VIBRATION AND SOUND PROTECTION FOR VIENNA'S MUSIKVEREIN

CASE STUDY
Vienna's Musikverein
Concert Hall (AT)

EFFECTIVE VIBRATION ISOLATION.

getzner

CONSISTENTLY HIGH PROTECTION AGAINST SECONDARY AIRBORNE NOISE AND VIBRATIONS

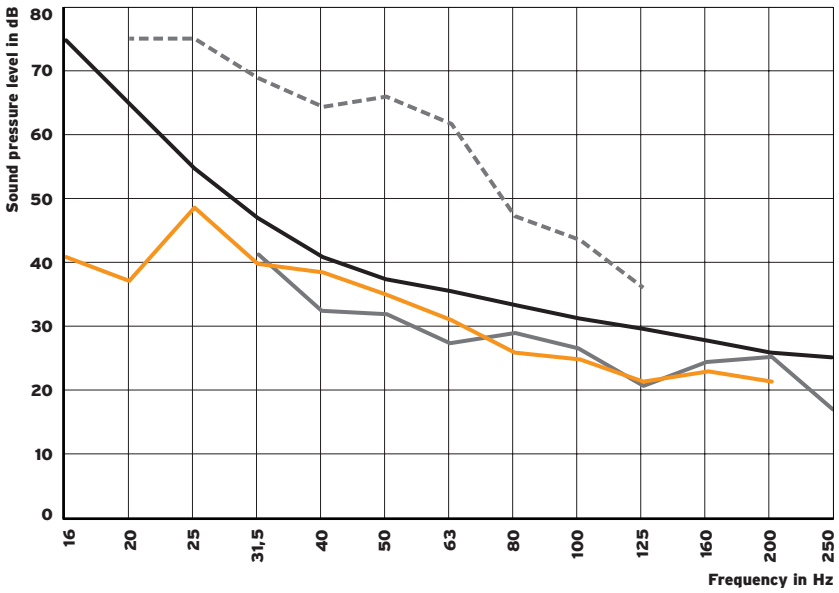
THE PROJECT

The Vienna Musikverein's Goldener Saal is renowned for its exceptional acoustics. In 2002, an underground tunnel was built only four metres from the building. To prevent disturbance to concert visitors, a mass-spring system (MSS) with discrete Sylodyn® bearings from Getzner was installed.

The "Goldener Saal": measurement of the secondary airborne noise immissions at a height of 2.5 m

Getzner Mass-Spring Systems are used in more than 40 cities worldwide, including Vienna. From the outset, the aim was to protect the Musikverein building from vibrations and noise generated by the nearby underground line. Acceptance tests in 2003 confirmed that all acoustic requirements had been met.

Today, the underground operates with more modern trains that produce different sound and vibration characteristics. The Musikverein building has also undergone changes, such as new windows and altered room uses. After around 450 million metric tonnes of load – generated by roughly 250 trains per track per day passing through the tunnel – questions arose regarding the long-term behaviour of the MSS.
This was especially important because a siding for damaged trains meant that, in addition to the slab's own 10-t/m mass, long-term stationary train loads had been exerting continuous stress on the Sylodyn® bearings. Therefore, in 2019, various measurements were carried out to verify whether the system still met the high vibration and noise-protection requirements defined during construction.



The most stringent requirements continue to be met: Even after more than 20 years, the secondary airborne noise (orange line) is well under the set limit (black) in the "Goldener Saal". Dotted line: the predicted level when a standard ballast track is used.

Limit curve to be observed
Acceptance test 2003
Forecast without insulation 2001
Control measurement 2019

THE GETZNER SOLUTION

The slab sits on elastic discrete Sylodyn® bearings spaced two metres apart. The planned natural frequency of the 100-metre mass-spring system is 5.5 Hz, which is the lowest vertical natural frequency achieved so far with an MSS using elastomer bearings.

The new V train type (left) causes more emissions in the tunnel than the old U11 train type (right).

Undisturbed music enjoyment: The discrete Sylodyn® Bearings insulate the immissions from passing trains.

Long-term performance
To assess ageing effects on the Sylodyn® bearings, several measurements were carried out using different train types. These included the natural frequency of the MSS, emissions on the slab, tunnel floor and tunnel wall, the slab deflection under passing trains, and the immissions of secondary airborne noise and vibrations within the building.

Lowest immissions in the building
Sound levels were measured in the centres of two concert halls at 2.5 m height. More than 20 years after installation, the MSS still provides the required vibration-isolation performance. Vibrations measured in the centre of the Goldener Saal floor remain well below the perception threshold.

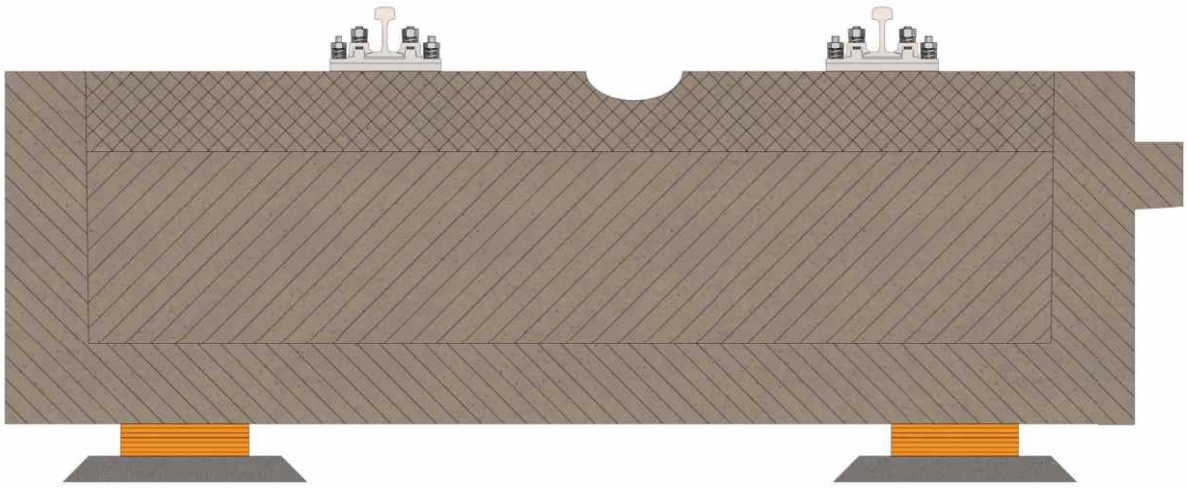
FEEDBACK

"The one-of-a-kind 'Goldener Saal' demanded particularly careful planning, component selection and implementation to satisfy the Musikverein's extremely stringent immission protection requirements."

Dr. Andreas Oberhauser
Superstructure | Head of Department
WIENER LINIEN GmbH & Co KG

Unchanged natural frequency
The new V-train type used in the Vienna underground excites the slab in the MSS natural-frequency range more strongly than the older U11 train type, which is still in use. Nevertheless, all assessment criteria regarding immissions continue to be met. For Markus Heim, who is responsible for system development at Getzner Werkstoffe GmbH, it is remarkable that the requirements set during the planning of the underground extension are still being met today: "A natural frequency of 5.5 Hz was proposed during planning of the mass-spring system, which resulted in the required sound level reduction."The vertical natural frequency of the MSS, determined by impulse excitation, ambient micro-seismic movements and passing trains, remains unchanged from the 2003 acceptance tests.

No noticeable change in immissions
The dynamic properties of the Sylodyn® bearings have remained stable over more than two decades of use. Vibrations from underground traffic in the concert halls are still far below perception thresholds, and passing trains do not increase the idle noise level. Noise immissions also remain well below the limit curve.



Cross-section of the mass-spring system with Sylodyn® Discrete Bearings

ADVANTAGES

The installation of Getzner's Mass-Spring System at Vienna's Musikverein Concert Hall brought a substantial improvement in acoustic quality and visitor experience. By effectively isolating vibrations and noise from the nearby underground, the system ensures that concerts remain undisturbed and the unique sound of the "Goldener Saal" is preserved.

Even after decades of heavy use, the MSS continues to deliver reliable, long-term protection, providing both operators and guests with a consistently quiet and comfortable environment for world-class musical performances.

Operator	WIENER LINIEN GmbH & Co KG
Solution	Mass-spring system, dimensions 430 × 370 × 100 mm, natural frequency 5.5 Hz
Loads	450 million metric tonnes in more than 20 years of operation (as of 2025)
Implementation	2002
Project support	Steinhauser Consulting Engineers ZT GmbH, Vienna

Additional references can be found on our website.

getzner.com/ references

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