Vibration Isolation by Floating Slab Track Systems
The GERB Floating Slab Track Systems

The Situation
Today, rail-bound systems are modern and serviceable transport systems for both people and goods and often the only solution to combat 21st century traffic disaster. However, all types of trains, even the wheelless Maglev trains, are known to induce disturbing noise and vibration. As in congested areas, the close vicinity of rail tracks to buildings is almost unavoidable, conflict in respect of the transmission of noise and vibration to people or sensitive equipment are inevitable.

It’s a vibrating and noisy world!

The Solution
GERB have developed a variety of anti-vibration bearing systems which successfully reduce the transmission of train induced vibration either at the nearby buildings or, more efficiently, at the source. Today, GERB Floating Slab Systems represent highly effective and reliable vibration mitigation measures recognized by experts in many parts of the world.

Based on helical steel springs, they are designed for system natural frequencies as low as 4 to 8 Hz. That means, excellent attenuation levels are achieved not only in the upper or audible but also in the lower range of excitation, where the vibrations are clearly perceptible. For instance, in nearby buildings, sensitive wooden or wide-span concrete slabs with typical natural frequencies at 10 to 30 Hz are safely protected from resonance frequencies.

GERB Floating Slab Systems are successfully installed in tunnels, above ground, and on elevated rail tracks. Different types of springs and spring elements are available to meet the requirements set by the respective conditions on site and by the type of trains, including

- trams,
- urban mass transit systems,
- heavy freight trains,
- high-speed passenger trains.

Due to the high elasticity of steel springs, GERB floating track slabs combine two essential features:

- the lowest possible system natural frequency and
- a cost-saving low construction height.

GERB Floating Slab Track Systems make a classical “Heavy” Mass-Spring-System look old.

There is no longer need to waste space and money on massive and bulky concrete slabs requiring spacious and expensive tunnels. In addition, they offer a number of benefits by a simple and cost saving installation.
The Cologne System

Jack-up type elements enable the building of the concrete track slabs directly on the substructure. This dispenses with expensive and time-wasting formwork or costly epoxy upstands to compensate for uneven surfaces. The slabs are lifted and adjusted by compressing the springs by means of a handy hydraulic tool. Always easily accessible from the top, the Cologne system allows fast readjustments when necessitated, e.g. due to inadmissible substructure settlement. The Cologne technique is especially suitable and cost-saving for mass-spring-systems applied to crossings and turn-outs.
The Puchon System

These low-built spring elements have a high load-carrying capacity and thus allow a larger spacing. They are arranged below the slabs or, in order to save construction height, within lateral recesses. For installation of the elements, the slabs or troughs are lifted up from the substructure. Therefore lateral access to the slabs is provided. In particular cases, e.g. if the elements are used below wide slabs designed for twin tracks or crossings, hatches may be arranged for installation, inspections or readjustments from above.
The Cheonan System

Prestressable elements with a high loading capacity are used in elevated structures where the track is supported on a large bridge slab or girder. They combine the function of a bridge bearing with that of an anti-vibration bearing. Already pre-compressed by the manufacturer before installation, they allow the building of the superstructure on rigid supports which are activated only after completion of the structure. In order to allow for structural temperature expansion, they can be equipped with slide bearings. In seismic zones, GERB Viscodampers® can be added to control the movements of the track.

The Advantages

GERB Floating Slab Track Systems offer quite a number of advantages in terms of construction, design, maintenance, efficiency, and costs.

**Construction**
Slab construction directly on the subsurface is most simple and does not require bottom formwork. Epoxy upstands and lateral walls are not necessary. Below crossings or turnouts, long and massive in-situ slabs are preferable to prefabricated slabs.

**Design**
The floating slab system can be accommodated to almost every situation. The slabs are usually of lower design than other systems. The steel springs take all horizontal train loads. Lateral bearings are not required. Access from above makes spring installation, adjustments and inspections fast and simple.

**Maintenance**
GERB spring elements generally do not require maintenance. They are fatigue-proof and designed to high longevity. However, periodical spot checks should be carried out including the inspection of the local conditions.

**Efficiency**
Steel spring systems provide the highest attenuation levels (35 – 40 dB). Insertion loss values of 20 to 25 dB are achieved even in the lower frequency range (> 25 Hz). Regarding audible vibration, further improvements are achieved by adding the GERB Coil Resonance Damping System (CRDS) to the springs. All types of elements may contain the same types of steel springs providing the same efficiency.

**Costs**
GERB Floating Slab Track Systems provide high attenuation levels at reasonable costs. Compared to other systems, substantial cost savings can be achieved with regards to construction, installation and maintenance.