

Rhine bridge in Speyer: Expansion joint constructions and bearings changed over just two weekends

First operation of its kind on a large bridge calls for manpower, planning and experience.

Speyer, Germany. In March 2024, MAURER successfully replaced the old roller shutter joint with a modern MSM® swivel joist expansion joint construction. It also overhauled a smaller MAURER girder grid and replaced four old roller bearings with new spherical segment bearings. All in the space of one weekend with a full road closure lasting just 50 hours. On the following weekend, they did it all again in the other direction. There were plenty of factors behind the success, from comprehensive advance planning and custom solutions to a large and well-coordinated team on site.

The A61 motorway crosses the river Rhine and its foreland near Speyer via two bridge structures: The striking asymmetrical cable-stayed bridge on the Rhine and an approach bridge on its left bank. Both bridges were built over 50 years ago and are mounted together on a pillar on the left bank. After decades of repair and maintenance work, the expansion joint on the bridge was in need of complete replacement.

Expansion joints are flexible construction elements that are fitted at the fixed ends of the bridge and compensate for the superstructure's movements caused by traffic, wind and temperature fluctuations. They also ensure that vehicles can drive across this juncture unimpeded, regardless of the bridge's displacement.

The special challenge posed by the Rhine bridge near Speyer was that the expansion joints had to compensate for the displacements and movements of two moving superstructures (the river and approach bridges). This is why they were designed and produced as a custom solution. Alongside this, the 450 m long asymmetrical cable-stayed bridge has a steel superstructure, while that of the 302 m long approach bridge is made of prestressed concrete. The expansion joints therefore had to be connected to steel on one side and steel-reinforced concrete on the other.

Further challenges came from the need to keep the full road closure times as short as possible. The old expansion joint was a roller shutter joint. This design stopped being used in the 1970s, and replacing it would be a complex procedure. But every intervention into the structure to remove the old joint and install a new one would cost time.

Press Contact

MAURER SE

Judith Klein

Head of Marketing & Communication

Frankfurter Ring 193, 80807 Munich

Telephone +49.89.323 94-159

Fax +49.89.323 94-306

j.klein@maurer.eu, www.maurer.eu



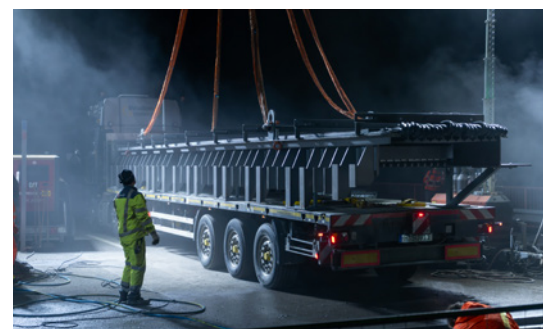
The A61 bridge over the Rhine at Speyer. The expansion joint between the asymmetrical cable-stayed bridge and the approach bridge on the right was replaced.

Photo: Lothar Reichel



The image shows the new expansion joint on the left, which was replaced on the previous weekend, under traffic load. On the right is the gap following the removal of the old roller shutter joint.

Photo: Andreas Hantschke



The new expansion joint construction transported by HGV.

Photo: Lothar Reichel

On top of this, the full road closure was to be used for other work, specifically the renovation of a MAURER girder grid at the abutment and the replacement of four bridge bearings in each direction.

Just 50 hours of closure time

Replacing an expansion joint usually takes four to six weeks in each project phase. The construction site team completed the project on two consecutive weekends in March 2024, each with full road closures of just 50 hours in each direction. This extraordinary feat was a first in Germany. The record time was achieved thanks to intensive planning and preparation involving everyone working on the project.

The key was optimising the connection details of the expansion joint to minimise the installation time, as there needed to be as few interventions into the structure on site as possible. With this goal in mind, as many tasks as possible were completed in advance at the plant in Munich. The entire weekend was then planned in 15-minute cycles:

- Removing the old expansion joints
- Preparing the installation points
- Lifting in the new expansion joints
- Connecting the new joints to the steel or concrete; the steel connection in particular was a technical challenge that required a lot of manpower.
- Casting the concrete
- Completing the road surface
- Acceptance

MSM® swivel joists for demanding bridges

The project on the A61 near Speyer used new MSM® swivel joist expansion joints (XS12) with 12 strip seals and noise reduction. These allow the bridge to compensate up to 1,140 mm of longitudinal displacement. Together with the footpaths, each of the joints is 16.5 m long (12.75 m in the lanes) and weighs 21 t, making them the largest MSM® swivel joists currently installed in Germany.

Expansion joint constructions with swivel joists have been used successfully in demanding bridge projects around the world for decades. They allow for movements of up to three metres and more in some cases, as well as rotations in all directions. The parallel profiles rest on top of the swivel joists. These run at a slight angle to the direction of travel, therefore ensuring that the bridge's expansions and contractions are spread evenly across the sealing elements between the steel profiles.

Press Contact

MAURER SE

Judith Klein

Head of Marketing & Communication

Frankfurter Ring 193, 80807 Munich

Telephone +49.89.323 94-159

Fax +49.89.323 94-306

j.klein@maurer.eu, www.maurer.eu



The new, 12-profile expansion joint is installed on the Saturday night: a complex operation that called for a large team of specialists.

Photo: Lothar Reichel



The expansion joint after installation. This image shows the joists with the gleaming W-shaped catamaran supports. These support the profiles running transverse to the road direction, with the rhomboid plates for noise reduction on top.

Photo: Lothar Reichel

Among the things that make MAURER's MSM® swivel joist systems special are the bearings for the profiles. Instead of simple elastomeric bearings, they run in newly developed W-shaped MSM® bearings. This so-called catamaran support allows the profiles to glide over the joists more easily and precisely. The shape and the high-performance MSM® sliding material prevent restraints and extend the service life.

The profiles on the expansion joints on the A61 bridge also have rhomboid plates on top to reduce noise. These specially profiled plates are welded on and reduce the noise level by 30 to 50%. Welded plates last much longer than screwed elements that can become loose after being driven over countless times.

Additional bearing replacement and expansion joint repair

Alongside this main project, MAURER used the weekend road closures to perform other work:

- A MAURER girder grid expansion joint (D240) at the northwest abutment was overhauled with all wearing parts replaced, including the sliding bearings and springs, control springs and strip seals.
- Four existing roller bearings were replaced with spherical segment bearings at the same abutment on the approach bridge and pillar.

This latter point is also proof of MAURER's expertise. Unlike conventional spherical bearings, MSM® spherical segment bearings have a rectangular design. They can therefore be adapted precisely to the connection surfaces of the old roller bearings, while also boasting better technical properties and a longer service life. These modern custom bearings are therefore the perfect replacement for existing roller bearings, without the need for major interventions in the structure.

Completing the work across the two weekends was only possible with a large amount of manpower. To achieve this, MAURER called upon the resources from all its assembly offices. The project management and expansion joint construction management came from Munich, while the team from Lünen took care of construction management for the bearing change. The team of over 30 installers came from all of the company's assembly offices in Bernsdorf, Lünen, Munich and Vienna. MAURER was involved in the project as the main contractor for a construction firm.

Text: 6,628 characters

Press Contact

MAURER SE

Judith Klein

Head of Marketing & Communication

Frankfurter Ring 193, 80807 Munich

Telephone +49.89.323 94-159

Fax +49.89.323 94-306

j.klein@maurer.eu, www.maurer.eu



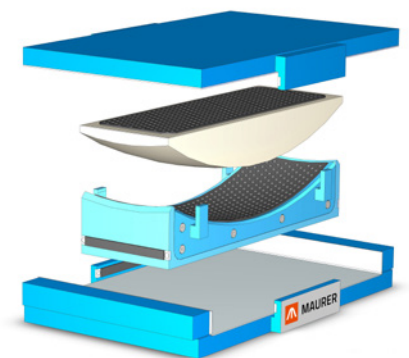
The new MSM® swivel joists are welded onto the steel bridge over the Rhine. The joists can be seen at the top supporting the profiles above.

Photo: Andreas Hantschke



The installed expansion joint with traffic passing over. The rhomboid plates reduce the noise of the vehicles.

Photo: Andreas Hantschke



An explosion diagram illustrating the principle of the spherical segment bearings. The longitudinal design is perfectly suited to replacing roller bearings, while the curved sliding surface also absorbs rotations.

Image: MAURER

Quick facts about MAURER SE

MAURER SE is a leading specialist in mechanical engineering and steel construction, with over 1,500 employees worldwide. The company is the market leader in structural protection systems (bridge bearings, expansion joints, seismic protection devices, tuned mass dampers and monitoring systems). It also develops and produces vibration isolation solutions for structures and machines, rollercoasters and Ferris wheels, as well as special structures in steel construction.

MAURER has been involved in many spectacular large-scale projects. These include the world's largest bridge bearings in Wazirabad, Pakistan, earthquake-resistant expansion joints for the world's longest suspension bridge, the 1915Çanakkale in Turkey, tuned mass dampers in the Baku and Socar Towers in Azerbaijan, and the unique guided cross-ties with derailing protection on the Champlain railway bridge in Montreal. Complete structural isolation projects range from the Acropolis Museum in Athens to the new airport in Mexico. MAURER has also worked on spectacular amusement rides, such as the Umadum Ferris wheel in Munich, BOLT™ – the first rollercoaster on a cruise ship, and the world's first duelling rollercoaster at the Mirabilandia Park in Ravenna, Italy.

Press Contact**MAURER SE****Judith Klein**

Head of Marketing & Communication

Frankfurter Ring 193, 80807 Munich

Telephone + 49.89.323 94-159

Fax + 49.89.323 94-306

j.klein@maurer.eu, www.maurer.eu