The Ołowianka Bascule Footbridge in Gdansk—A Bridge That Makes the Difference

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Abstract: In the city of Gdansk in Poland, in the very center of the Baltic capital, on 17th of June 2017, a new draw footbridge was ceremoniously opened to the public. The Ołowianka footbridge represents the long-time much needed link between the highly tourist-visited historical old town and Ołowianka Island, where further cultural, tourist and recreation facilities are located. The bridge spans a very busy navigable channel of the Motława River, leading inward towards other city channels, a harbor for many tourist ships and the Gdansk Marina. Being the main navigable entrance to the city center, the Motława is constantly under nautical traffic, so the Ołowianka footbridge operates 24/7, according to a 30-min schedule. The Ołowianka footbridge is an extraordinary acquisition for the city of Gdansk, which immediately became a new landmark and much more in the already very picturesque historic city center. Not just its design, but also its carefully chosen location and its realization at the right moment, has made this bridge indispensable to the inhabitants, visitors and the administration of the city of Gdansk, decisively contributing to further development in the Ołowianka Island area and its surroundings.

Key words: Bascule bridge, draw bridge, footbridge, bridge design, structural design, design competition, steel structure.

1. Introduction

On November 9th 2012 the winner of an international architectural design competition for the design and construction of a new pedestrian drawbridge connecting the historic Old Town and the Island of Ołowianka across the Motława River in Gdansk, was announced. In a strong international competition of 68 submitted entries, the expert jury awarded the first prize to the Slovenian Consulting Engineering Company Ponting d.o.o. (Ltd.) from Maribor.

The solution of Slovenian engineers, with its distinctive modern design, simple, economical and technically sophisticated structural solutions, decisively beat the competition and soon aroused great public interest.

The design competition was tied to a public tender for the design of the bridge, meaning, Ponting was also entitled to a contract for all subsequent design stages including construction supervision. In Poland, the project structure is very similar to the one in Slovenia, including preliminary design, building permit design, detailed design, tender design and construction supervision. The project language was exclusively Polish, and more than 10 different Polish engineering licenses were required by law. To be able to fulfill all contractual obligations we needed to connect with a Polish partner, which we found in the engineering design company Mosty Gdańsk Sp. z o.o., with its headquarters in Gdansk. After several months of negotiations with the client, at the end of October 2013, almost a year after winning the design competition, we signed a contract for the preparation of project documentation for a new drawbridge in the center of Gdansk.

Shortly after signing the contract, we immediately felt the raising public interest for the future bridge in Gdansk, but unfortunately also how such project can be used to gain political points, culminating during local elections at the end of 2014. Many tried to use the project in political reckonings, attacked the project in the media and within some project involved public institutions, but fortunately they failed to achieve anything more than a small implementation delay.

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Design project timeline (May 2012-June 2017)

- May 2012-November 2012
- design competition implementation
- December 2012-April 2013
- preparation of design tender and negotiations
- April 2013-July 2013
- negotiations and regulation of all formalities
- October 2013

- signing of design contract
- October 2013-January 2015
  building permit design (with extended deadline due to delays in issuing project conditions and consents through certain institutions)
- January 2015-May 2015
- detailed construction design
- December 2015
• issuing of building permit
• January 2016-April 2016
  preparation and implementation of the tender (7 bids in the amount from €1.85 million to €3.55 million, selected contractor Przedsiębiorstwo Usług Technicznych Intercor Sp. from Zawiercie)
• May 2016-June 2017
• construction
• June 17th 2017
• bridge opening/operation

2. Bridge Design

2.1 Innovative Design Approach

The Ołowianka footbridge is no ordinary bascule bridge. Its design is clear and simple. The lifting mechanism is completely hidden to the naked eye and, due to its unique and smart design, there are no counterweights needed to operate the bridge within 2 min. These features distinguish the Ołowianka footbridge decisively from other bascule bridges and enabled us engineers to meet very high requirements in terms of transparency and environmental integration set by the owner, even during the design competition stage.

We have managed to push the design even further, not just to fit perfectly into the surroundings, but to even take some shapes from it and successfully integrate them into the basic design of the bridge.

The bridge’s lightweight superstructure itself is shaped in the concept of nautical forms of contemporary vessel design. The integrated control building connects the past with the future. On the one hand, it is reminiscent of a modern cruise ship bridge and on the other hand, it imitates the famous “Zuraw” building which stands in close proximity. The white color of the bridge was also chosen deliberately to blend in with the tourist ship fleet moored to the shore piers in the Ołowianka channel next to the bridge.

2.2 Structural Design

The length of the main bascule span of the bridge is 40.5 m. Together with the fixed northern side span of 13.4 m, the southern abutment and approach ramps at both sides, the bridge’s total length amounts to 70.6 m. The width of the bridge changes from 6.8 m, with a single footpath and clear width of 6.0 m, to 8.5 m, with two parallel footpaths with clear widths of 2.50 m, divided by the uprising triangular superstructure.

During the building permit design stage, according to clients’ demands to ease the passage of emergency vehicles, the footpaths were widened from originally 2.30 m.

Fig. 3 The control building is kind of reminiscent of the old port crane “Zuraw”.

Fig. 4 Original structural design of the bridge.
In the main/bascule span the superstructure of the bridge is a steel trapeze-shaped torsional girder, cambered with an additional triangular string towards the trunnion. The deck is a symmetric cantilevered orthotropic steel structure. Some 10 mm thick steel orthotropic plates are strengthened with longitudinal and transverse stiffeners. The transverse stiffeners, set on a 2.50 m raster, extend, over the outer longitudinal beam, into railings bollards. The longitudinal stiffeners follow the main girder geometry 60 cm apart. The structural height of the main girder varies from only 45 cm, at both ends, to 190 cm in the middle of the span. The height of the cambered string at the trunnion is 5.20 m.

In horizontal position (bridge in function and hydraulic off) the structure acts almost as a simply supported girder, while in the lifting stage this is a stayed bascule bridge.

The whole steel superstructure is manufactured from standard structural steel grades S355 respectively S460, welded in workshop and assembled on site.

2.3 Trunnion and Draw Mechanism

The trunnion of the draw bridge is integrated into the end cross girder above the caisson abutment at the Ołowianka Island. The trunnion bearings are manufactured as completely maintenance free swivel bearings. The bridge superstructure is rotated for 65°, raised and lowered app. 3,000 times a year.

The bridge is equipped with an electro-hydraulic lifting mechanism consisting of a hydraulic drive unit, two main hydraulic cylinders, a locking cylinder, for locking the bridge in the raised position, electronic gear for maneuvering and securing the hydraulic drive and various bridge operating and monitoring equipment.

The maximum load of the hydraulic cylinders is 6,252 kN (3,126 kN each), and the maximum stroke when lifting the bridge is 4,560 mm. The power of electric motors during normal operation is 250 kW, in safety mode 50 kW. The operating time for raising/lowing the structure is 2 min during normal operation, 15 min in safety mode.

Fig. 5 Control and engine room with two hydraulic cylinders 2 × 312.5 ton load capacity.
3. Construction

Construction work on site began in mid-summer and the contractor proved to be extremely effective. The entire foundation and bridge substructure, with demanding “in water” construction works and with constant, fairly dense, seasonal, nautical traffic, were carried out in just two months. In the autumn, looking at the construction site, with the almost finished concrete substructure of the abutments and the riverbed pillar extending from the water, one could already feel what was happening. We were able to constantly monitor and supervise the construction site via a web-camera, installed by the client for this purpose, and later used to promote the bridge and to promote the Pomeranian capitol of Gdansk (http://www.gdansk.pl/kamera/kladka).

A period of winter months followed, which in northern Gdansk are mostly unsuitable for construction, but the construction site did not rest even then. The bulk of the action, all the way there until February, moved to the interior of the abutment on Ołowianka Island. Installation works in the engine room and control building were also extensive and demanding. At the same time, at the workshop the construction of steel structure, and the production of hydraulic drives, were carried out.

The spring weather was very favorable, as temperatures quickly exceeded freezing point and work on the construction site could be resumed. By the end of March everything was ready for the assembly of the steel structure, hydraulic mechanisms and the remaining electrical and mechanical hardware.
Finalization works of the structure, arrangement of bridge access plateaus and setting of extremely complex and sophisticated bridge equipment, including lifting mechanisms and monitoring and safety systems, followed in April and May.

The initial raise of the structure was carried out on May 24th, and the technical approval and commissioning of the bridge on June 14th. The bridge was inaugurated with a grand opening ceremony on June 17th 2017, which was attended by over 10,000 people.

At its completion, the investment cost for the new Ołowianka Footbridge reached just over €2.2 million, of which €1.00 million for the bridge structure (foundations, sub- and superstructure, control building), €0.65 million for the two powerful hydraulic drives, €0.35 million for the sophisticated electrical equipment and telecommunications and about €0.20 million for the architectural urban equipment and landscaping.
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Fig. 11 Bridge layout in front of the old town scape.

Fig. 12 Night view of the bridge.
4. Conclusion

The Ołowianka footbridge in Gdansk is the first draw bridge designed by Ponting and the first project implemented in Poland, both turned out to be a unique experience. The conditions for foreign designers in Poland are very demanding, without a good local partner it is practically impossible to operate normally. Language differences, geographical obstacles and highly politicized, sometimes whimsical authorities and local initiatives have also added their share to it. The path from the beginning of the project to its implementation was quite long, sometimes complicated, but also very interesting, and the result thereof is a new attraction of the Baltic capitol.

It took 4.5 years from the original idea with which Ponting engineers won the design competition to the bridge completion. During this time, many things changed, but the design of the Ołowianka Footbridge remained the same. The bridge was built exactly the way it was designed from scratch and, with its construction cost of just about €2.0 million, became the most lucrative investment in recent years in Gdansk. Its importance to the city of Gdansk immediately proved to be significant and therefore Ponting and Mosty Gdansk were recognized by the Mayor of Gdansk Mr. Paweł Adamowicz, receiving the Gdansk City Award for the best architectural implementation of 2016-2017.

The Ołowianka footbridge won the Polish National Bridge Competition in the “footbridge” category (2017) and was awarded in the Competition for the Award of the Polish Minister of Investment and Development for outstanding creative achievements in the fields of architecture and construction as well as planning and spatial development (2018).

References