

DOI: 10.24904/footbridge2017.09645

CROSSING HAMBURG'S HISTORIC SCHLEUSENGRABEN WITH A SWING – LANDSCAPE AS THE GOVERNING FACTOR

Sören QUAPPEN

Structural engineer
WTM Engineers
Hamburg, Germany

s.quappen@wtm-hh.de

Prof. Dirk JUNKER

Landscape architect
Junker + Kollegen
Georgsmarienhütte, Germany

Dirk.Junker@jkl-architektur.de

Jan LÜDDERS

Structural engineer
WTM Engineers
Hamburg, Germany

j.luedders@wtm-hh.de

Dr. Gerhard ZEHETMAIER

Structural engineer
WTM Engineers
Hamburg, Germany

g.zehetmaier@wtm-hh.de

Keywords: steel bridge; frame structure; landscape design; interdisciplinary design approach; competition

The city of Hamburg is currently transforming a former industrial area into a new urban area. The historic Schleusenengraben, a channel dating from the 15th century, is cutting the development area in two parts. A highly frequented bike route runs along the channel. However, a pedestrian and bicycle bridge crossing the channel is key to the development of the area, which will link the working and living quarters with the social center as well as the waterside promenades and bike routes along the channel.

Therefore, in 2014 the district administration of Hamburg Bergedorf opened a competition for a pedestrian bridge crossing the Schleusenengraben underlining the role of the bridge as a vital link was.

In our eyes there were two general approaches to the task. Either focus on the structure itself by generating an iconic structure and connect it in a second step ('landmark approach') or focus on the path network by developing a walkway layout with optimal functionality and then design a footbridge that fully supports this functionality in a second step ('landscape approach').

Very early we decided to follow the landscape approach. We formed a joint team of landscape architects and bridge engineers to concentrate on an overall design concept addressing the landscaping aspect as well as the connecting footbridge thus forming a united urbanized area. Our key to bridge design in this respect: develop a structure that is fully integrated in the landscape and that provides full functionality but still provides an eye catcher on its own.

In the initial design step a 'natural' layout of barrier free walkways addressing the need of direct connections was formed, which resulted in an organic, curved alignment.

Following our design approach, the bridge layout had to reflect the flow of pedestrians and hence the walkway layout. The boundary conditions of the bridge structure based on the walkway system have been a y-shaped layout, which takes the swing from the east towards the west bank as well as a wide meeting place at the center of the bridge providing a good overview of the channel, thus inviting people to linger and stroll.

Furthermore, boundaries for the design of the bridge structure were set by the vertical alignment of the walkways resulting from wheelchair accessibility, clearance for boats as well as for the bike lane along the

channel. The final geometry limitations were determined in an iterative process between architects and engineers.

When finally concentrating on the bridge design, it was essential for the team to reflect the swinging horizontal layout of the landscape in a vibrant bridge structure. Since any support structure atop the deck would have conflicted with the smooth walkway layout, a support structure below was chosen. The given clearances limited the bridge depth to 0.50 m at certain sections. To realize this, we decided to go for a slender frame structure with a single, central leg (Fig. 1). This central frame leg is rigidly fixed to the foundation – thus resulting in a semi-integral structure.



Fig. 1. Bridge – cross section and longitudinal section / view (WTM + JKL)

The central leg is located between the waterside promenade / bike lane and the channel at the 'heart of the bridge' (the center of the Y). The main span is 36 m, the two backspans are 16 m and 10 m respectively.

The superstructure (frame tie) consists of a central box girder with crossbeams (lateral cantilevers), a lightweight orthotropic steel deck and longitudinal stiffeners with variable depth. The box girder width corresponds to the width of the central frame leg. The partly open cross section with visible cross beams / cantilevers that are extended into handrail poles gives an organic impression reminding of a backbone-like structure.



Fig. 2. Final award winning bridge (left) and overall design concept (right) (WTM + JKL)

The design presented in this paper was awarded the first price. The jury honoured that the design fully supports the natural flow of pedestrians and bicyclists; at the same time the bridge structure reflects the swinging pathway layout, but is a structure in its own right.

We would like to add the team's perception of the collaboration during the competition: We enjoyed the nonbiased and trusting teamwork of landscape architects and structural engineers following our 'landscape approach'. Even though the engineers are to some extent more in a position to react to the boundary conditions stipulated by the landscape architects, the task to design a structure that is not subordinate but self-conscious is even more challenging.

Due to budget limitations the initial award winning design was put on hold. The district administration asked for design modifications to significantly reduce costs. Despite the initial ideas the current design shows a reduced walkway layout with primarily straight connections including a straight bridge with reduced span length.