

Quality Control Measures for Construction Materials Testing of Highway Bridge Engineering

Junhua Wu

College of Science and Technology of China Three Gorges University, Yichang 443000, Hubei, China

Abstract: In recent years, the construction safety accidents of highway and bridge projects have increased the attention of all sectors of society to the quality problems of highway and bridge projects. This paper studies and discusses the quality control of building materials testing for highway bridge engineering, explains the main content of the quality control of building materials testing, summarizes the common problems of highway bridge building materials testing, and puts forward the quality control measures. Through the analysis of the quality of engineering materials in many aspects, a new idea is provided for the quality control of the subsequent construction materials of highway and bridge engineering.

Keywords: Highway bridge; Building material; Testing; Quality Control

1. Introduction

The significance of controlling the quality of construction materials testing for highway and bridge engineering is multifaceted. The materials for engineering construction not only directly affect the construction effect and use effect of the entire construction project, but also relate to the subsequent development of the materials themselves and the rational structural collocation of materials for the subsequent highway and bridge engineering construction design^[1]. Building materials with good quality and high practicability are not only an effective guarantee for the safety after the project is put into use, but also one of the safety guarantees for saving resources and maximizing the profits of highway construction. By carrying out the quality inspection of building materials, we can ensure that the materials selected in the project are reasonable and scientific, which is to lay a solid foundation for the selection of new materials, provide a reliable guarantee for all aspects of data, and have a very important significance for ensuring the safety in the construction process and the safety in use.

2. Problems in construction material testing of highway and bridge engineering

2.1 The qualification rate of sampling samples is not high

Nowadays, in order to save construction period, some construction units have some problems such as unrepresentative samples, lax supervision and untimely testing. At the same time, it also has the problem that the detection form is superficial, which seriously affects the detection results, thus affecting the project quality control and evaluation results^[2]. The sample detection is not in place, which leads to the difference between the sample sampling and the actual construction, which leads to the failure of the inspection work. Because of the weak supervision of supervisors and the imperfect supervision system, there are safety problems in bridge detection and engineering quality control. In addition, the construction starts before the test data is available, which will lead to difficulties in ensuring the quality of materials and projects used in the construction. The key is that the construction unit does not pay enough attention to sample submission for inspection.

2.2 Unreal quality monitoring results

First of all, in order to reduce the cost and shorten the construction period, the construction company has few spot check quality points and lacks typicality. Secondly, the test was not conducted according to the relevant standards in China, or typical test results could not be obtained. Finally, a large amount of data is selected for some testing items, but the accuracy of testing data is low due to technical and construction reasons. The main reason is that the data used in the detection process has a certain randomness. In most

cases, the detection data is selected in the polarization range, which is equivalent to random fabrication. It is difficult to truly reflect the actual situation of the project.

2.3 Quality defects of testing equipment

The accuracy of the detection results will be directly affected by the detection equipment. The detection equipment of individual units is aging, which cannot meet the requirements of the current bridge test detection data. The quality is not up to standard, and it cannot fully play its role in a relatively complex environment^[3]. The main reason is that the inspection work is not paid enough attention, and there is a lack of capital investment in inspection equipment. Although some units have carried out relevant inspection work, they have not provided complete data result reports, but only developed the content framework of inspection, without providing relevant solutions, and lack guidance for project quality management.

3. Quality Control Measures for Building Materials Testing of Highway and Bridge Engineering

3.1 Specify quality inspection items

The key link of building materials testing is to carry out accurate and reasonable testing items, which plays a key role in ensuring the authenticity and accuracy of testing results. A variety of materials will be used in the construction of the project. During the testing process, the person in charge of technical supervision needs to test in strict accordance with the relevant requirements of the construction industry. For example, in the testing of cement materials, testing should be carried out according to the setting cycle, strength, fineness and stability of cement batches.

3.2 Reduce human error in detection

Engineering material testing often leads to certain testing deviation due to human factors, which is closely related to the professional ability and experience of relevant workers. Therefore, in order to reduce or eliminate test errors and violations as much as possible, it is necessary to require testers to conduct testing according to material testing standards, so as to ensure the authenticity and accuracy of the results. For example, in the tensile test of reinforcement, the tensile coefficient of reinforcement can be accurately determined only when the specimen is stretched to the fracture state. During the tensile test of elongation, some workers stopped the test when the steel bars were stretched to the stiffening state, which will affect the accuracy of the test structure to some extent^[4].

3.3 Strengthen the standardization of testing operation

As a key point in the detection of building materials, the test sampling must be carried out in strict accordance with the relevant technical standards and requirements. The staff need to be proficient in the relevant operating techniques, maintain a high sense of responsibility, and adopt scientific and effective sampling methods. The actual sampling must be in strict accordance with the relevant standards of material testing, a supporting sampling plan must be formulated, and the number of sampling points must be specified. Taking bagged cement as an example, it is necessary to test the same type of cement according to the production time, production number, manufacturer, production date and other standards, and control the total amount of a single batch above 10%, within 150 tons, and the number of sampling inspection points shall not be less than 25.

3.4 Control and detection of environmental impact

Building materials are affected by environmental conditions such as temperature and humidity to varying degrees^[5]. Take elastomer modified asphalt waterproof roll as an example. Because the temperature environment conditions have a great impact on the performance conditions of this material, the temperature should be controlled between 20-25 °C during the tensile test. According to the analysis of relevant test data, the material is sampled from the same population. If it is tested in the same tensile test mode at 28 °C, the tensile strength will be reduced by 3.65% compared with the specified ambient temperature. If the temperature is 15 °C, the tensile strength will be increased by 2.88%. Therefore, when testing, it is necessary to reasonably control the environmental conditions, especially to avoid the impact of temperature, humidity and other conditions, so as to ensure effective testing data.

3.5 Comprehensive analysis of test data

Due to the discreteness of building material testing structure, pretreatment is required before analyzing the testing result data^[6]. When different testing equipment and methods are used for the same kind of building materials, the test results will also have different degrees of deviation. Take the steel detection as an example, the steel of the same batch needs to be divided into two equal parts, and the construction unit will conduct the independent detection and the relevant quality inspection department will conduct the detection. If there is a large gap between the two groups of test data through comparative analysis, the reasons for the gap should be comprehensively analyzed and improved through certain methods. In addition, the homogeneity of material texture, the accuracy

of instruments and equipment, the detection ability of personnel, and the detection conditions are easy to affect the authenticity of material detection results. If the data deviation is higher than the fixed range of the standard, the material needs to be tested again by repeated measurement.

Conclusion

To sum up, building materials are a very important part of highway bridge engineering, which not only affects the quality of highway bridge engineering, but also determines the future development direction of highway bridge industry. The construction material testing and quality evaluation work is of great significance to all kinds of engineering construction. Therefore, it is an inevitable trend for the development of the highway bridge industry to establish a building material detection system project and strengthen the standardization of detection operations, which plays an extremely important role in the entire highway bridge industry.

References:

- [1] Zhang J . Study on Quality Problems and Construction Management Control of Highway Bridge Engineering[J]. Construction & Design for Engineering, 2019.
- [2] B. Phares J. Miksell J. M. Rouse. Laboratory and Field Testing of an Accelerated Bridge Construction Demonstration Bridge: US Highway 6 Bridge over Keg Creek.[J]. high performance concrete, 2013.
- [3] Sobala D,Rybak J . Role to Be Played by Independent Geotechnical Supervision in the Foundation for Bridge Construction[J]. IOP Conference Series Materials Science and Engineering, 2017, 245(2):022073.
- [4] Elizabeth, Kraft, Keith, et al. Project Quality Assurance Organization Selection for Highway Design and Construction Projects:[J]. Transportation Research Record, 2018, 2347(1):29-37.
- [5] Wang Z . Analysis of Quality Control Measures of Highway Bridge Maintenance Project[J]. Construction & Design for Engineering, 2018.
- [6] Yue XD . Analysis on Quality Control Measures for Structural Engineering Construction of Highway Bridge High-rise Buildings[J]. Building Technology Development, 2019.

About the author:

Name: Junhua Wu, Gender: female, native place: Huanggang, Hubei, Nationality: Han, Date of birth: 198908, degree: Master, Professional title: Lecturer, Research direction: Research and analysis of large-span bridge structure.