Experimental verification of numerical models of a long-span cable-stayed bridge over the Odra River in Wrocław

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Summary

Experimental verification of numerical models by means of load test results of the long-span cable-stayed Rędziński Bridge over the Odra River along Wroclaw Motorway Bypass is presented and discussed. The analysed bridge consists of two parallel decks connected with the central pylon by means of cable stays. Each deck construction is a four-span continuous box beam made of prestressed concrete with the spans: 49 m + 256 m +256 m + 49 m. The pylon is 122 m high and is constructed as RC structure. This one-pylon cable-stayed bridge with the longest concrete spans in Poland was designed by MOSTY-WROCŁAW s.c. and constructed by Mostostal Warszawa S.A. and Acciona.

Keywords: bridge, concrete, cables, computational methods, dynamic effects, testing

1. Introduction

Preliminary load tests of the bridge performed before the opening of the structure to traffic [1] enable evaluation of the design accuracy and the quality of construction works. Information on bridge condition at the beginning of its life forms a background for the analysis of the structure's degradation process during operation. Static and dynamic characteristics of the bridge structure, based on experimental data, are of vital importance to effective management of the structure's maintenance and operation during the whole life of the bridge. This issue is particularly relevant in relation to long-span bridges, whose reliable operation is crucial to the efficiency of the transportation system. According to the procedure presented in Figure 1, the structure is subjected to a detailed numerical analysis, often using several different computational models, then the obtained results are the basis for the selection of static and dynamic load test schemes. The results of measurements of selected physical quantities (displacements, strains, velocity and acceleration of vibrations, etc.) at the specified points allow evaluating the response of a structure to proof loads. The comparison of the values of physical quantities identified experimentally and theoretically allows assessing the behaviour of the investigated structure. Finally, the experi-mentally determined static and dynamic characteristics of the structure are the basis for defining the operational conditions and monitoring process. The basic aspects of planning and programming of the proof loads as well as their selected representative results for the long-span Rędziński Bridge (Figure 2) are presented. Results of the experimental load tests are compared with the effects of theoretical analysis performed by means of various numerical models.

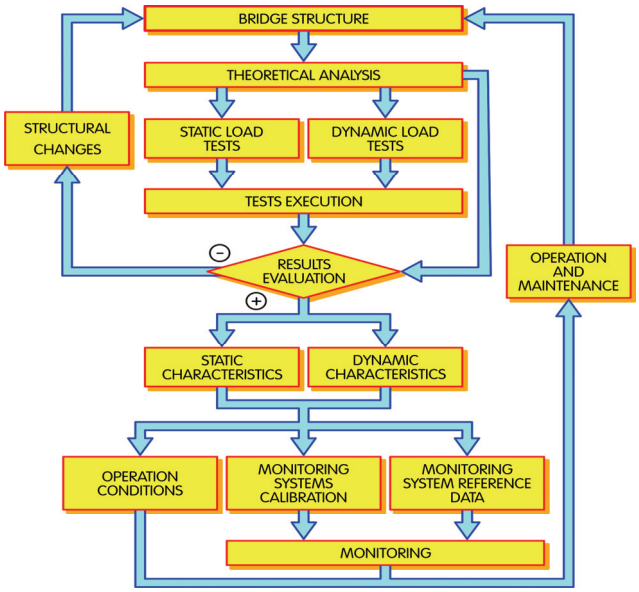

Fig. 1: Load tests procedure for long-span bridges.

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