Application of material testing technique in Highway Engineering

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Abstract. The various factors that affect the quality, cost and progress of highway engineering, a common point have been found-- material quality have plays a decisive role. Material testing technology is the key technology to ensure the quality of materials. In recent years, it has been paid great attention to in many fields of construction engineering. The significance and application of material testing technology are briefly analyzed. It was found that the material testing technology has strong practical value in the application of highway engineering, which not only influences the quality, cost and progress of highway engineering, but also accelerates the popularization of new construction technology and construction materials.

Key words: Material testing technology; Highway engineering; application.

1. Introduction
In order to promote China's urbanization process, the number and scale of highway construction projects are under the background of increasing. The quality of highway engineering is not only highly valued by the state, but also concerned by all sectors of society. In this context, highway engineering needs to pay attention to the continuous improvement of its own construction quality, and take a variety of measures to achieve effective control of construction quality. Material test and detection technology is the key measure to ensure the quality of highway engineering. It is of certain practical significance to improve the quality management system of highway engineering by strengthening the application research of material test and detection technology.

2. Significance analysis of material testing technology
(1) Strengthen the construction quality control effect
There is a positive correlation between the quality of construction materials and the quality of highway engineering, and the quality problem caused by material quality is difficult to make up fundamentally. Before carrying out highway construction, it is one of the effective measures to realize the quality control of the project to carry out strict scientific appraisal of all construction materials to judge whether the construction materials meet the design standards of highway engineering.

(2) Strengthen the control of project cost
The construction material cost is relatively high in the overall proportion of the project cost, so the control of the construction material cost has become the key to the control of the project cost. The application of material testing technology can help construction units to know the real quality of all kinds of construction materials in a timely manner, so that when selecting construction materials, the
price and cost performance factor of materials can be fully considered. In this way, we cannot only ensure that the selected construction materials meet the construction conditions and basic requirements, but also realize the effective management of the project budget.

(3) Promote the progress of the project

From a certain point of view, the project schedule determines the overall economic benefit of highway engineering, which is also the main reason, why catching up with the construction schedule becomes a normal state in highway construction. The improvement of project progress needs to be built based on project quality, while the application of material testing technology can ensure that construction units can select high-quality construction materials to carry out construction, which mainly focuses on the following two aspects: one is to ensure the smoothness of the construction process. In the process of actual construction, if quality problems occur in the construction materials used, the overall fluency of construction will be affected, and even the project will be forced to stop. The second is to improve the construction time required by individual processes. The advantages and functions of high-quality construction materials are not limited to quality, but also affect the construction process, which can promote the decline of construction time of individual processes.

(4) Speed up the spread of new construction technologies

The significance of the existence of new construction technology is to replace the old construction technology, to achieve the purpose of improving the construction speed or construction quality. The application of material testing technology can create good objective conditions for the application of new technology, accelerate the inspection speed of new construction technology, and promote its use in highway construction. Therefore, the material testing technology can not only realize the promotion of new construction technology, but also drive the promotion of new construction materials.

(5) Main basis for project acceptance

The project acceptance segment is the last link of the highway project, whose purpose is to systematically test and evaluate the quality, scale and various parameters of the highway project, and judge whether the highway project meets the expected quality standard. The inspection results provided by the material testing technology will become the main reference for the acceptance process, which will play a certain role in shortening the acceptance time and improving the acceptance rate of the project.

3. Application analysis of material testing technology

(1) Testing of general materials

Before carrying out highway construction work, all construction materials to be used must be subject to general test and analysis of quality standards and specifications of various construction materials to ensure that they are within a reasonable and controllable range. The main content of general material testing refers to the general materials with the largest amount and highest frequency, such as cement, sand, steel bar, asphalt, etc. The quality standard of different construction materials is not the same. For example, in highway engineering, clay materials usually choose clay with liquid characteristics; Sand and gravel materials with a certain amount of mud content and particle size standard sand and gravel; and the test content of crushed stone material is relatively more, including water content, density, grading, hardness and so on. The quality parameters of any construction materials shall meet the requirements of highway engineering materials standards stipulated by the state. If the quality of materials is found to be substandard, the source of materials shall be identified in time and the materials shall be replaced.

(2) Ratio test

The standard test results are the first step in the project quality tracking. After the single material testing in the early stage, it is necessary to carry out the mixing ratio test in time, and conduct comprehensive testing on the quality and performance of the mixture. First, the construction personnel need to ensure that the mixing ratio of the mixture meets the expected design standards, and strictly control the water content in the mixture to avoid the phenomenon of insufficient water content or exceeding the standard. Secondly, in the design of mixture ratio, it is necessary to judge the evaporation and condensation of water in the transportation process and construction site based on the actual
situation of the construction site. Finally, special construction materials require specific test methods. For example: in the asphalt mixture quality testing, the general use of Marshall test method, the test method can detect the basic performance parameters, but also can detect the density of asphalt mixture, porosity, saturation, flow value and other special parameters.

(3) Tracking and testing

Material testing is a quality control measure to carry out the whole highway project, which should be carried out not only before construction, but also in the construction process. In the construction process of highway engineering, it is necessary to test each sub-engineering and construction process of the project. Moreover, the tracking test is not a unilateral test, but should be composed of the construction unit, the supervision unit and the government supervision department. In order to ensure that the tracking and testing work can be carried out in an orderly manner, the construction unit needs to establish a reliable tracking and testing management system based on the project. The construction unit also needs to set up a professional working team with high quality instruments and equipment to ensure that the project quality tracking and testing work can fully reflect its own role value.

(4) Acceptance testing

The acceptance test is mainly responsible for the relevant government departments. The test content is mainly about the engineering quality and the parameter compliance of key parts, and the comprehensive evaluation of the highway project is made based on the engineering quality, aesthetics, flatness and other factors. At the same time, the inspection and acceptance is also the main link to explore the potential defects of the highway project. If quality defects are found in the project, the responsible unit has the right to order the construction unit to rework the highway project. In the segment of acceptance, the quality inspection results of materials obtained through the material test and detection technology will often evaluate the main basis of engineering quality. The construction unit needs to pay attention to the preservation of the quality inspection results of materials, and actively cooperate with relevant departments in the link of acceptance to carry out the acceptance work. In addition, when faced with rework problems, construction units need to conduct in-depth analysis of rework problems from the perspective of material quality, correctly judge the main causes of substandard engineering quality, and take reasonable, effective and low-cost measures to deal with rework problems.

4. Conclusion

In general, the material testing technology is an indispensable key component in highway engineering, and the basis to ensure the quality of highway engineering. Construction units need to correctly recognize the important value of material testing technology, adhere to the scientific and reasonable application, to ensure the quality of material testing technology. At the same time, the construction unit needs to strengthen the introduction of advanced material test and detection technology, and constantly summarize experience in the process of practice, improve the working ability, so that the role value of material test and detection technology can be fully played.

5. References

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