

Vibration Isolation Solutions in Building Design



Addressing Vibration Challenges in Urban Environments

Prime locations often face significant challenges, particularly with regard to vibration and structure-borne noise from sources like metro lines, heavy traffic, and industrial machinery. Those vibration sources can lead to problems, such as vibrating floors and noise-radiating walls, often discovered only after construction has been completed, making a retroactive correction costly and difficult. A well-designed building begins with careful consideration of external noise and vibration, ensuring both comfort and long-term performance. Conventional foundations often fail to block vibration transmission, and retrofitting structural modifications can limit design flexibility. Specialized vibration isolation measures in the building are essential for mitigating risks and avoiding future costs, regardless of building type.

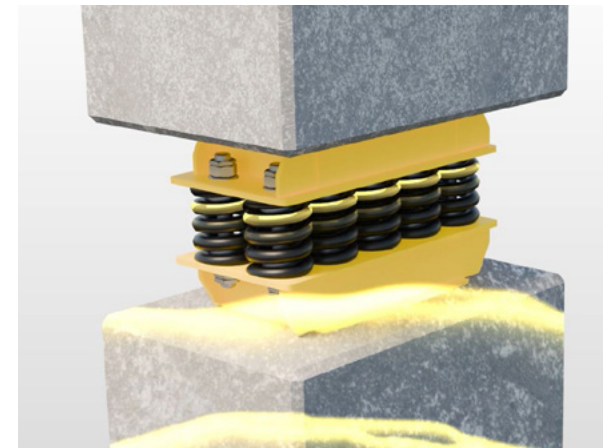
Depending on the use case of the building and its sensitivity, various vibration isolation solutions can be integrated. Buildings can be fully isolated or partially isolated. A vibration isolated building can be achieved by using either **GERB spring elements** or **NOVODAMP® closed-cell polyurethane bearings**.

If vibrations originate within the building itself—for example, from gyms or dance studios—it is most effective to isolate the room with the vibration source. In these cases, partial isolation systems like Box-in-Box solutions or Floating Floors are used. Additionally, for building services equipment, such as HVAC systems or emergency generators, vibration isolation measures can ensure a comfortable environment and minimize disruptions.

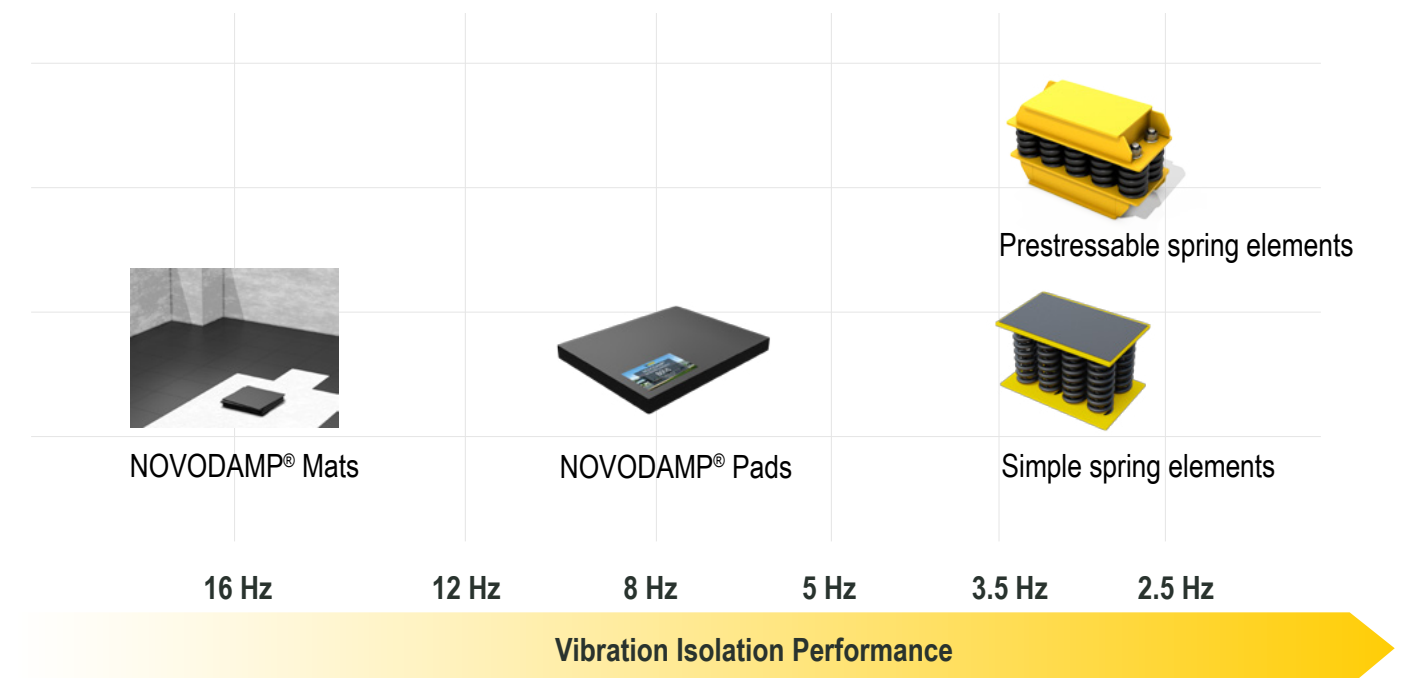
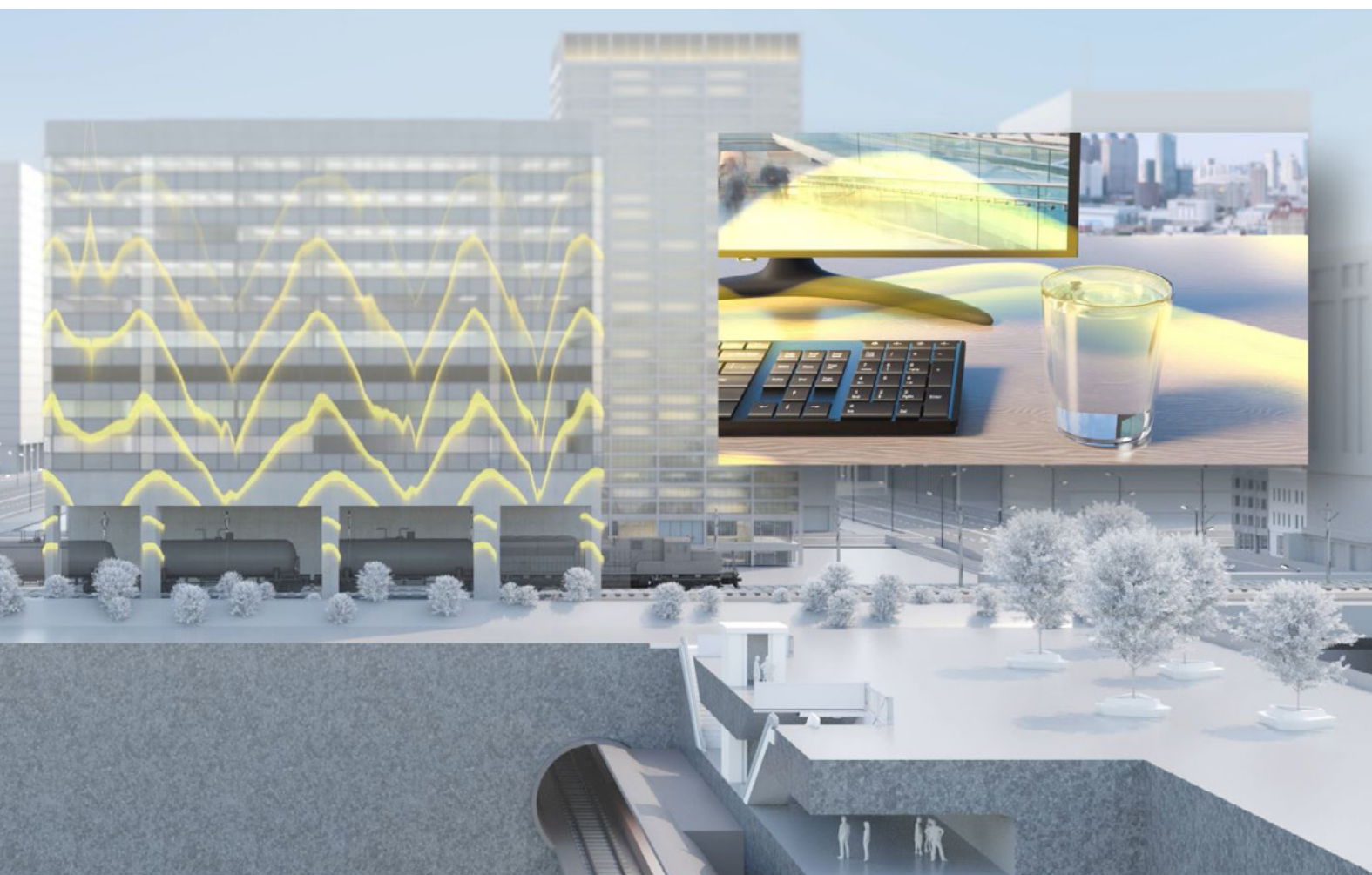
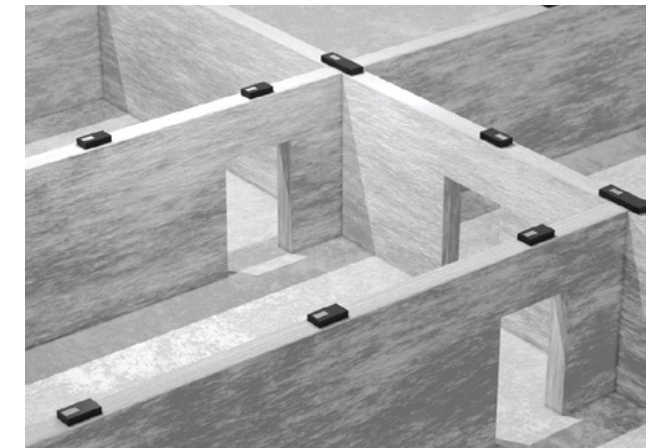
GERB offers tailored isolation systems using steel spring or NOVODAMP® bearings to meet specific project needs.

GERB designs highly elastic support systems for buildings with vertical system frequencies as low as 3–6 Hz, and in special cases, down to 1 Hz. These systems effectively attenuate vibrations starting at 5 Hz and significantly reduce vibrations (e.g., from railway lines) by 80% or more in the 10–20 Hz range, and even more in the audible range, above 20 Hz. GERB bearings ensure compliance with vibration limits, even in challenging conditions.

Spring Elements

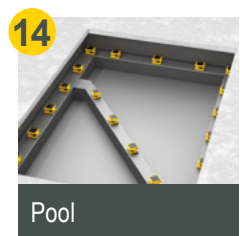
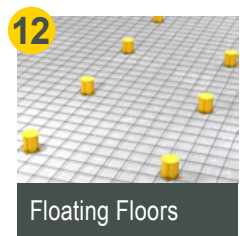
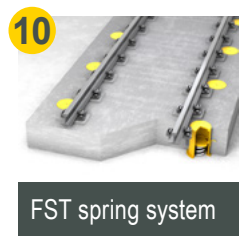
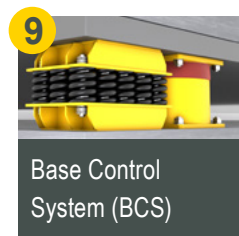
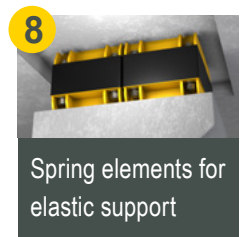
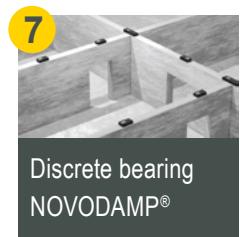
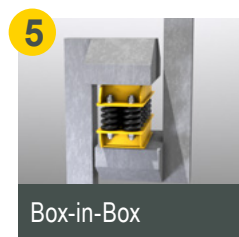
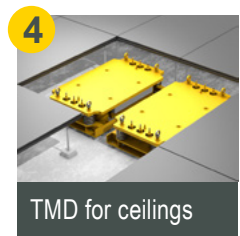


NOVODAMP®



Your Partner for Vibration Isolation in All Areas of a Building

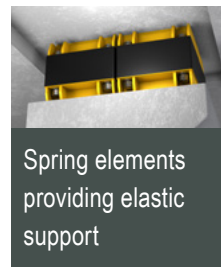
Deepdive in our variety of applications and exemplary solutions:



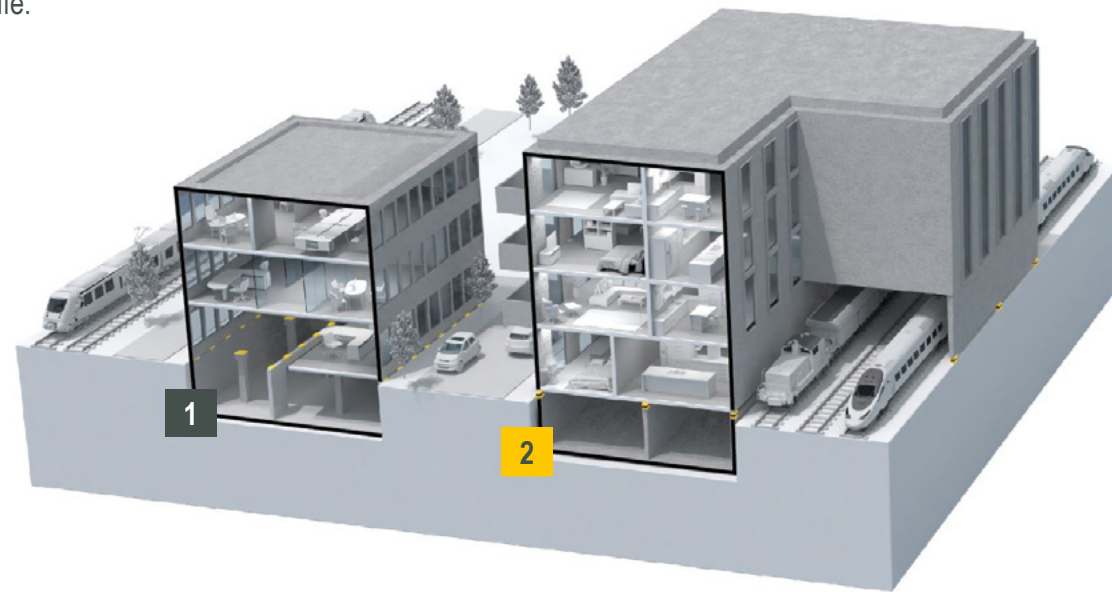
Early integration of vibration isolation reduces cost of integration



Full Building Isolation Using Spring Elements



Rail-induced vibrations cause significant disturbances, affecting commercial spaces, workspaces, and reduce quality of life.

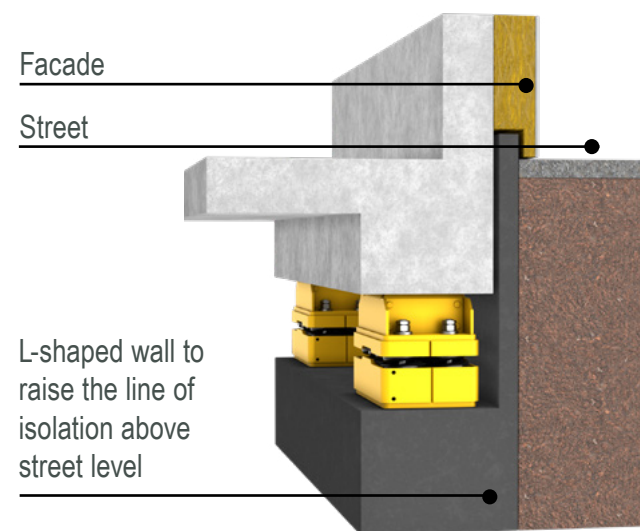


GERB's steel spring systems are ideal for isolating vibrations from sources like rail traffic. Made from high-quality helical steel spring, they feature a linear load/deflection curve and support loads from 100 to 4,600 kN (22 to 1,034 kips). High horizontal stiffness allows them to withstand wind loads without additional restraints. Options like noise-stop pads or the GERB Coil Resonance Damping System (CRDS) further enhance noise reduction, while anti-corrosion coatings ensure durability and maintenance-free operation.

The springs are adaptable to various applications, with installation options under buildings, within basement walls, or on top of walls and columns. A collaborative approach between architects, engineers, and GERB specialists ensures precise adaptation to building loads and tailored vibration isolation solutions for every project.

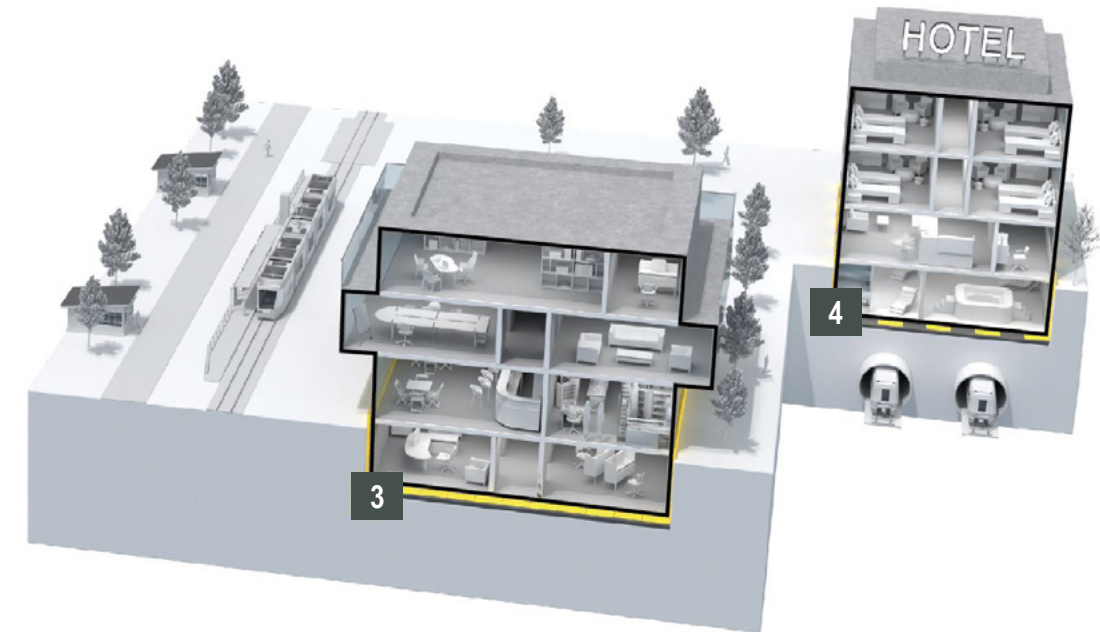
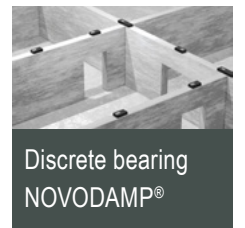
1 NOVODAMP® pad solution

2 Elastic support with spring elements



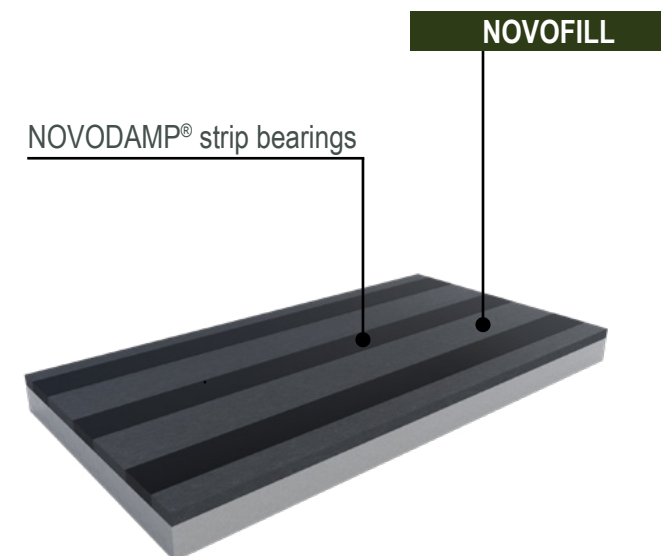
exemplary integration.

Full Building Isolation Using NOVODAMP®



3 NOVODAMP® full-surface solution

4 NOVODAMP® strip solution

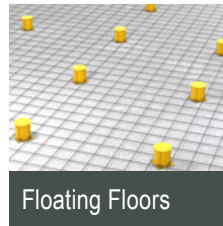


exemplary integration with NOVOFILL by GERB.

NOVODAMP® systems provide a cost-effective solution for medium support frequencies above 8 Hz. Available as full-surface or discrete bearings, they are versatile and suitable for various applications. NOVODAMP® bearings are highly resilient, capable of withstanding mechanical stresses like fatigue and compression set, as well as chemical stresses from water, oil, and ozone. Their easy installation and range of thicknesses and materials ensure adaptability to specific design requirements.

To ensure simplified construction and fully leverage the technical benefits of our pads or strips, we offer NOVOFILL. This acts as a form of lost formwork for easier installation. This high-quality, technical solution is more cost-effective than full-area bearing systems, providing both efficiency and savings without compromising on performance.

Partial Building Isolation to Ensure Comfortable Living



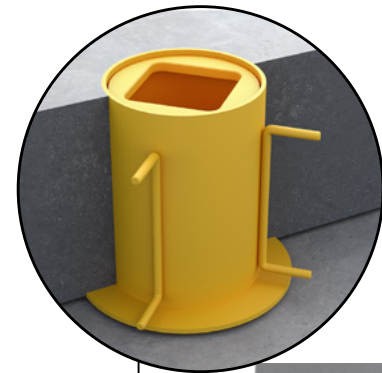
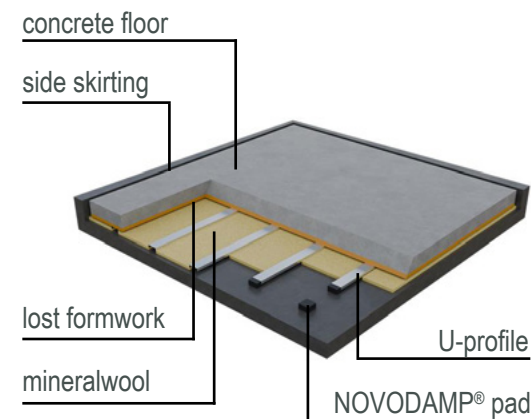
Floating Floors

In addition to entire building isolation, we also offer partial building isolation. GERB's floating floor systems have been carefully designed to meet the demanding acoustic requirements of different applications. Whether it's the energy of a dumbbell studio or the intimate atmosphere of a rehearsal room, GERB's floating floors protect against mechanical vibrations and structure-borne noise, providing unrivalled isolation and quiet for any space.

Floating floors utilize resilient spring elements and/or elastomeric bearings to create a floating concrete slab that is dynamically and acoustically decoupled from the underlying structure. This technology ensures that vibrations and structure-borne noise are effectively minimized, creating a quiet and distraction-free environment.

Floating Floors can be executed with:

- **PF-Elements:** Jack-Up spring elements with superior isolation efficiency
- **LS100:** spring system for very low slab height and simple installation
- **NOVODAMP® NCP:** noise-control pads
- **NOVO-U-GUARD:** Floating Floor turn-key solution with U profiles



adding hangers for a box-in-box isolation

Floating Floor with PF Jack-Up Elements

NOVO-U-GUARD Floating Floor

Isolation of Rooms in Rooms

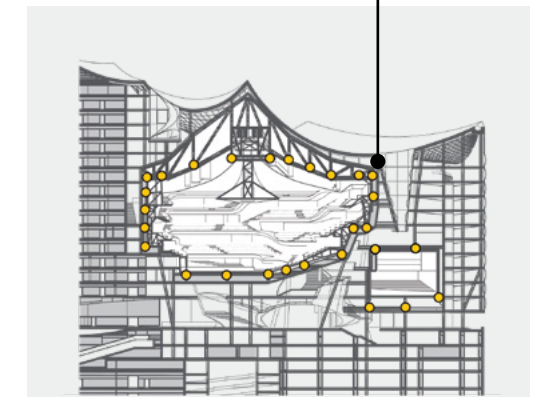


Box-in-Box

In an era where hybrid buildings and mixed-use spaces are increasingly common, ensuring acoustic isolation is more critical than ever. Box-in-box construction provides a state-of-the-art solution, delivering exceptional isolation and acoustic performance for the most demanding environments. Box-in-Box construction technology involves creating an isolated inner structure within a larger building. This approach is ideal for spaces requiring the highest levels of acoustic isolation, such as concert halls, recording studios, and upscale residential environments. By integrating GERB's advanced helical steel spring elements, this solution ensures that external noise and vibrations are significantly reduced, preserving the pristine acoustic environment within.

Box-in-Box constructions not only isolate against vibrational noise from external sources but also contain internal vibration, preventing it from disturbing adjacent areas. This dual benefit makes it perfect for mixed-used buildings where diverse activities occur side by side. Whether it's a serene residential area next to a vibrant commercial space or a quiet concert hall amidst a bustling urban environment, GERB's solution maintains harmony. By addressing the unique challenges of each space, GERB provides tailored solutions that enhance acoustic comfort and structural integrity.

418 prestressable spring elements



Box-in-Box solution for Elbphilharmonie Hamburg

Design Load:	90,000 kN great concert hall 20,000 kN recital hall
Support frequency:	4.5 & 3.5 Hz
Vibration source:	Structure-borne noise from the environment and music inside



Vibration Isolation of Helipads



Helipads, commonly referred to as rooftop helipads, are typically found on hospitals, hotels, and high-rise office buildings. In hospitals, these helipads are often near operating rooms to minimize the distance for time-critical patients arriving by helicopter. The design ensures that helicopter operations do not disturb doctors during surgeries or interfere with sensitive equipment. Similarly, luxury hotels use helipads to offer VIP guests direct access without disrupting regular hotel operations.

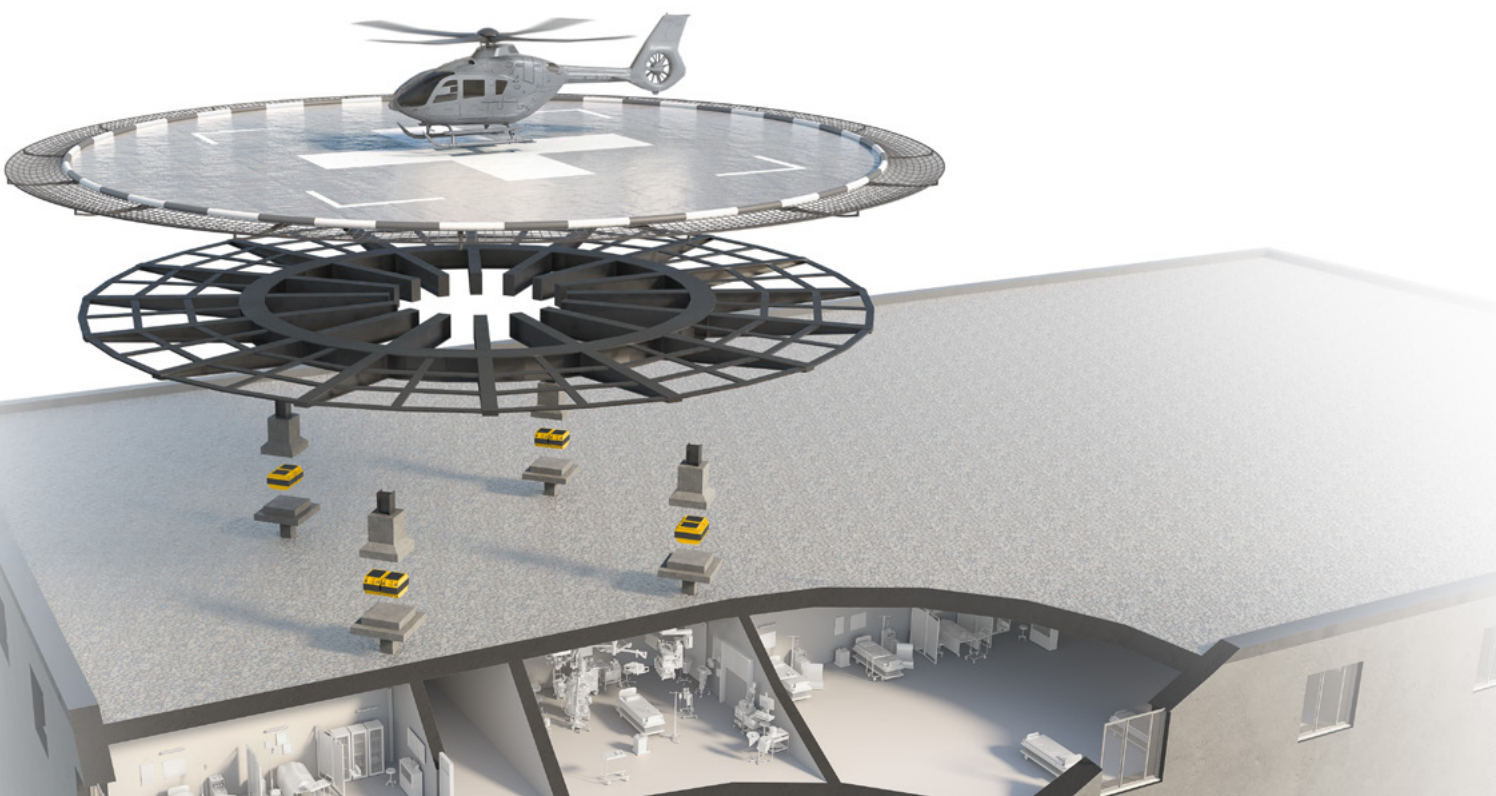
Helicopter take-offs, landings, and idling generate strong downdrafts on the landing platform, potentially causing components to resonate. These resonances vary with the rotor blades' speed, number, and flight altitude. For instance, helicopters with two rotor blades can create excitations up to 11 Hz, which can restrict the use of the space under the platform.

To achieve desired environmental utilization, helicopter landing platforms should be elastically mounted. A tuning ratio of at least 3.0 (87.5% isolation) is recommended. For an 11 Hz resonance frequency, this requires a tuning frequency of around 3.5 Hz, ensuring effective isolation from vibrations.

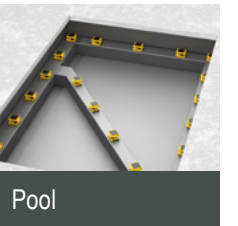
Landing platforms can be either open or closed at the bottom. Open platforms are more susceptible to wind and uplift forces. They can be constructed from various materials, including:

- Concrete
- Steel
- Aluminium
- Composite structures (e.g., concrete and steel, steel and aluminium, or steel and plastic)

The sensitivity of a landing platform to wind increases with lighter materials, which can cause tensile forces on the elastic bearing. To counteract potential uplift forces, these bearings must be securely bolted. For the dimensioning of elastic bearings, two materials are primarily used: steel springs for low tuning frequencies and NOVODAMP® for higher frequencies. These materials are selected based on the specific requirements of each helipad design.



Elastic Support Solutions for Pools to Protect Sensitive Neighbors



Pools are often situated on the rooftops of luxury hotels or private residences with a common objective: increasing property value while maintaining the comfort of neighboring living spaces. When constructing swimming pools and whirlpools in or on buildings, it is essential to carefully assess whether their use might have any disruptive effects on the built environment.

The use and maintenance of swimming pools and whirlpools are invariably associated with induced vibrations and structure-borne noise. Depending on the intensity of user activities and the facility's equipment, vibrations are generated and transmitted into the structure. This structure-borne noise can be perceived as disruptive airborne noise.

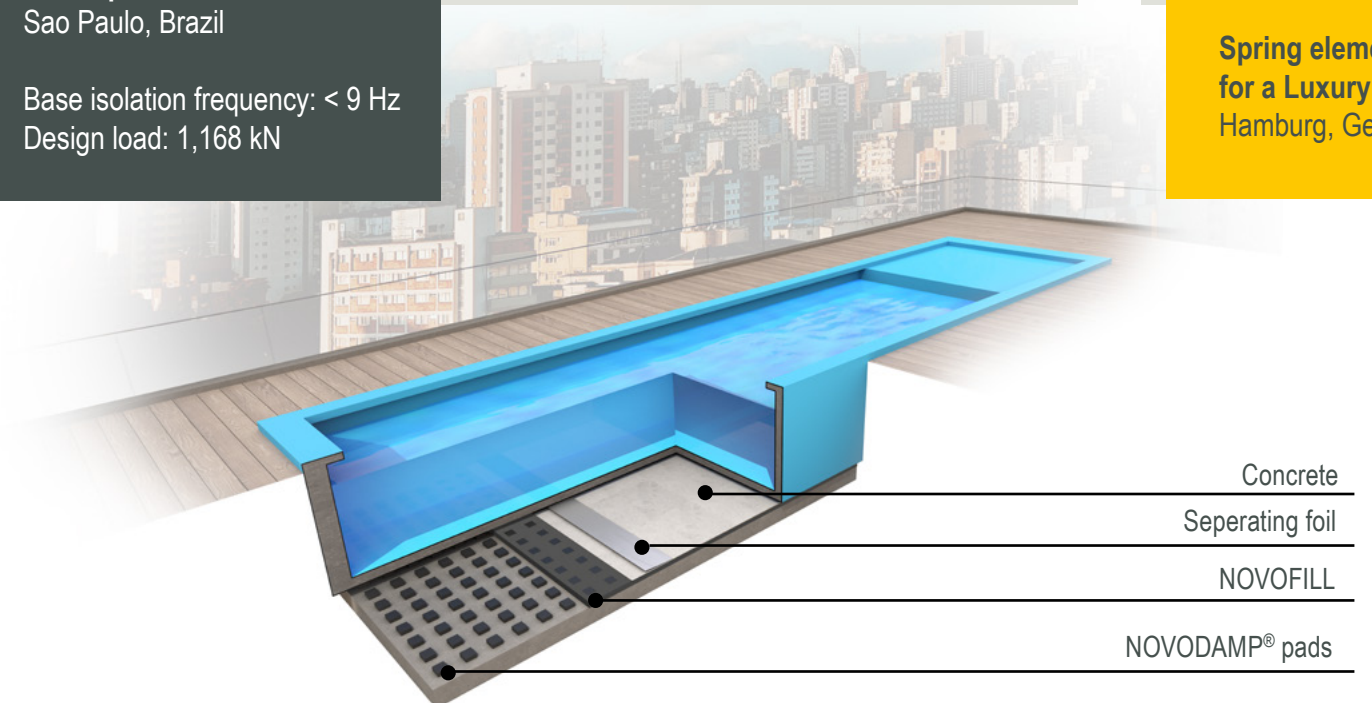


GERB NOVODAMP® for Rooftop Pool
Sao Paulo, Brazil

Base isolation frequency: < 9 Hz
Design load: 1,168 kN



Spring elements for a Luxury Hotel
Hamburg, Germany



Elastic Support for HVAC Systems



Small machines such as HVAC units are often hidden away from view, but they can be significant sources of vibration and ground-borne noise, particularly in quiet environments. Due to their rotary motion, these units can transmit disturbing vibrations and structure-borne noise throughout a building, affecting comfort levels and even the performance of sensitive equipment.

By elastically supporting HVAC units, vibration transmission into the building structure is minimized. GERB offers a range of solutions tailored to meet specific HVAC system requirements, including NOVODAMP® elastomer bearings for standard applications and highly efficient steel spring systems for more demanding conditions. These systems are designed for easy installation, are durable and maintenance-free, ensuring long-lasting performance.

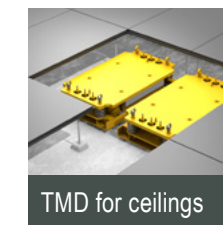
GERB's HVAC isolation solutions are versatile, adaptable to various installation scenarios, and can be integrated into new and existing buildings. By addressing the unique challenges posed by HVAC units, GERB ensures that even small machines do not cause disruptive vibrations.



Vibration Isolation of Heat Pumps on Residential Building
Waalwijk, Netherlands



Tuned Mass Dampers (TMD)



Long-span floors and slender or monumental stair cases can be susceptible to vibrations due to human activity, mechanical equipment, or environmental forces like wind. To mitigate these vibrations and enhance comfort and safety, Tuned Mass Dampers (TMDs) are applied.

- 1 Vibration Control and Comfort Improvement**
Long-span floors and staircases often have low natural frequencies, making them prone to vibrations from dynamic loads like foot traffic. TMDs counteract these vibrations with a secondary mass-spring-damper system, enhancing occupant comfort by reducing floor movement and shaking.
- 2 Enhanced Structural Performance and Longevity**
TMDs dissipate vibrational energy, which reduces dynamic stress. This prolongs the lifespan of floors and staircases while minimizing maintenance and risk of damage.
- 3 Cost-Effective Alternative to Structural Modifications**
TMDs provide a targeted, adaptable solution to vibration control without extensive material use or design changes. They can be retrofitted or integrated into new structures with minimal impact on architectural intent.

- 4 Flexibility and Adaptability**
TMDs are customizable to structures and tunable to critical vibration frequencies, making them ideal for various applications like offices, concert halls, and bridges. They can also be adjusted if building usage changes.
- 5 Improved User Experience in Sensitive Environments**
TMDs ensure stability in vibration-sensitive areas like laboratories, hospitals, and luxury buildings, benefiting equipment calibration, patient comfort, and high-end living.

By efficiently reducing vibrations, enhancing structural performance, and offering a cost-effective solution, Tuned Mass Dampers are a crucial innovation for long-span floors and monumental staircases. Their ability to improve occupant comfort and safety while preserving architectural freedom makes them an indispensable tool in modern structural engineering.



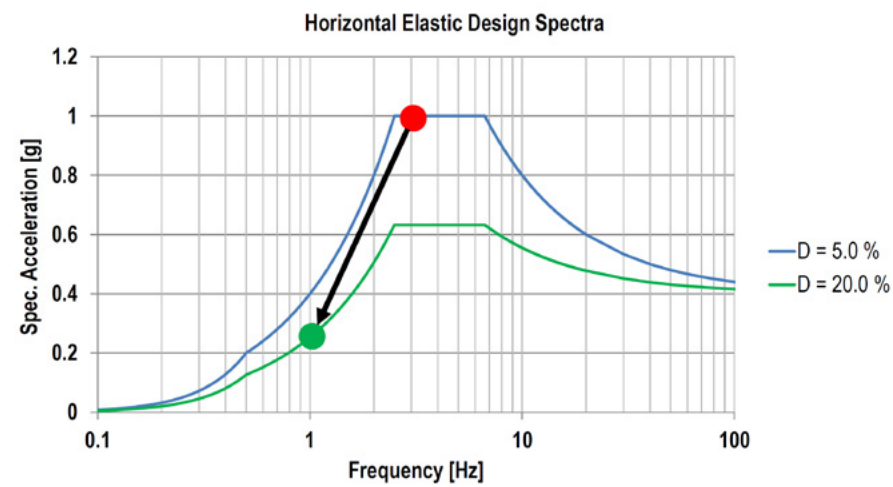
TMD for Staircase in
Edge Südkreuz
Berlin, Germany

Earthquake Protection Systems: 3-Dimensional Base Control System



Seismic activity poses a significant threat to buildings and their occupants, making earthquake protection a crucial consideration in building design. Buildings can be affected by earthquakes in various ways, depending on the duration of the seismic event, soil conditions, and construction details. While seismic construction regulations primarily focus on life safety, GERB's seismic protection solutions go further by also addressing the serviceability limit state, ensuring the operability of important facilities and reducing damage to valuable structures.

GERB's Base Control System (BCS) provides three-dimensional elastic support against earthquakes using helical steel spring elements and Viscodamper®. The system is flexible in horizontal directions, but possesses also a vertical elasticity. Viscodamper® provide absorption forces in horizontal and vertical directions. In particular the resulting demands (e.g. accelerations, base shear etc.) of the structure can be significantly reduced by using the BCS - due to reduction of frequencies and increase of structural damping.



Earthquake Protection Systems: GERB Viscous Wall Damper (GVWD)



GVWDs are a specialized type of Viscodamper®, installed between floors to reduce inter-storey drift during wind or seismic events. They enhance structural damping, improving comfort, safety, and reliability. Each GVWD consists of a steel housing, an inner piston, and viscous fluid. Relative movement between floors displaces the piston, which dissipates kinetic energy. Various sizes are available to meet damping needs, with multiple units working in parallel if required. Designed for architects and engineers, GVWDs fit within regular walls and are suitable for both new construction and retrofits.



Earthquake Protection Systems: Tuned Mass Control System

Tuned Mass Control Systems (TMCS) are additional mass-spring-damper systems. They provide passively working earthquake protection through an increase of structural damping. Tuned Mass Control Systems absorb horizontal forces and are practically maintenance-free. Requiring no electrical power supply or any other form of drive or control mechanism, they are immediately effective when an earthquake strikes.

GERB designs seismic protection systems to meet project-specific needs— whether for new builds or retrofits. Our solutions not only safeguard structures and occupants from earthquake forces but also provide vibration isolation from external sources. These solutions enable earthquake-resistant design even in areas with vibration challenges.



About GERB

– Your single source of expertise

With locations worldwide, GERB is a full range provider and your professional partner for developing, manufacturing and supplying vibration isolation solutions. Our service covers all phases of your project, from structural dynamic analyses, dynamic measurements, project-specific product development, to the installation of our products and inspections.



Consulting

We offer comprehensive consulting: from simplified dynamic calculations and measurements to complete calculations with numerical models.



Engineering

Our **GERB Engineering** division is at your disposal for further structural dynamic analyses. Our specialist engineers deal with all problems of vibrational dynamics, from feasibility studies to execution design, drawings, planning and construction supervision.



Research & Development

In addition to a wide range of standard elements, our products are tailor-made to project- or customer-specific requirements. New developments are constantly advanced and project-specific tests are carried out. We also accompany you in the approval process through our own or through third-party testing.



Manufacturing

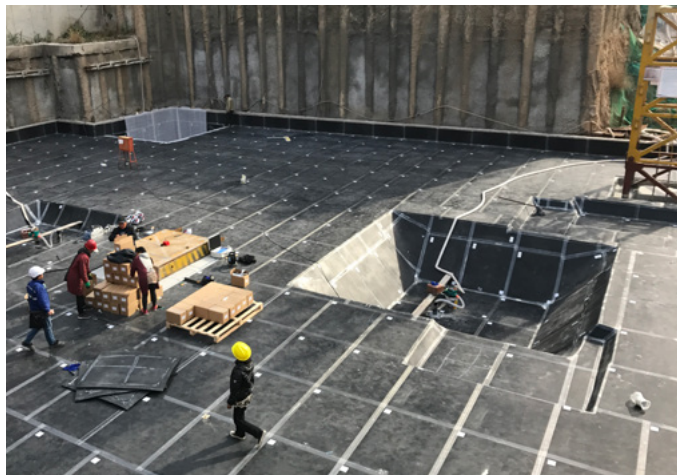
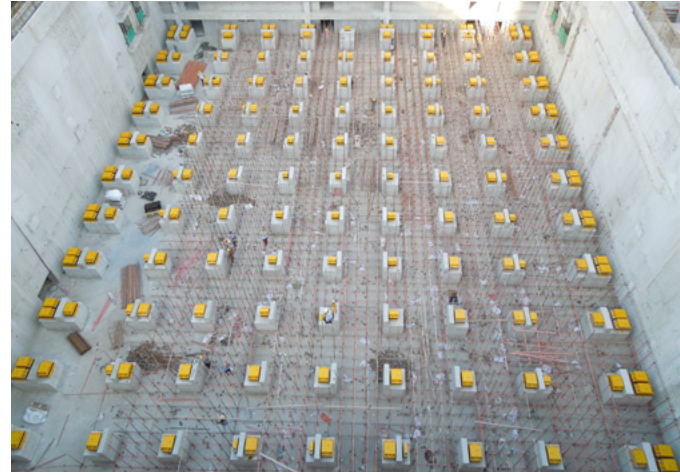
We maintain the highest quality standards in all of our 5 production facilities. We are able to produce according to various standards and requirements and hold the necessary quality certificates.



Installation Supervision & Assembly

We offer installation of our elements or onsite supervision. Our engineers also carry out inspections on existing installations regularly.

References - Excerpt



References - Excerpt



2020: **Shanghai Music Opera House** - 320,000 kN - 3.5 Hz | 2020: **Qingdao Airport Terminal** - 133,600 kN - 3,5 Hz | 2021: **Beijing University Building** - 71,731 kN - 10 Hz (NOVODAMP®) - 3.5 Hz (spring elements) | 2000: **Czech Broadcasting Prague** - 83,000 kN - 3.5 Hz | 1990: **Le Corum Montpellier Opera House** - 230,000 kN - 4 Hz | 2014: **Porta Nuova Isola „Bosco Verticale“ Milan** - 250,000 kN - 3.1 Hz | 2023: **Geone Marina Port7, Building E** - 493,600 kN - 15 Hz | 2022: **Prague Lappi, Building Kemi** - 142,700 kN - 16 Hz, **Building Ranua** - 158,300 kN - 16 Hz, **Building Tornio** - 109,600 kN - 12 Hz | 2023: **“T6B logement et commerces” Paris** - 204,700 kN - 2,9 Hz | 2020: **No. 1 Grosvenor Square, London** - 450,000 kN - 3.5 Hz | 2015: **Glasgow Royal Concert Hall** - 43,000 kN - 3.5 Hz | more upon request.





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Worldwide.



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**VIBRATIONS CAN BE CONTROLLED
– WHEREVER THEY OCCUR**