

Mexico: Luxury and Family Hotel Stands on 410 Seismic Isolators

Double Sliding Isolation Pendulums reduce construction costs and secure hotel operations on the Pacific coast even during the strongest earthquake movements.

Puerto Vallarta. The Secrets & Dreams Bahia Mita Hotel is currently the largest building in Latin America to stand entirely on seismic isolators. 410 isolators can accommodate horizontal displacements of up to ± 500 mm. An early involvement of MAURER's earthquake experts in the structural planning not only protects the structure against earthquake-induced damage, but also reduced construction and operation costs.

The luxury hotel "Secrets & Dreams Bahia Mita" is located between the picturesque headland of Punta Mita and the seaside resort of Puerto Vallarta on the Pacific coast. The huge complex consists of two hotels: "Secrets" for adults and "Dreams" for families, and it also houses a shopping centre. It is currently the largest Latin-American building standing on isolators.

Seismic isolation in 4 sections

"The greatest challenge at the start of planning was to define the position of the seismic isolators and distribute the structural heights and loads in a roughly equal way," as described by Dr Luís Pinto Carvalho, Area Manager for MAURER SPS GmbH. "Unfortunately, this is often neglected. But regarding this project, cooperation with the structural planner was good, and we were able to work out an optimal solution together."

The starting point was that the dream hotel was built step by step into the rising terrain. Accordingly, it was difficult to distribute loads evenly over the isolators. Therefore, the complex was divided into 4 sections, which are separated from each other by expansion joints and can thus move separately in the event of an earthquake.

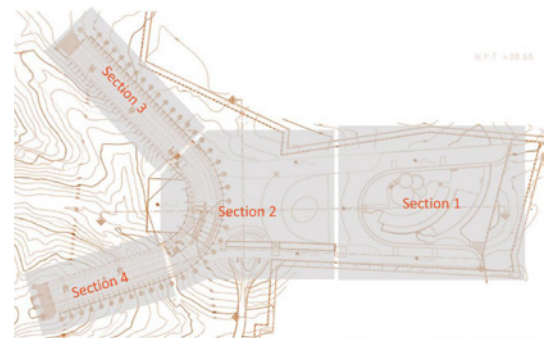
SIP®-D: Double Sliding Isolation Pendulums

The main task in the event of an earthquake is carried out by the bearings. So-called SIP®-D-Bearings were installed. SIP® stands for Sliding Isolation Pendulum (Gleitpendellager).



The Secrets & Dreams Bahia Mita hotel complex in Mexico was built step by step into the rising terrain and stands entirely on seismic isolators.

Photo: MAURER



Division scheme of the structure into four sections.
Graphic: QUASAR



Construction site with foundations: seismic isolators are already positioned in the front and in the middle of the picture.

Photo: MAURER

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Isolating, dissipating, centring, transmitting

SIP®-Bearings have four functions:

- They isolate the building from its foundations and allow horizontal movement of up to ± 500 mm in all directions.
- They limit movements through internal friction by converting kinetic energy into heat.
- They re-centre the building in its initial position following an earthquake.
- They transmit vertical loads.

"D" (Double) indicates that the bearings beneath the hotel have two concave surfaces (instead of one). The reason for this is that earthquakes at the hotel location are mainly characterised by large horizontal displacements of ± 500 mm. The bearings would thus become relatively large in order to accommodate these. But with the Double-Bearings, the displacement is distributed equally over both concave surfaces. Therefore, SIP®-D-Bearings can be built smaller and lighter. The reduced dimensions save space, time and costs.

A total of 410 SIP®-D-Bearings with maximum vertical loads of 4,900 kN up to 14,100 kN were installed.

Sophisticated positioning of the bearings

The distribution of the bearings is particularly sophisticated. The loadbearing structure of the hotel mainly consists of a concrete scaffold, stiffening walls provide stability. However, these walls tend to "tilt" or rotate due to the horizontal forces in the event of an earthquake. "This lever effect could cause tensile forces, which means lifting forces in the isolators," Dr Pinto describes. "We solve this through a sophisticated distribution and positioning of the bearings. Directly under the stiffening walls are the largest bearings and prevent a lift-off." They also accommodate the largest loads.

Quality is key

The client AMR Collections, an international hotel operator owning many luxury hotels, placed great value on the building's quality and safety. "It was not only about the primary structure, but also the secondary structure, such as lamps or suspended ceilings. AMR wanted to ensure that operation could continue without interruption after a stronger earthquake – without closure and several months of repair work." This was achieved with the seismic acceleration in the structure now reduced by the factor 2 – 3.

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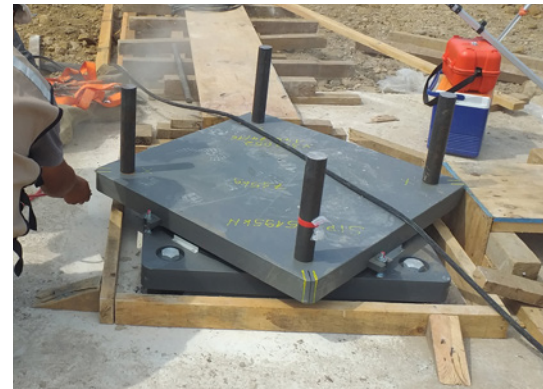
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SIP®-D-Bearings during installation.

Photo: MAURER



Installed SIP®-D-Bearing with protection against concrete.

Photo: MAURER

Quality assurance played a decisive role in the tender – and this is where MAURER could score points. Quality assurance in the production in Munich was personally inspected by AMR representatives. Tests were also required. EUCENTRE in Pavia/Italy carried out two prototype tests and 21 randomly selected production tests for each of the three bearing types.

Lifelong due to MSM®

A central requirement of the client was also that the isolators should have the longest possible service life. “We were able to ensure this by using our patented sliding material MSM®.”

Of the advantages provided by MSM® (MAURER Sliding Material) compared to conventional Teflon (PTFE), the main decisive factor was twice as high load capacity. It reduces the cross section of the bearing. Furthermore, MSM® can accommodate at least fivefold accumulated sliding displacements, a seven-and-a-half-fold displacement velocity and high temperature fluctuations. The approval indicates a service life of 50 years. However, since the limit loads are rarely exhausted, the bearings achieve the required 100-year service life of the structure.

15% costs saved on the loadbearing structure alone

Finally, using SIP®-D-Bearings with MSM® in the sliding surfaces also reduced construction costs, because the loadbearing structure was built with leaner supports and many beams could be dispensed with. The latter reduced the height of the building which meant less façade and less space – and thus less cooling during operation.

“In the area of the loadbearing structure alone, 15% costs were saved – while also increasing safety,” Dr Pinto reports. “This only succeeded due to the good and early cooperation with the engineering firm Quasar regarding the design of the loadbearing structure.”

Start of construction of the hotel complex was in 2019, the SIP®-D-Bearings were installed between October 2019 and February 2020.

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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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