

Wind Response of the New Varodd Bridge Balanced Cantilever

Martin N. Svendsen, Arne Øyvind Kolstrøm, Randi N. Møller

Ramboll, Copenhagen/Denmark and Drammen/Norway

Contact: mnns@ramboll.dk

Abstract

The New Varodd Bridge is a 655m concrete girder bridge with four main spans with a maximum length of 260m. The bridge will be located in a very narrow position between the existing Varodd suspension bridge on the southern side and the existing Varodd girder bridge on the northern side. The new bridge will be constructed as a balanced cantilever with a connection to the existing girder bridge that connects the bridges in transverse displacements but not in vertical displacements. During this phase the bridge is very sensitive to wind effects. An additional complication lies in the proximity of the existing bridges which highly impact the flow around the new structure. This paper addresses the coverage of these aspects, through a combination of wind response calculations in both frequency domain and time domain, as well as wind tunnel tests performed on a 1:160 scale aeroelastic model of the balanced cantilever.

Keywords: Structural dynamics; wind engineering; frequency and time domain response calculations; wind tunnel testing; balanced cantilever; concrete bridge.

1 Introduction

The New Varodd Bridge, crossing Topdalsfjorden near Kristiansand, Norway is a 655m long post-tensioned concrete girder bridge with four main spans with a maximum length of 260m.

Construction is scheduled to start in February 2017 and Ramboll is the lead designer with Johs. Holt as sub consultants. The detailed design is carried out for the Norwegian Public Roads Administration, according to the Norwegian N400 standard [1]. The Ramboll consultancy covers all technical matters of this infrastructure project, including design of land works, marine foundations and superstructure.

The bridge will be constructed as a balanced cantilever and has a cross-section height varying from 13.6m to 3.2m. The bridge will be located in a very narrow position between the existing

Varodd suspension bridge on the southern side and the existing Varodd girder bridge on the northern side, see Figure 1. The space between the bridges will be in the region of 1m on both sides of the new bridge.



Figure 1. Existing bridges (Google Earth).

The existing girder bridge was constructed as a partial balanced cantilever with interim vertical