



PROGRESS: 100% - COMPLETED
GERMANY

EIGHT-LANE MOTORWAY BRIDGE OVER THE ISAR CANAL

Demolition and New Construction of the A99 Bridge

Text: Bernhard Jesner, Markus Murauer, Wilhelm Scheutz

Within the scope of widening the A99 to eight lanes, PORR was commissioned to demolish and rebuild two bridge superstructures crossing the Isar Canal.

The A99 is the busiest motorway in southern Germany with up to 170,000 vehicles per day. The fact that the work had to be carried out without interrupting traffic posed challenges for PORR, as did the sensitive ecological environment and the sophisticated architecture.

Project data

Employer	Autobahndirektion Südbayern
Contractor	PORR . NL Salzburg
Project type	Civil engineering . Infrastructure / bridge construction
Project scope	Demolition and new construction of two motorway bridges, each with four lanes and one hard shoulder
Construction start	12/2017
Construction end	10/2019

Overview

From 2016 to 2020, the South Bavaria Motorway Authority will widen the 8km section southeast of the Allianz Arena from the North Munich junction to the Haar junction. The widening of the Munich motorway ring – which dates back to the 1970s – to four lanes plus a stationary lane in each direction, should significantly improve the traffic flow in and around Munich. The total volume of the project amounts to 170 million euros.

The most challenging technological and logistical aspects of the project were the two bridge superstructures crossing the Isar Canal. Due to the close proximity to the recreational area around Munich's Feringa Lake, particular emphasis was placed on the architectural quality of the new structure. The two bridge superstructures at their central location in the motorway section closed a logistically vital gap for the subsequent road construction works. PORR was awarded the contract for implementation at the end of 2017.

Challenging demolition work

The demolition work on the existing three-span structures had to be carried out without interrupting traffic and in compliance with various protective measures for the Isar Canal. Demolition also had to be done without affecting the water quality and without damaging the several decades old, 20cm thick concrete channel. For this purpose, a 20cm thick, watertight intermediate slab was attached to the demolition scaffold.

Furthermore, the habitats of more than ten different bat species on the construction site were not to be disturbed.

Special protective barriers were installed that enabled the bats to cross the illuminated construction site undisturbed during the night. A monitoring system was used to record, control and document all the flights through the construction site.



The existing superstructure is being demolished in the background, while the sheet piling work for the new construction is being carried out in the foreground. Source: PORR



PORR MET THE HIGH TECHNICAL AND ENVIRONMENTAL REQUIREMENTS WITH A SPECIAL DEMOLITION SCAFFOLD, WHICH WAS DEVELOPED TOGETHER WITH PORR DESIGN & ENGINEERING GMBH.

Bernhard Jesner
Project Manager, PORR Bau GmbH

One framework – four segments

The existing superstructure is being demolished in the background, while the sheet piling work for the new structure is being carried out in the foreground. The result was a versatile scaffold that could be used for demolition as well as for the new construction of lanes in both directions. This was achieved with six 2.30m high HV21 tubes, a cross girder and 20cm thick wood panels.

To achieve the required versatility, the tubes were mounted on skidways consisting of strip foundations and steel girders. This allowed the scaffolding to be hydraulically repositioned in the area of the superstructures, which made

it possible to use the same scaffolding for demolition and for the new construction of lanes in both directions. The skidways were constructed on small bored piles manufactured by PORR Grundbau.

The approximately 45m long and 100t heavy HV21 tubes were delivered in four segments, bolted on site and tandem-lifted by two mobile cranes.



The small bored piles for the skidways were constructed by PORR Grundbau. Source: PORR

A sophisticated design

Due to the close proximity to the recreational area around Munich's Feringa Lake, the customer placed particular emphasis on the architectural quality of the new structure. The bridge piers were conically tapered and several pier heads chamfered. The longitudinal girders, which were adapted to the flow direction of the central Isar Canal, were parabolically shaped.

As both lower edges of the longitudinal girders had to be offset, the undersides of the girders were designed with a curve that increased towards the pier heads. An adaptable and precisely structured formwork was required to produce the complex formwork geometry, which was achieved with a combination of shaped panels and standard shoring formwork.



The load-bearing formwork was constructed with parabolic longitudinal girders and conical piers. Source: PORR

The geometry of the conical longitudinal girders was created using prefabricated trapezoidal slabs, known as pre-formed slabs. The deflection of the support structure during the course of concreting was calculated to be approximately 10cm and taken into account beforehand, as was the counteracting of long-term deflections under the load of the pre-formed slabs. The deck slab was conventionally formed with slab towers.

The entire bridge had to be constructed according to architectural specifications with sawn and planed tongue and groove boards in order to meet the architectural concrete requirements. In addition, all construction joints were specified in terms of design and position. The piers were designed with only one joint plane.



DESPITE THE CHALLENGING CONDITIONS AND THE COMPLEX DEMOLITION PROCEDURES, THE FIRST SUPERSTRUCTURE WAS CONCRETED AS EARLY AS JULY 2018, ONLY SEVEN MONTHS AFTER THE START OF CONSTRUCTION.

Wilhelm Scheutz
Main Foreman, PORR Bau GmbH

Concreting in a single pour

Despite the challenging conditions and the complex demolition procedures, the first supporting structure was concreted as early as July 2018, only seven months after the start of construction. After completion of the excavation and noise protection measures, traffic was redirected in November 2018. The demolition and concreting of the second supporting structure was successfully completed in May 2019.



The delivery of concrete for concreting the superstructure proved to be a real challenge because of the high volume of traffic. Source: PORR

In both structures, 1,800m³ of concrete was delivered in one pour with four concrete pumps of up to 70m in length. The superstructure concrete (approx. 1,700m³) was delivered during the night between 7 pm and 6 am because of the enormous volume of traffic on the outskirts of Munich. Delivering the concrete from two mixing plants was also a major logistical challenge.

The concrete surface was compacted and levelled with two vibrating screeds; each 28m long. Suitable concrete quality could be ensured over the entire supporting structure, even in the oblique corners, due to the inclined arrangement of the screeds parallel to the abutments.



View under the new bridge while moving the scaffolding. Source: PORR

Final works and commissioning

At the same time as completing the excavation and implementing the noise protection measures for the rest of the section, in late summer 2019 PORR took care of the traffic route and landscape design under the new bridge structures. For this purpose, feeder roads for the motorway ramps and a pedestrian and cycle path were built and the river bank shaped.

Thanks to the close cooperation with PORR Grundbau and PORR Design & Engineering, all challenges were successfully handled to the complete satisfaction of the customer. The traffic assignment and the opening for traffic took place according to plan in November 2019.



The contract also included road, cycle path and landscape design under the new bridge structures. Source: PORR

THE CONSTRUCTION WAS COMPLETED BY PORR ON SCHEDULE AND TO A VERY HIGH STANDARD OF QUALITY IN A SPIRIT OF PARTNERSHIP. THE MOTORWAY AUTHORITY WOULD LIKE TO TAKE THIS OPPORTUNITY TO THANK PORR EMPLOYEES FOR THEIR EXCELLENT COOPERATION.

Helge Clauß
South Bavaria Motorway Authority

Technical data

1,700m³ each in a single pour

Quantity of concrete per superstructure

Total bridge length	approx. 80m
Bridge width	two bridge structures – each 26m
Steel incorporated	approx. 1,300t
Concrete incorporated	approx. 9,000m³