

Live load analysis for the Hisingen Bridge

Isak Svensson

Coordinator Arpeggio

COWI Sweden

Gothenburg, Sweden

issv@cowi.com

Coordinator for the detailed design of Arpeggio. Background as bridge designer with a MSc in structural engineering.

Thomas Darholm

Detailed design manager

COWI Sweden

Gothenburg, Sweden

thdm@cowi.com

Detailed design manager for the new Hisingen Bridge. Background as bridge designer with a MSc in structural engineering.

Kristoffer Ekholm

Project manager design

City of Gothenburg Urban Transport Administration

Gothenburg, Sweden

kristoffer.ekholm@goteborg.se

Project manager for the design of the new Hisingen Bridge. Background as bridge designer with a PhD in structural engineering.

Contact: issv@cowi.com

1 Abstract

The new bridge in Gothenburg Sweden, called Hisingen Bridge, consists of a lift bridge and approach spans. The bridge will connect the city by crossing the river Göta älv. The bridge is constructed as a vertical lift bridge which allows for up to twenty openings each day. To ease commute, the bridge has dedicated lanes for trams and buses as well as wide bike and pedestrian lanes separated from the regular traffic.

Due to its complex structure, large number of different traffic loads and complex load combinations, extensive system analyses are required. Design loads considered were loads from Eurocode, special vehicles from the Swedish national annex and tram loads unique for the city of Gothenburg. How the regular traffic should be combined with the tram loads are specific for this project. Three different design companies from different countries have been involved in the process and two complete structural analysis models have been used for the detailed design. One of the models was produced by LAP Germany, while the other was produced by ELU Sweden. The models have been used to verify each other with COWI Sweden as coordinator, which showed to be more time consuming and complex than expected.

The comparison of the two models gives mixed results. On the global level, reaction forces are found to be similar, but the deflections shows quite a big difference. Even though some differences can be found, both models are considered to be sufficient, as the primary results from each model can be verified by comparable results from the other. If the design process were to be made again the models would have been handled differently. The simplified model would have been used early in the project for preliminary global design, and then to verify the more advanced model later on.

Keywords: tram loads; special vehicles; system analysis models, lift bridge.

2 Introduction

In the center of Gothenburg the river Göta älv is passing through, dividing the city. The main connection over the river in the central parts of town is the bridge Götaälvbron, which is close to the end of its service life and needs to be replaced. An

architectural design contest was held and the proposal Arpeggio by the architectural firm Dissing+Weitling was victorious. Arpeggio is the main bridge of the new Hisingen Bridge, which in addition to the main bridge also consists of ramps, a few other bridges and a ship guiding system. The different parts of the Hisingen Bridge can be seen in Figure 1.