

Hospital in Chile isolated with MSM®-SIP®-Bearings for the first time

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Double Sliding Isolation Pendulums protect the Hospital Alto Hospicio against earthquake-induced damage.

Alto Hospicio, Chile. For the first time, a hospital in Chile was isolated with Double Sliding Isolation Pendulums. The innovative building design is the outcome of intense co-operation between structural planner, construction company and MAURER. The isolators significantly save costs, and the building can still be used in its entirety even following an earthquake.

The clinic centre in Alto Hospicio in the north of Chile has a total area of nearly 50,000 m², divided into three buildings with three floors and a basement in each case. It consists of 235 beds, operating theatres and labour wards and around 70 facilities and surgeries ranging from emergency rooms to dialysis or dental treatment to various specialists.

Hospital with seismic risk

Alto Hospicio is located in an earthquake zone of medium intensity with up to 0.5 g ground acceleration. That is why the clinic centre was entirely seismically isolated. It was the first time that sliding isolation pendulums rather than elastomeric bearings were installed for that purpose in Chile. "The innovative design is the outcome of intense co-operation between structural planner, construction company and MAURER," Raul Arranz, Regional Sales Director LATAM, reports. "I think the client really appreciated our dedication and expert knowledge, since it was their first project with sliding isolation pendulums and the first ever public building of this kind in Chile."

The task of the bearings is to isolate buildings from the ground in the event of an earthquake. There are several aspects to this.

1. Protecting people against injuries or even death.
2. Protecting the structure so that it can also withstand aftershocks.
3. Continued Functionality, in other words: The hospital continues to be functional even in the aftermath of an earthquake, which is essential for earthquake victims. This can only be achieved by using isolators and not through the building structure, as medical devices are highly sensitive. They cannot often withstand more than 0.2 g acceleration without damage.
4. Higher economic efficiency through service life compared with a strengthened building structure. The isolators not only save money due to the more slender design. Even for a medium intensity earthquake, which occurs in Alto Hospicio approximately every 20 years, the repair costs of a strengthened structure are substantially higher than the additional costs of isolators for a new building. The isolators amount to approximately 1.5% of the construction costs, whereas elastomeric bearings would have been roughly twice as expensive.



The clinic centre in Alto Hospicio in May 2021. The building structure is in place – entirely seismically isolated.

Photo: MAURER



Foundation of the clinic centre in Alto Hospicio in 2019: On top of the concrete bases lie the first SIP-D-Bearings.

Photo: MAURER



Bearing plate during installation in 2019.

Photo: MAURER

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

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Double sliding isolation pendulums isolate, dissipate, centre and transmit

So-called SIP®-D-Bearings of MAURER were installed under the basement. SIP® stands for Sliding Isolation Pendulum (Gleitpendellager). "D" (Double) indicates that the isolators have two concave surfaces (instead of one). The horizontal displacement is thus equally distributed over two surfaces. Therefore, SIP®-D-Bearings can be built smaller and lighter. This saves space, time and costs.

The SIP®-Bearings have four functions:

- They isolate buildings from the ground and facilitate a horizontal movement of up to ± 250 mm in all directions during a maximum considered earthquake (MCE).
- At the same time, they limit movements through a high internal friction of 4% by converting kinetic energy into heat (dissipation).
- They centre the buildings in their initial position following an earthquake, as they have a concave sliding surface.
- They transmit vertical loads of up to 8,000 kN.

Service life of at least 50 years

These requirements for the isolators were drawn up by VMB, the Chilean structural planner. A service life of 50 years was also required, which MAURER was able to more than fulfil with the sliding material MSM® (MAURER Sliding Material). Compared to other materials, MSM® withstands extreme compressions and rapid displacements, even after several maximum earthquakes and without damage to the material itself or the bearing. MSM®-Bearings are thus immediately ready for use again, which is important due to the frequent aftershocks.

The total of 212 SIP®-Bearings have three different sizes. The largest ones are 650 x 650 mm, 150 mm high and weigh 400 kg each. They fulfil both the European standard EN 15129 and the national Chilean standard Nch 2745.

The bearings had to undergo extensive testing prior to installation. Testing according to EN 15129 took place in SISMALAB Crispiano (Italy) in March 2019. Two prototype tests per bearing type and 15% production tests were required.

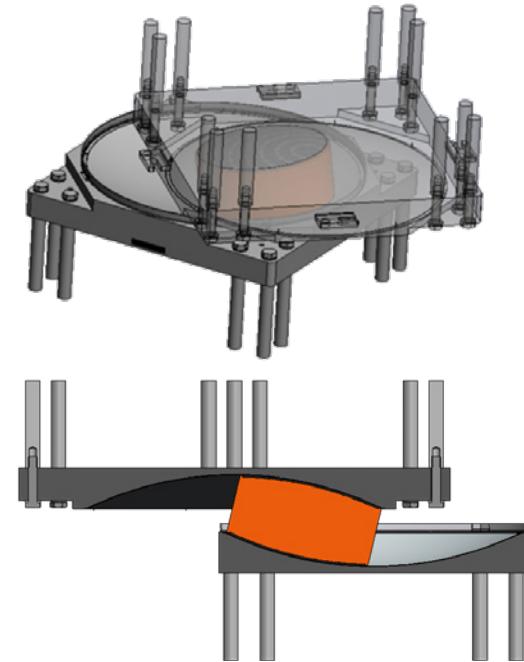
The clinic centre was built between 2018 and 2021. The bearings were installed following the excavation and foundation in spring 2019. The opening is scheduled to take place by summer 2022. The client is the Consorcio Alto Hospicio S.A – SACYR Chile, the hospital operator is the Servicio de Salud Iquique.

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Installed bearing in 2021.

Photo: MAURER



View of a SIP®-D-Bearing – highlighted in orange is the sliding lens through which the horizontal displacement is equally distributed over both concave sliding surfaces.

Graphic: MAURER

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Quick facts about MAURER SE

The MAURER Group 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, 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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