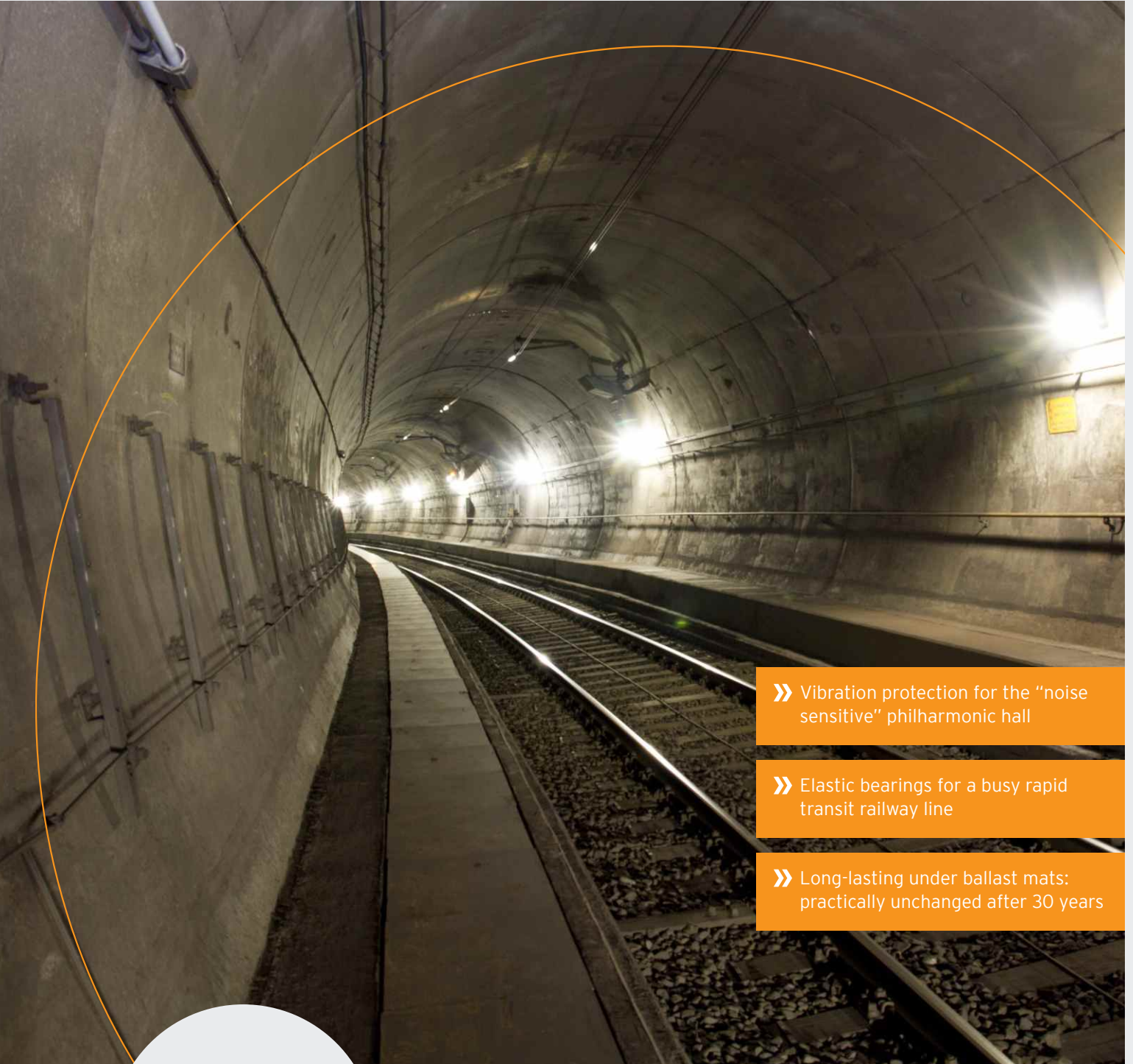


# Case Study

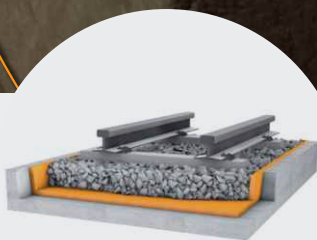
## 30 Years of Vibration Protection for the Philharmonic Hall Gasteig, Munich (DE)



» Vibration protection for the “noise sensitive” philharmonic hall

» Elastic bearings for a busy rapid transit railway line

» Long-lasting under ballast mats: practically unchanged after 30 years



# Long-Lasting Quality of Under Ballast Mats – even under Extreme Conditions

## Description

### Busy rapid transit railway tunnel near the Munich Philharmonic Hall

The cultural centre “Am Gasteig” in Munich is situated next to the central tunnel of the Munich rapid transit railway system: the centre is also home to the philharmonic hall and the city library.

The railway line - a standard ballasted track with timber sleepers - is subjected to a load of around 150,000 metric tons a day and ranks as one of the busiest rapid transit railway lines in Germany. When the cultural centre was built in 1983, the planners had to ensure that the background noise level in the concert hall did not exceed the specified limit of 25 decibels

when a train is passing so that the concert hall could also be used for recording.

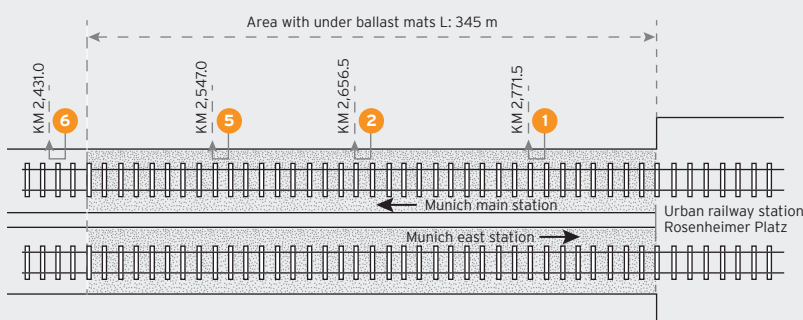
To protect the noise-sensitive cultural centre from structure-borne noise emissions, the under ballast mats from Getzner were installed over a distance of 345 metres. Since 1983, they have been subjected to an extreme operating load of around 1,300 million tons and a variety of environmental influences in the track. In 2013, it was discovered just how effective they are in the long-term: the under ballast mats have reduced vibrations on this key route for over 30 years - and in turn the maintenance work and costs.

## The Getzner solution

### Under ballast mats remain highly effective even after 30 years

Railway lines such as that next to the “Am Gasteig” generate vibrations and noise which are disturbing to people – the busier the route, the more disturbing the effect. Strong vibrations also have a negative impact for track operators: since they subject the superstructure to strong loads, they cause an enormous amount of maintenance work. The under ballast mats from Getzner reduce the specific load and, in turn, the mechanical strain on the superstructure components. The fact that the polyurethane under ballast mats from Getzner remain effective and retain their material properties, even over a period of 30 years, is evidenced by the studies conducted.

### Sketch map of the measuring points



### Three measurements – one result

Since the under ballast mats were installed in 1983, Getzner has initiated several investigations and measurements of the material's effectiveness. In order to examine the long-term properties of the Sylomer® B 851 under ballast mats, Getzner took a material sample from the Munich rapid transit railway tunnel in December 2012, along with a structure-borne noise measurement, under the supervision of Deutsche Bahn AG. The



Imprints of the track ballast on the under ballast mats



Exposed under ballast mat

“Prüfamt für Bau von Landverkehrswegen” (Institute of Road, Railway and Airfield Construction) at the Technical University of Munich subjected the extracted samples to a visual evaluation. They also determined the static stiffness and compared this with the values that were determined in 1983 as part of quality control during installation and in 2001 when a sample was taken.

### Measuring the structure-borne noise and the static and dynamic stiffness

The visual evaluation of the sample extracted – after 29 years – revealed that the under ballast mats are in excellent condition. The side of the mats facing the ballast, the load distribution layer, exhibits only slight plastic imprints; there is no sign of any damage. The imprints show that the ballast is embedded well in the surface of the mat. The enlarged contact area ensures a reduced specific load, which protects the ballast and results in less ballast destruction. The static stiffness test showed that the under ballast mats still meet the requirements defined in the specification – despite the extreme operating load of around 1,300 million tons. “The dynamic spring properties of the under ballast mats remain almost the

same as they were in 1983,” explains Wolfgang Daiminger, Project Manager at engineering company Müller-BBM GmbH. In order to assess the long-term properties under “real” traffic loads, structural-borne noise measurements were also carried out in a section of the tunnel in the same manner as in 1983.

### The result

The under ballast mats successfully reduce the structure-borne noise when a train passes through; the acoustic performance remains sound until today.



“All the tests indicate that our under ballast mats will remain effective for at least another 30 years. If we take the standard track service life of 50 years for our calculations, then we can be sure that the under ballast mats will remain effective throughout and beyond this period,” says Mirko Dold, Product Manager at Getzner.

## Feedback

“The under ballast mats from Getzner retain their properties and function even under extreme conditions. Environmental influences, such as standing water, couldn't affect these mats.”



Wolfgang Daiminger, Project Manager at Müller-BBM



The Philharmonic Hall Gasteig



## Facts and figures at a glance

### Measurement of the long-term properties of under ballast mats at "Am Gasteig"

Client/ general contractor:	Getzner Werkstoffe GmbH
Operator:	Deutsche Bahn AG
Scope of the order:	2,830 m <sup>2</sup> of under ballast mats over a distance of 345 m
Opening:	1983
Solution:	Under ballast mats, type: Sylomer® B 851
Project support:	Deutsche Bahn AG, Prüfamf für Bau von Landverkehrswegen der Technischen Universität München (Institute of Road, Railway and Airfield Construction at the Technical University of Munich)

### Bibliography

Daiminger, Wolfgang/Dold, Mirko: Langzeitqualität von Unterschottermatten nach 30 Jahren. Ermittlung der Langzeiteigenschaften von Unterschottermatten durch Messungen am Material und Ermittlung der akustischen Leistungsfähigkeit unter Zugbetrieb (Long-term quality of under ballast mats after 30 years. Determination of the long-term properties of under ballast mats by taking material measurements and determining the acoustic performance when subjected to train operation). In: EI - Internationale Fachzeitschrift für Schienenverkehr und Technik (Railway engineer - international trade journal for railway transportation and technology), June 2014 issue, P. 2 et seq.

### Getzner Werkstoffe GmbH

Foundation:	1969 (as a subsidiary of Getzner, Mutter & Cie)
Chief Executive Officer:	Ing. Jürgen Rainalter
Employees:	340
2015 turnover:	EUR 77.9 million
Business areas:	Railway, construction, industry
Headquarter:	Bürs (AT)
Locations:	Berlin (DE), Munich (DE), Stuttgart (DE), Lyon (FR), Amman (JO), Tokyo (JP), Pune (IN), Beijing (CN), Kunshan (CN), Charlotte (US)
Ratio of exports:	85 %

Image 1: © Deutsche Bahn AG

### References (extract)

- Cologne rapid transit railway:  
Cologne-Chorweiler tunnel (Germany)
- Berlin rapid transit railway: Friedrichstraße  
station (Germany)
- Berlin rapid transit railway:  
Berlin-Dorotheenhöfe station (Germany)
- Berlin rapid transit railway: link to  
Berlin-Schönefeld airport (Germany)
- Stuttgart rapid transit railway:  
airport link (Germany)
- Hamburg rapid transit railway:  
airport link (Germany)