TRACKBEDS

GERB

VIBRATION ISOLATION BY FLOATING SLAB TRACK SYSTEMS & STIFFNESS TRANSITION ZONES

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 wheel-less 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.

GERB have developed a variety of antivibration 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.

GERB support systems - in the form of coil springs made from steel or technically high-quality polyurethanes - not only provide effective insertion loss in the audible or higher frequency range, but also reduce low-frequency vibrations successfully. In this way, resonance effects in surrounding areas or in neighboring buildings can be prevented. Attenuation systems from GERB are deployed in tunnels, at grade sections and elevated tracks. Thanks to the large variety of available systems, requirements of each installation can be met for all rail systems.

Floating Slab Track (FST) / EBS System, Expo Line, Los Angeles, USA

FST, High Speed Train, Cheonan, South Korea

Control of ground-borne noise and vibration effectively – with GERB customized solutions

GERB systems are suitable for all types of rail traffic systems:

HEAVY HAUL | HIGH SPEED | TRAMS | SUBWAYS | URBAN MASS TRANSIT | MAGNETIC LEVITATION

» STEEL SPRING SYSTEMS

+ Highest possible efficiency of isolation
+ Cost-saving low construction height
+ Natural frequency 4 - 8 Hz

» NOVODAMP® SYSTEMS

+ Moderate to high efficiency of isolation
+ Natural frequency 8 - 25 Hz

» NOVODAMP® DISCRETE BEARINGS

+ High efficiency of isolation
+ strips or pads
+ System frequency 8 - 14 Hz

» NOVODAMP® MAT SYSTEMS

+ Medium efficiency of isolation
+ Full-surface
+ System frequency: < 25 Hz

» NOVODAMP® UNDER BALLAST MATS

+ For ballasted trackbeds
+ Special antiperforating system with protective fleece
+ Protection of ballast and bed

» NOVODAMP® STIFFNESS TRANSITIONS ZONES

+ Protection of trackbed
+ Extension of maintenance intervals
+ Reduction in operational downtime

FST with earthquake protection, subway Tokio, Japan

FST, tram, Basel, Switzerland

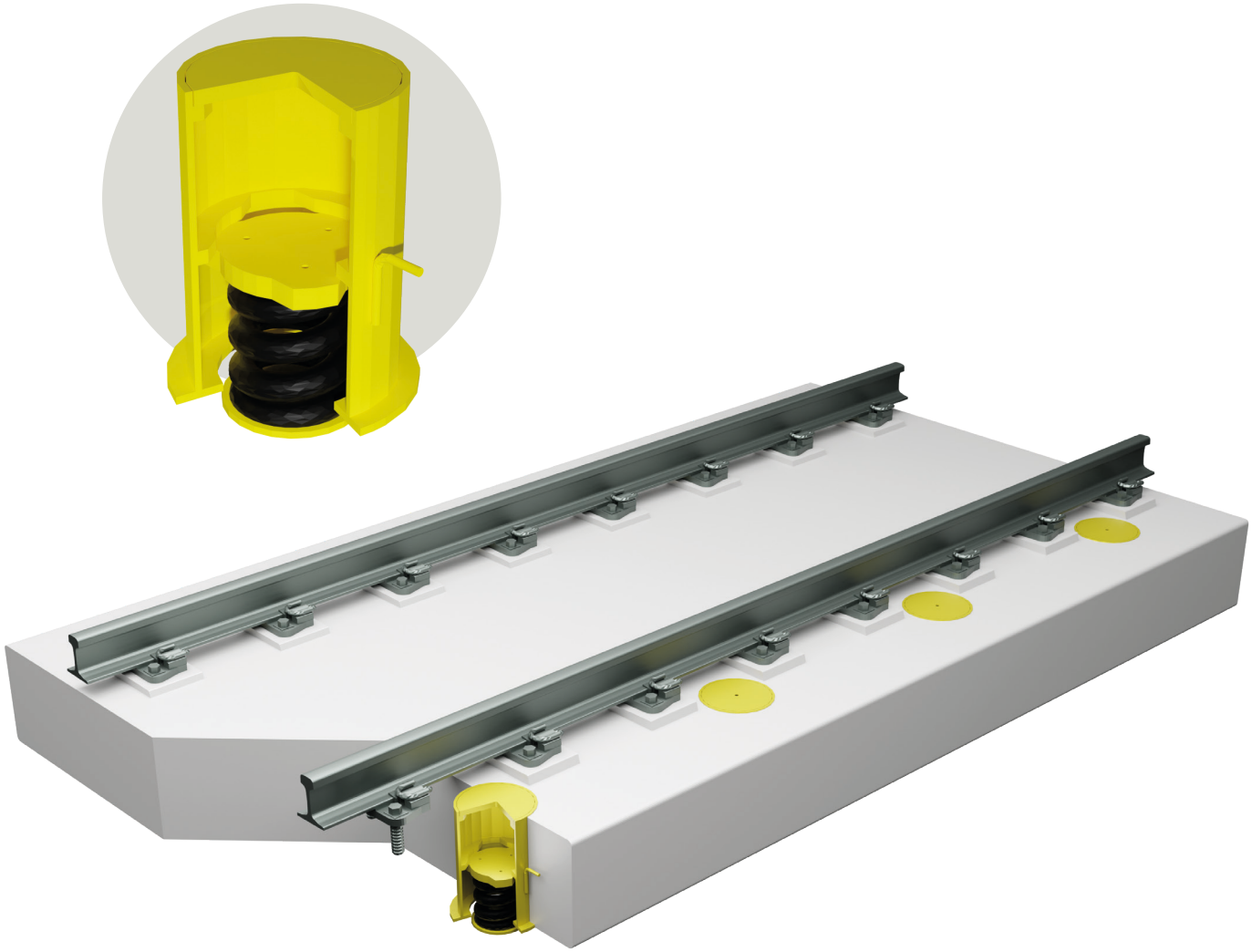
Solutions for your Application: Steel Spring Elements

» FST with steel springs elements in single or multi-spring design

Steel spring elements in single or multi-spring design offer a high level of load-bearing capacity and thus enable large distances between the individual elements. They are either placed below the slab track or in the gaps on each side in order to achieve low construction heights. For the installation of the spring elements the slab tracks are raised from the support structure. Side recesses or central openings for placing hydraulic jacks enable the lifting of the track. Elastic elements can be removed for inspections.

Spring elements with lifting-function

Spring elements with an integrated lifting function enable casting of the reinforced concrete slab track directly on the substructure (1st stage concrete or bridge deck). The slab tracks are raised and aligned both easily and quickly with the help of hydraulic equipment. Subsequent adjustment or inspection without any significant interruption of rail traffic is enabled by accessibility from above. This procedure is suitable for turnouts and crossing zones and combines an optimal isolation effect with a compact design. In comparison to classical mass-spring systems, the height of the slab track can be reduced significantly with this GERB system.



Solutions for your Application: NOVODAMP® closed-cell polyurethane

» Pads:

» Strips:

» Mats:

» Elastic systems based on NOVODAMP® closed-cell polyurethane

Polyurethane in the form of mats, strips or pads has proven itself as highly elastic track support. The NOVODAMP® solutions from GERB are extremely resistant - against both mechanical (e.g., fatigue and compression set) and chemical wheatering (e.g., water, oil, lubricants and ozone). The systems can be easily installed and are available in different thicknesses. They can be dimensioned and installed for required attenuation ranges. Different materials are available and by varying the thickness it can be adapted to all design loads typical for railway systems.

Product	Application Trackbed Isolation	Support Frequency (Hz)
T150 T125 T100 T075 T060 T045 T035 T025 T018	FST / Discrete Bearings Strips Transition Zones	≥ 8
T010 T008	Under Ballast Mats FST / Full Surface Mats	≥ 10

Other materials are available on request. All data may become subject to change.

SUDDEN CHANGES IN TRACK STIFFNESS AT TRANSITION ZONES

One of the basic challenges in fields of rail traffic is maintaining the railway infrastructure. Especially the zones with different substructures, like at the transition from ballasted to slab tracks or vice versa are challenging. They occur at superstructures, like bridges, tunnels, or culverts – there's probably no railway line without any stiffness transition zones.

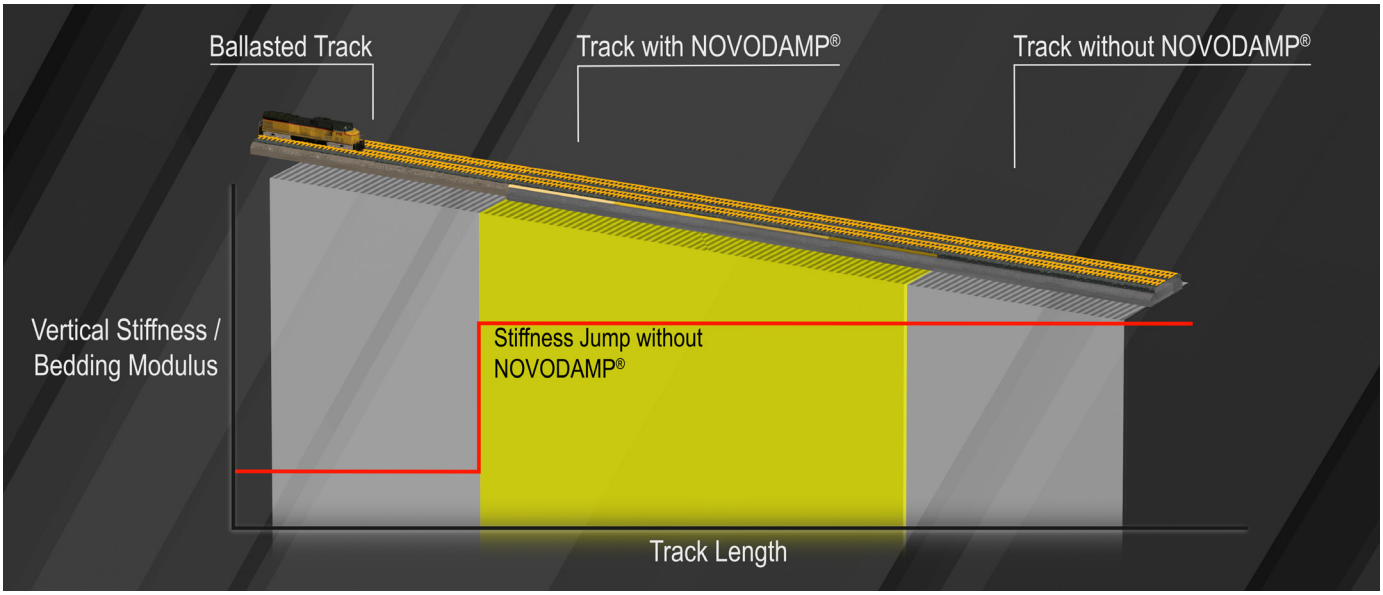
So, for instance, the bedding modulus respectively the elasticity of the supporting structure of the free track is significantly lower than the stiffness of a viaduct rigid slab track. Moreover, the reference design of Railways Application DIN EN 16432 demands, that no sudden changes in track stiffness occur at the transition.

Stiffness transition zones cause frequent need for conducting additional maintenance and reconstruction effort. In consequence, high direct and indirect costs and work expenditures must be expected. These costs are many times higher than for normal tracks. Other consequences are lower safety, lower comfort, and the reduction of track capacity as well as of traffic continuity in rail services. The most common problems are the degradation of ballast and track components, like clamps, clips, reels, and sleepers, as well as the rail deformation. And the main reason for all those problems is a sudden change of the elasticity.

In every vibration isolation system stiffness transition is already considered as standard – in the field of track construction special application areas become relevant, such as bridges / viaducts, tunnels, culverts, track switches (turnouts, railway stations.

Tunnel Phra Puttachai | NOVODAMP® MAT, Thailand

Chachoengsao | NOVODAMP® MAT, Thailand



GERB SOLUTION FOR ALIGNMENT & SMOOTHING OF STIFFNESS TRANSITION ZONES

The main idea of the GERB solution is to compensate the sudden change of the stiffness and track elasticity. For an aligned and smooth transition, the high difference in stiffness and vertical displacement is overcome gradually, step-by-step. This leads to a clear reduction of this difference.

GERB provides a solution with NOVODAMP® Closed-cell Polyurethane: With it, GERB controls the elasticity of your track. After analyzing your special stiffness transition zone situation, the GERB experts select the optimal mat collection out of a rich portfolio of closed-cell polyurethane full-surface mats for you – for ballasted tracks and rigit slab tacks – in line with DIN EN 16432. And as GERB provides the complete package, the engineers support with words and deeds through the whole process.

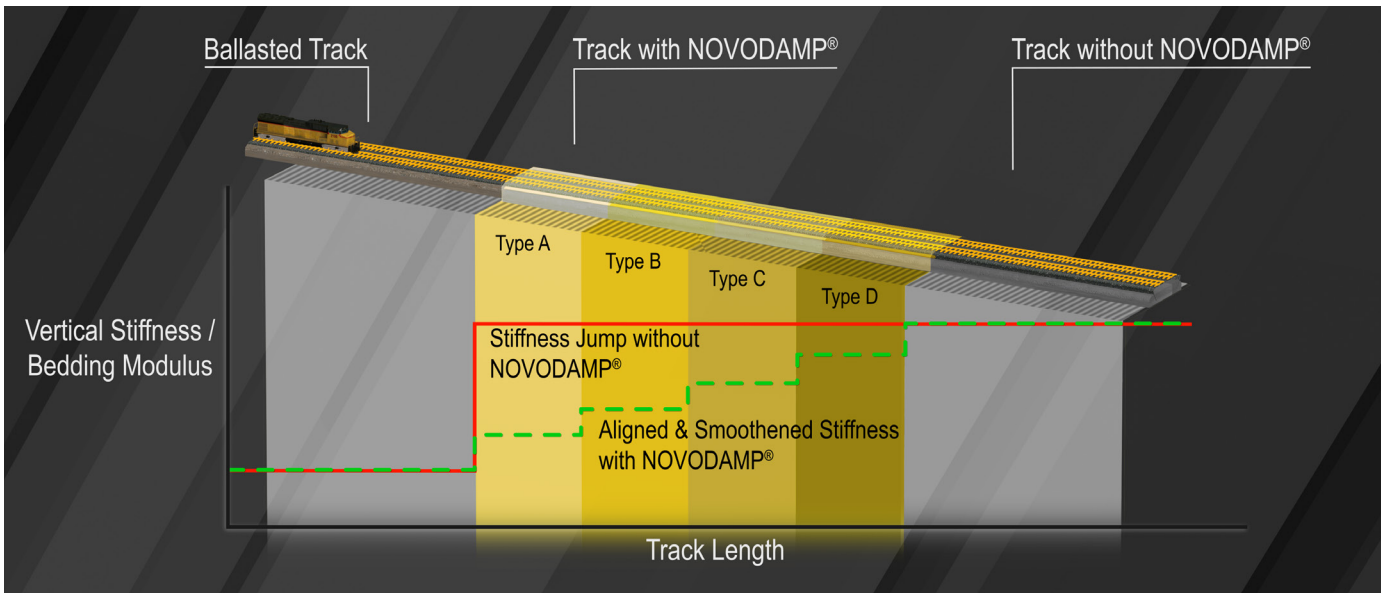
» Advantages

+ NOVODAMP® Closed cell polyurethane
+ Mechanical loss factors of max. 0.1
+ High load capacity up to 650 tons/m2
+ Very low creeping
+ Fatigue safe
+ High resistance to aging
+ Extremely low water absorption (0 – 10 %)

» Benefits

+ Longer lifetime for ballast (due to less crushing on contact of ballast and bridge deck and less subsidence)
+ Longer lifetime of track components (clamps, clips, reels,
and sleepers – due to less hardening of ballast layer)
+ Lower life cycle costs
+ Lower maintenance costs & efforts
+ Higher transport volume
+ Higher riding comfort
(track capacity and traffic continuity)

SRT Double Track | Ballasted Track at Transition Zones (Bridge / Approached Slab), Thailand



ABOUT GERB

GERB is committed to the isolation and reduction of vibrations. The fundamental objective of the company group is to protect people, buildings and facilities from vibrations, shocks, dynamic load transmission, and structure-borne noise and to solve settlement problems, whether caused by people, machines, wind, earthquakes, environmental or natural disasters or other influences. It's about improving living, labor and comfort - for the GERB industry sectors and respective application areas:

MANUFACTURING, INDUSTRY & ENERGY
(Metal Forming, Industrial Machinery, Power Generation)

ARCHITECTURE & CONSTRUCTION
(Buildings & Extensions, Structures)

TRANSPORTATION & INFRASTRUCTURE
(Rail Tracks, Shipbuilding)

They are flanked by the GERB Special Applications Earthquake / Seismic Protection, Pipework Damping, Tuned Mass Damping (TMD), Microseismic Isolation, and Restoring & Upgrade.

With the onset of the machine age – the first industrial revolution – the need for protection against noise and vibration had arisen. That's why, in 1908, a young German engineer, named William Gerb, developed an innovative solution by installing vibration intense machines on spring elements. In subsequent years, this founding idea of the GERB company group was continually developed further – together with machine manufacturers, engineers and architects – and thus numerous new solutions of dynamic problems were made available.
The GERB list of superlative project references is long: If thinking about the elastic support of remarkable machines, such as the largest steam turbines/generators, forging screw presses, and forging hammers in the world, the vibration isolation of hundreds of buildings, long-span and slender structures, amongst them, the tuned-mass damping of skyscrapers, like the Burj Al Arab and the steel spring support of the concert halls of the Hamburg Elbphilharmonie, or the elastic support of hundrets of kilometers of rail track, like the Crossrail London, the Tokyo subway, or the Miami Brightline.

GERB designs and supplies vibration control systems within the GERB Product Proups Helical Steel Springs, viscous fluid Dampers (Viscodampers®), Tuned Mass Dampers (TMD), NOVODAMP® Closed-cell Polyurethane, and Combined & System Solutions as well as Tailor-made/Customized Solutions. And finally, the clients profit from further GERB Services & Consulting: Technical Consulting, Measurement & Tests, Research & Development, Engineering, Mounting, Installation & Supervising and – of course – Quality Management.

The company's global headquarters resides in Berlin. Worldwide, the GERB group operates subsidiaries at numerous locations, has several hundred employees, and is supported by other partners.

» RAIL TRANSPORT SYSTEMS

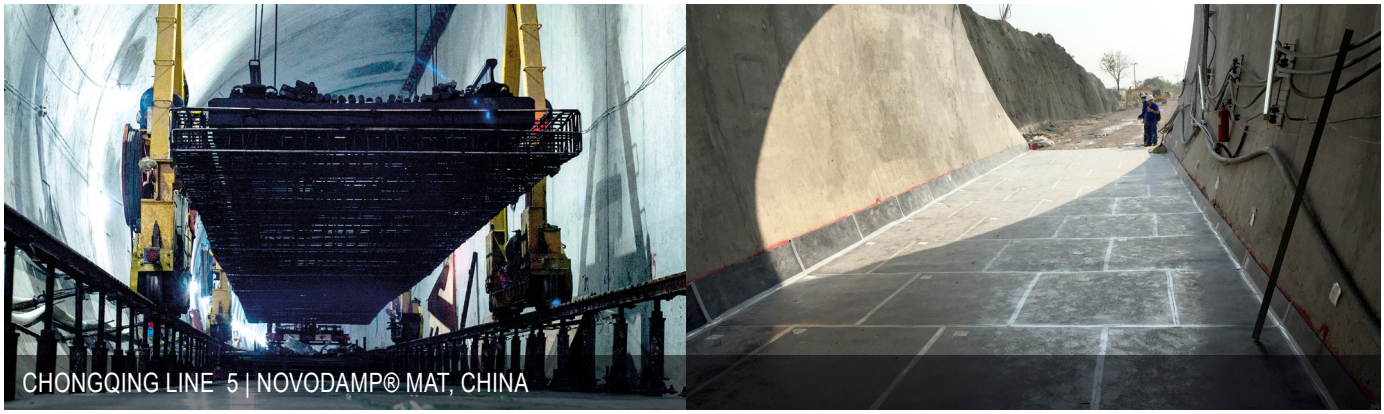
+ Heavy haul
+ High speed
+ Trams
+ Subways
+ Mass urban transit
+ Magnetic levitation

» GERB SERVICES & CONSULTING

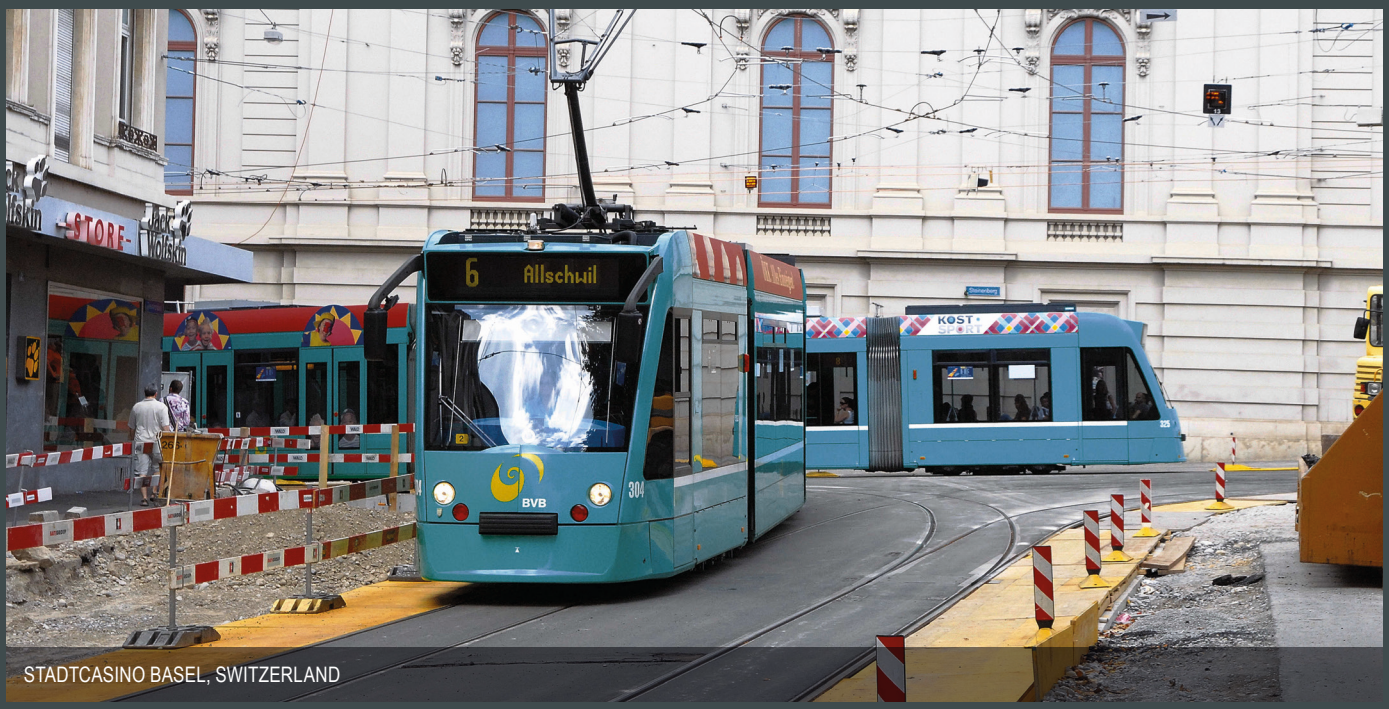
+ Technical consulting, Measurement & Tests
+ Research & Development
+ Engineering
+ Mounting, Installation & Supervising
+ Quality Management

Excerpt of References

Country	Project	In operation since	Max. axle load (kN)
Brazil	Suburban Railway, São Paulo	1999	210
	Subway, Brasilia	2000	175
China	Subway, Nanjing	2004	140
	Subway, Guanzhou	2005	150
	Subway, Chengdu	2010	140
	Railway, Tianjin	2010	170
	Subway, Chongqing	2018	150
Germany	Subway, Berlin	1994	90
	Tramway, Bielefeld	1995	100
	Airport Transfer, Frankfurt a. M.	1997	70
	Tramway, Stuttgart	2000	100
	Tramway, Heidelberg	2007	100
India	Subway, Chennai	2021	170
	Wimco Nagar Depot	2021	170
	Metro, Nagpur	2021	160
Japan	Subway, Tokyo	2000	100
	Intercity Railway, Tokyo	2004	150
	Subway, Yokohama	2006	150
	Railway, Fukuoka	2009	170
Norway	Tramway, Oslo	2004	100
Singapore	Thomson-East Coast Line	2022	160
South Korea	Railway, Puchon	1997	220
	TGV High Speed Train, Cheonan	1999	220
Switzerland	Tramway, Basel	2006	100
Taiwan	Taoyuan International Airport, Taoyuan	2010	153
	Circular line, Taipei	2018	103
Thailand	Krungthep Aphiwat Central Station, Redline Project, Bangkok	2020	200
United Kingdom	Subway, London	1999	100
USA	Commuter train, Charlotte, NC	2002	125
	Brightline, Miami, FL	2018	177
	Expo Line, Los Angeles, CA	2016	110



CHONGQING LINE 5 | NOVODAMP® MAT, CHINA

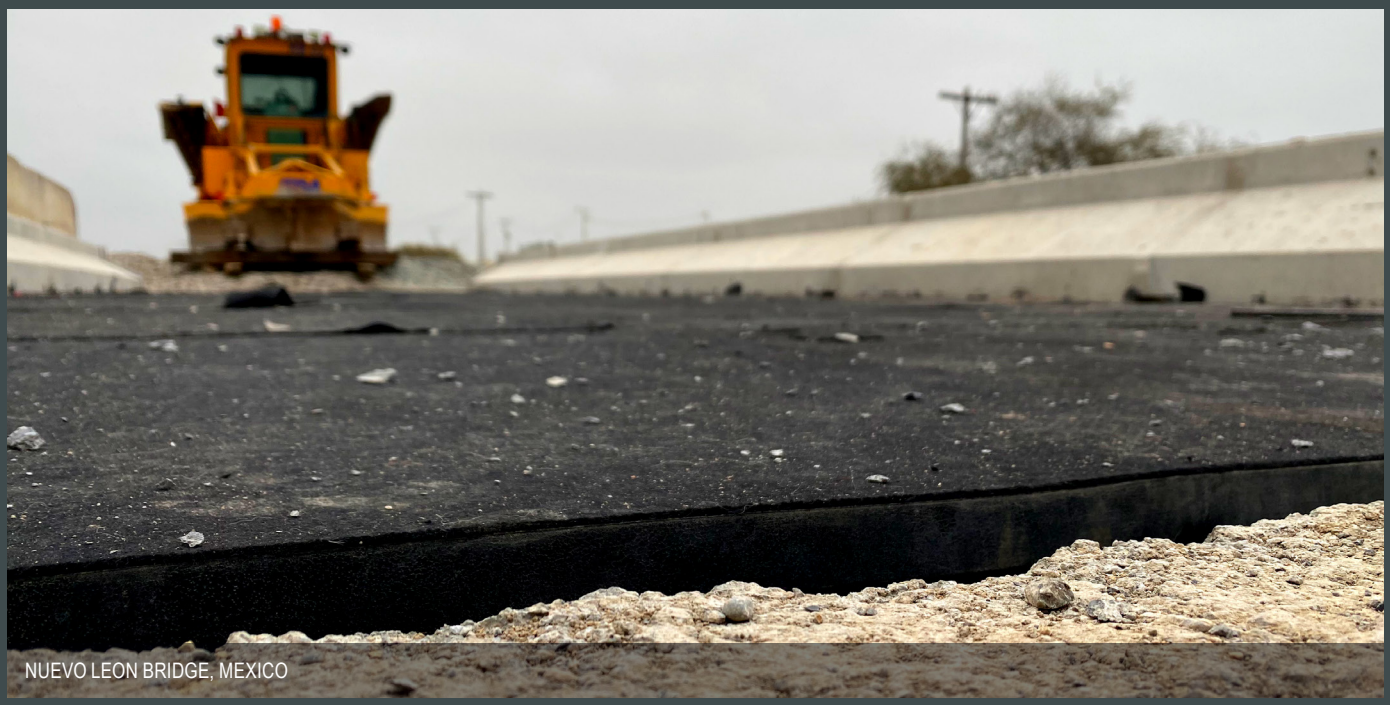


STADTCASINO BASEL, SWITZERLAND

SWITZERLAND

SINGAPORE

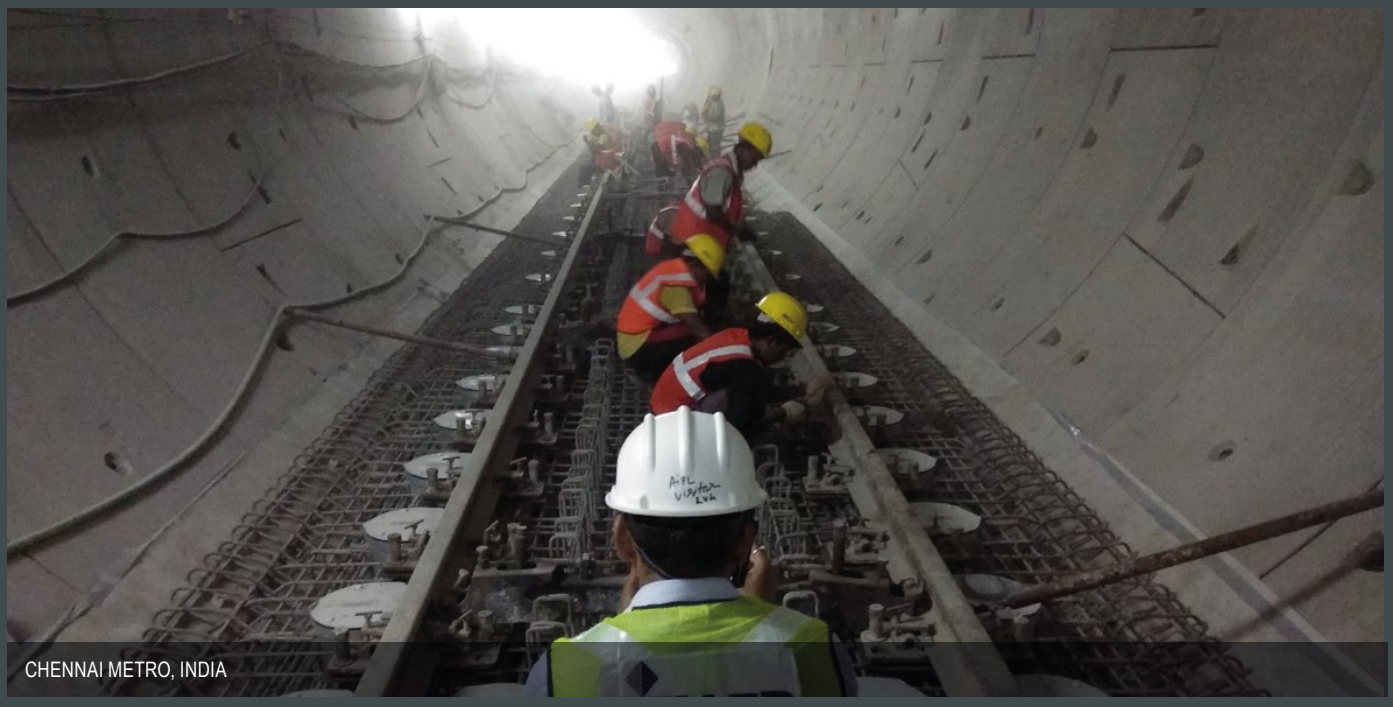

THOMSON-EAST COAST LINE SINGAPORE



NUEVO LEON BRIDGE, MEXICO

MEXICO

INDIA



CHENNAI METRO, INDIA

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VIBRATIONS CAN BE CONTROLLED – WHEREVER THEY OCCUR

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