process, and require relevant responsible persons to promptly correct any quality problems found. In addition, it is necessary to give full play to the quality supervision function of the supervision unit and comprehensively supervise the construction quality.

6. Summary

To sum up, roads are of great significance for regional development, so it is necessary to do a good job in quality management. This requires high ideological attention, while formulating scientific and reasonable construction design schemes, strictly controlling the quality of materials, properly preparing for construction, and establishing a sound quality management system to truly and effectively ensure road quality.

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