Construction phases and reception tests of the new cable-stayed bridge over the Adda river (Northern Italy)

Carmelo Gentile
Associate Professor
Politecnico di Milano
Milan, Italy
gentile@stru.polimi.it

Roberto GENTILE
Senior Engineer
STAG Consulting
Milan, Italy
st.gentile@libero.it

Summary

The paper focuses on a cable-stayed bridge recently erected about 60 km far from Milan, in the Province of Lecco. After the description of the main characteristics and the construction phases of the bridge, the paper presents the most relevant results obtained from the bridge reception tests, including extensive characterization of the materials, load tests and ambient vibration tests.

Keywords: Cable-stayed bridge, construction phases, full-scale test.

1. Introduction

The "Cesare Cantù" cable-stayed bridge (Figs. 1-2) is a roadway bridge, crossing the Adda river between the municipalities of Olginate and Calolziocorte (about 60 km north-east of Milan). The bridge, opened to traffic on February 13th 2009, is the seventh crossing of Adda river in the Province of Lecco and represents an important commercial link between the opposite banks of the river in a very intensely industrialized area; the conceptual and executive design of the new bridge were completed in 1999 and 2003, respectively.

During the construction of the bridge, accurate checks of the materials quality and of the geometric layout were performed. After the erection of the bridge and before its opening to the traffic, severe static load tests (that are mandatory in the Italian Code for a new bridge) and two series of ambient vibration tests (AVT) were carried out. Both dynamic tests were performed using what can be considered as the standard procedures for AVT, with several set-ups in order to measure the acceleration responses in a selected number of points and considering 3 sensors as reference transducers, which were kept at the same locations in all the set-ups.

The first AVT was performed on September 2008, after the construction of deck and towers and tensioning all cables; the test was aimed at checking the tension forces in the stays and evaluating the modal behaviour of the bridge in order to design and optimize the subsequent adjustment of the forces in the suspension system. After the adjustment of the forces in the stays, the paving execution and the completion of guard-rails, a more extensive AVT was performed on February 2009 to evaluate the global dynamic characteristics of the bridge in its final configuration. Subsequently, the accuracy of the finite element (FE) model used for designing the bridge was checked through the comparison with experimental modal behaviour (natural frequencies and mode shapes); the model, notwithstanding various simplified assumptions, provided an excellent representation of the bending dynamic characteristics of the bridge and was used to predict the bridge performance during the load reception tests.

The identification of modal parameters from data collected during the two dynamic tests was carried out in the frequency range 0–10 Hz provided clear identification of at least 13 vibration modes. Furthermore, most of these modes were detected by automated identification procedures, that will be adopted in the near future, since a permanent monitoring system (including accelerometers and temperature sensors) is going to be installed on the bridge.

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