



Aerodynamic and Aeroelastic Design of Long Span Bridges: Recommendations for Chile

Matias Caram

Civil Engineer, Santiago, Chile

Matias A. Valenzuela

Civil Engineer, PhD, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile

Contact: matias.valenzuela@pucv.cl

Abstract

Bridge design under wind load in Chile has been limited to the regulations established in the road manual (Manual de Carreteras in Spanish) and the specifications for traditional bridges presented in the AASHTO Standard code and the LRFD (Load and Resistance Factor Design). All in which is assumed static conditions and fundamentally developed for construction stages.

Nevertheless, those codes are not applicable to medium to long span bridges due to the aerodynamic and aeroelastic behaviour they might present. Nowadays, bridge design in Chile has included new typologies of bridges such as the Chacao multi-span suspension bridge, therefore this requires a review and analysis of the current design codes, especially when aerodynamic and aeroelastic affects the superstructure as well as the infrastructure.

The following paper presents a proposal of recommendations for long span bridges in Chile, considering the international experience gathered and the national development of Chacao bridge.

Keywords: Aerodynamic, aeroelastic, wind, bridge, deck.

1 Introduction

Chile is one of the most seismic countries in the world. This has resulted in an important development in seismic engineering, creating an up-to-date state of knowledge and always proposing avant-garde improvements.

This approach is negligent when designing structures that are not traditional, such as suspension bridges. At the moment of design, the traditional loads are considered, such as seismic

induced vibrations or wind drag. But wind loads cease to be a uniform and constant load when a long span suspension bridge is designed. Wind becomes a load that can induce unstable dynamic behaviour that might lead to the structures collapse.

In 2014 was assigned the project of the design and construction of a suspension bridge that connects the large island of Chiloe with mainland. Unlike pre-existing Chilean suspension bridges, this bridge has spans that exceed the 1.000 meter mark. The