



# Tiflex



## TRACKELAST

Specialist Rail Solutions  
the high performance solution provider



# Tiflex

*When only the best will do*

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## Company information

### TIFLEX LIMITED

Your partner in research, development and production of rail pads, baseplate pads, undersleeper pads and ballast mats for the reduction of vibration in rail track. Tiflex Limited has specialised since 1946 in the manufacture of resilient track support materials and other components which are designed to reduce ground borne vibration from rail track.

We have test apparatus specially designed and dedicated to determine the best materials and configurations for use in the rail track.

We are able to examine in detail the response to a variety of solutions to wheel flat impacts. Baseplate pads and Undersleeper pads are tested at large amplitude and high frequencies (typical of the track situation) so the vibration insertion loss can be determined accurately.

Tiflex Limited have some of the most advanced testing equipment available anywhere in the world, and our research is dedicated to finding the most cost-effective solutions for our railway partners and providing them with the best possible advice, designs and materials.

The quality of our products and dedication to customer service are fundamental requirements throughout the Tiflex organisation. Tiflex anti-vibration products are manufactured from a variety of the highest quality raw materials with strict quality control at every stage.

The Tiflex quality management system is assessed regularly and is approved to BS EN ISO 9001. Tiflex is also an authorised and approved supplier to many key railway organisations both in the U.K. and overseas.





Selecting the most appropriate solution is very important. Tiflex materials have been continually developed to produce products which are capable of providing solutions to a range of different problems encountered when designing permanent way systems. Tiflex products can assist areas including:

- **Insulation Resistance**
- **Impact Reduction**
- **Noise & Vibration Attenuation**
- **Attrition Resistance**

Tiflex offer a full technical service to provide you with assistance in specifying and selecting the correct materials to provide you with the outcome which you require. As a company, Tiflex are committed to working with our customers to develop new materials, systems and solutions. Tiflex Specialist Rail Solutions have been supplied to the industry under the brand name TRACKELAST for over 50 years.

**TRACKELAST**

Other well known Tiflex brands include;

**treadmaster**  
transport flooring



# TRACKELAST

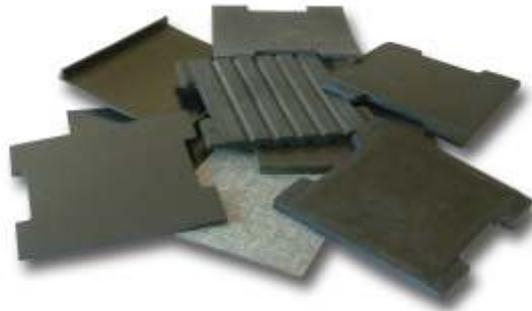
Specialist Rail Solutions

## Trackelast Rail Solution

### Anti -Vibration Pads

Trackelast pads are designed to fit under rails or baseplates to provide mitigation of the dynamic loading of train passes, reducing the stressing and fatigue loading on the sleepers (ties) and the track structure. Tiflex can supply flat and profiled pads to any shape or size in thickness up to 12mm (½ in) for rail pads and 25mm (1 in) for baseplate pads. Performance will depend on the axle loads, speeds and the structure but attenuation of 5-10dB can be reliably achieved.

Trackelast pads can be tailor made for use with wooden, steel, concrete and composite sleepers.



### Anti-Vibration Rail Strips

For some applications the rail is continuously supported by the track-bed structure in the form of slab or plinth. From our own manufacturing plant, Tiflex can make continuous bearing strips up to 10 metres (33ft) long to reduce the dynamic impact forces from the wheels which could be damaging the structure.

Trackelast strips can be engineered for specific applications tailored to meet local conditions.





## Structural Protection Mats

Structural Protection Mats (SPM) are used to prevent repeated loading of ballast causing damage or wear to the structure. SPM are thinner and stiffer than ballast mats.

Usually supplied in rolls 1m wide and 5m long (40 in x 16.5 ft), these can be tailored to your needs.

## Stray Current Protection Mats

Stray Current Protection Mat (SCPM) mat is made from a thin elastomeric material. Stray currents escaping from block jointed signalling systems can cause severe corrosion to nearby underground services and utilities such as water or gas pipes, as well as affecting adjacent signalling systems – for example where a metro and main line systems are in near proximity. By laying insulating mats under the track formation the stray currents can be contained.

Usually supplied in rolls 1.25 m wide and 10m long (50in x 33ft), these can be tailored to your needs.

## Delkor Eggs and Alt-1 resilient baseplates

Tiflex is able to supply the well proven range of anti-vibration Delkor Baseplates for tram, light rail and heavy rail applications. With over 20 years track experience, the product is available with different stiffness characteristics so that performance can be optimised to suit specified requirements. We are able to supply pads, shims, screw spikes and rail anchor systems for a complete fixing system.



# TRACKELAST

## Specialist Rail Solutions

## Trackelast Floating Slab Track Solutions

Tiflex has over 15 years experience of floating slab track systems designed to reduce the problems of noise and vibration within stations, tunnels, in highways and on viaducts.

Trains and railway vehicles cause vibrations to be transmitted through the ground causing problems with and possible damage to adjacent structures, buildings and their occupants. The best way to reduce these problems is to isolate the track bed from the surrounding structure by using a heavy mass support on low modulus materials to give a mass-spring-system. By considering the train operating parameters, the structure and the soil conditions it is possible to purpose design the track-form to minimise the problems of vibration transmission.

There are several ways that this can be achieved but they generally fall into two categories, isolated slab track (IST) or floating slab track (FST).

### Isolated Slab Track

Isolated Slab track IST (often referred to generically within Europe, as floating slab track) consists of a concrete slab being constructed directly over a slab track mat. Tiflex, together with its sister company edilon)(sedra, can offer a range of T//R//S slab track mats to provide the most cost effective solution.

The range of materials included;

Bonded Rubber Chip (FSGR500)

Cellular Cork modified natural rubber ( FC907C, FC208, FC250, FC600, FC75)

Cellular Polyurethane (STM RPU Blue or Orange)

Thickness range from 6mm up to 50mm. Stiffness levels will be dependent on the load range specified in the method of testing, which reflect the axle loading and the speed of the train.





## Floating Slab Track with rubber bearings

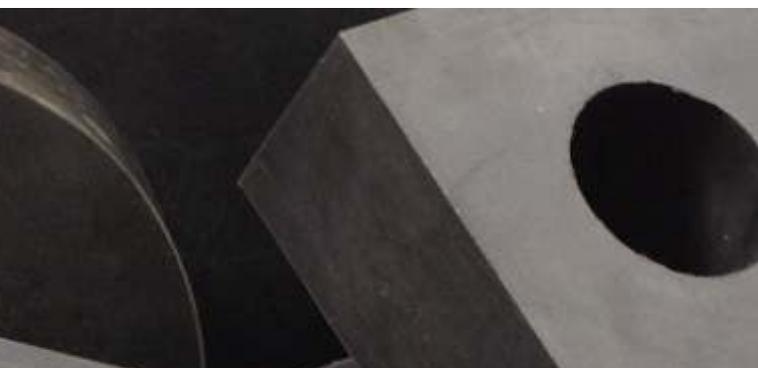
Floating slab track FST consists of a concrete slab being placed directly on to discrete natural rubber bearings. Maxi-slab systems require the construction of concrete slabs of 6- 20m in length, which after curing, are jacked up to permit bearing placement under the slab. Whereas mini-slab systems involve shorter slabs (1-2m long), constructed off-site, to be positioned directly onto the rubber bearings located on the track bed. Both systems are purpose designed, taking into account the track operating parameters and the performance requirements. For turnouts and crossovers concrete slab are constructed in situ. Assistance in the design of the concrete slabs, both from the vibration requirements as well as the mechanical performance can be provided by Tiflex partners who have the necessary expertise and experience.

The FST rubber bearings are specifically designed and manufactured to strict quality control standards by Tiflex for each project.

Floating slab track utilises a variety of different type of bearings. Vertical or support bearings provide the vibration isolation, in conjunction with side bearings, end bearings, restrained bearings, key bearings.

All the latter control and limit the lateral and longitudinal movement.

Rubber support bearings are generally 225-315mm diameter with a thickness of 40-75mm. These support bearings can be plain rubber or with surface reinforcement of steel plates or Kevlar reinforced rubber for wear resistance and durability.







### References List

Location	Year	End User	Contractor	Quantities
Tsing Ma bridge Hong Kong	1995	MTRC	Balfour Beatty Rail Projects	14750 bearings (2000m track)
London Underground	1996	LUL		400 bearings (100m track)
London Underground	1996	LUL		1636 bearing (450m track)
Kowloon Southern Line Hong Kong	2007-8	KCRC (MTRC)	Chun Wo JV	24084 bearings (4000m track)
Taoyuan Airport Link Taiwan	2010-11	BOHSR	Marubeni/ Heitkamp Rail	2921 bearings (700m track)
Downtown line, Singapore	2010-11	LTA	Alstom Transport	1300 bearings (300m track)



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# TRACKELAST

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## Trackelast Undersleeper Pads Solutions for heavy haul applications

### Improvement of track quality with reduced maintenance costs for heavy haul railway tracks

Heavy haul lines demand high quality track performance to protect revenue streams. In the event of track failure, the financial consequences can be very high and therefore the operators are used to undertaking very regular maintenance in the limited possession times that are available. Regular rail grinding and cleaning and re-tamping ballast form the backbone of the maintenance regimes.

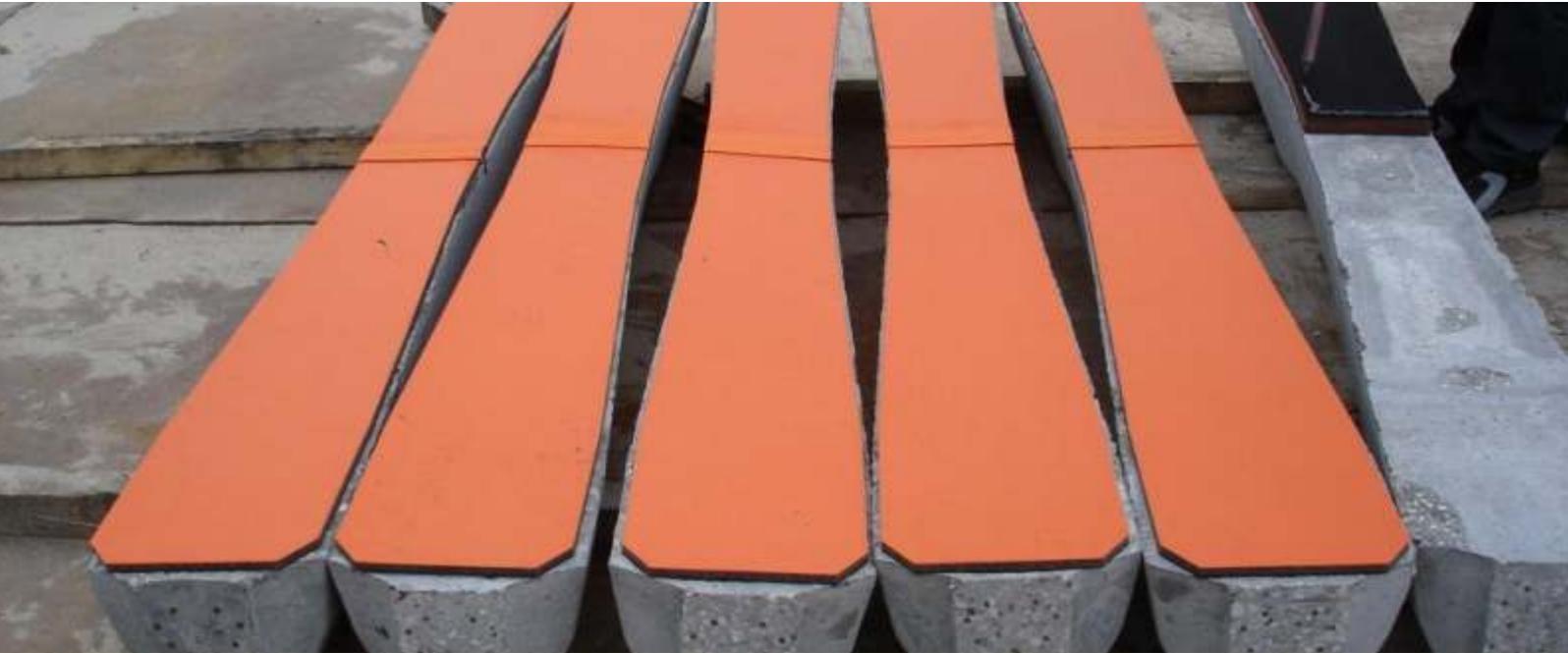
Rails and ballast structures take a heavy pounding with long trains travelling at a typical 80kph. This results in ballast wear, corrugation of rails, creation of false flanges on wheels, all of which lead to an accelerated reduction in the performance of the track.

Whilst there has been considerable research into ballasted trackforms, it is clear that the transmission of regular impact loading through the rails and fasteners via the concrete or wooden sleepers leads to degradation of the complete system, but it is only recently that steps to mitigate the deterioration of the track have been identified.

### Reduced dynamic loading of ballast

It has now been established that it is possible to reduce the static and dynamic loading between the sleeper and the ballast. In a conventional track the sleeper is supported by a series of point contacts from the ballast. The dynamic loads then cause wear and breakdown of the ballast, so called ballast attrition, which results in more dust, and greater deflection of the track.



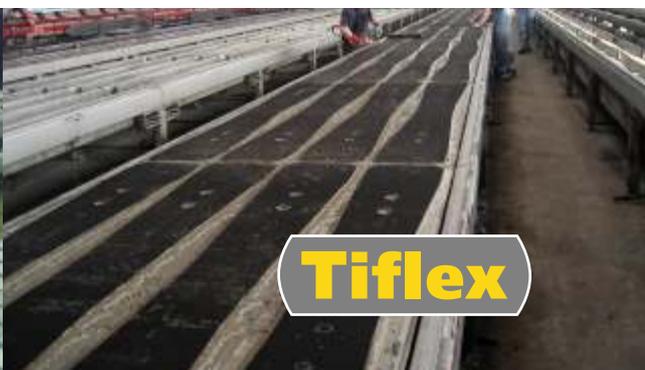


It has been proven that by fitting a resilient pad to the sleeper soffit face, the ballast stones embedded themselves into the pad and as a result that there is a greater surface area now supporting the track load thus reducing the loads transmitted to the ballast. The resilient pad acts as a spring to reduce the level of dynamic impact reducing the peak loading on the ballast. This combination of effects significantly reduces the track deterioration and increases the time between grinding and ballast cleaning and tamping.

## Undersleeper pads

Tiflex have been supplying undersleeper pads for over 20 years. These were originally developed as soft pads in order to reduce ground borne noise being transmitted through the ground to adjacent building structures. These pads with a hard rubber ballast protection layer were stuck to the sleepers using a high quality durable adhesive. More recently geotextiles materials such as multi-filament felt which can be bonded to the pads have been found to be a more cost effective ballast protection layer to protect the working core of the pad. New techniques have been successfully developed for integrally fixing undersleeper pads during the production of concrete sleepers, producing a composite sleeper/pad solution.

Research undertaken in Europe on mixed mode and heavy rail tracks has established that resilient undersleeper pads with a relatively high stiffness have a significant effect on track quality with a significant reduction in the costs of maintenance. The pay back period for the increased cost of sleepers has been estimated to be between 3 and 7 years.



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### Trackelast Undersleeper Pads Solutions for heavy haul applications

For heavy haul lines the use of undersleeper pads to improve track quality will give a quick pay back through savings by reduction in the frequency of re-grinding, less frequent ballast tamping and cleaning. There can be additional benefits because of reduced wear and tear on wheels and it is anticipated that there will be lower incidents of rail breakage.

#### Transition zones

Where there are transition zones from ballast track to slab track or bridges there will be an abrupt change of track stiffness which can result in deterioration of track quality. Therefore it is necessary to have a transition zone with an intermediate stiffness. This can be achieved using different grades of undersleeper pads. Generally it is advisable to have a transition zone equivalent to between 0.5 and 2 seconds of train pass-by.

#### Noise and vibration mitigation

Tiflex can also offer undersleeper pads, ballast mats or structure protection mats for use on concrete and steel bridges. These tend to be purpose designed to take into account axle loads, track speeds and local environmental conditions.





Property for USP7-0258

Value

Static Bedding Modulus,  $C_{stat}$   
(BN 918 145-01, 0.01 - 0.1 N/mm<sup>2</sup>)  
Tested on standard ballast plate to DIN 45673-1

0.25 N/mm<sup>3</sup>

Static Bedding Modulus,  $C_{stat}$   
(BN 918 145-01, 0.01 - 0.2 N/mm<sup>2</sup>)  
Tested on standard ballast plate to DIN 45673-1

0.30 N/mm<sup>3</sup>

Static Bedding Modulus,  $C_{stat}$   
(BN 918 145-01, 0.02 - 0.16 N/mm<sup>2</sup>)  
Tested on standard ballast plate to DIN 45673-1

0.30 N/mm<sup>3</sup>

Dynamic Bedding Modulus,  $C_{dyn}$   
(BN 918 145-01, 0.01- 0.1 N/mm<sup>2</sup>)  
Tested on standard ballast plate to DIN 45673-1

0.33 N/mm<sup>3</sup>

Dynamic Bedding Modulus,  $C_{dyn}$   
(BN 918 145-01, 0.01- 0.2 N/mm<sup>2</sup>)  
Tested on standard ballast plate to DIN 45673-1

0.42 N/mm<sup>3</sup>

Dynamic Bedding Modulus,  $C_{dyn}$   
(BN 918 145-01, 0.02- 0.16 N/mm<sup>2</sup>)  
Tested on standard ballast plate to DIN 45673-1

0.42 N/mm<sup>3</sup>

Nominal Thickness :

Approx 6.5 mm when  
embedded in sleeper

Construction :

3 layers for concrete  
sleeper embedment  
2 layers for wooden  
sleepers

Resilient Layer : Natural rubber/Cork

Protection Layer : Geofelt

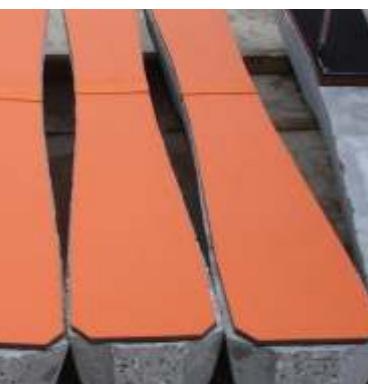
Embedding Layer : Geo textile

Specific Weight : 6.6 kg/m<sup>2</sup>

Tear Strength (Protection Layer, ISO 34-1) : 3.5 N/mm

Compression Set (ISO 815) : 25%

Electrical Resistivity (500vdc, dry) : 10<sup>12</sup> Ohms cm



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### Trackelast Ballast Mats Solutions

Trackelast Ballast Mats are designed to give the optimum static and dynamic properties for use with main line, urban, light rail and metro axle loads. Trackelast Ballast Mats are one of the most effective methods of reducing vibration transmission from ballasted track.

When installed under ballast, Ballast Mats isolate the track structure from the supporting foundation or substrate, which can result in attenuation levels in excess of 20dB

Trackelast Ballast Mats are proven to give reliable performance over a very long service life under any climatic conditions.

Our ballast mats comprise of a soft resilient layer, usually made from natural rubber because of its excellent dynamic properties. This layer is typically 8-30mm thick and is faced on one or both sides with a very tough ballast protection material. The mats can be pre-cut in our factory for immediate installation. Alternatively, as Tiflex is the manufacturer of Trackelast we are able to deliver the mats in component form for rapid assembly. In both cases, installation is straightforward, and full fitting instructions are supplied.

A range of rubber formulations are available to give a wide range of stiffness for different conditions and applications.

Mats are available in a range of formulations, all based on cork modified natural rubber.

Tiflex can also offer a range of polyurethane materials for light rail applications.





Ballast mats are supplied with an integral bonded geotextile felt type of ballast protection layer. Mats can be supplied with this protection layer on both sides to provide additional protection from stones and gravel in the track-bed substrate.

## Proscriptive design or tailored-made performance design

Tiflex has a flexible manufacturing process and is able to manufacture small quantities as well as large quantities of ballast mats which is most useful for selecting small quantities of more suitable ballast mat materials for transition zone of turnouts and crossovers.

Tiflex make ballast mats in line with the requirements of DeutscheBahn and German Standards (DIN). This proscriptive approach designates the stiffness of the ballast mats for differing axle loads, speeds and application.

Tiflex can also tailor make ballast mats to achieve specific performance requirements for the attenuation of vibration in environmentally sensitive areas, taking into account track bed and soil conditions, train operational loads and other local factors.

## Flat profile sheets

All Trackelast ballast mats are supplied as flat non profiled sheets, and the resilience is designed into the material by a combination of a microcellular structure and compressible cork particles. Using flat sheets eliminates the need to counteract drainage paths and dirt collection points under the mat which could influence the long term attenuation levels.

All mats are supplied on pallets easily transported to site and can be laid by one or two men very quickly. It is easy to cut the sheets to negotiate curves or access points in the track bed



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## Trackelast Ballast Mats Solutions

### Typical construction for ballasted track in a concrete channel or at grade

For open construction at grade, the sub base should be prepared and adequately compacted. The ballast mat should be extended beyond the length of the sleepers, by taking a line at 45° from the end of the sleeper, i.e. by the equivalent of the height of the ballast on both ends. It is best if the ballast mats extend beyond the ballast.

Where ballast mats are to be laid on concrete slab track or in a concrete channel it is necessary to ensure that the concrete is smooth and free from sharp peaks which could damage the mats.

Ballast mats are laid as large tiles, being cut to fit to fit the space and traverse around any obstacles or drainage points.

Ballast mats must be joined by welding or use of Duct tape to prevent ballast getting down the edges.

For some installations it is necessary to put ballast mats on the side walls, these may be thinner and stiffer than those on the base of the channel. These vertical mats are sometimes pinned or glued to the side walls.

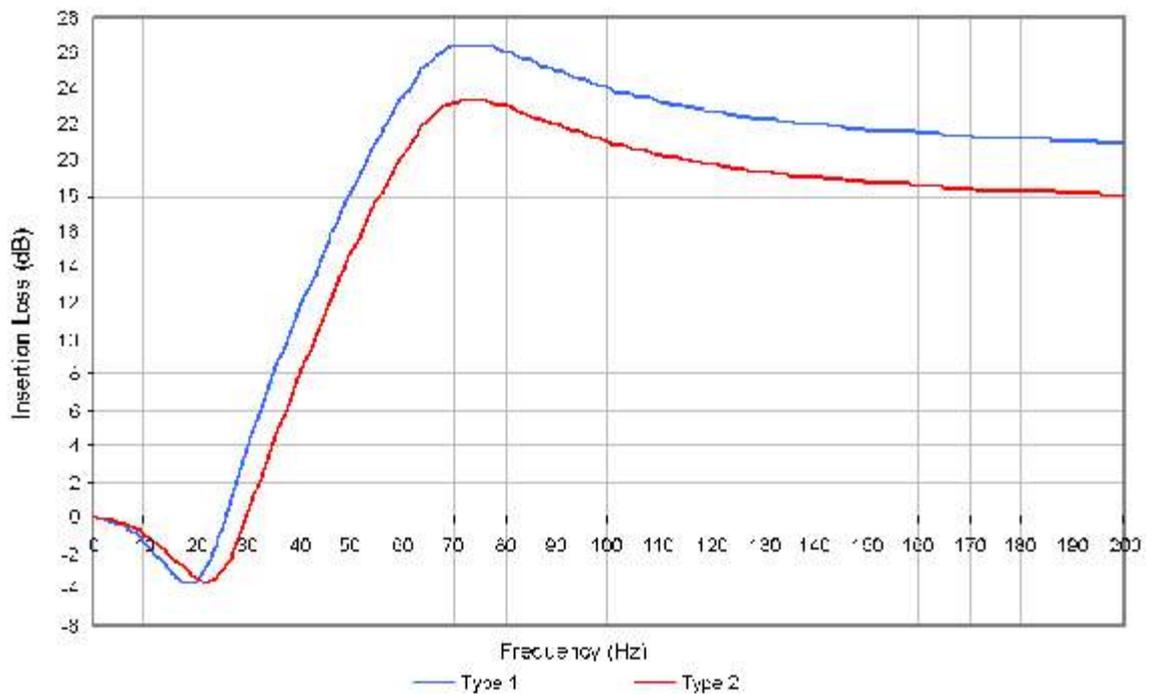




## Performance Prognosis

Tiflex will undertake a prognosis using the known track and operating parameters which provide an indication of the level of attenuation (insert loss) over the range 31 to 250Hz, and the level of track deflection.

Typical insertion loss prognosis for two different grades of mat

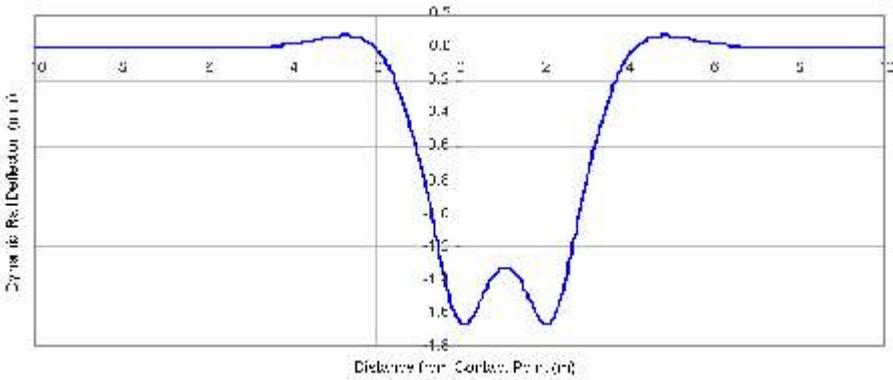


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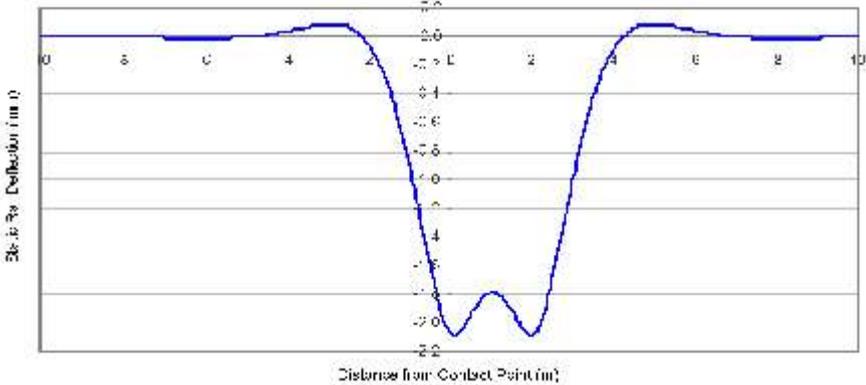
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## Trackelast Ballast Mats Solutions

Typical deflection under dynamic loading



Typical deflection under static loading



# Trackelast Real World Solutions



**Tiflex**

- o Cost effective, high-integrity elastomer engineering
- o High performance vibration attenuation
- o Standard and custom-designed products
- o Researched, developed, tested and proven
- o Backed by surety of global supply

## **TRACKELAST**

Specialist Rail Solutions

are manufactured by

**Tiflex**

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