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| RESEARCH ARTICLE

Analysis of Site Construction Management of Huangshi Section of Wuyang Expressway

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| ABSTRACT

In recent years, all aspects of our society have been in rapid development. The construction of the highway has also been greatly promoted, especially in the field of transportation, and has made a lot of achievements. With the continuous advancement of social development, the quality requirements for highway projects are also increasing. Therefore, the construction unit should deeply understand the problems existing in the current construction management and take effective measures to strengthen the construction management to ensure the safe and reliable operation of highways. This paper takes highway project construction management as an example, adopts the literature research method and case analysis method, and carries on a series of analyses of the Wuyang Highway Huangshi Section project and current Chinese highway project construction management by searching the literature about standardized highway construction. First of all, the background and significance of the research topic, as well as the status quo at home and abroad, are introduced, and the main research content and purpose of this study are proposed. Secondly, the content and concrete measures of standardization of expressway construction are expounded, respectively. Thirdly, on this basis, combined with the example of the Wuyang Expressway Huangshi Section project construction management, the highway project construction management is analyzed and studied. In the process of research, some problems existing in the construction management process at this stage are put forward. Finally, the paper puts forward the improvement measures and further optimization plans for the problems. In this paper, the freeway project construction management is studied, and the theory is explored for the development and improvement of our country's freeway project construction management system.

| KEYWORDS

Expressway; Site construction management; Construction technology; Engineering project management.

| ARTICLE INFORMATION

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1. Introduction

Due to the progress and development of society, the urbanization process of our country is getting faster and faster, and the dev elopment of transportation is also getting faster and faster. At the initial economic level, the construction of expressways played a n important role in the economic development at that time. With the improvement of road level, more and more roads provide a n important means of transportation for our country's economic construction. Combined with the experience of other developed countries, the highway is gradually establishing its own highway design and construction system. How to improve the quality of t he construction site according to the characteristics of highway construction, improve the construction efficiency, and achieve hig h quality. Low energy consumption is the biggest problem for our highway construction workers. This paper expounds on the cur rent construction management status and existing problems of the Huangshi section of Wuyang Expressway project, and makes a profound analysis of it in connection with the project's current schedule plan and safeguard measures, and makes use of advance d schedule control theory and mature construction experience at home and abroad, so as to obtain corresponding solutions. The refore, in order to improve our country's road capacity further, we must increase the construction of roads. However, we should p ay attention to both construction benefits and construction quality. With the continuous development of highway construction in our country, we are facing more and more hidden dangers in the process of development. Therefore, it is very important to impr ove the quality of highway construction.

2. The main content and purpose of the study

2.1 Main contents

Taking the actual project of Huangshi Section 4 of Wuyang Expressway as the research background, this paper studies the construction management problems in the construction process. Wuyang Expressway is an important part of the southeast passage of Wuhan. The construction of the Wuyang Expressway can shorten the distance between Wuhan and Nanchang, and it is also an important part of Wuhan's "four ring roads forming an independent ring road and expanding the outer ring road to the east".First of all, the relevant information of the project to be studied is searched, the research background and research significance of the subject are introduced, and the research status at home and abroad is analyzed. Secondly, introduce the project site construction situation of the fourth section of the Huangshi section of the Wuyang Expressway. Thirdly, the problems existing in construction progress control, safety control and quality control are analyzed. Finally, once again, summarize and analyze the actual content of this paper and draw corresponding conclusions.

2.2 Research purpose

Fundamentally speaking, the management of the expressway construction site is the in-depth embodiment of the specialized management and basic management of the construction site. Strengthening site management, in essence, is seeking the best integration of industry management and site grass-roots management so as to achieve the overall optimal construction units. The main contents of construction site management include material circulation management, construction quality management, construction operation management, and the implementation of a post-responsibility system. Its main purposes are, first, reasonable arrangement of construction production so that the construction of standardization, standardization, and legalization without hindering the production work, according to the market supply and demand, the user is supplied with both economical and green building materials that meet the requirements, which ensures the safety and civilization of construction. Second, we should organize the construction scientifically and rationally, fundamentally eliminate the remnants of on-site production and construction, implement the overall benefits in a coordinated manner, exert our own capabilities to the minimum, invest the minimum into the largest transformation, and put the economic and social benefits of our production and management first. Third, it is necessary to rationally allocate personnel and establish a high-quality construction team. Fourth, it is necessary to strengthen expenditure, increase the control of project costs, reduce materials and energy consumption, and reduce the occupation of funds caused by materials and materials.

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3. The content of highway standardization construction

The standardized construction management of expressways must be carried out according to the actual situation of the project, and all construction conditions must be taken into account. It is necessary to ensure the standardization of the management system, the standardization of the construction site, the standardization of the construction process, the standardization of management, and the standardization of construction quality. [Cao 2024]

3.1 Standardization of management system

It is imperative to ensure the standardized management of engineering projects and then establish a unified rule and standard; it becomes an inevitable requirement. Therefore, it must be determined according to the actual situation of the project, but also needs to refer to the relevant standards and suggestions of the superior company, using this method to develop quality, safety, environment, progress and other management modes, for engineering construction projects, it must be strictly controlled to ensure that the process of highway project construction management can be followed by rules and evidence. Thus, the construction process can be promoted smoothly in the later stage.

3.2 Construction site standardization

The standardization of the construction site refers to the standardization of the construction site and the standardization of the r esident site. It should have strict requirements for the production and living environment of construction, unified construction, an d ensure that laboratories and other infrastructure are improved. All kinds of mixing stations, precast treatment sites, and storage sites should be set up according to standardized requirements so that concrete is centralized mixing, steel bars and gravel are ce ntralized treatment, and prefabricated parts and purchased parts are centralized prefabricated, which gives full play to the advant ages of construction intensification, ensures the quality of the project, and eliminates hidden dangers in construction. Ensure the construction site and construction environment are orderly and promote civilized construction.

3.3 Standardization of the construction process

For the tunnel, subgrade and bridge culvert projects during the construction of the expressway, according to the relevant norms and requirements, combined with the actual situation during the construction period, the analysis and research were carried out, and perfect construction standards were formulated to ensure the efficient construction process. At the same time, the constructi on quality was also strictly checked. Through the test and standard test, accurate data results are obtained to ensure the quality o f the construction process. In addition, the hidden items and key links in the project should be paid more attention to and strictly checked to ensure that their indicators meet the design requirements.

3.4 Standardization of Construction Management

In the construction of highway engineering projects, relevant laws, regulations, norms and standards are strictly implemented, dy namic management of the whole process of the project is implemented, weak links are found in time, and the system is improved in a targeted way, so as to optimize the overall management process and implement management standards and technical stand ards for the construction process. Only in order to ensure the project implementation schedule, energy conservation and environ mental protection goals and construction quality. In addition, the information and data formed during the construction process s hould also be collected and sorted out in a timely manner and archived according to regulations for discovery and reference.

3.5 Quality management standardization

All construction activities and management activities should aim at quality and efficiency. To improve engineering quality, the ulti mate goal of expressway engineering projects is to ensure high quality. [Li 2022] To this end, we should establish and improve th e quality management and supervision mechanism. From all aspects of supervision, acceptance of construction quality should tak e the initiative to carry out technical disclosure. Strengthen the education and training of relevant technical personnel and superv isory management personnel, and require it to clearly understand and master the difficulties and keys of construction technology, formulate technical programs and safety programs in a targeted manner, as well as improve the construction process in order to achieve strict and standard quality acceptance and supervision, and ensure the quality of the project.

3.6 Standardization of safety management

Highway construction safety is a prerequisite to ensure the smooth progress of the project. Therefore, the safety of construction personnel should be paid great attention to in expressway construction. To carry out the standardization management of highwa y construction safety, it is necessary to formulate scientific and standardized safety standards and carry out comprehensive imple mentation and execution. It is necessary for construction personnel to standardize their behaviors during construction and strictly implement operation standards. [Liu 2023] In addition, safety training for construction personnel and good safety protection mea sures should be strengthened to avoid injury to the personal safety of construction personnel and non-construction personnel du ring construction, and scientific and reasonable treatment of wastewater and other garbage discharged during construction shou ld be carried out to prevent pollution and harm to local people. [Zhang et al 2022]

4. Case study

4.1 Project Overview

Wuyang Expressway starts from Fenghuang Mountain, interconnecting with Wuhan East Lake High-tech Development Zone, cros ses Wutong Lake along Fenglian Avenue, enters the Ezhou area, and ends at Huangshi section of Wuhan-Yangxin Expressway, Th e total length of the main line is about 34.29 km, of which Wuhan 16.73 km and Ezhou 17.56 km. The whole line is built according to the standard of two-way 6-lane expressways, and 14 new large Bridges have been built, with a total investment of about 8.5 bi llion yuan. On December 29, 2017, the construction of the Wuhan to Yangxin Expressway site broke ground, marking the comme ncement of the construction of the Wuyang Expressway construction project. In September 2021, the Mugang Tunnel, the first tu nnel of the Wuyang Expressway, was broken through, and the construction of the Huangshi section of the Wuyang Expressway w as successfully completed. The construction progress of the project was nearly 40%, and it is expected to open to traffic by the en d of 2023. On June 2, 2022, the Qifeng Mountain Tunnel, Section 5 of the Wuhan-Yangxin Expressway, was successfully complete d.

4.2 Construction significance

Wuyang Expressway is located on the southeast passage of Wuhan City, which can narrow the distance between Wuhan and Nan chang in time and space, and is also an important part of Wuhan's "four rings forming a separate ring and the outer ring extendi ng east". This project has a very positive significance for connecting the core scenic spots in eastern Hubei and northern Jiangxi a nd helping the integrated development of Wuhan City Circle and Wu-e-Huang-Huang citycluster. On November 25, 2019, the Na tional Development and Reform Commission approved the feasibility study report of the new Wuhan-Xiangyang Expressway (Hu bei section), which was submitted to the Provincial Department of Transportation for approval and is expected to start constructi on by the end of 2020. Funds shall be jointly raised by the central and local governments. The completion and opening of the Wu yang Expressway make the road between Wuhan and Nanchang thoroughly through, and the three-hour high-speed traffic circle between Huangshi, further improving the road network in the southeast of Wuhan metropolitan area and serving the economic d evelopment of the less developed areas in the junction of Hubei and Jiangxi provinces.

5. Engineering project construction management analysis

5.1 Management of construction technology

5.1.1 Roadbed Construction Technology

In the construction of highway subgrade, we must also pay attention to it, and it can play a direct role in pavement construction. Therefore, in order to meet the actual needs, it is necessary to continuously improve the level of highway engineering constructio n. The analysis of roadbed construction technology shows that it involves many aspects, including foundation treatment technolo gy, drainage technology, earth filling and compaction technology, embankment protection technology, etc. [Liao 2021]Therefore, the specific application of these roadbed construction technologies needs to be combined with the actual situation so as to achie ve the best results. If we want to ensure that the construction quality meets the standard requirements, we need to take effective measures to improve the strength and stability of the roadbed, and in order to achieve this purpose, we must ensure the selectio n of the most appropriate filler. In addition, it is necessary to strengthen the subgrade protection work, which is one of the most c ritical factors to ensure the quality of the project. Through subgrade protection, the highway can always be in good condition, an d the drainage of the subgrade can be ensured in place. While effectively improving the drainage efficiency, the surrounding envi ronment should not be affected. [Tang et al 2020]

5.1.2 Pavement Construction Technology

With the continuous improvement of the development speed of road engineering, pavement engineering has also attracted a lot of attention. It takes pavement design as the principle and method as the research object. Besides, the structure and material of p avement are composed of quality detection and maintenance management. During pavement construction, the base and surface layer of the pavement structure cannot be ignored. [Wang 2022] In the construction of highways, it is necessary to ensure that th e function of pavement construction technology is fully tapped, and there must be a reasonable mix ratio of asphalt concrete in t he mixing process. In the construction process, it is necessary to ensure that the current specifications can be effectively impleme nted. When paving an asphalt mixture, the most appropriate mechanical equipment is used. Yu [2023] should be selected based on the actual conditions of the road, and the speed should be strictly controlled to ensure that the paving can be smoother. It is a lso necessary to tamp the road surface, and these steps of initial pressure, repressure, and final pressure must be carried out acco rding to the set standards.

5.1.3 Analysis of key technical points of tunnel construction

For highway construction, tunnel construction at the present stage mainly uses the following technical methods. Highway tunnel construction can be constructed by concrete jet technology, which can also be divided into two kinds: tidal jet and wet jet. In the construction of high-speed tunnels, wet spraying technology can effectively enhance the bond and support performance of conc rete. After injection, the rock mass bearing capacity and support strength can be significantly improved. Compared with the tidal injection technology, it is found that the wet injection technology can significantly improve the working environment quality and reduce the amount of accelerator [Chang 2021], so the cost of tunnel construction injection can be significantly reduced.

In the process of wet spraying the construction of highway tunnels, the staff should control the strength, adhesion, and tightness of concrete spray accurately so as to improve the effect of the spray further.

5.2 The main problems in construction safety management at present stage

5.2.1 Construction safety organization is weak

Highway maintenance and construction units consider the interests too much and do not pay attention to safety production. One is the neglect of safety management education. Road maintenance personnel have not received pre-job technical training, so the y have a weak sense of safety, have a lucky mind, and feel that they have contracted a road for maintenance operations and have a very clear road, thus ignoring their own safety problems, often cannot standardize the setting of signs during construction, or n o construction signs at all. Once encountered traffic accidents or other emergency situations are encountered due to the weak aw

areness of construction personnel, it is often too late to respond, resulting in safety accidents. In addition, when the amount of ro ad work is relatively large, the staff usually arbitrarily change the road warning range for the convenience of construction, resultin g in narrow traffic roads, affecting the normal running speed of vehicles and resulting in accidents. [Wang et al 2023]

5.2.2 Construction site management is not standardized

In many cases, in order to save costs, highway construction enterprises do not set up full-time safety staff to match it. Although s ome maintenance units are equipped with security guards, they do not fully play the role they can play. They are just a decoratio n. Some maintenance personnel do not unify the clothing they need, some maintenance personnel will put construction material s, waste materials, etc., outside their work scope, and they will casually open the guardrail in the central isolation area of the high way without the consent of the highway management authority, thus making an irregular move of retrograde and turn around. S ome engineering operations of the vehicle are not placed in a prominent position. There is no clear sign of work.

5.2.3 Traffic signs are not set up properly

In accordance with the relevant regulations of the traffic and public security departments, the maintenance operations on the roa d should be checked, and the construction supervision unit should arrange the road safety signs reasonably and in strict accorda nce with the norms and scientific norms. [Du 2023] In addition, many maintenance operations and inspection units are carried ou t in a way that is convenient for construction and operation, are directly used, cannot strictly implement these standards, and traf fic warning signs are incomplete, damaged, lost, and cannot be repaired or supplemented. This not only increases the maintenan ce cost but also affects driving safety. In addition, the vision of drivers at night is limited, and they may crush or crashed into the main road of high-speed maintenance sites due to fatigue driving. The phenomenon of destruction of road closed areas often oc curs, which poses a great threat to traffic and the site of road maintenance work.

5.3 Project Site Construction Management Improvement Measures

5.3.1 Complete the management system

In order to realize the standardization of highway construction project construction, it is necessary to have a perfect managemen t system. At the same time, it is also necessary to promote the standardization and standardization of highway construction in ou r country. On the basis of improving various management systems, clarify and standardize management responsibilities, establish a management system with owners as the core and staff at all levels as the auxiliary, and establish a corresponding responsibility system, which is implemented layer by layer and thorough, institutionally ensure the coordination and cooperation between all li nks in the project implementation process, so as to improve the project quality level. Only in order to achieve the purpose of stab le quality control. [Zhao et al. 2023] In addition, in the operation process, we should be able to find the problems in the construct ion process and put forward corresponding countermeasures so as to ensure the smooth progress of the whole project. In the co nstruction, to achieve the whole process control of the project, check and supervise the daily construction, to ensure the smooth progress of the project, we must grasp each construction process, do a good job in the implementation and supervision of variou s management regulations, audit the budget and final accounts related to the project construction, and do a good job in quality approval and control according to the project report and monthly report.

5.3.2 Continuous innovation in management

In the process of expressway construction, construction management undoubtedly occupies an important position, and it is beco ming increasingly prominent. Therefore, the relevant management departments and construction units should constantly optimiz e and innovate in the process of management, analysis, and exploration in combination with their actual conditions so as to ensu re management means and ways. Management departments and construction enterprises should attach importance to managem ent innovation and technological innovation and implement scientific management. [Wang 2024] In the construction process, rel evant management departments should take the initiative to improve the technical application level of construction personnel, e ncourage relevant technical personnel to continue to innovate in technology, continuously introduce advanced technology in the construction process, and improve the construction evaluation system according to the needs of the project, so as to provide acc urate positioning and evaluation for the construction management of the project, so as to find problems. At the same time, defici encies are also found, and timely optimization is needed in order to innovate so as to promote the standard management level o f construction.

5.3.3 Improve site construction technology

In the expressway project, there are many aspects involved, so we should make specific provisions and requirements for the cons truction technology and process, but also the requirements of standardized construction management, optimize the construction technology and strengthen the management of the construction technology, so as to improve the construction efficiency and im prove the quality of the project. For quality inspection, ensure that the test items are complete, and the test data is true and credi ble. For example, the standardization of highway engineering construction technology mainly focuses on roadbed technology, pr otection engineering process, road and bridge engineering technology, and pavement engineering process. [Liu 2020] In the roa

dbed process, the main is filling and compaction in the paving and other links, according to the characteristics of roadbed engine ering and the actual construction situation, the development of clear management objectives, and carried out standardized mana gement.

6. Peroration

The construction of expressways in our country is increasing day by day. Only by continuously improving the management ability can the project management gradually become systematic, legalized and standardized. The development of technology makes m anagement measures continue to innovate and promotes management ability. Expressways play a very important role in the eco nomic construction of our country, and the construction quality of expressways is closely related to vehicle traffic and personal lif e. Therefore, we should pay attention to the quality of construction, do a good job in the management of highway construction, a nd carry out standardized management of construction so as to ensure the quality and efficiency of highways. Let Chinese highw ay construction enterprises internationalise at the same time, as soon as possible, to familiarize with international practices, highw ay construction enterprises project management mode timely adjustment, improve the level of project management, as soon as p ossible international standards.

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