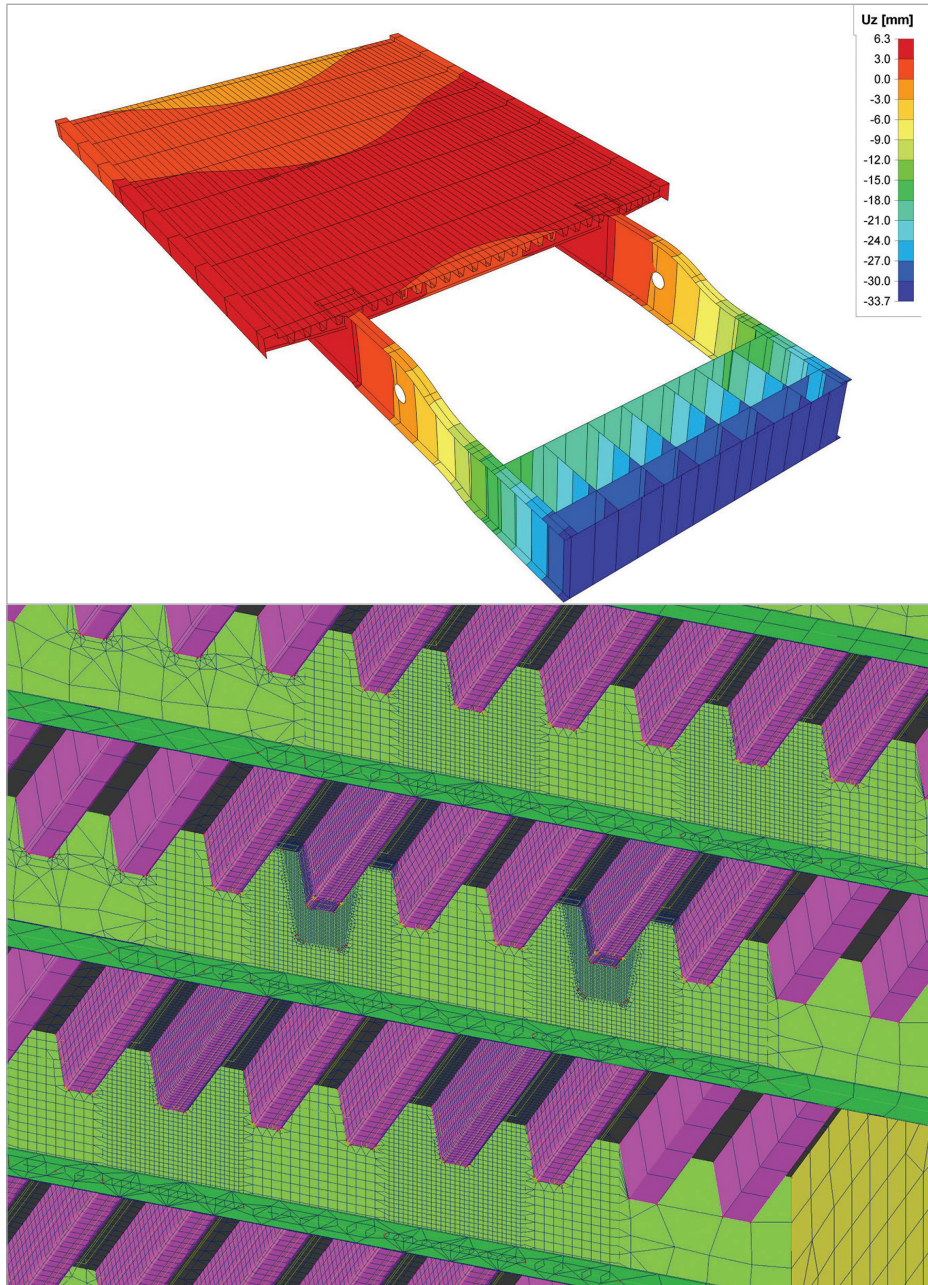


“Ketelbrug” Movable Bridge - Ketelmeer, The Netherlands



Introduction to the Ketelbrug

The Ketelbrug is located at the A6 motorway crossing Ketelmeer between Lelystad and Urk in the Netherlands. The bridge has the total span of 800 m. A bascule bridge is incorporated.

The bridge consists of 2 carriageways, both on separate bridge decks, with 2 traffic lanes. On the east side there is also a connection for slow traffic. The height of the bridge is 13.1 m and it has a movable part on the south side.

The Ketelbrug is the property of Rijkswaterstaat (national road authority) and is one of the fourteen steel bridges which must be strengthened before 2018.

Since being put into service in 1970, the traffic has increased and the trucks become heavier. This increase is more than could have been provided for at that time. The heavier load has caused fatigue in the steel structure of the bridge. The renovation is intended to ensure the safety of the bridge deck.

The renovation of the Ketelbrug entails the replacement of the two moveable bridge decks and both accessory driving mechanisms, including the electrical systems. The renovation is in order to continue to guarantee smooth and safe flow on water and road. The goal of Rijkswaterstaat is to cause the least possible disruption for the traffic on the road and waterway. The replacement of the bridge deck must take place within a weekend.

The project

The steel structural part of the project consists of creating a new design for the existing bridge deck. The new design of the bridge deck must be equal to the existing one, hence a minimum of modifications was required to the existing sub-structure. This requirement leads to a new design within the existing situation. The new design must be in accordance with the current regulations (EuroCode).

The deck of the Ketelbrug is an orthotropic steel deck where the troughs are welded between the girders. The cross girders span approximately 8 m between the two

main beams. The main girders span approximately 23 m between the main bearing and the front supports.

The use of Scia Engineer

The design of a bridge with a steel bridge deck is dominated by the fatigue assessment. For a good fatigue assessment, a very detailed model is needed. For this reason, the whole deck, including the counter weight, is modelled in Scia Engineer. The model is constructed entirely of plates. Locally, a very fine mesh is used to get detailed information.

To carry out a good fatigue assessment influence lines are needed. The influence lines are created with Scia Engineer by placing an axle load every 40 cm. This is done by using the function Traffic Loads (Lane Loads Manager). Furthermore, the result per load (axle load location) could be exported to a spreadsheet by using the detailed results in the mesh node. Finally, the fatigue assessment is realised.

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From concept to completion

Movares is an engineering consultancy providing solutions in the fields of mobility, infrastructure, building and spatial planning. Usability, future value and sustainability play a major role in the designs we produce and the advice we give. We contribute to accessibility through our unique combination of expertise. With some 1,400 members of professional staff, Movares operates throughout Europe and has offices in the Netherlands, Germany and Poland.

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Project information

Owner	Rijkswaterstaat
General Contractor	BSB Staalbouw
Engineering Office	Movares Nederland
Location	Ketelmeer, The Netherlands
Construction Period	10/2012 to 03/2013

Short description | "Ketelbrug" Movable Bridge

The Ketelbrug is a bridge with a bascule bridge incorporated. The existing bascule bridge has fatigue damage and needs to be replaced. In this project a new design for the existing bridge deck must be made. The design is an orthotropic steel deck and steel main girders with a span of 23 m. The replacement of the bridge deck must take place within a weekend.

The design of a bridge with a steel bridge deck is dominated by the fatigue assessment. This means a very detailed model, with a fine mesh, and a model made with only plate elements. From this model, influence lines could be exported and a fatigue assessment made.

