

Beautiful Bridge under Monitoring

The Valdebebas Bridge in Madrid was closely monitored during the construction phase.

Madrid. How do loads really develop during the construction phase of a bridge? The planners in Madrid wanted to know precisely how and therefore asked MAURER. The bearing experts from Munich developed special spherical bearings with pressure sensors. Moreover, five bearings were designed to be used as fixed points during construction and equipped with lateral guides only during the construction phase.

The "Puente de la Concordia de Valdebebas" is an arch bridge connecting Terminal 4 at Madrid-Barajas Airport with the Valdebebas district in a wide sweep. With a main span of 162 m and a total length of 207 m, it has the largest span in the region. Valdebebas is a completely new district of Madrid and is expected to have 40,000 inhabitants in the future.

Spherical bearings with monitoring system

MAURER supplied a total of 22 MSM®/MSA® spherical bearings. Spherical bearings facilitate very large rotations about all axes while sliding with low friction.

All sliding surfaces are equipped with the high-performance material MSM® (MAURER Sliding Material) which, among other things, can accommodate particularly high loads. Ten of the bearings used in the Valdebebas Bridge are designed for loads of up to 39,000 kN. For these bearings, MAURER guarantees a wear-free service life of 50 years.

To achieve low coefficients of friction, the MSM® discs are equipped with dimples that ensure constant and permanent lubrication of the sliding surfaces.

The calottes in the centre of the bearings are made of MSA® (MAURER Sliding Alloy), an extremely corrosion-resistant material. Compared to a hard chromium-plated calotte, the sliding alloy reduces tolerances and increases service life. To that end, the sliding surfaces are polished to the lowest possible surface roughness.

However, due to the high loads, the designers did not want to rely on calculated values as usual. "This is a tendency we observe in bridge construction", explains Luca Paroli, Project Manager at MAURER. "The designers wanted to see precisely what happens during the construction phase and how the structure actually behaves."

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A beauty: the new "Puente de la Concordia de Valdebebas" in the northwest of Madrid.

Photo: MAURER



Spanning 162 metres, the arch bridge is the largest of its kind in the region.

Photo: MAURER

MAURER installed a monitoring system in six of the large spherical bearings. "The special thing about it is that we are able to continually measure the pressure and read it via an internet connection at any time", Paroli says.

The sensor system measures the pressure in the bearing in real time, from which the superimposed load is calculated. The sensors are installed in a mid-position in the bearing under the calotte.

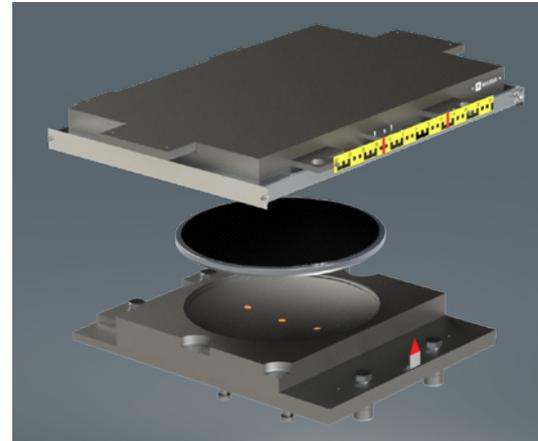
The monitored bearings are positioned at key sections where the load application strongly fluctuates during the construction phase.

Variable bearings

In addition, the planners wanted one of the piers to be designed as a fixed axis during the construction phase. That is why the bearings of the P2 axis were designed to be variable, in other words: They were provided with lateral restraints, which were removed following the construction phase.

The Valdebebas Bridge was inaugurated in March 2022. Ferrovial was the construction company, IDEAM S.A. was responsible for the structural conception and the site management.

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Highlighted in orange: the pressure sensors.

Graphic: MAURER

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Quick facts about MAURER SE

MAURER SE is a leading specialist in mechanical engineering and steel construction with over 1,000 employees worldwide. The company is market leader in the area of structural protection systems (bridge bearings, roadway expansion joints, seismic devices, tuned mass dampers, and monitoring systems). It also develops and produces vibration isolation of structures and machines, roller coasters and observation wheels as well as special structures in steel construction.

MAURER participates in many spectacular large-scale projects worldwide, like, for example, the world's biggest bridge bearings in Wazirabad, earthquake-resistant expansion joints for the Bosphorus bridges, tuned mass dampers in the Baku and Socar Tower, or uplift bearings for the Zenit Arena in St. Petersburg. Complete structural isolations range from the Acropolis Museum in Athens to the new major airport in Mexico. Spectacular amusement rides include, for example, Umadum – the Munich Observation Wheel, BOLT™ – the first roller coaster on a cruise ship, the Rip Ride Rockit Roller Coaster in the Universal Studios Orlando, or the worldwide first duelling roller coaster at the Mirabilandia Park in Ravenna.

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