THE SLAB TRACK SOLUTION FOR THE REQUIREMENTS OF TOMORROW

LOW VIBRATION TRACK (LVT)

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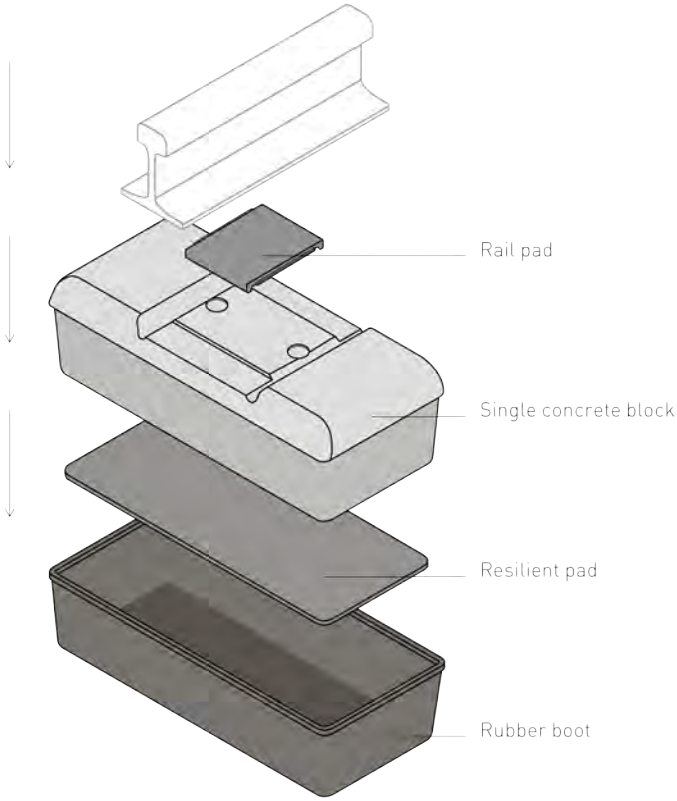
LVT, one of the first non-ballasted track forms in the world, has proven its worth in many famous and ambitious railway projects. Its excellent worldwide reputation is attributable to precise track geometry and to its excellent vibration protection. References from five continents bear this out.

In its present form, the system is on the idea of twin-block sleepers on a ballasted track. From this basic idea, Roger and Bernard Sonneville developed the single block system for the slab track. Not only does the Sonneville AG provide the design and quality monitoring of the system components but also technical support for different aspects of slab track technology. Engineering offices, construction companies and final clients all fall within their charge.

THE SYSTEM

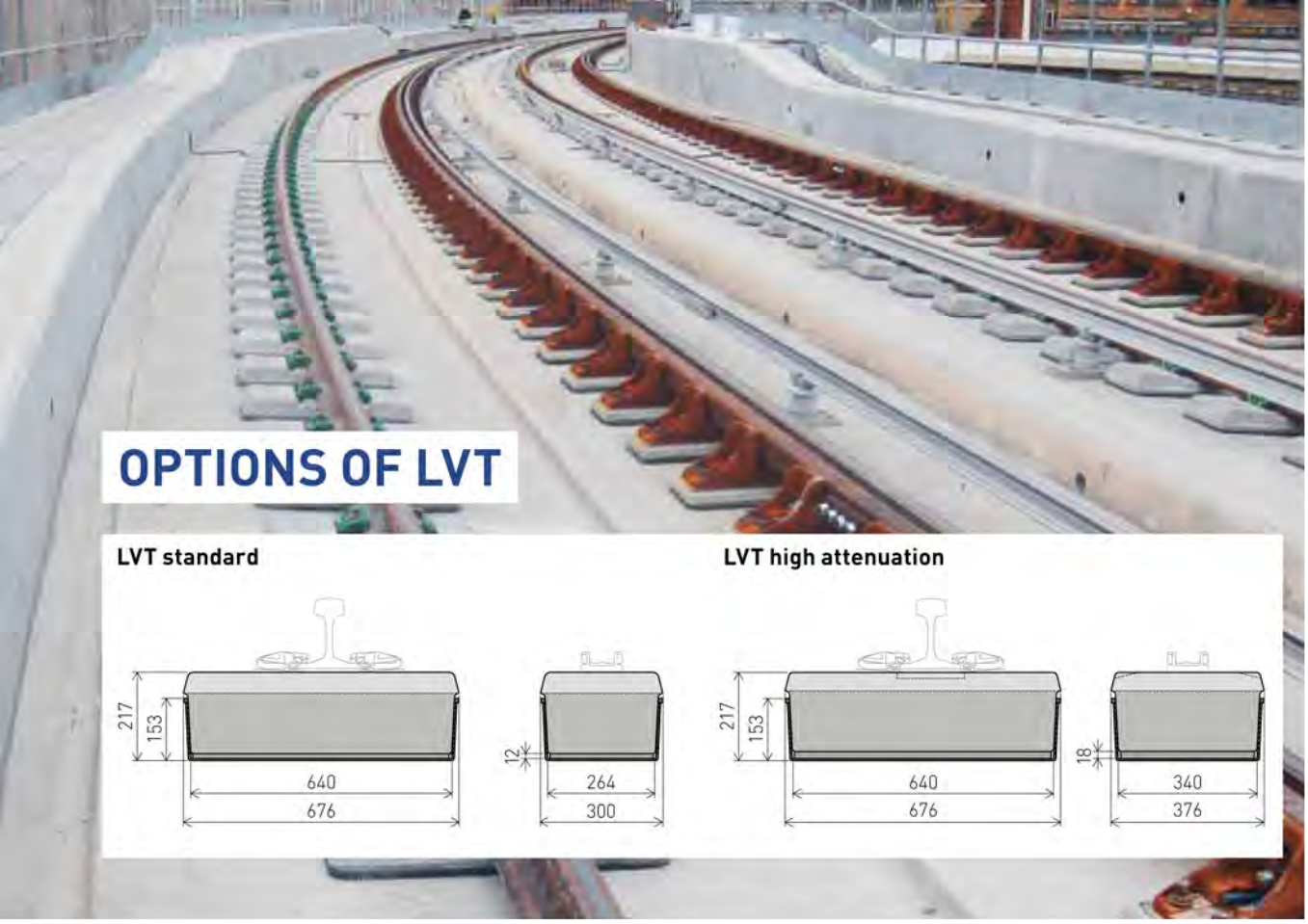


The LVT-System consists of a concrete block, a resilient pad and a rubber boot, surrounded by unreinforced concrete (2nd stage concrete). No special demands on the rail fixation are made; merely an elastic rail pad is used. For each specific project, these two elastic components are matched to each other, thus bestowing upon the system the properties characteristic of dual-level elasticity.

The resilient pad provides for the load distribution analogous to the ballasted track and reduces the influence of low frequency vibrations. The rail pad in turn protects against the effects of higher frequencies.

The rubber boot allows an unhindered deflection that, together with the high quality of the resilient pad, leads under dynamic loads to a very low system stiffening ($c_{dyn}/c_{stat} < 1.5$).

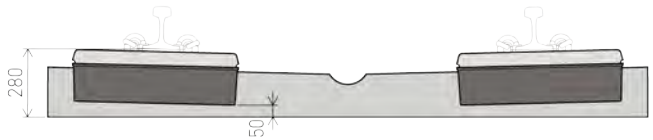
All necessary functions for the track are taken over by the decoupled concrete block. This reduces the demands made on the 2nd stage concrete.



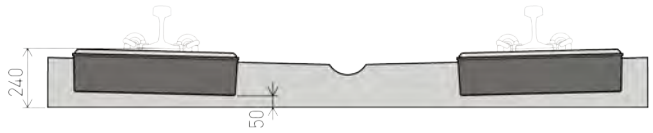
The LVT-System is tailor-made for each project. The following system options have proven themselves on the market:

LVT standard (LVT): for excellent track running performance on high-speed sections, for metro systems and for heavy haul lines.

LVT high attenuation (LVT HA): with a larger block and softer pad, for higher demands of noise and vibration attenuation. These two characteristics result in a lower natural frequency of the system that lies in the range of floating slabs.

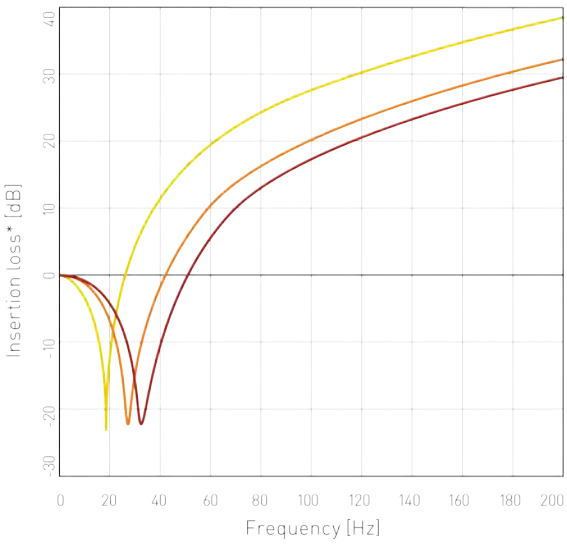


Both options are available as **LVT low profile (LVT LP)** and are especially suitable for restricted conditions of the structure gauge.



All options are exceptionally well suited for use in tunnels, at grade and for viaducts, these applications having been well confirmed by many reference objects.

An example of the effectiveness of various LVT options is illustrated by shown insertion loss:

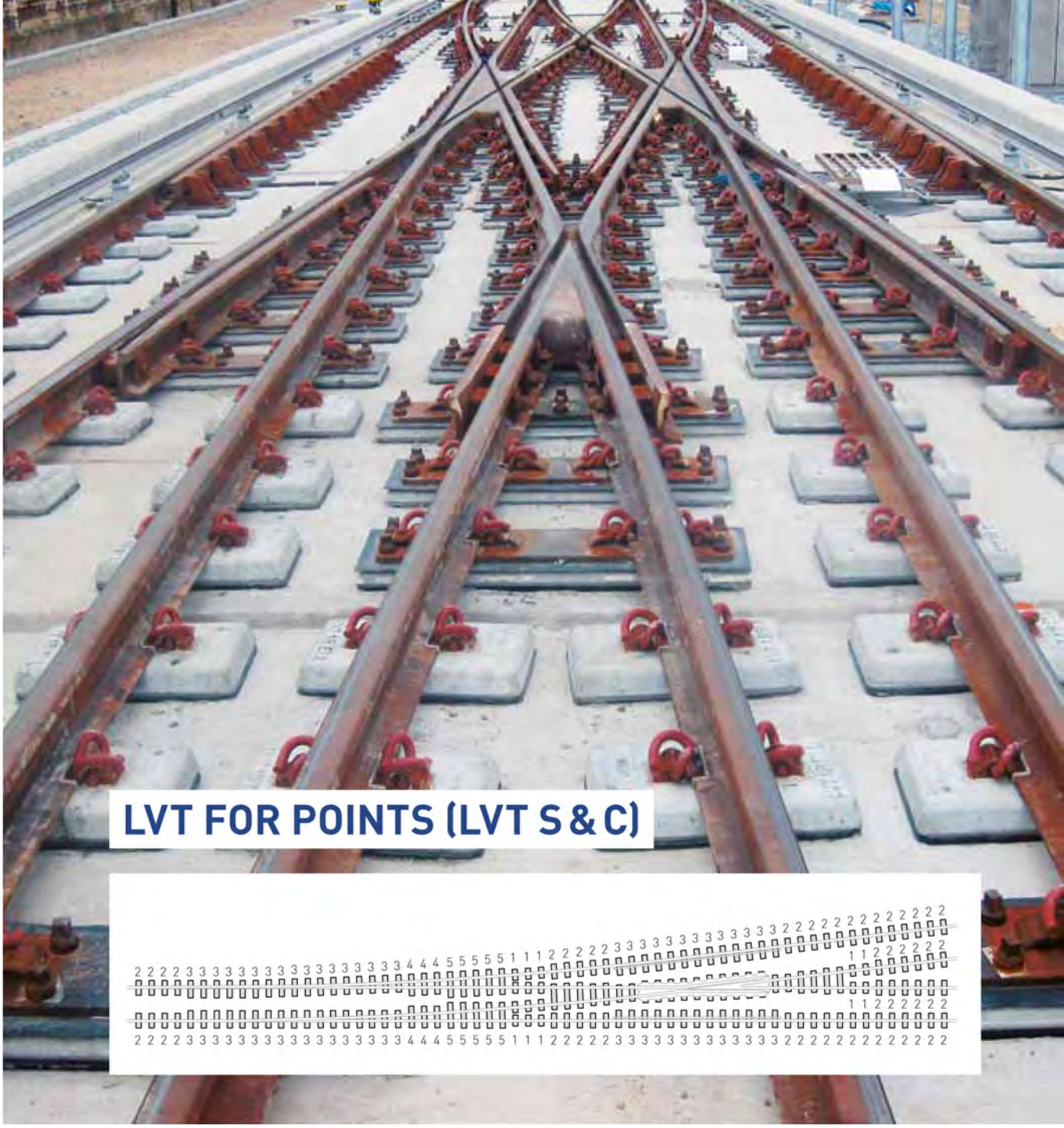


LVT HA c_{pad} = 9 kN/mm
Axle load = 16 t

LVT c_{pad} = 25 kN/mm
Axle load = 16 t

LVT c_{pad} = 40 kN/mm
Axle load = 25 t

* calculated, reference system LVT c_{pad} = 2000 kN/mm



Apart from turnouts and crossings, rail expansion joints as well as fixations for guard rails and check rails are secured through LVT S & C systems on elastic bedded blocks. With five standardised LVT-supports all geometries can be represented. A uniform track-riding performance is ensured by various block pad stiffness's.

The system LVT S & C ensures also within points and junctions, a slab track having homogenous rail riding conditions. The high degree of standardization and the very frequent relinquishing of reinforcement in the 2nd stage concrete make LVT S & C a highly competitive system in all respects.

THE ADVANTAGES

More efficient vibration protection
Thanks to the two levels elasticity LVT attenuates vibrations in all frequency ranges.

High flexibility
The project-specific design of the components and the use of various fastening systems fulfil the demands of many different rail projects.

Low installation costs
The functioning mode of LVT allows one to dispense with reinforcement of the 2nd stage concrete apart from at interfaces with ballasted track and at major drainage inlets.

Highly accurate rail limits
The «top-down»-construction and the high embedment of the LVT-supports in the concrete leads to a very high gauge accuracy with values of ± 0.5 mm.

Low need for maintenance – simple access to all components
LVT is practically maintenance free. All components are easily accessible should, in the case of a derailment, individual parts need to be changed or if the track height requires adjustment.

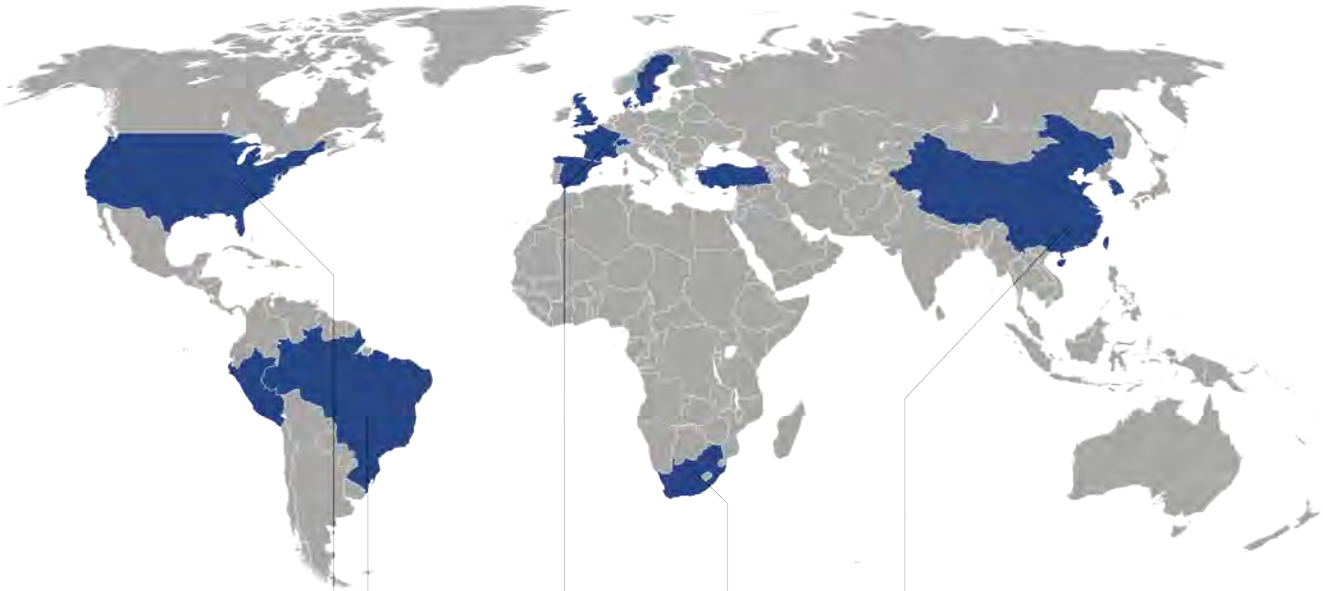
No electric conductance
No direct connection exists between the blocks.

Good aerodynamics and simple access to rails
The space between the rails is unobstructed: this improves the track aerodynamics and allows unhindered access during construction work or rescue of passengers.

Flexible design of drainage system
In accordance with local conditions the water drainage system can be installed not only at the sides but also in the track centre.

Travel with work trains
During the installation phase, work can be done simultaneously on assembly sections – benefits a rapid advance in construction.

REFERENCES



North America
56 km

South America
31 km

Europe
375 km

Africa
22 km

Asia
563 km

LVT has proved to be the perfect solution for all types of slab track systems, irrespective if that is a high speed track where highly accurate track geometry is required or within inner city limits, where vibration attenuation is of primary importance. Whether heavy haulage, high speed or metro lines – decisive is always the low need for maintenance of the system. It is not surprising therefore, that three of the four longest tunnels in the world are included in the over 1000 km of the LVT-System installed to date.

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