



Modul Bridge Bögl



The partially poor condition of Germany's bridge structures makes it necessary to implement a large number of replacement measures in the next few years. This situation, recognised by politicians, is reflected in the Transport Infrastructure Plan 2030 for Federal Highways adopted by the Federal Government in August 2016.

Investments of 133 billion euros are planned for the construction and renovation of road bridges – a significant increase compared with previous investment programmes. However, the mere provision of funds does not guarantee a sensible investment. The analysis of various design variants using life cycle-oriented calculation methods can positively support decision-making in this context.

New construction methods with a high degree of prefabrication therefore offer great potential for becoming an important building block for the solution of the upcoming bridge renewal measures in Germany. With the Modul Bridge Bögl, the Max Bögl Group offers an innovative and novel construction concept with a separate load-bearing system. The prefabricated bridge consisting of prefabricated composite girders and roadway elements can be driven on directly without waterproofing and surfacing, which significantly shortens the construction time on site.

The Modul Bridge Bögl also has an advantage over conventional bridge construction methods in terms of life cycle costs. From a cost point of view, it is a clear alternative to the previously practiced bridge construction and also leads to a significant reduction in externally generated costs. In particular, the economic damage caused by the enormous traffic jams during the construction phase of conventional bridge constructions should be mentioned here.

The economic and technical advantages to be achieved by the Modul Bridge Bögl should in future be taken into account by planners, builders and authorities in tenders and in subsequent award procedures. This could lead to a situation where the cheapest bid price is not always the most economical solution. An incentive for more openness towards innovation. Because Germany can only be and remain competitive if new ideas find fertile ground for development.

Martin Holfelder
Member of the Board Infrastructure



The Modul Bridge Bögl

With the Modul Bridge Bögl, the technicians and specialist engineers of Max Bögl have succeeded in creating a convincing innovation in bridge construction. Already in the planning phase, all parameters for the structure to be constructed are processed in a 3D model. The structure data is then transferred to production using BIM technology. In this way, the prefabricated composite girders as well as the roadway elements can be produced simultaneously in the various workshops of the group of companies.

At the same time, the foundations as well as the substructures specially simplified for this system are realized on the construction site. The prefabricated composite girders are then delivered to the installation site and hoisted onto the prepared substructures by truck-mounted cranes. The measurement of position and height plays an important role here. The prefabricated composite girders are then concreted into the substructures and the bearing surfaces for the roadway elements in the wing area are supplemented.

Parallel to these activities on the construction site, the roadway elements made of self-compacting concrete are ground in the precast factory in the area of the later contact surfaces by means of a CNC milling machine developed by Max Bögl.

In a further work step, the surface treatment of the roadway elements is carried out, as these are directly driven on or walked on without any sealing or road surface. Finally, the sealing strips, which are also used in tunnel construction, are installed on the contact surfaces of the roadway elements.

The roadway slab elements, which weigh up to 30 tons, are then laid on site on the previously prepared support surfaces. Immediately afterwards, they are clamped together in the longitudinal direction to form a quasi homogeneous carriageway slab. Control and retensioning devices are installed in both abutment chambers to secure the position. Finally, the bridge is extended with railings, crash barriers and markings. As soon as the road construction work up to the modul bridge has been completed, the structure can be opened for traffic.

From the ground-breaking ceremony to the opening for traffic, the construction time for the Modul Bridge Bögl is generally only around 80 working days for spans of up to 50 m. Compared to conventional construction methods, this corresponds to a construction time reduction of around 40–50 percent.



For its outstanding and innovative engineering performance, the Modul Bridge Bögl was awarded the Engineering Prize 2019.



Modul Bridge Bögl



High-precision precast concrete parts
Individuality of the components due to CNC-controlled grinding developed by Max Bögl in the factory



Modular construction system
Fast assembly and simple replacement of individual roadway elements up to complete disassembly



Concrete quality
Highest quality standard through factory production and use of self-compacting concretes





□ **Monolithic bridge cross-section**

Bridge caps and roadway from a single mould and thus no need for bridge sealing and roadway surfacing



□ **Directly accessible concrete surface**

Contrary to the standard construction method, the bridge surface does not require waterproofing or road surfacing. The concrete surface of the roadway elements is directly driven on in the same way as concrete motorways.



□ **Maintenance-friendly design**

All components are easily accessible and can be inspected during main bridge inspections.



□ **Short construction time (80 days)**

Significant reduction of construction time on site due to high degree of prefabrication

System description

The superstructure of the Modul Bridge Bögl is divided into two separate load-bearing systems. The longitudinal support system consists of two prefabricated composite girders, consisting of airtight welded hollow steel boxes with connected concrete top chord. These prefabricated composite girders are concreted into the abutment discs to form a frame system. The roadway elements are supported on the prefabricated composite girders and the abutments in a longitudinally displaceable manner.

The precast concrete slabs (cross support system) are prestressed in the longitudinal direction of the bridge by means of exchangeable clamping strands. In this way, the sealing elements between the roadway elements are compressed in a controlled manner, resulting in a guaranteed watertight roadway slab. The precast concrete slabs, which are produced in the factory, already have the pavement and cycle track caps monolithically integrated.





Production



Logistics



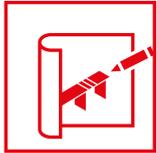
Construction



Dismantling



Construction time: 80 days



Planning



Operation

Economic and technical advantages:

- Clear separation of the load-bearing systems in longitudinal and transverse directions
- High quality standard thanks to extensive prefabrication of the bridge elements in the factory
- Roadway elements in main load-bearing direction, i.e. full in bridge transverse direction prestressed
- Due to the elimination of bridge sealing and road surfacing, there is no need for weather-dependent work on the construction site required
- High traffic safety due to directly driven concrete roadway slab (long-term high grip values and bright road surface)
- Elimination of bridge bearings and transitional structures due to integral design and thus lower maintenance costs
- No ruts, as the concrete is directly driven on; thus significant reduction in direct and indirect maintenance costs
- No supporting scaffolds or central supports for the fabrication of the superstructure required; therefore considerably lower traffic disruptions during the construction phase
- Quick and easy exchangeability of the roadway elements (both the complete as well as in partial areas)
- Short interventions in the traffic flow due to extensive prefabrication of the bridge elements
- Reduced maintenance costs due to renewal of the waterproofing, the no pavement caps and road surface required
- Enormous construction time reduction compared to conventional construction methods
- Lower Life Cycle Costs (LCC) in comparison to conventional bridge structures
- The bridge can be easily dismantled thanks to the modular construction principle
- No mixing of different building materials (concrete and bridge waterproofing); thus, the reuse of the building materials possible at the end of use (sustainability)



Max Bögl Group

With over 6,500 highly qualified employees at 40 locations worldwide and an annual turnover of over 2 billion euros, Max Bögl is one of the largest construction companies in the German construction industry. Since its foundation in 1929, the company's history has been characterised by innovative strength in research and technology - from tailor-made individual solutions to constructionally and ecologically sustainable overall solutions.

With forward-looking in-house developments on topics of our time, such as renewable energies, urbanisation, mobility and infrastructure, the Max Bögl Group is already realising solutions for the megatrends of our globalised world. Based on many years of experience and competence in high-prec-

sion precast concrete construction, Max Bögl is also positioning itself as an important driving force in the development of innovative products, technologies and construction processes.

The wide range of services and the high level of vertical integration with our own steel construction, our own precast plants, the most modern fleet of vehicles and equipment as well as our own raw materials and building materials guarantee the highest quality. The use of BIM, lean management/ production and standardised project management ensures adherence to schedules and cost-effectiveness from the initial concept idea to the finished building product.

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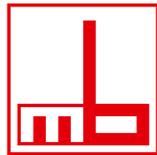


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MAX BÖGL

Progress is built on ideas.