Wind Tunnel Testing and Aerodynamic Consulting for Indian Bridges Today

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Abstract

It has been many years since the wind engineers of RWDI provided aerodynamic consulting for the Anji Khadi Arch Bridge in Jammu and Kashmir, India. Wind tunnel testing and aerodynamic consulting in India has advanced considerably since 2005 as everyone would expect. The authors will revisit the methodologies used then and what would be done today to ensure climate resiliency for the desired design life of the structure far away in the future.

Although the Anji Khadi Arch Bridge was eventually rejected in favour of a cable-stayed bridge which is currently under construction the site is the same. It is anticipated that the complex topography of the site would have a major influence on the bridge microclimate which in turn could have been modified considerably due to climate change affecting this mountainous area of India.

The authors will revisit this project and detail the state-of-the-art analysis and wind tunnel testing that can now be carried in India thanks to a newly built and commissioned bridge test rig for cable-stayed bridges, suspension bridges, arch bridges, and cable-supported pedestrian bridges.

Keywords: Bridge Aerodynamics, Aerodynamic Stability, Wind Tunnel Testing, Wind Loading

1 Introduction

In support of the economic growth that is envisaged for India in the next decade, important investments in transport infrastructure have been initiated in several regions of the country or are at the planning phase by the local authorities, structural engineering firms and bridge contractors. Among these investments, several medium and long-span bridges are considered.

Bridges that are supported by cables; or have fundamental frequencies lower than 1 Hz; or with a span-length-to-deck-width ratio larger than 30 are considered sensitive to the dynamic actions of the wind. In many cases, wind loading is the dominant source of loading and special attention needs to be paid to capture wind effects, to prevent aerodynamic instabilities and to develop site specific wind loading patterns to complete their design.

In support of the development of India's transport infrastructure, RWDI has recently designed, built, installed, and commissioned an innovative bridge sectional model test rig for its wind tunnel facility in Trivandrum, Kerala in the south of India. This test rig is the first of its kind worldwide and constitutes

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