

## Design of Gothenburg's new landmark bridge

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### Abstract

One of Gothenburg's three existing connections across the Göta älv river is to be replaced, as the *Götaälv* bridge, constructed in 1939, has reached the end of its service life. The bridge is an important part of Gothenburg's transportation infrastructure, with roadways, light rail track and cycle and pedestrian paths crossing the river fairway. The City of Gothenburg Urban Transport Administration held an international design competition to meet the city's ambition to create a new landmark for the city. The winning entry, *Arpeggio*, 440 m long and with a 42 m lift span, is part of the new *Hisings* bridge, which has a total length of approximately 800 m. The width of the bridge varies between 35-42 m and it runs parallel to the existing Götaälv bridge. The detailed design of the new bridge was produced by COWI Sweden together with the winning design team of *Arpeggio*.

One of the great challenges for the project comes from the ground conditions in Gothenburg, with great depths of soft clay often containing contaminations from historic heavy industry. Pipe piles with minimal mass displacement were chosen both to safeguard the function of the existing bascule bridge and to provide a solid foundation for the new lifting bridge. Keeping public transport in Gothenburg and the fairway open during the entire construction period of the new bridge requires well adapted technical solutions and meticulous planning. The construction of the bridge started in January 2017, but this paper presents the design phase which lasted for about four years.

**Keywords:** bridge; movable bridge; lift bridge; steel pipe piles; steel-concrete composite

### 1 Introduction

The Götaälv bridge, which is one of Gothenburg's main connections across the Göta älv river, has been in service since 1939. Some 125,000 people cross the bridge on a daily basis on foot, by bicycle, car, bus or tram. The Götaälv bridge is a single bascule bridge (shown in Figure 1) which allows ships to travel the up Göta älv river to Sweden's largest lake, Vänern. The height of the bridge allows ships up to 18m high to pass without opening it. The old bridge was constructed using

Thomas steel which was common at the time. That particular steel has proven to be quite brittle, and in 1999 and 2000 three cracks were discovered on the main steel structure. Investigations started on how long the bridge could stay in service. A monitoring system was installed and the remaining service life of the bridge was set to 2020 [1].

An initial investigation in 2009 compared different bridge heights and tunnels as well as possible locations. Aspects that were evaluated were: possibilities for urban development, access for public transport, environmental effects, cost of