A Study on Integrated Geometry Management and Wireless Control System for the Construction of Concrete Pylon of Cable Stayed Bridges

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Summary

A new geometry management system for the erection of the concrete pylon of long span bridges is developed and proposed by improving former systems. The so-called integrated geometry management and wireless control system is an automated system, which controls wirelessly the GPS and tiltmeters installed in the same vertical than that the form system so as to manage the geometry and, enables the field workers to control conveniently and remotely the operation of the hydraulic jacks for the motion of the forms using the acquired data. This study verifies experimentally several types of GPS systems in order to assess their applicability during the erection. In addition, the software for the integrated management is developed, and the design and verification test of the wireless control module is also conducted. This system will be of valuable help for the improvement of the constructability, safety and comfort during construction after the completion of the development and experimental verification of the sensing system and integrated program through future complementary studies.

Keywords: geometry management; slip-form system method; pylon of cable stayed bridge; wireless control system.

1. Introduction

The erection of the concrete pylons of long span bridge cannot be completed at once and is conducted stepwise using auto climbing system method or slip-form system method. Accordingly, the most important feature during the erection is naturally the geometry control of the pylon since defective management of the geometry is likely to induce unexpected additional moments in the pylon that might have adverse effects on its safety.

GPS (Global Positioning System) is extensively used in various fields. The implementation of R&D dedicated to the improvement of the geometry control of the pylon of long span bridges using GPS will enhance the management of the geometry, reduce the manpower and shorten the time spent for measurements and by the way reduce the construction costs. The resulting system will also enable to conduct continuous monitoring of the behaviour of the completed pylon subjected to the erection of the superstructure and contribute to secure the safety of the pylon during that period. Especially, GPS-based measurement from which absolute coordinates can be identified regardless of the climatic conditions constitutes the most appropriate offshore measurement for the construction of sea-crossing long span bridges. Furthermore, the measurement method using laser scanners may provoke serious problems like the interruption of the construction process since this method cannot

https://doi.org/10.2749/222137810796063175