

Heavy Freight

Solutions for Heavily Loaded Rail Tracks



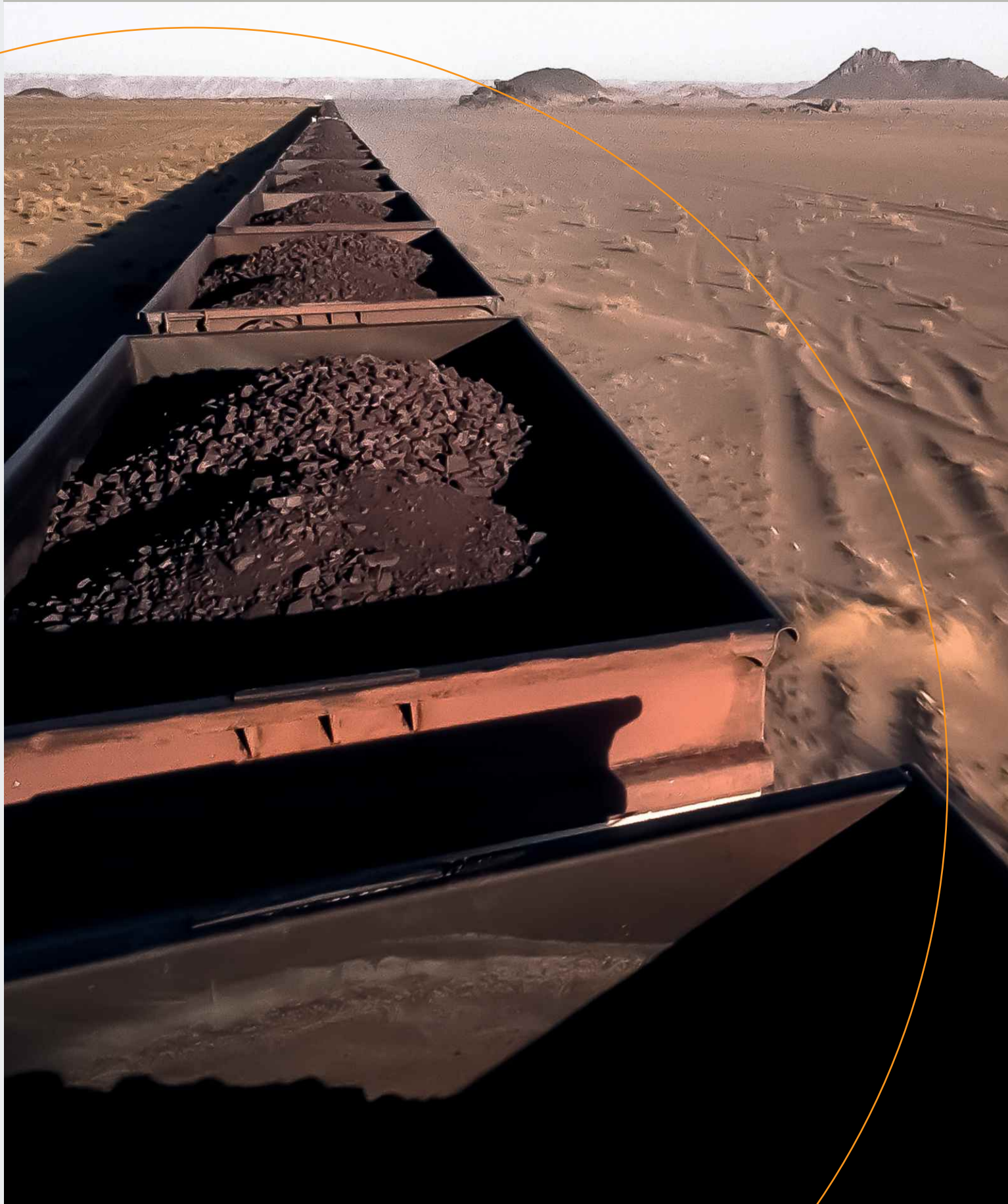
» Higher availability of heavy traffic routes

» Longer service life

» Reduction in life cycle costs

getzner
engineering a quiet future

1 | Increased Profitability, longer Service Life





Union Pacific heavy freight train in the USA

**Higher
availability**

>> *Getzner provides solutions for reducing the life cycle costs of heavy freight routes.*

Higher loads,
higher demands

Increasing loads on railway networks accelerate track wear. In the heavy traffic sector, availability and maintenance are the main factors that determine the profitability of railway lines. Getzner offers expert solutions in this area, providing higher availability and a longer service life.

Demand for transport capacities on railway lines is rising rapidly around the world. In the heavy traffic sector in particular, the demands placed on the railway infrastructure and its components are increasing. Heavy freight trains are those with an axle load of 25 metric tons and above or a total train weight of at least 5,000 metric tons. Heavy traffic routes are found in countries such as the USA, Canada, Australia, Brazil, Sweden, South Africa or in fast-growing economies like China.

Key factors of availability and service life

The considerably higher loads placed on the superstructure of heavy traffic routes often cause serious damage to individual components. For example, destruction of the ballast and consequently rail, sleeper and tension clamp breakages. These are all factors that

reduce the availability and service life of heavy traffic routes and significantly increase maintenance costs.

Solutions for the heavy traffic sector

Getzner has developed solutions specially for this sector to increase the availability of heavy traffic routes. The service life of the entire superstructure is prolonged and maintenance costs are cut, thereby reducing the life cycle costs of a route.

Benefits for customers

- Increased availability of railway routes
- Less maintenance work required
- More elasticity in the superstructure
- Protection of the superstructure components, including ballast, rails, sleepers and tension clamps
- Improvement in track stability
- Reduction in life cycle costs
- Longer service life



The Malmbanan (Iron Ore Line) in Sweden

2 | Finding Solutions means Identifying Causes

Identifying cost drivers

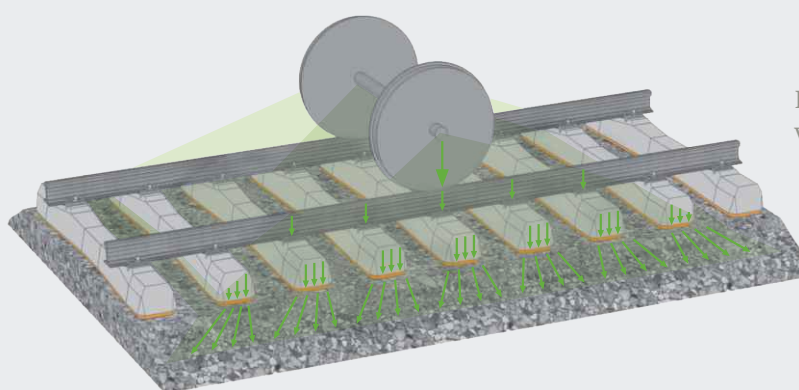
Heavy traffic route operators are faced with a number of challenges. Damage to superstructure components and increased wear reduce the availability of the route, increase maintenance requirements and thus drive up operating costs. Getzner has the ideal solutions for every sector.

On the open track

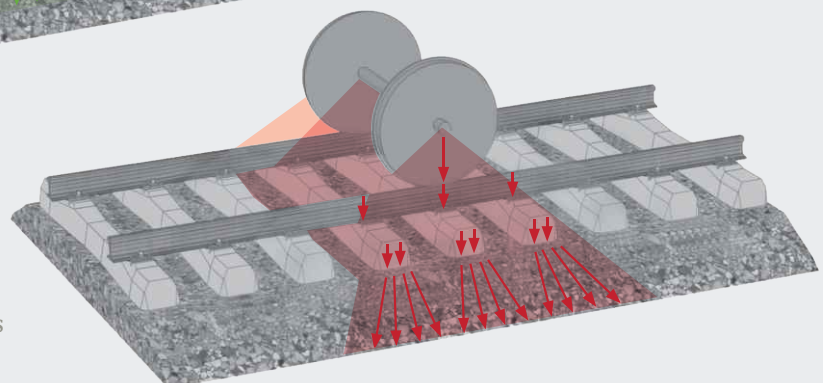
Relieving loads on ballasts

Due to the overloading of railway lines, destruction of the ballast is common. This causes damage to the essential superstructure components. If the ballast remains intact, the high quality of the entire system is preserved and superstructure components such as rails and sleepers are subjected to less stress.

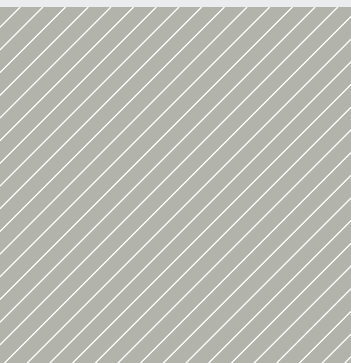
Reducing the load on the ballast can be achieved in two ways: by increasing the size of the contact area between the sleeper and ballast, or through improved load distribution over the rail (increasing the bending line). Getzner provides operators of heavy traffic routes with the ideal solutions to achieve these improvements.



Load distribution with under sleeper pads



Load distribution without under sleeper pads



Tension clamp fracture



Destroyed ballast

**Longer
service
life**

Distributing loads

Solutions from Getzner add elasticity to the superstructure and prevent individual components from being overloaded. For example, elastic rail pads from Getzner placed under the rail base significantly improve the load distribution. Under sleeper pads can intensify this effect and also increase the size of the contact area between

the sleeper and ballast. The latter is embedded in the Syldyn® or Sylomer® under sleeper pads. Using under ballast mats is another way of providing the superstructure with a defined level of elasticity. In addition, they relieve the interface between the ballast bed and hard concrete subsurface or bedrock.

Solutions from Getzner for the heavy traffic sector



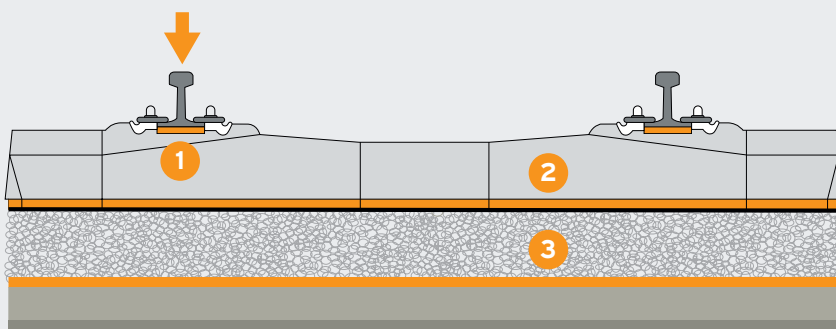
Rail pads



Under sleeper pads



Under ballast mats



Benefits for customers

- Protection of ballast and other components
- Defined level of elasticity
- Improved load distribution
- Entire superstructure is of a higher quality



Find out more about Getzner rail pads, under sleeper pads and under ballast mats at:
www.getzner.com/downloads/brochures



Fengsha coal line in China



Shenhua coal line in China

**Less
maint-
enance**

In sensitive areas

1. Protecting turnouts

Turnouts always require a high level of maintenance. On the one hand, variations in stiffness and the resulting high dynamic forces cause components to wear more quickly. On the other, the specific geometry and additional elements of a turnout lead to asymmetrical loading. The consequence of this is uneven settlement, eventually causing the entire turnout to “tilt”.

Compensating for variations in stiffness

Highly elastic rail pads and baseplate pads from Getzner also achieve an improved load distribution when used on turnouts. Stiffness variations in the system, caused by varying support point geometries, are also evened out to a certain extent.

Under sleeper pads can be even more effective in this respect. The increased size of the contact area between the sleeper and ballast reduces settlement and helps to prevent the turnout from tilting.

Relieving critical areas

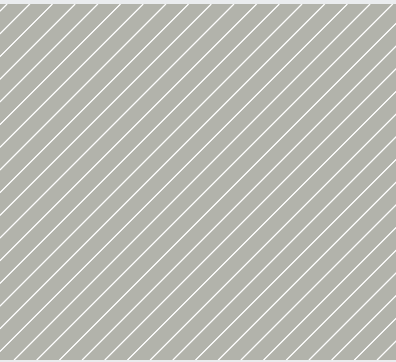
If the turnout is positioned on an extremely hard subsoil, under ballast mats can be used to add elasticity to the superstructure. This measure relieves the critical interface between the ballast and the structure underneath it, which not only protects the ballast, but also prevents settlement and tilting.

Getzner has developed dedicated calculation programs for choosing the ideal solution. Scenarios based on the real circumstances can thus be simulated on the turnout before installation or renovation to ensure the perfect solution is found.

Benefits for customers

- Balancing out differences in stiffness
- Less wear of all turnout components
- Settlement and tilting of turnouts is prevented





Hunter Valley coal line in Australia



Transition area on a steel bridge

Individual solutions



2. Evening out transitions

Transitions are sections of track with variations in stiffness. The reason for these differences are the varying superstructure constructions, for example when the track passes over a bridge or enters a tunnel. As these constructions exhibit different levels of elasticity, the resulting differences in deflection need to be evened out. If no measures are taken, the ballast at these transition points will be damaged, leading to increased wear of the essential superstructure components.

Using customised products

Rail pads, under sleeper pads and under ballast mats from Getzner are used to level out these variations in stiffness. The solution or combination used in each individual case depends on the design of the transition.

Here too, experts from Getzner can provide customised solutions thanks to their finely tuned product range and calculation programs.

Benefits for customers

- Balancing out differences in stiffness
- Calculations and simulations before installation
- Customised solutions

Turnout on the Carajás line in Brazil operated by Vale



Rail with corrugation



Tunnel on the Fengsha coal line in China

**Less
damage**

Benefits for customers

- Higher quality superstructure
- Reduction in rail corrugation and short pitch corrugation on the rail running surface
- Longer service life for superstructure and wheels
- Less noise for residents
- Relieving of the interface between sleeper and ballast
- Defined level of elasticity between ballast and bridge support structure or tunnel invert

3. Protecting track curves and wheels

Overloading at curves causes destruction of the ballast, resulting in settlement and damage to individual components. Other damage, such as rail corrugation or short pitch corrugation on the rail running surface, requires further maintenance measures, including rail grinding and premature replacement of the rail. In addition, a rail with corrugation or short pitch corrugation damages the wheels of locomotives and carriages; once damaged, they cause heavier loading on the rest of the track network.

Less rail corrugation and short pitch corrugation

Rail pads from Getzner increase the elasticity below the rail and help to prevent rail corrugation and short pitch corrugation on the rail running surface. Thanks to the elasticity, the rail has a certain amount of play and the ability to “move”. Under sleeper pads ensure a high-quality superstructure and play a significant role in helping to counter rail corrugation and short pitch corrugation. Using a combination of complementary rail pads and under sleeper pads is an effective way of preventing damage of this type.

4. Relieving bridges and tunnels

Bridges and tunnels are very rigid sections of the track. This is mainly due to the structure of the subsoil in these areas. The ballast and other superstructure components are often destroyed. In addition, compaction of the subsoil close to these structures is a problem; insufficient compaction leads to increased settlement in the transition area.

More elasticity in the superstructure

Rail pads modify the stiffness to a certain degree. Under sleeper pads are a more effective measure and add more elasticity to the superstructure. Furthermore, they increase the size of the contact area between sleeper and ballast and reduce settlement in the transition areas. Under ballast mats provide the system with a large amount of elasticity and relieve the critical interface between the ballast and bridge support structure or tunnel invert.

3 | Solutions from Experts that Pay Off

Proven over more than 40 years

The exceptional properties of Sylomer® and Sylodyn® materials and their tried-and-tested use in various system components speak for themselves. These materials from Getzner have been used in countless projects worldwide for over 40 years.

Effective solutions

Getzner provides durable solutions that guarantee significantly higher route availability – in many cases twice as high – thanks to lower maintenance requirements. This means fewer closure periods for operators of heavy traffic routes. Overloading of components (destruction

of the ballast, sleeper and rail breakages, etc.) and wear are significantly reduced and the service life of railway routes is increased. This saves time and money.

Getzner also provides its customers with comprehensive project support, from the planning stage right through to installation.



A MRS Logistica S.A. heavy freight train in Brazil

B Installation of under ballast mats on a section of Union Pacific track in the USA

C Padded sleepers for the Malmbanan (Iron Ore Line) in Sweden

4 | Experience, Expertise and many satisfied Customers



Padded sleepers for the Fengsha line

International success

Getzner has a wealth of experience working on heavy traffic routes and can boast the required expertise, which is evidenced by international references and projects implemented around the world.

MRS Logistica S.A., Brazil

A section of the heavy traffic route in Ferrovia do Aço in Brazil operated by MRS Logistica S.A. has been fitted with Getzner rail pads. The axle load of the trains on the route exceeds 33 metric tons. Due to the considerable stress on the line, rail breakages were occurring more and more frequently, which resulted in significant maintenance requirements and long closure

periods. For this reason, the customer installed Syldyn® rail pads on steel and timber sleepers on a defined test section. The result: not a single rail breakage on the test track after subjecting it to a load of 400 million metric tons over a three-year period. Some of the rail pads were removed to check their condition. Both a visual inspection and the results of elastic property measurements in the laboratory demonstrated that the high-strength Syldyn® rail pads showed no signs of wear whatsoever.

Malmbanan, Sweden

In northern Sweden, Getzner has equipped over 17,000 sleepers and

turnouts with under sleeper pads on the "Malmbanan" (Iron Ore Line). The client, Trafikverket, renovated the section between Gällivare and Koskuskulle. To increase the availability of the route, the operator decided to install under sleeper pads. Meanwhile, under sleeper pads from Getzner were installed on sections of the Trafikverket heavy traffic route.

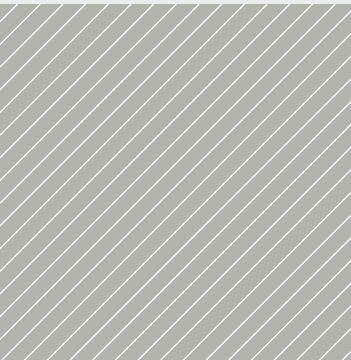
Union Pacific, USA

American rail operator Union Pacific Corporation has installed Getzner under ballast mats on a bridge on a heavy traffic route in Nebraska. The axle load of the trains on the route exceeds 36 metric tons and the su-



More references and Case Studies from Getzner for the heavy traffic sector can be downloaded from:
www.getzner.com/downloads

MRS Logistica S.A. route section



Installation of padded sleepers on the Malmabanan route



Union Pacific heavy freight train in Nebraska

perstructure is subjected to a load of approximately 250 million metric tons each year. Before the installation, ballast wear occurred extremely quickly, causing sleeper breakages and thus a high level of maintenance work.

Since the under ballast mats were installed, there has been practically no wear to the ballast and therefore no sleeper breakages. After five years and an operating load in excess of one billion metric tons, there has also been no wear of the under ballast mats. No additional maintenance work has been required during this period, so the heavy traffic route has remained continuously available.

Fengsha line, China

The Chinese state railway operates the Fengsha line in the north of the country – a heavy traffic route along which mainly coal is transported. The axle load of the trains on this route exceeds 25 metric tons. Damage to sleepers and other components, as well as destruction of the ballast, are the consequences of this high level of loading. To improve the quality of the line and reduce the maintenance requirement, the operator installed Getzner under sleeper pads on a defined test section. After being in the track for a year, some of the sleepers were removed for inspection. Both the under sleeper

pads and the ballast beneath them were found to be in excellent condition. The measurements performed on the track also demonstrated a significant improvement in the quality of this test section.

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Heavy traffic route references (extract):

Rail pads

- Brazil, Ferrovia do Aço; MRS Logística S.A.
- Colombia, Santa Marta; Ferrocarriles del Norte de Colombia S.A. (FENOCO)
- USA, Pueblo; Transportation Technology Center, Inc. (TTCI)
- USA, Oshkosh; Union Pacific (UP)
- USA, Pendelton; Union Pacific (UP)
- Mexico, DF; Ferrocarril y Terminal del Valle de México S.A. de C.V. (Ferrovalle)

Under sleeper pads

- Sweden, Gällivare - Koskuskulle; Malmabanan
- Norway, Narvik; Ofotbanen
- China, Fengtai - Shacheng; Fengsha line of the Beijing Railway Bureau
- USA, Pueblo; Transportation Technology Center, Inc. (TTCI)
- USA, Oshkosh; Union Pacific (UP)
- USA, Pendelton; Union Pacific (UP)
- Brazil, Estrada de Ferro Carajás (EFC); Vale S.A.

Under ballast mats

- USA, Oshkosh; Union Pacific (UP)
- USA, Pueblo; Transportation Technology Center, Inc. (TTCI)
- Mexico, Monterrey; KCS de México (KCSM)
- Canada, Oakville; Canadian National (CN)
- Canada, Moncton; Canadian National (CN)

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