

A bridge bearing for different construction stages

MSM Spherical Bearings display various functions at the Randersacker Bridge.

Munich/Randersacker. The lateral shifting of the bridge in February was the visible highlight for the new Randersacker Bridge. However, the working horses of that structure are the sliding bearings. They demonstrate their performance in construction mode, in deviation mode of the traffic, next during the lateral shifting of the bridge, and finally in their all year long operation mode. 32 MSM Spherical Bearings master this extraordinary challenge, supporting together a vertical load of 1 Mio. kN, up to 570 mm displacement and 5 ‰ rotation.

With a main span of 540 m, the Randersacker Bridge spans the Main river, a railway line, and a Federal Highway. In the course of the widening of the A3 motorway to 6 lanes, this 48 year old structure was completely replaced. A new bridge structure while maintaining traffic poses a special challenge, because 4 lanes must always be available for the traffic. The Northern Bavarian Expressway Administration therefore specified the construction mode as follows: The first superstructure was erected north of the existing bridge and then absorbed the existing traffic. The old bridge was dismantled in 2009 and the second superstructure was erected at its location. Now the traffic was shifted from the first to the second superstructure, and from February 21st to 23rd the lateral shifting of the northern superstructure took place. The official inauguration is planned in the second half of the year.

Successful planning and cooperation

The special challenge in particular for the northern superstructure was in the various load conditions which occurred over several years. Already in 2006 Maurer Söhne specified the bearing characteristics in cooperation with the site management of the contractor Dywidag. Design checker was Dr. Ing. Hochreither. In total the construction of this bridge not only is a masterpiece in engineering, but also sets an example for a long and anticipatory cooperation of various partners.

Load in Construction Mode – Live Load – Fixation

MSM Spherical Bearings were the preferred choice, because only this type is capable to accommodate the various load cases. It begins with the free cantilever construction. Because with progress in construction the fix point changes, the bearings had to be fixed alternately and then be released again. During the next phase the bearings had to accommodate the traffic – first at the northern side, then on the southern side – of the deviation traffic of 4 lanes, thus an increased live load with increased displacements.

For the lateral shift of the northern structure in February 2011 all bearings had to be designed such that they could be fixed, in order to place the lateral shift bearings below them. Further to be considered were the forces during the fixation phase, in particular the horizontal forces lateral to the axis of the bridge which occurred at the beginning of the lateral shift.

Contact for the press

Maurer Söhne Structural Protection Systems Division
 Judith Klein, Marketing Coordinator
 Frankfurter Ring 193, 80807 München
 Phone: +49 (0)89 32394-159
 Fax: +49 (0)89 32394-306
 E-Mail: klein@maurer-soehne.de



Installation of an MSM Spherical Bearing on a pier head. To be followed by the superstructure in a free cantilever construction method. At the front side the fixation elements can be discerned.

Photo: Maurer Söhne



Fixed MSM Spherical Bearing at the abutment (axis 100) prior to lateral shifting.

Photo: Maurer Söhne



End position of the MSM Spherical Bearing after lateral shifting. The bearing is still fixed on the shifting sledge.

Photo: Maurer Söhne

The lateral shift was accomplished as planned from February 21st to 23rd. On 5 axes the 540 m long and 32,000 t heavy structure was shifted with the help of hydraulic strands by 26 m in lateral direction.

Constant load, Monitoring, and Foresight

In their final stage, the 32 bridge bearings accommodate a total of 1 Mio. kN of vertical loads caused by dead load of the two superstructures combined with the live load. The biggest bearing with a diameter of 1.5 m transfers 72,000 kN of vertical load, and the highest horizontal forces act in the axis of the fix point with 5,000 kN. To be added are up to 570 mm of displacement and 5 ‰ rotation. As a principle such forces and displacements can only be mastered by way of a differential construction mode (i.e. with the help of bridge bearings and expansion joints, as opposed to the integral construction mode that per definition does not entail bridge bearings and expansion joints).

The sliding material MSM in the spherical bearings thereby ensures that all forces and displacements are safely transmitted into the abutments and piers with a maximum friction of 2 %. The bearings enjoy a service life of at least 50 years and are maintenance free. Furthermore, during the next decades the movements of the superstructure are being monitored by way of integrated measurement points. In case that over the years the bridge structure should incur different settlements, the MSM Spherical Bearings are designed in a way that shim plates can be inserted to balance a difference in height.

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