

# Site Management Strategy in Highway Project Management

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**Abstract:** Highway project management involves overseeing the on-site construction of a highway project, taking into account the specific circumstances and conditions of the site. This type of management requires a high level of expertise and is characterized by its dynamic and systematic approach. Effective on-site management can ensure the quality, cost-saving, smooth progress, and safety of highway construction. However, there are still some problems in the implementation of site management in some highway projects, which seriously affect the improvement of site management. This paper analyzes the characteristics and existing problems of highway engineering management, and puts forward the effective strategies of site management, hoping that this study will help to improve highway engineering site management.

**Keywords:** Highway engineering; Characteristics; Problems; Site management

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## 1. Introduction

In recent years, in the context of rapid economic development and rapid improvement of living standards, the demand for road transportation has been increasing. Highway engineering carries a large amount of road transportation every day, in order to ensure that people's demand for road transportation can be well satisfied, it is necessary to ensure the quality and safety of highway engineering construction<sup>[1]</sup>. The effective development of site management in highway project management can ensure that the highway project can be completed safely within the specified time limit with quality and quantity

## 2. Characteristics of highway engineering site management

Highway engineering site management is specialized, dynamic, and systematic. In the context of rapid social and economic development, the number of highway projects has increased significantly and the scale has expanded significantly. The requirements for professional skills, safety, and quality have also increased. This requires site managers to be knowledgeable in terms of management and relevant skills<sup>[2]</sup>. Thus, it can be seen that the site management of highway engineering is a work with strong professionalism. Secondly, highway

engineering construction is constantly evolving making highway management a dynamic process. For example, with the continuous progress of highway engineering construction, not only the construction environment is changing, but also the equipment and personnel, so the site management also needs to be dynamically adjusted, to ensure safe and high-quality highway engineering<sup>[3]</sup>. Thirdly, highway engineering management should also be systematic as it involves large quantities of work. In site management, managers need to coordinate construction materials, machinery, and personnel to prevent conflicting situations in the construction process and ensure the orderly progress of the project<sup>[4]</sup>.

### **3. Problems existing in highway project site management**

#### **(1) Lack of safety awareness**

Some construction companies lack safety awareness, resulting in many hidden safety risks during the construction of projects. These risks may lead to large economic losses or even casualties<sup>[5]</sup>. Studies show that most highway engineering safety accidents are traceable, and one of the fundamental causes of these accidents is the lack of safety awareness and management. In fact, these accidents can often be avoided. Accidents occur frequently because construction companies do not emphasize safety management and regulating staff behavior.

#### **(2) Lack of clear division of responsibilities among personnel**

Highway projects typically cover extensive distances, so the construction work is often divided into different segments. These segments can be constructed simultaneously without interfering with each other. However, when construction companies lack clear divisions of site responsibilities, managers may shift blame onto each other, leading to accountability issues. Additionally, each segment might be managed by different site managers who apply varying standards of site management. This inconsistency can result in chaotic and poorly coordinated construction activities.

#### **(3) Problems in quality management of site construction**

Some enterprises choose to cut corners by using cheaper or substandard materials in their projects to maximize profit. In addition, some companies do not supervise the construction process, leading to the late discovery of problems<sup>[7]</sup>. When the highway construction is completed and the project undergoes acceptance inspection, some detailed quality issues may go unnoticed. Consequently, this can result in the highway project becoming a substandard or poorly constructed project.

### **4. Effective strategies for site management**

#### **(1) Emphasizing safety management**

Construction companies should emphasize safety management. Firstly, construction companies should provide comprehensive safety education for their personnel to increase their safety awareness and prevent accidents. Companies should realize that safety accidents will cause delays in construction and lead to huge economic losses. Secondly, it is necessary to formulate a sound site construction safety management system. Implementing a robust site safety management system standardizes procedures and clarifies safety standards, preventing accidents. Thirdly, the management should supervise the entire construction process, monitor the site for risks, and address them promptly. Scientifically dividing the site into safety zones, such as separate construction and dormitory areas, prevents chaos and safety issues. Furthermore, management personnel need to conduct both regular and random inspections of the construction site to accurately identify and address potential safety hazards, formulating practical

prevention plans to mitigate risks at the source. Additionally, strict management of mechanical equipment is essential. This includes conducting trial runs when equipment enters the site to ensure it operates safely and performing regular maintenance thereafter to maintain its safe operational state <sup>[8]</sup>. Through these measures, management can ensure the equipment remains in a consistently safe condition, thereby preventing accidents.

(2) Establishing a sound on-site management mechanism

In highway project site management, it is essential to establish a comprehensive management mechanism tailored to the actual conditions of the construction site and project requirements. This mechanism should standardize management practices and fully integrate them into the construction process to ensure high-efficiency and high-quality project completion. Key steps include clarifying the responsibilities of managers for each construction phase, defining the main tasks and procedures of site management, and setting clear, unified standards for on-site management to guide managers in their duties. Additionally, a robust assessment mechanism should be developed, outlining various indicators and processes for evaluating site management. This mechanism should include both regular and random assessments to ensure comprehensive and effective evaluations, avoiding biased results and enhancing overall management effectiveness <sup>[9]</sup>. To ensure the fairness of the assessment results, it is crucial to announce the results after each assessment and allow personnel to raise any objections directly. Reassessments should be conducted if necessary. Additionally, an incentive mechanism should be established alongside the assessment mechanism. Different incentives and penalties should be assigned based on assessment scores to further motivate site management personnel. Furthermore, establishing a reward-penalty system will significantly enhance the enthusiasm and commitment of the management team, leading to better overall site management.

(3) Strengthening construction quality management

Management personnel should rigorously enforce quality management according to established standards to achieve the project's quality objectives. Firstly, clear standards for the construction quality of each phase of highway engineering should be established. This not only standardizes the actions of construction personnel but also provides a solid foundation for quality management, enhancing its credibility. Secondly, managers must recognize that the quality of construction materials and technical standards are critical factors affecting overall quality. Therefore, it is essential to thoroughly inspect all construction materials entering the site to ensure they meet the required standards for quality, specifications, and performance. Regular spot checks should also be conducted on materials already on-site, and strict protocols for their storage should be implemented to prevent quality degradation due to improper handling. Finally, after completing each phase of construction, management personnel should conduct stringent quality inspections to ensure compliance with quality standards before proceeding to the next phase. Conducting quality inspections only after the entire project is completed makes it difficult to identify and rectify earlier issues, potentially leading to extensive rework and significant economic losses. <sup>[10]</sup>

(4) Strengthening time management

In overseeing the construction schedule for highway engineering projects, management personnel must first thoroughly grasp the schedule's alignment with on-site realities. This involves clarifying key aspects of schedule implementation and actively engaging with the construction site to ensure each phase adheres to the plan. By promoting a strong awareness of progress among construction personnel and encouraging standardized behaviors, management can maximize construction efficiency while

ensuring adherence to the schedule <sup>[11]</sup>. During site inspection, managers must design each checkpoint thoughtfully, ensuring uniform and appropriate spacing between them. Any deviations between actual construction progress and the schedule must be promptly identified and adjusted. Accountability measures should be in place for such deviations, with responsible individuals held answerable and their performance appraised accordingly. Those contributing to delays should face penalties as outlined in the predetermined reward and punishment system. Conversely, efficient and high-quality work should be duly rewarded to effectively motivate construction personnel and ensure the smooth progress of the highway project construction.

(5) Cost management

Highway construction cost management encompasses various components such as site management, safety production, mechanical materials, and labor costs. Effective implementation of cost management requires enhanced warehouse management to ensure optimal utilization of construction materials without wastage. Similarly, meticulous management of construction machinery and equipment is crucial to prevent redundancy and ensure full utilization of their capabilities, thereby avoiding resource wastage. Additionally, comprehensive collection of construction cost data and accurate cost calculation and accounting are essential. Prompt identification of any instances where actual costs exceed budgeted amounts allows for timely investigation into the underlying reasons and appropriate corrective measures, ensuring effective control over highway engineering construction costs.

(6) Highway construction management

In site management, comprehensive management of the construction scheme is essential. Managers must have a thorough understanding of the entire construction scheme for highway engineering, ensuring its accurate disclosure before commencement of construction. During specific construction activities, meticulous on-site inspections must be conducted in strict accordance with the construction plan to promptly identify any deviations from the plan and rectify them accordingly. Additionally, effective management of highway engineering construction technology according to the construction scheme is imperative. Clear definitions of the construction technology and technical standards to be employed in each construction phase, as outlined in the construction plan, must be adhered to. Furthermore, precise requirements should be established for the technical proficiency of construction personnel to ensure the professionalism of highway construction and alignment with the technical standards stipulated in the construction plan.

## 5. Conclusion

Site management is a crucial aspect of highway project management, encompassing various aspects such as construction quality, progress, safety, and cost management. Managers must ensure strict adherence to the construction program to align technical processes and actual construction activities, thereby guaranteeing high-quality, cost-effective project completion within the agreed timeframe. Additionally, it's imperative to develop comprehensive systems to regulate field management behavior, enhancing the efficacy of on-site management practices.

## Disclosure statement

The author declares no conflict of interest.

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