RAIL.ONE

Pfleiderer track systems

RHEDA MRT

The ballastless track for underground and surface commuter transit

Cities on the move

Living and working today confront people with increasing demands for mobility. Planners and engineers are constantly searching for innovative sustainable solutions that improve the quality of life. We have already proven our ideas – under extreme conditions.

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Old Berlin – a modern metropolis

In the German capital the past meets the future in unparalleled fashion. While commercial and government buildings are rapidly rising, the architectural heritage of the city requires preservation. With its monumental viaduct arches, the Berlin surface commuter rail system (S-Bahn) has been a prominent feature of the city for over one hundred years. This important technical monument is also one of the most frequented stretches of railway in the world – a real challenge for urban planners and engineers.

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The goal: 100 % availability

When in 1994 the engineering and construction companies later to be involved with the railway superstructure first confronted RAIL.ONE with the project of a ballastless track system for refurbishment of the Stadtbahn Berlin (S-Bahn), this system – the backbone of the Berlin surface commuter rail infrastructure – was still in a deplorable condition. And the technical requirements were enormous: over a stretch of 36 km the line passes 731 viaducts, 54 bridges of many and various kinds, and numerous sharp bends with a radius of less than 250 m. It was also necessary to take into account buildings and residential areas that are very sensitive to noise and vibration. It was necessary to integrate more than 30 turnouts, and to create extensive safety redundancies. Due to the high volume of traffic, one top priority was to reduce maintenance to a minimum.

More than just track construction

RAIL.ONE offers future-proof track systems and components for railway operating companies.

Mobility and flexibility

Intelligent urban traffic is an essential component for the infrastructure that serves as nervous system of any city. Mobility is more critical than ever before, and new concepts are in urgent demand.

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The solution: RHEDA-BERLIN

RAIL.ONE has many years' experience with ballastless track systems. For the first time, however, RHEDA structural design has recently been exactly tailored to meet the precise requirements of urban and mainline traffic as encountered on the massive Berlin commuter-rail network and its viaduct arches. In collaboration with the company Spie Enertrans, an optimum technical and economic solution has been developed: of course with observance of all basic design-dimensioning requirements satisfied by the RHEDA family. The special features of this further development in Berlin consisted of simplification of the system structure, streamlining of the installation technique, and enhancement of techniques for embedding the sleeper in the infill concrete. The bi-block sleeper, which was especially harmonized with the track system, was a key factor in this procedure.

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High-tech for urban traffic: RHEDA MRT

The RHEDA MRT ballastless track system was especially developed for use with underground and surface commuter networks. The basic principle of the MRT was derived from the RHEDA 2000® for mainline and high-speed traffic. RHEDA MRT users accordingly benefit from the vast experience gained with the RHEDA 2000®, with modification of its individual components to meet the special requirements of urban mass rapid transit. Adaptation for the RHEDA MRT has significantly reduced the structural height and weight of the system: therefore optimally suiting the system for use in tunnels, with simultaneous enhancement of quality, safety, and permanence. RHEDA MRT models can also be implemented as mass-spring systems.

A light system for heavy tasks

The RHEDA MRT track system offers optimum travel convenience, top safety, low maintenance, as well as economical methods of construction. The system was especially developed for underground and surface commuter transit.

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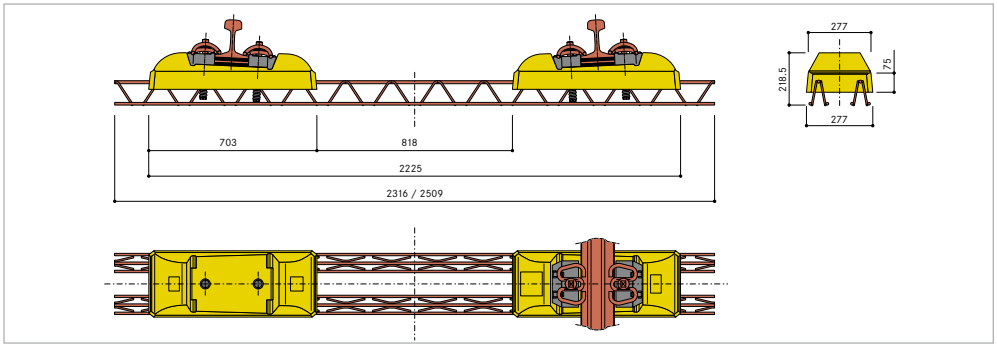
System structure and key components

The system is basically designed to satisfy all individual project requirements with respect to the intended rolling stock, existing or planned track substructures, as well as other components from railway-related systems and other disciplines. The core of the system is a monolithically cast concrete slab that securely fixes bi-block sleepers in their intended position and effectively distributes traffic loads into the structure below. The slab can be customized to ideally suit the geometry and other requirements of adjacent structures and components. Structural design can be adapted to relevant codes and standards without impairing system performance – particularly regarding safety and reliability.

The modified B 355-U-M concrete bi-block sleeper represents the key component of the system. This sleeper was adapted to satisfy the requirements of urban transit. Its lattice-truss reinforcement makes it easy to install, and ensures accurate gauge and rail inclination. With this basic structure, it is possible to extensively avoid using compensation tolerances. It enhances the bond with the concrete sub-base, provides excellent structural properties, and extends the useful life of the system.

Rail-fastening systems play a key role in ballastless track systems. As for high-speed applications, it is crucially important for MRT systems to assure sufficient track elasticity. For ballastless track systems, only the rail fastenings can provide the necessary elasticity. By default, RHEDA MRT is equipped with Vossloh type UTS rail fastenings whose equivalent – System 300 – has been successfully used with the RHEDA system on mainline track sections. For many years now, the Vossloh 300 system has proved its effectiveness in applications for Deutsche Bahn AG (German Railways) and many other major and high-speed lines. Basically, however, it is possible to use any rail fastening system suitable for application with ballastless track systems. It is necessary, in such cases, to adapt the anchorage and the geometry of the concrete blocks.



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Safety

The RHEDA 2000® system was developed in a systematic process, in compliance not only with the technical regulations, but especially with the strict safety stipulations of Deutsche Bahn AG (German Railways) and international safety authorities. RHEDA MRT was developed according to the same principles. For its engineering work – as well as production, supply, and logistics – RAIL.ONE reliably ensures quality control and sustainability. After completion, each product is fully covered by quality management assurance procedures.

RHEDA MRT:

- High flexibility for adaptation on existing structures and sub-structures
- Customized for all rolling stock
- Reliable construction process for a variety of site conditions

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Bridges and viaducts

RHEDA MRT is a monolithic, concrete-based ballastless track system. It can be easily laid on newly designed as well as old and lightweight bridges and viaducts. These essential benefits result from its relatively low weight, low structural height, the monolithic construction method, uncomplicated installation technologies, as well as uniformity and flexibility of the system.

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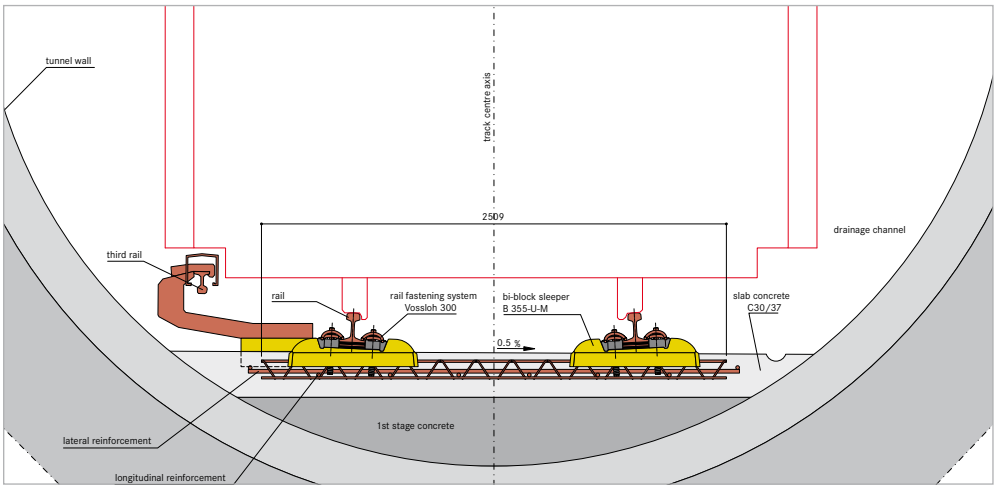
Installation in tunnels

The monolithic construction method and simple installation techniques are characteristic for the RHEDA MRT system: Owing to the lower loads encountered in tunnels, a considerably lighter track structure is possible for these applications in comparison to main-track installations. The installed structural height is significantly reduced, and trough solutions are unnecessary. These benefits simplify installation, reduce material requirements, and make it possible to decrease the tunnel diameter: making the system optimal for installation in tunnels with small track radii. Another advantage is the enhancement of track quality and safety. With its smooth surface, in addition, RHEDA MRT provides favourable conditions for evacuation paths and rescue exits.



RHEDA MRT with third rail

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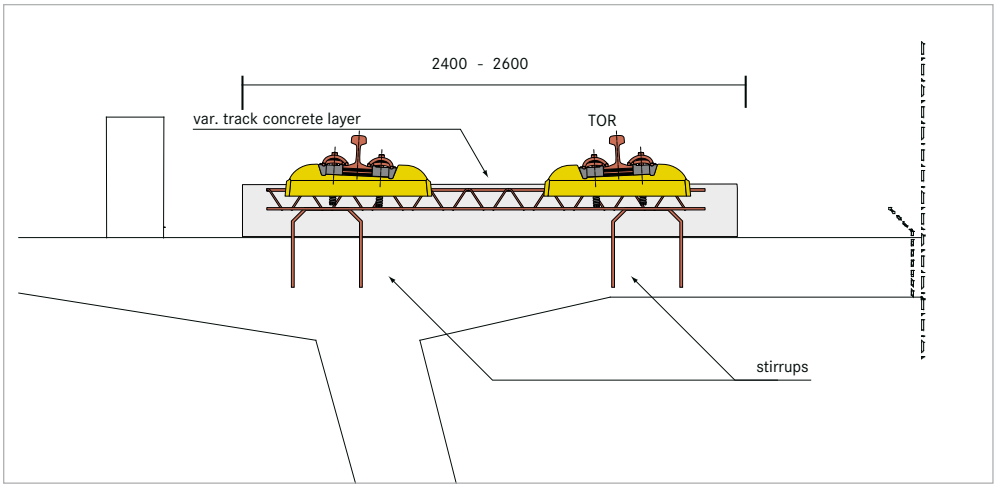
Turnouts and crossings

Special concrete turnout sleepers were developed for use in conjunction with the RHEDA MRT system. They allow optimum compatibility between the track system and the turnout, as well as unproblematic installation.

Solutions are also available in conformity with the respective system for transitions from ballastless to ballasted tracks and vice versa. Seamless transition are effectively possible, with individual designs in accordance with the local conditions and requirements.



Reduced RHEDA MRT with stirrups

Definitely a clean business

Mass rapid transit is a matter of responsibility. In order to ensure top quality over the long term, RAIL.ONE relies on transparent processes and safe solutions: beginning right from the planning, production, and installation stages.

The RHEDA MRT system

- Adaptation for compliance with all standards of international urban transport
- Precise gauge and rail geometry by installing cross sleepers
- Elastic bearing support for the rails
- Simple, transparent system structure
- High degree of safety and long service life
- No need to use compensation adjustability in rail fastenings
- No special tolerance requirements for individual components
- Design according to LCC aspects

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Assembly and installation

Because systems technology for all modes of alignment is consistent, assembly is considerably simplified. Concrete sleepers with lattice trusses are laid out on the existing substructure: e.g., tunnel floor or concrete base. The sleepers with third-rail support fittings are installed at the same time. The respective intervals are determined by the application plans for the third-rail system. After installation of the track reinforcement, the rails can then be mounted onto the sleepers with fully preassembled rail-fastening elements. When the track panel thus formed has been finally adjusted, it is cast in concrete. Cable shafts and the wastewater system can be integrated into the track when the concrete has been cast. The third rail is mounted after the track itself is complete.

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Protection from noise and vibration

Depending on the frequency range and volume of structure-borne noise, RAIL.ONE supplies a variety of effective noise-abatement solutions. By modifying the system structure and the track fastening, it is possible to achieve considerable reduction of emissions.

A mass-spring system provides further possibilities: an elastic element placed between the track system and the tunnel extensively absorbs vibrations transmitted to the surroundings (e.g., buildings and the ground surface). The system can be tuned to suit individual requirements, with implementation as light to heavy mass-spring system.

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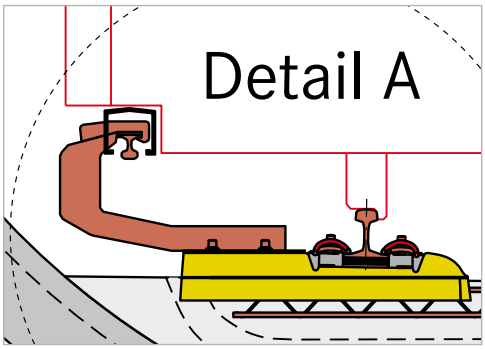
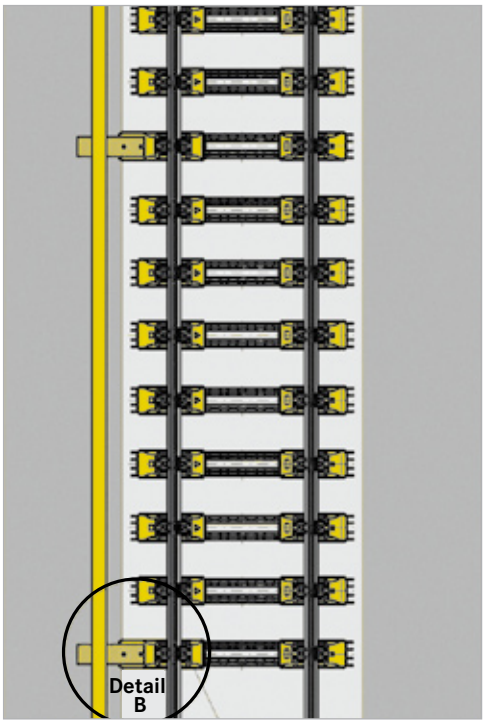
The third rail

In underground transit, electricity is often supplied to trains via a third rail. In addition to standard rail sleepers, RHEDA MRT supplies electric-rail support sleepers, longer than normal sleepers, with geometry adaptable to the respective project requirements. The third-rail fittings can be mounted directly, which simplifies installation. This precise and safe solution furthermore requires no further adjustments – maintenance and repair work and the accompanying costs are thus reduced.





RHEDA MRT

- Availability in all gauges, rail types, and rail inclinations
- Compatibility with international standards
- Turnout solutions in conformity with this system

At present the following methods of track adjustment are available:

- Spreader-bar adjustment
- Spindle-base adjustment

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