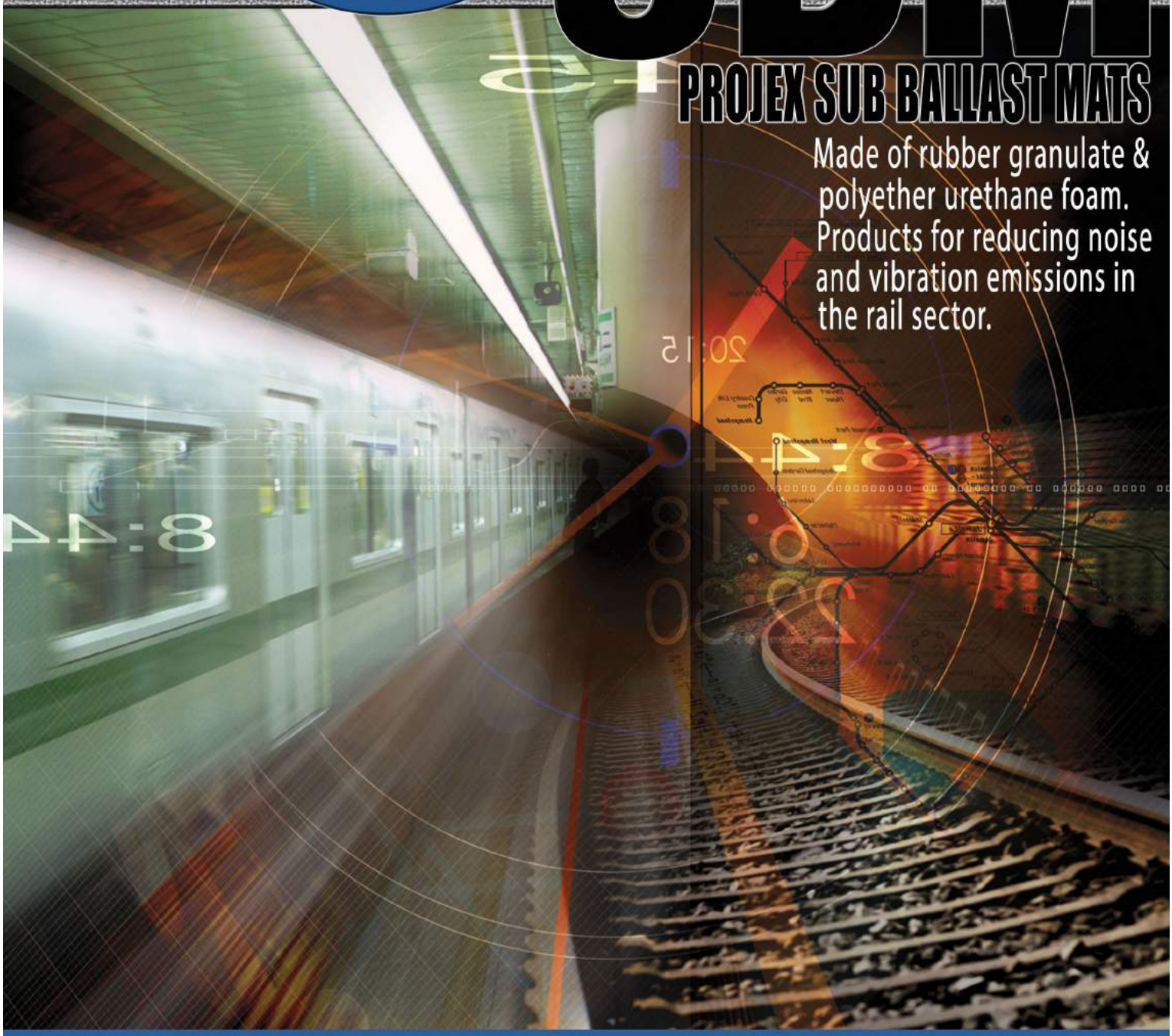
PROJEX

DAMTEC

SBM

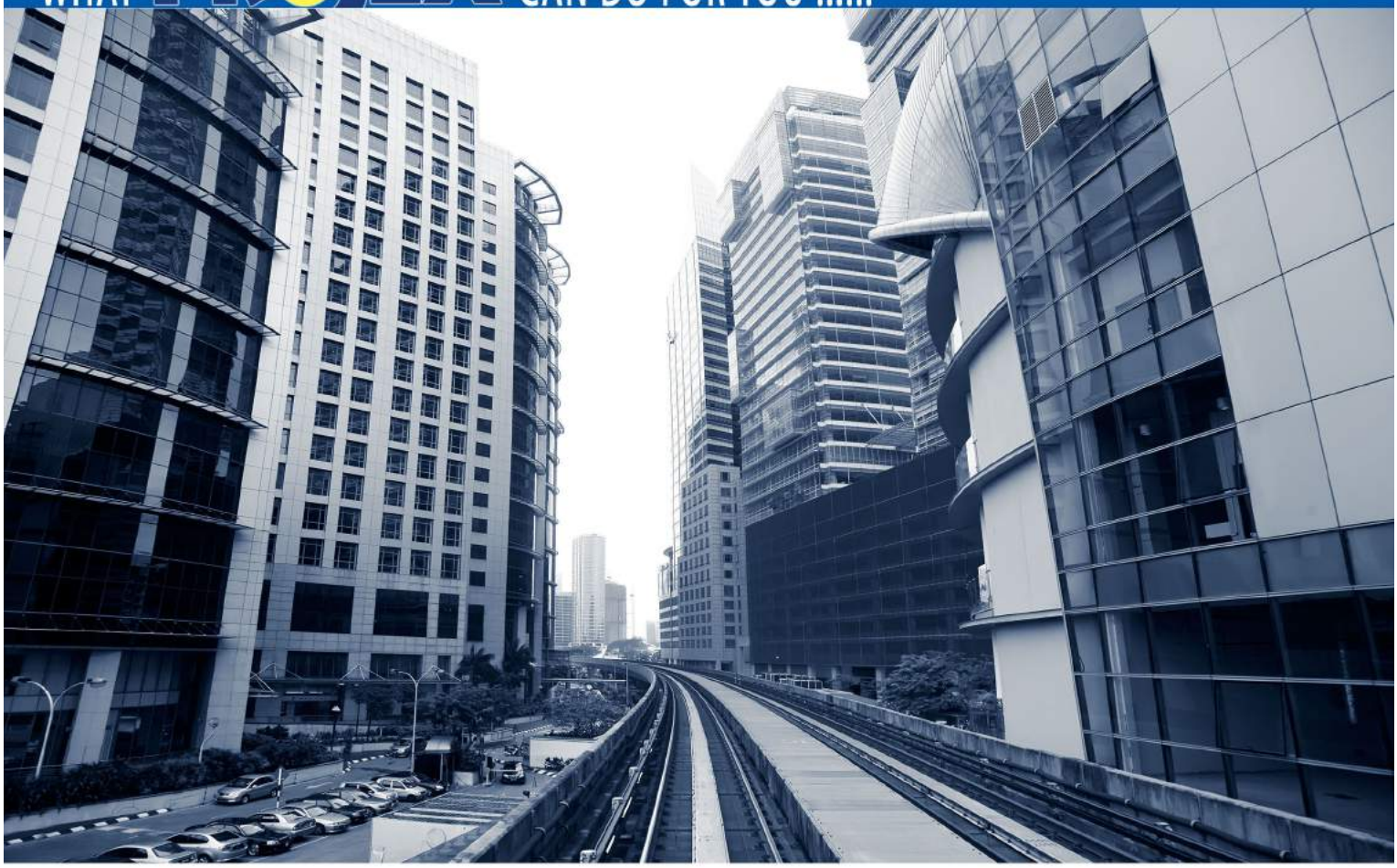
PROJEX SUB BALLAST MATS

Made of rubber granulate & polyether urethane foam. Products for reducing noise and vibration emissions in the rail sector.



ENGINEERED SOLUTIONS AGAINST STRUCTURE AND AIRBORNE NOISE.

WHAT PROJEX CAN DO FOR YOU .....



Projex Group have over 20 years of experience in working with professionals in the railway industry. Projex operates in partnership with Kraiburg Relastec since day one in providing the solutions for acoustic and vibration reduction in railway transportation. All Projex Group railway products have been tested and certified to the industry standards.

Our Commitment is to advise which product is suitable for your project and/or application to ensure optimum solutions are achieved.

REDUCING ACOUSTIC AND VIBRATION EMISSIONS

GENERAL EXPLANATION OF TERMS

Sound is the term generally used for continuous and regular vibrations that travel through the air or another medium and can be audible by humans through the sense of hearing. Sound represents the propagation of the smallest pressure and density fluctuations in an elastic medium (gases, liquids, solids).

Noise refers to sounds that by their structure have a disruptive, unpleasant, irritating or harmful effect on the environment. Whether the listener consciously perceives sounds as noise depends particularly on the assessment of the sound source.

Airborne sound is caused by sound waves & vibrations transmitted at any frequency through the air. In physiology this is called air conduction. Airborne sound consists of pure longitudinal waves, since fluids (gases) do not transmit shear forces. In a narrower sense, the term "airborne sound" is used for the frequency range of human hearing that begins at about 16Hz, with an extreme upper limit of 20kHz depending on age.

Structure-borne sound is sound that propagates in a solid object. This includes various phenomenasuch as tremors and earthquakes, the sold-borne transmission of vibrations in buildings, vehicles, machinery, etc., or the ultrasonic waves used for material testing.

Active isolation (emission) is the reduction of the transmission of vibrations of a machine or other source into the environment directly at the source.

Passive isolation (immission) is the shielding of machines, equipment or buildings against vibration influences from the environment.

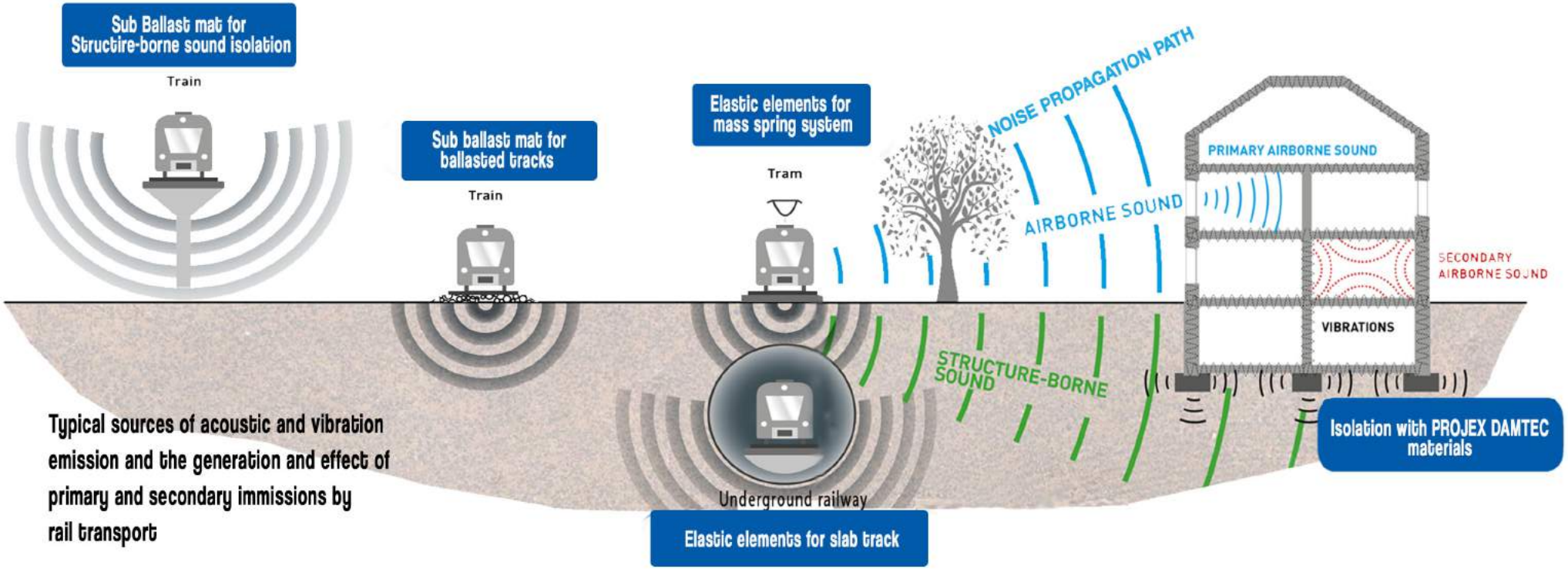
REDUCING ACOUSTIC AND VIBRATION EMISSIONS

NOISE SENSITIVITY AND PERCEPTION

	Source of noise	Sound power W	Sound level dB
Acute, irreversible damage	Saturn rocket	100,000,000	200
	Jet fighter engine	100,000	170
	Jet plane taking off	1,000	150
	Propeller plane taking off	100	140
Pain threshold	Machine gun	10	130
	Orchestra Jet fighter from passenger ramp Heavy thunder	1	120
	Accelerating motorcycle Heavy metal, hard rock concert Chainsaw	0.1	110
	Car at highway speed Helicopter, passing train at distance of 25 m	0.01	100
Danger to the ears	Traffic jam in the city Aircraft cabin during normal flight	0.001	90
	Alarm clock	0.0001	80
Impact on communication	Toilet flushing Loud office	0.0001	70
	Restaurant/Canteen Hairdryer	0.00001	60
	Quiet office	0.000001	50
	Quiet home Birds chirping	0.0000001	40
	Quiet conversation	0.00000001	30
	Rustling of leaves Whispering	0.000000001	20
Audibility threshold	Breathing	0.0000000001	10

Rail transport is a major source of noise. Elevated levels of noise and vibration are the main factors of dissatisfaction, especially in urban areas. Reduction of rail traffic noise and vibration is a widely used concept for improving the life standard in the vicinity of railway lines.

Rail vehicles generate rolling noise and vibrations during vehicle operation(s). The primary reasons for this are roughness and imbalance both on the wheels and on the rail running surfaces. Surface defect such as head checks, grooves and rail corrugations on the rails are among the most common sources of disturbance.



Typical sources of acoustic and vibration emission and the generation and effect of primary and secondary immissions by rail transport

These vibrations are transmitted to the substrate via the track system and propagate from there as structure-borne sound. If buildings are located adjacent or in close proximity to the track system, then a transfer takes place through their foundations. The buildings begin to vibrate, and if this becomes intense enough, it is also interpereted as a noticeable vibration or disturbing noise.

Another consequence of this transmission chain is the emission of vibrations from parts of buildings, for example ceilings and walls, to the environment. This takes place through the air, which itself starts to vibrate and then becomes audible as "secondary airborne sound".

PROJEX DAMTEC SBM
CHARACTERISTICS AND BENEFITS

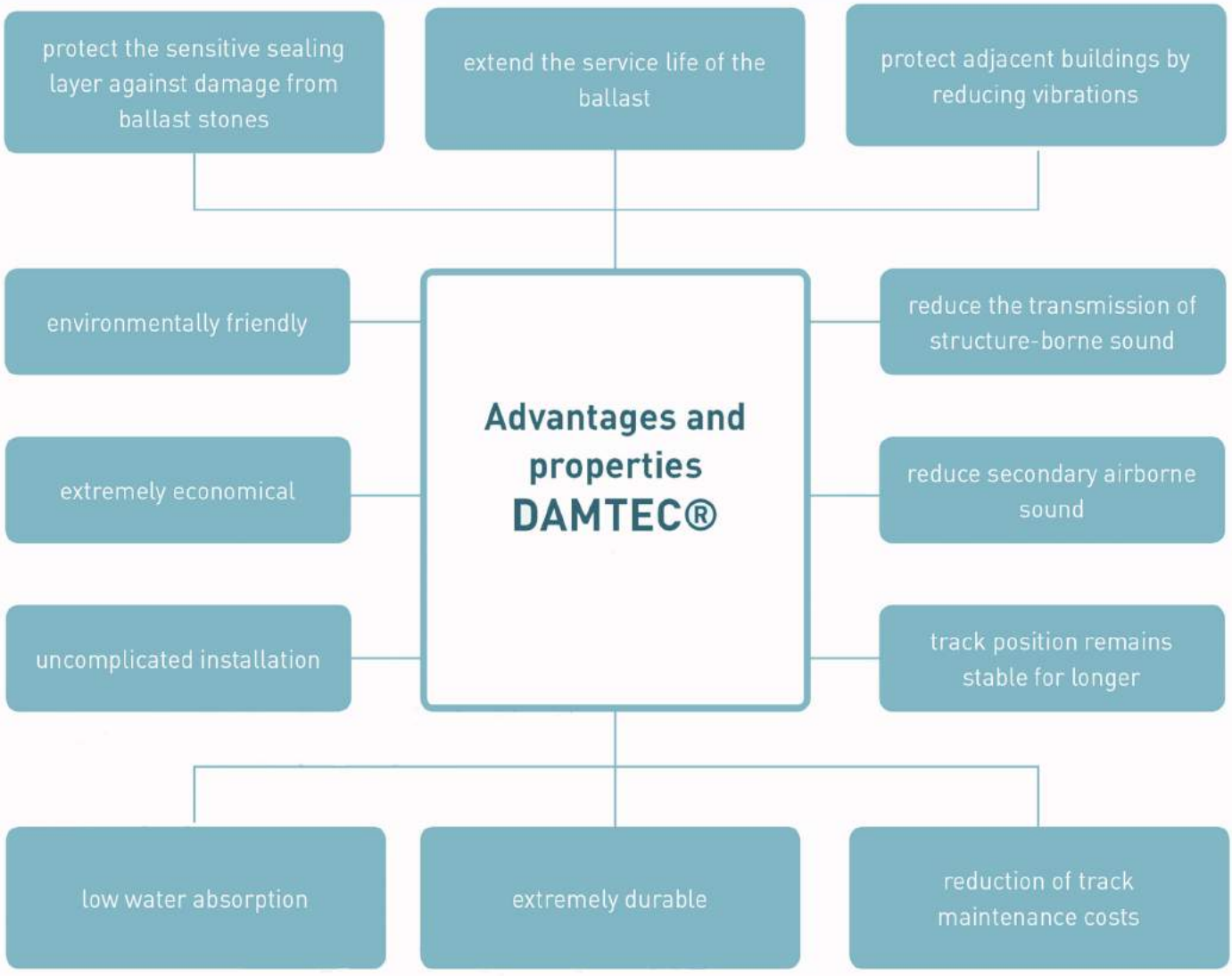
Projex Damtec Sub Ballast Mat (SBM) is a product of high quality elastomer materials consisting of a special rubber compound, cellular polyether urethane foam with open or closed pores. The SBM minimises both static and dynamic forces occurring during train operations. They effectively counteract the multifrequency oscillations and vibrations that are transmitted to the environment.

Projex Damtec SBM is available in rolls of 10mm, 15mm or 20mm. **It can handle axle load in excess of 40 TAL**

Specifications

THICKNESS	WIDTH	LENGTH	DENSITY	CSTAT
10mm	1,250mm	6 000mm	600-700 kg/m3	0.12 N/mm3
15mm	1,250mm	4 000mm	600-700 kg/m3	0.152 N/mm3
20mm	1,250mm	4 000mm	600-700 kg/m3	0.06 N/mm3

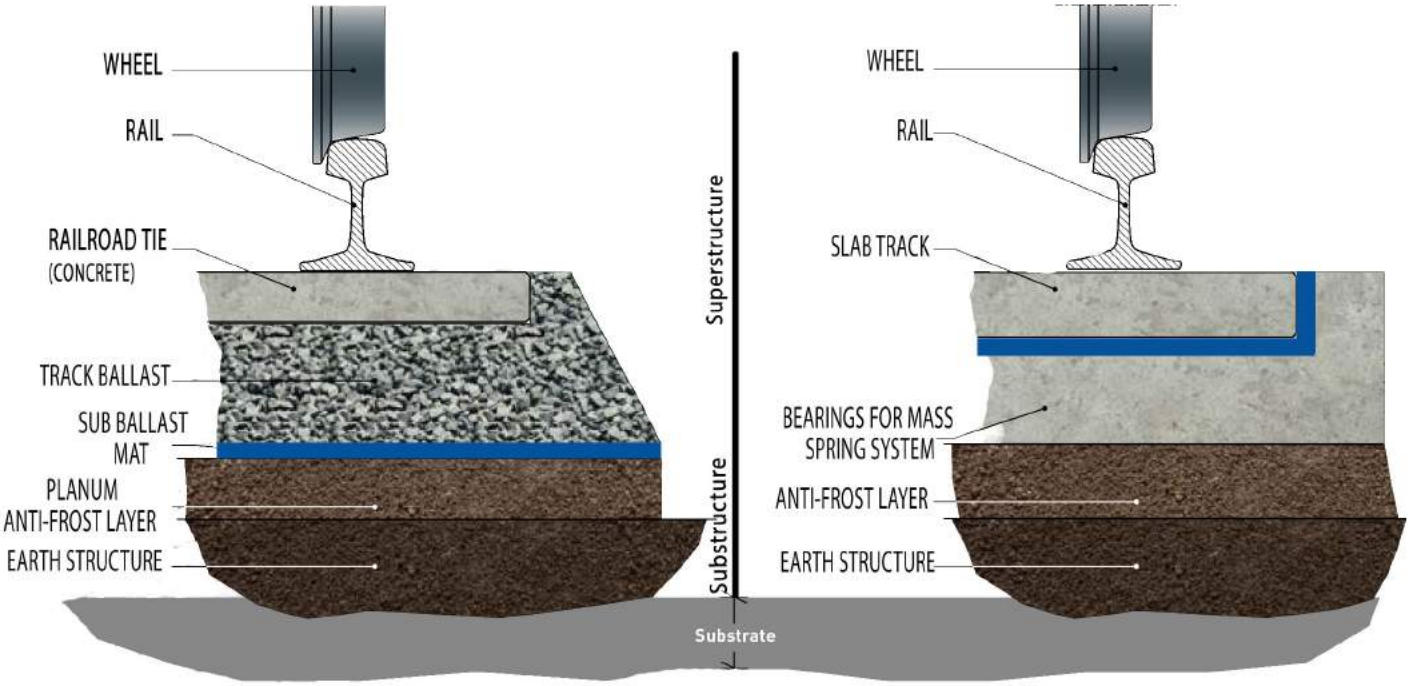
PROPERTIES AND ADVANTAGES OF PROJEX DAMTEC® SBM



TYPES OF TRACK DESIGN

BALLASTED AND SLAB TRACKS - USING ELASTIC ELEMENTS

Track systems for rail transportation consist of tracks, switches, junctions and railway crossings. Construction can be divided roughly into three levels: superstructure, substructure and substrate, in which the superstructure can also be divided further into ballasted and slab track.
The substrate can be an earth structure or an engineered structure (bridge, tunnel).
Figures 01 and 02 show the schematic structure of both superstructure constructions and the possible applications of elastic elements to reduce sound and vibration emissions.



PROJEX DAMTEC SUB BALLAST

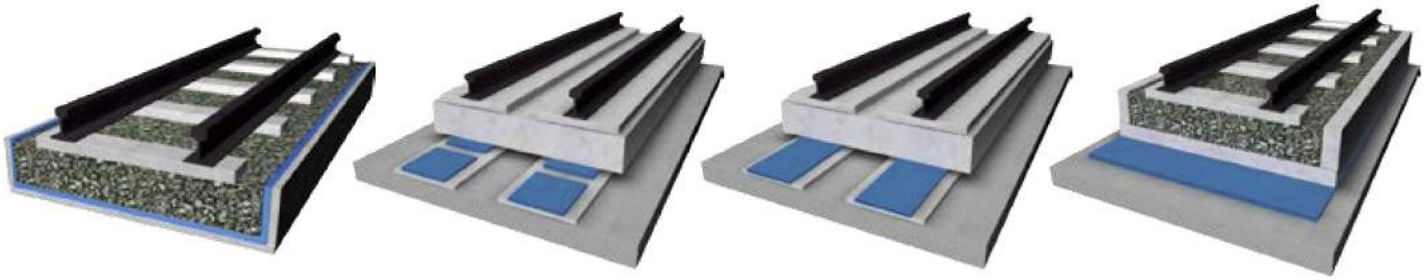
APPLICATION TYPES

Sub Ballast Mat

Sub ballast mat combined with side mat

Mass-Spring System

Point-like support | Strip-like support | Area support



Typical field of application:

+ Structure-borne noise isolation on track systems in urban centres; especially in the immediate vicinity of buildings

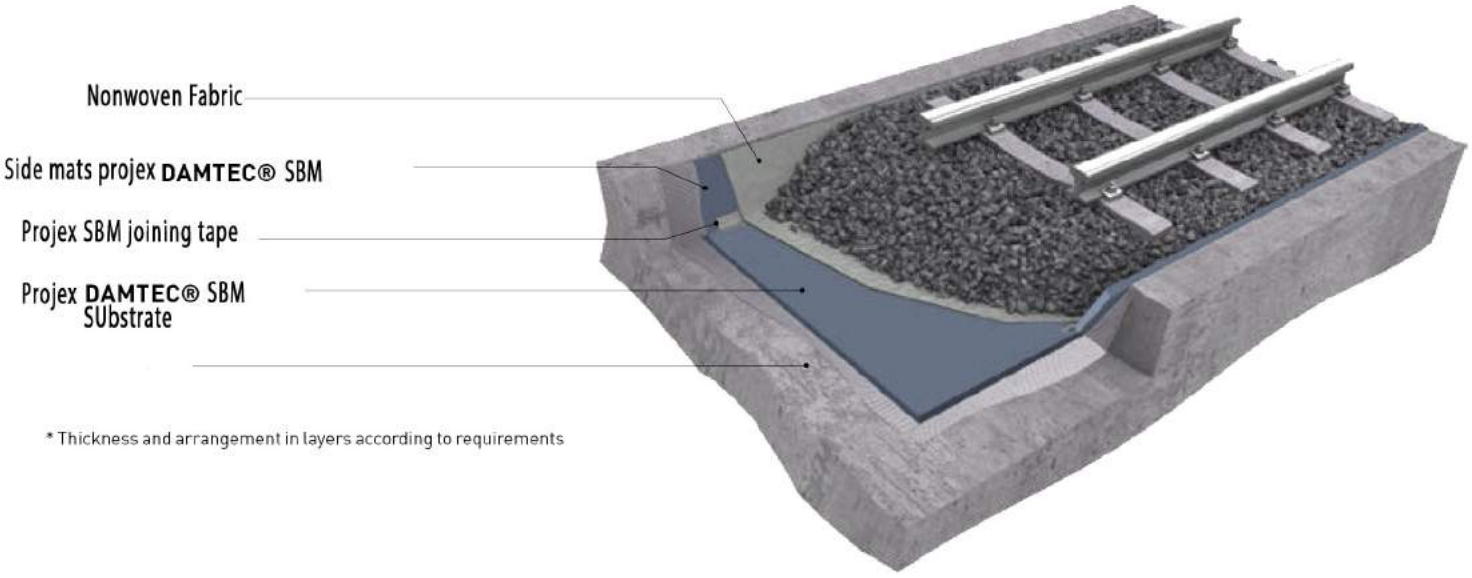
+ Reducing the noise and vibration emission to buildings with particularly high requirements for noise prevention (for example, opera houses, concert halls, test institutions, hospitals)

+ Protecting against low-frequency vibrations caused by space-limiting surfaces (secondary airborne sound) Stabilising track constructions; particularly in high-traffic routes

DAMTEC SUB BALLAST MAT

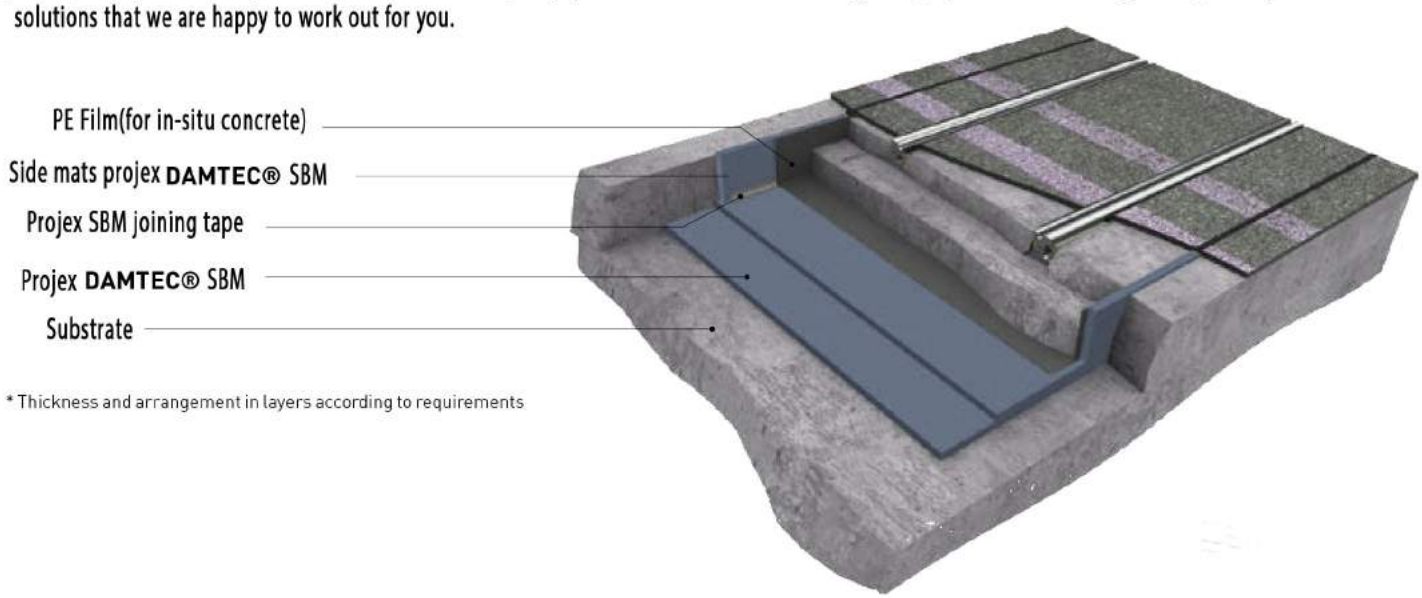
APPLICATIONS: SLEEPER TRACK ON BALLAST & MASS-SPRING SYSTEM

Embedding the mass-spring system in our DAMTEC® products reduces the peak pressure in the track ballast, allows the track geometry to remain stable for longer and effectively reduces structure-borne sound.



* Thickness and arrangement in layers according to requirements

Embedding the entire track system intDAMTEC® products creates a mass-spring system that with the appropriate dimensions acts as highly effective acoustic and vibration isolation. This effect also occurs with complicated track geometries. In mass-spring systems, DAMTEC® products are installed at points, in strips or covering the whole area. The mass-spring systems in the form of track supporting layers and track troughs are generally individual solutions that we are happy to work out for you.

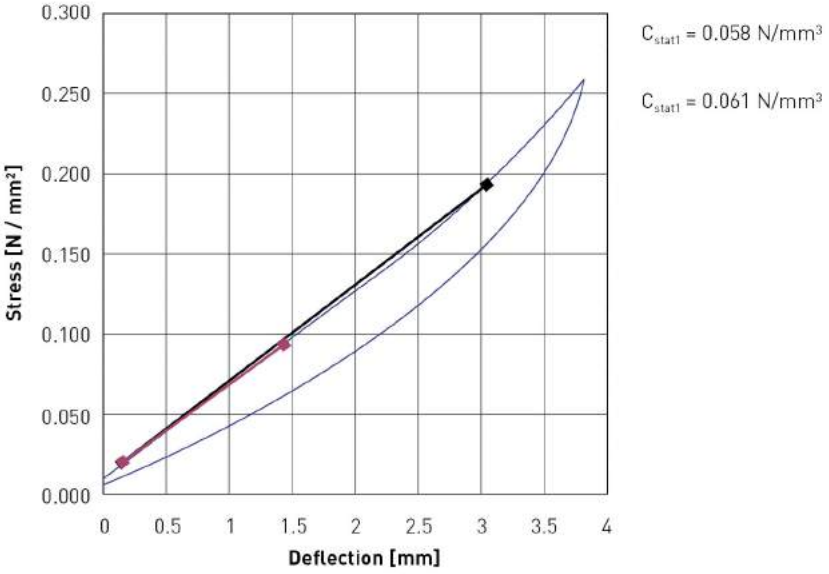


* Thickness and arrangement in layers according to requirements

STATIC BEDDING MODULUS

With bedding theory, the track is imagined as an infinitely long rod that is laid on a continuous, elastic base. The bedding modulus is the velasticity value of the whole system, rail - railroad tie - ballast - substructure - substrate, and is used to estimate the static deflection of the operating load. This quantity is a measure of the stiffness that must be determined experimentally. The static bedding modulus basically indicates how deep the rail sinks under slow traffic conditions or a stationary train.

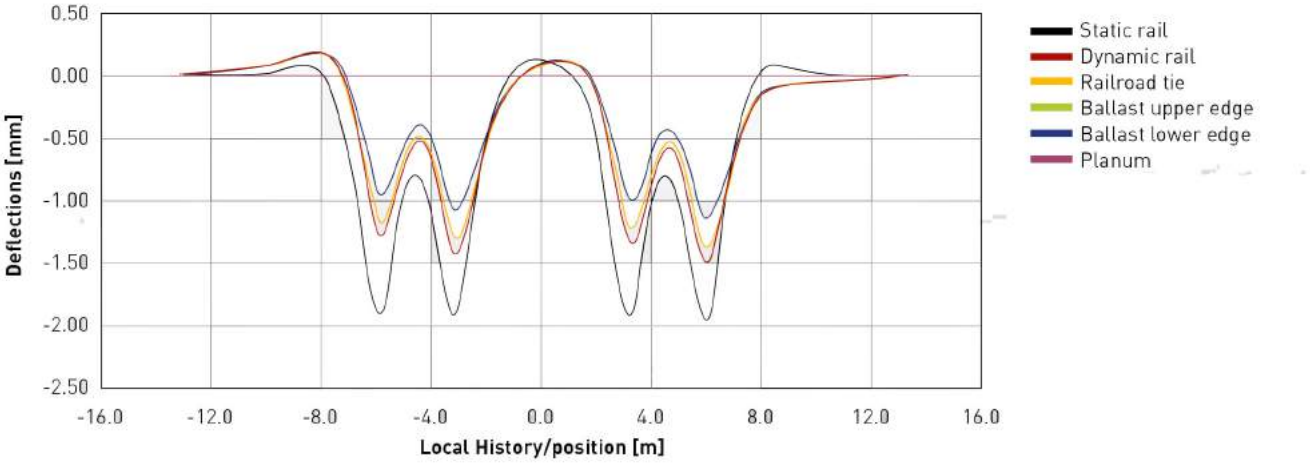
The bedding modulus is the ratio of the stress to the deflection. Usually, the secant modulus is measured, for example, between 0.02 N/mm2 and 0.10 N/mm2 . Alternatively, the tangent modulus can be determined.



DEFLECTION

A distinction must be made between the deflection, or subsidence of the elastomer and the rail deflection. The deflection can be determined using the spring characteristics and is the distance in millimetres by which the material is compressed under a certain tension.

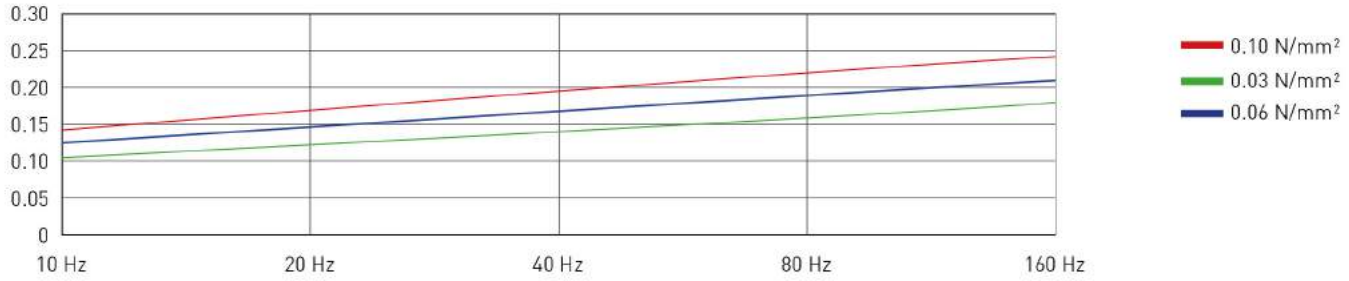
The rail deflection when in use takes into consideration the stiffness in the track superstructure from the vehicle to the substrate. It is calculated statically for the stationary and dynamically for the moving train. Depending on speed, axle load, superstructure type, sub-type and DAMTEC® type, the deflection is usually between 1 mm and 3 mm.



DYNAMIC BEDDING MODULUS

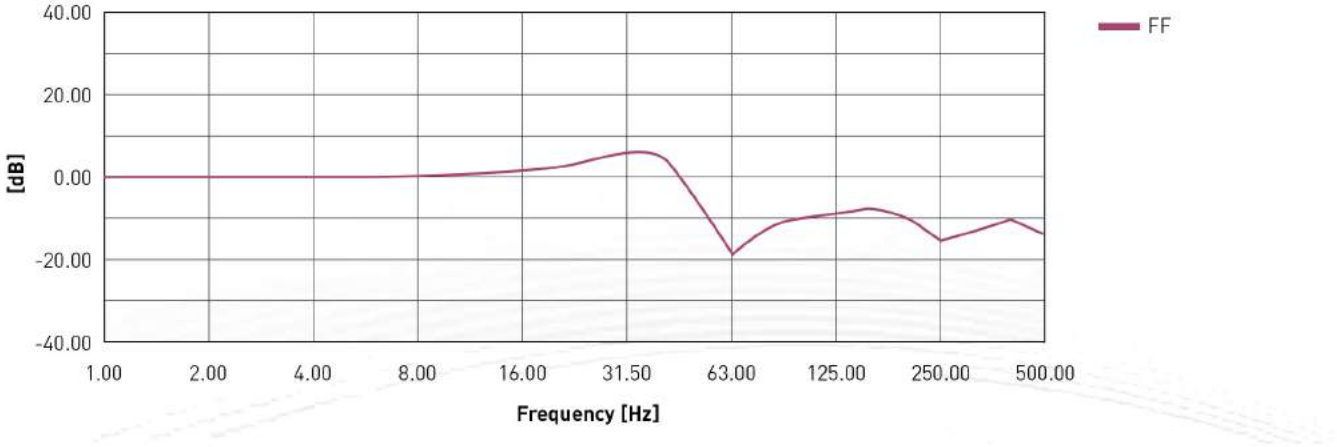
A distinction must be made between the low-frequency (superstructure dynamics) and the high-frequency dynamic bedding modulus (damping of structure-borne noise). With the first-mentioned characteristic value, the bending deformation of the rail under the rolling wheel can be estimated from the interaction of bending elasticity of rails and railroad ties, including ballast.

The higher-frequency dynamic bedding modulus of a ballast mat influences the natural frequency of the elastically mounted superstructure as a vibratory system as a whole and thus the insertion loss. The test is performed with a static preload.



INSERTION LOSS

The insertion loss ΔLe (in dB) is a characteristic value that expresses the extent to which inserted measures contribute to reducing the structure-borne noise introduced into a system. The insertion loss ΔLe is the ratio of the structure-borne sound power "without installed measures" to "with installed measures". It is a characteristic value of the entire system - from the vehicle to the substructure.



FORECAST CALCULATIONS

Since the mechanisms for the generation and propagation of structure-borne sound associated with rail transport are widely known, the expected effect of mitigation measures can be calculated in advance after a thorough evaluation of the system in the way they are to be used. There are many tried and tested calculation models available for this purpose. The combination of advanced materials that meet all modern requirements for effective sound and vibration protection, as well as the vast experience in implementing more effective measures make DAMTEC® the ideal partner for sound and vibration reduction in the railway sector.

PROJEX GROUP PTY. LIMITED

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