Analysis of stress in construction monitoring of long-span concrete bridge

Li Jianwei
Yellow River Survey Planning and Design Co., Ltd

Abstract: In order to improve the quality of the relevant construction development activities and effectively meet the special requirements of the design and construction of long span concrete bridges, the safety, effectiveness and economy of the bridge are fully enhanced. In this paper, the spatial structure of the long span concrete bridge is very special. As well as environmental adaptability, technical staff should be based on the development of large and span concrete bridge construction activities of the actual needs of large-span concrete bridge for scientific design and planning, but also the construction technology application activities for scientific supervision. The purpose of this paper is to explore the scientific and efficient application of stress monitoring in the construction process of large span concrete bridge under the guidance of the relevant theory of construction from the perspective of stress monitoring, so as to ensure the accuracy of construction activities and promote the development of bridge orderly development.

Keywords: long span concrete bridge; construction monitoring; stress monitoring; application

Introduction

The rapid development of social economy and the deepening of urbanization have promoted the construction of bridge construction in China. The original bridge design method, concept and quality monitoring system have become more and more difficult to meet the actual needs due to various reasons. In order to prolong the service life of the long span concrete bridge and enhance the stability of the bridge itself, it can ensure that it can alleviate the transportation pressure of the transportation industry in China and meet the objective requirements of the regional economic factors. At present, based on the actual situation of traffic development, the construction of large span concrete bridge is widely carried out in China. It is expected that by means of large span concrete bridge, the transportation efficiency of transportation system should be improved effectively, and its own optimization and upgrading will be realized through a more diversified regional transport system. In order to ensure the scientific construction of large span concrete bridge construction and enhance the safety and economy of bridge construction, it is necessary to carry out the technical difficulties, construction characteristics and process of bridge construction. The stress monitoring is the starting point, During the construction process of the span concrete bridge, the stress analysis is carried out, and the stress analysis is carried out through the bridge to realize the comprehensive analysis of the stability of the whole stress structure of the large span concrete bridge, and ensure the scientific and efficient development of the bridge construction in practice.


Copyright: © 2017 Li Jianwei. This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/), permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.
1 Analysis of construction characteristics of long-span concrete Bridge

It can help the relevant staff to further clarify the key link and core requirements of the stress monitoring in the construction process of the large span concrete bridge, and then realize the construction technology in bridge construction depends on a good foundation.

1.1 Stress characteristics of long span concrete bridge

Large span concrete bridge is an important branch of bridge structure in China. In the process of design planning, the long span concrete bridge structure is composed of continuous rigid frame bridge as the main bridge structure, so it is shown the stress in the performance of a bridge and bridge consolidation of the building structure of the force characteristics. At the same time, the main girder of the continuous rigid frame bridge is a continuous beam, which makes the stress show the characteristics of the continuous beam and the T-type rigid frame bridge. This complexity of the stress characteristics, not only to a large extent, increased the design of large span concrete bridge construction of the degree of difficulty, but also to carry out the work of stress monitoring has brought a series of adverse effects, resulting in lower monitoring efficiency. The overall situation of the bridge force cannot be evaluated in a short time[1]. In order to ensure the integrity of the bridge force structure, the large span concrete bridge in the process of stress planning, the main bridge and piers for direct fixed operation, this force structure makes large span concrete bridge in the spatial structure of the stress Holistic characteristics. It is precisely because of the rational monitoring of the stress structure to be able to support the existing technical means to reduce the top of the piers of the negative moment value, which makes the long-span concrete bridge in the process of running, showing good bridge stability, Safety and seismic performance, showing a good structural advantages[2]. However, due to the large span concrete bridge rigid frame bridge belongs to many statically indeterminate structure, its special structure makes the large span concrete bridge itself for the horizontal direction of the stress change is weak, once the dramatic temperature changes, the concrete volume Shrinkage, will cause the bridge structure of the horizontal direction of the damage to the bridge structure of the adverse effects, so in the construction of large span concrete bridge monitoring process, the need for technical personnel to carry out the necessary monitoring of horizontal stress, and further improve the large The basic process of horizontal construction of concrete, and thus to improve the overall construction quality of the bridge to provide a guarantee.

1.2 Stress monitoring of continuous bridge construction

In order to ensure the quality of construction, under normal circumstances, the use of continuous bridge construction technology, in the actual operation of the process, the construction unit to cantilever construction method as the main way. With the help of the accurate use of the relevant construction equipment, it has made the construction of the long-span concrete piers to ensure that the bridge in the direction of the adjacent diameter, making its application of symmetrical and continuous construction of the bridge construction. Under the premise of ensuring the construction quality, it can improve the construction efficiency and shorten the project cycle, but the way of continuous bridge construction, the stress distribution of the bridge structure and the traditional bridge structure has a more significant difference, this force difference is great. The degree of stress monitoring increased the degree of difficulty. At the same time, in order to improve the stability and safety of the stress-stressed structure, the construction unit needs to optimize the cantilever construction according to the actual situation of the construction of the long-span concrete bridge in the process of the construction of the long-span concrete bridge. To facilitate the rationalization of choice, which requires the relevant construction technology staff to summarize all
kinds of information and analysis of the cantilever assembly and cantilever pouring way to effectively choose to promote the stress monitoring operation in an orderly manner under the premise of promoting large span concrete bridge. The scientific and efficient application of the construction technology in practice satisfies the objective requirements of the construction quality of the large span concrete bridge during the process of regional development.

2 Practical significance of stress monitoring in bridge construction project

The application of stress monitoring in bridge construction project is of great practical significance. With the stress monitoring as the starting point, the construction unit and technical personnel can comprehensively analyze the actual stress state and design planning scheme in the bridge structure, and clarify the stability factors of bridge construction. And the acceptance parameters are summarized, it is based on this consideration, the bridge construction project in the construction preparation, the actual construction and acceptance stage, the need for stress monitoring mechanism to ensure that the bridge construction project stress monitoring work quality and level. In order to realize the real-time monitoring of the stress change of the bridge, it is necessary to ensure that the variation range of the stress is within the normal range, but the stress of the bridge structure changes in the course of the construction of the bridge structure, the magnitude of the stress and the direction of the action will change. Found that the difficulty is high, if you do not take a reasonable monitoring methods, technical staff in a short time, it is difficult to clear the stress changes, resulting in decreased stress monitoring quality, cannot really meet the objective requirements of bridge construction.

3 Application of stress monitoring in the application of long-span concrete bridge construction

In order to further regulate the behavior of large-span concrete bridge construction stress monitoring, the construction unit and the technical personnel should focus on the stress characteristics of the long-span concrete bridge at present, combined with the beneficial experience of the previous stress monitoring, guided by the relevant principle, And large span concrete bridge construction management work together to improve the long span concrete construction force monitoring system to promote the construction of the bridge in an orderly manner.

3.1 Stress monitoring in the construction of long-span concrete bridge construction must follow the scientific principles.

Only from the scientific point of view of stress monitoring program planning, long-span concrete bridge stress characteristics and bridge construction technology and other aspects of a number of aspects of detailed and comprehensive consideration, the only way to maximize the guarantee of large span concrete bridge Stress monitoring can meet the objective requirements of the bridge development and construction work practice, only in the scientific spirit, scientific means, under the guidance of scientific philosophy, we can based on the existing technical conditions for large span concrete bridge construction stress monitoring work Scientific and efficient development.

3.2 Stress monitoring in the construction of long-span concrete bridge construction must follow the principle of practicality.

Due to the relatively simple operation environment of large span concrete bridge construction site, it is difficult to realize the detailed treatment and operation of stress monitoring of large span concrete bridge. In order to adapt to this reality, it is necessary to increase the compatibility of stress monitoring of large span concrete bridge as
much as possible and reduce the influence of external environment on construction and construction of large span concrete bridge. To ensure the continuous construction of bridge construction activities, to a certain extent, to achieve the effective control of construction costs, to avoid unnecessary waste of human and material resources, and promote the healthy development of the relevant construction enterprises.

4 The way and method of stress monitoring of long span concrete bridge

In order to effectively improve the quality of stress monitoring, the long-span concrete bridge in the process of stress monitoring is fully reflected in the stability and scientificity of the large-span concrete bridge. The construction activities of the bridge are sustained and stable. The need for construction units and technical staff to fully analyze the stress characteristics, clear the importance of stress monitoring, scientific principles and practical principles under the guidance of large-span concrete bridge to ensure the smooth implementation of stress monitoring activities.

4.1 Application of stress post-event monitoring in large span concrete bridge construction

Stress monitoring, as the core of the construction and acceptance of large span concrete bridge, the actual state of the engineering force structure and the design objectives of the horizontal comparison, in the course of the process, once the data deviation, the monitoring personnel should be timely to the deviation data to the construction Management personnel to report, on this basis, to take the necessary coping strategies, the error control within the acceptable range of values, so as a whole, to enhance the effectiveness of long-span concrete bridge stress monitoring. In the actual operation process, the construction unit and technical personnel according to the construction project design requirements and construction environment, the scientific principles into the stress monitoring work, combined with the advantages of stress monitoring related technology, stress on the main after the monitoring Process to sort out, clear monitoring the focus of the work and the core. The core of the stress after the monitoring work on the assessment of security risks, error calculation and analysis of several aspects, through this way to a certain extent to ensure that the construction of large span concrete bridge stress monitoring scientific, while the construction unit and technical staff In the process of monitoring the stress, we need to clarify the application area of post-monitoring, and then combine the stress and the post-event monitoring work with the actual planning and construction of the large span concrete to realize the effective monitoring of the stress.

4.2 Application of predictive control method in construction of long-span concrete bridge

In order to realize the integrity of stress monitoring, the construction unit and the technical personnel can adopt the forecasting control method. In the course of the bridge design and construction, the various factors that affect the stability of the bridge structure and the construction technology in the construction of the large span concrete bridge are in the construction preparation stage. During the design and construction of the bridge, the various factors that affect the stability of the bridge structure and the construction technical parameters are analyzed comprehensively. In the process of analysis, the practical principle should be integrated into the construction prediction method of large span concrete bridge construction. Stress monitoring personnel can carry out the stress monitoring method according to the beneficial experience of the bridge construction project design and the result of the past stress monitoring work Reasonable forecasting, the construction of the construction structure and the process of operation, the various types of state may be a comprehensive forecast, which can be in the construction process, all kinds of invisible factors to exclude, so that the construction of large span concrete bridge and the actual construction of the
Error control within the allowable range, predictive control method of the specific operational process as shown below:

According to the design parameters of the large span concrete bridge, the technical personnel make the necessary simulation and analysis of the various types of bridge structures, and the analysis results are divided into two kinds of paths: data acquisition and construction phase prediction. The actual data and theoretical data of large span concrete bridge are compared by two paths. The results of the comparison and the stress limit are summarized and the relationship between the two is determined. Once the problem is found in the process of comparison, the necessary coping strategies should be taken in time to design parameters, construction flow, staffing and force structure Optimize the adjustment, so as to really play a predictive control method in the construction of large span concrete bridge significance, to ensure the smooth and orderly construction activities.

4.3 Application of automatic adaptive control in construction of long-span concrete bridge

Automatic control is an important branch of stress monitoring for long-span concrete bridge. During the actual operation, the bridge design and the technical parameters in the construction process are scientifically identified and corrected in time to ensure the quality of stress monitoring in order to meet the current stage of large span concrete bridge construction activities of the objective requirements. For example, from the actual situation, in the construction of long-span concrete bridge, the wet weight, elastic modulus, friction coefficient, shrinkage and ambient temperature of the concrete will greatly affect the stability of the bridge as a whole, Which requires the actual operation of the stress monitoring process, the need for technical personnel and construction units to take the form of automatic control, concrete pouring, pre-stressed tension and concrete displacement process involved in the wet weight of concrete, elastic Modulus, friction coefficient and other technical parameters for a
comprehensive analysis, and in the analysis process, the use of Kalman filter, iterative method and gray theory of various technical parameters of a comprehensive integration analysis to ensure that large span concrete bridge construction Stress monitoring work in a scientific and efficient manner. At present, the gray system theory is used to carry out the stress monitoring work. The core of the gray system theory is to analyze the design and planning of the construction project and the various data in the construction process through the integration of the gray sequence of the bridge, and summarize the design and construction rules, and then for the follow-up bridge construction activities to provide the necessary theoretical basis. Gray system theory and bridge construction deformation monitoring, stress monitoring and risk analysis and many other aspects of its basic profit monitoring model for the GM (1,1), the basic operating mode is \( X^0 = \{ x^{(0)}(1), x^{(0)}(2), x^{(0)}(3), \ldots x^{(0)}(n) \} \), \( x^{(1)} = \{ x^{(1)}(1), x^{(1)}(2), x^{(1)}(3), \ldots x^{(1)}(n) \} \), we can simplify it as \( x^{(0)}(k) + az^{(1)} = b \), \( a \) as a development coefficient, \( b \) as an exogenous variable, which reflects the basic form of GM (1,1), which can fully reflect the influence of various technical parameters on stress monitoring in bridge design and construction. According to the change of information data, the reasonable extension of the evaluation system is realized, which improves the accuracy of the stress prediction work and provides the necessary theoretical basis for the scientific and efficient implementation of the subsequent stress monitoring work in the bridge construction practice.

5 Conclusion

Stress in the construction and monitoring of large span concrete bridge construction monitoring and application is a long process, in order to ensure the stress monitoring in the concrete bridge construction design planning and construction process in the rational application, the construction unit and technical personnel need to fully analyze the stress characteristics, fully understand. To the practical significance of stress monitoring, under the guidance of scientific principles and practical principles, with the help of stress after the monitoring, predictive control and automatic adaptation control and other stress monitoring methods.

References