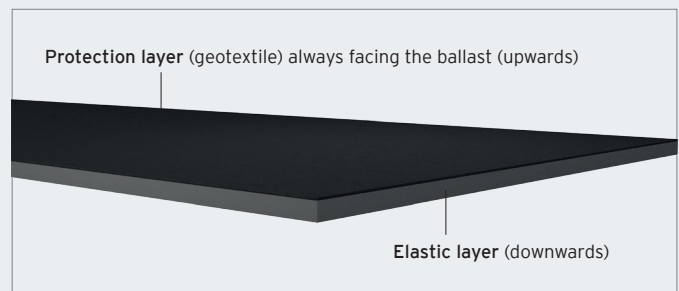


Guideline for the Installation of Under Ballast Mats

1. Transport and Storage

- Always transport in original packaging, the plastic wrapping protects the Under Ballast Mats (UBM) from environmental impacts.
- Attention has to be paid during transportation to avoid damages. Damaged packaging shall be immediately repaired (using plastic foil and adhesive tape).
- UBM are delivered in rolls and in a width of 1,500 mm. Side mats are delivered as plates and on pallets. The length of the mats usually meets the width of the track bed and is clarified with the client in advance.
- UBM rolls should be in an upright standing position (refer to picture above on the right) in order to avoid squeezing of the mats.
- Storage should be in a dry environment in original packaging.
- Protection from direct sunlight is preferred.
- Temperatures below -20°C and above $+50^{\circ}\text{C}$ should be avoided.
- Once the original packaging is removed, UBM must be kept dry.
- UBM are subject to normal thermal expansion/shrinking. This physical effect is completely reversible.
- Storage conditions should match installation conditions; in case of big temperature differences between storage and installation area, it is recommended to condition UBM for at least 24 h.



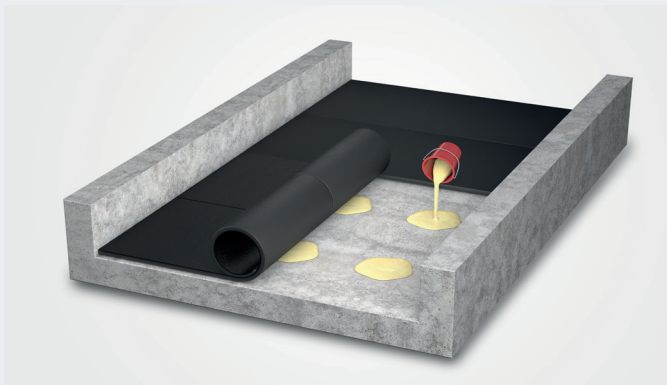
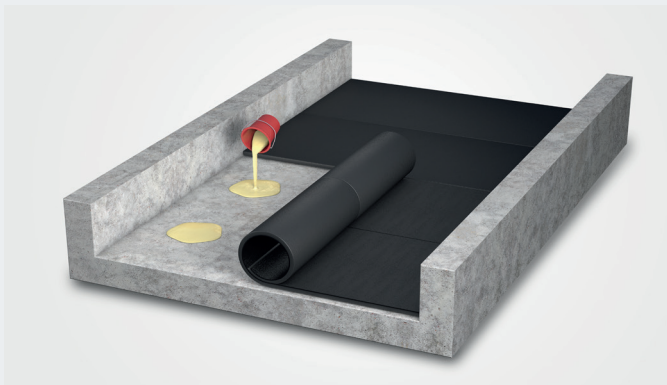
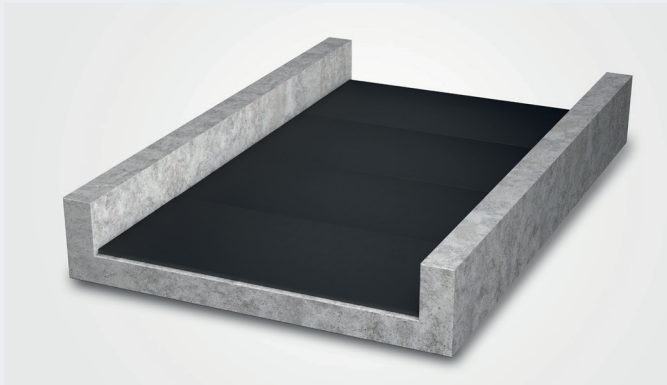
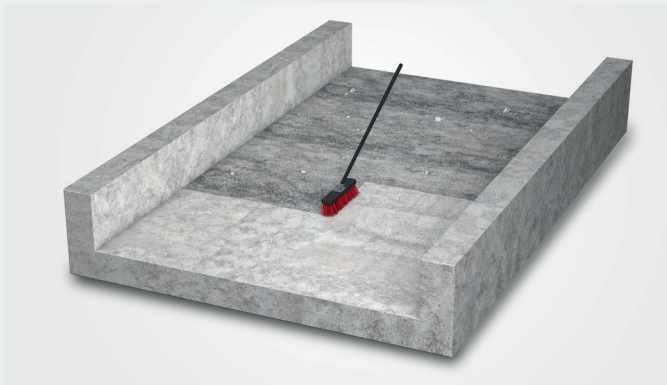
2. General Description

Getzner UBM are high-tech polyurethane materials able to withstand extreme dynamic loads. They exhibit excellent resistance against all chemical substances normally used in railway operations. Getzner UBM passed all serviceability tests in accordance with DIN 45673-5 (2010).

Although Getzner UBM are extremely robust, a few rules must be followed during installation in order to enable hassle-free installation and the highest possible performance.



Guideline for the Installation of Under Ballast Mats



3. Installation

3.1 Preparation of the substructure

The substructure has to be clean and dry, frost-free as well as free of depressions and sharp-edged elevations. Loose objects, e.g. stones, have to be removed with appropriate tools (e.g. broom etc.).

3.2 Placing of UBM

The UBM are unrolled transversely to the track axis in order to avoid joints in the driving direction. The UBM are placed in their respective position with the protective geotextile layer facing upwards and, if necessary adjusted on site by cutting. When exposed to extreme temperatures and differences in temperature, the UBM should at first be unrolled, placed in position and left to settle for a few hours before glueing. This allows the material to recover from compression and stretching caused by on-site handling.

3.3 Adhesion to the substructure

To avoid displacement during ballasting, the mats can be glued to the substructure.

The adhesive to be used depends on the respective ambient temperature (not less than +5 °C). Ideally a two-component solvent-free polyurethane adhesive is used. Roughly 0.3 - 0.5 kg adhesive per m² UBM is applied. Deviations in certain cases are possible. The adhesive can be supplied directly by Getzner Werkstoffe.

The adhesive is applied in dots in order to enable proper drainage underneath the UBM.

Firstly one half of the UBM is folded from one sidewall to the other one to uncover half of the track bed. After this half is glued, the same steps are repeated for the other half.

Guideline for the Installation of Under Ballast Mats



3.4 Connection of UBM / sealing of joints

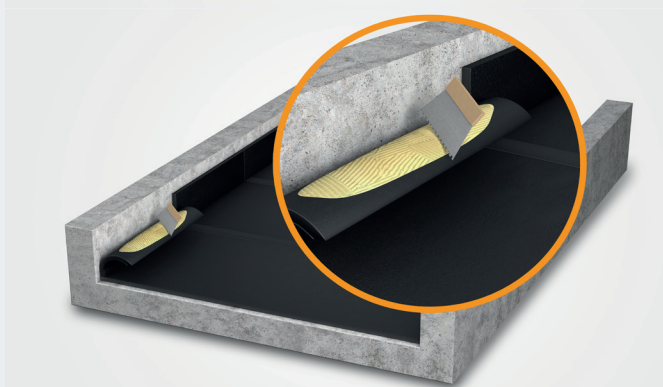
The side of the mats facing the ballast is protected by a geotextile, which has two functions: It both serves as a protective layer against ballast-grain penetration of the elastic layer as well as a load-distribution layer.

The connection of the mats will be executed with a Getzner Weld-Jet using a geotextile strip of 9 - 10 cm which covers the butt joints completely. This strip is also supplied by Getzner Werkstoffe.

Alternative: The strip which covers the butt joint can also be glued with a PU adhesive.

If radii are very narrow, some special measures have to be taken (e. g. correction cuts on site). Please refer to the separate document "Installation Instructions for UBM in Curved Sections".

After completing the installed section it is recommended to visually check the sealed mat joints again.

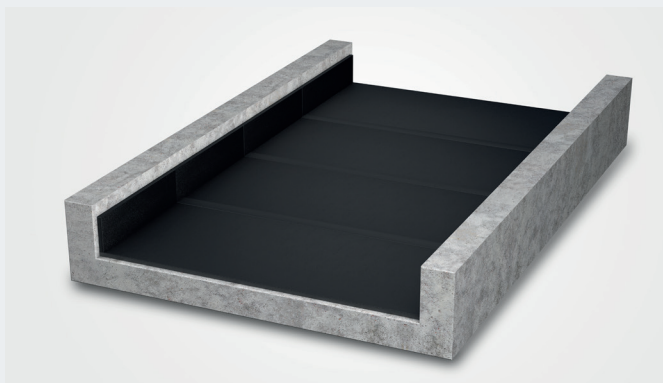


3.5 Installation of side mats

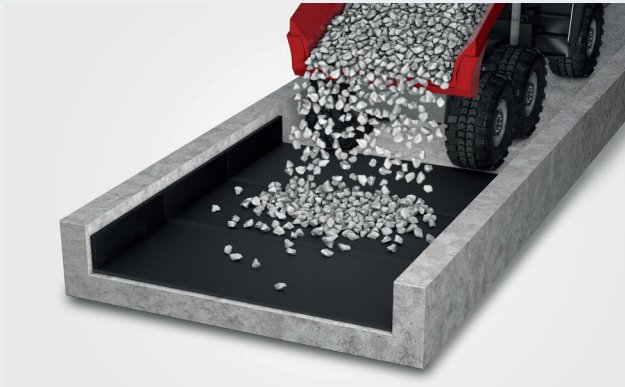
The installation of side mats is carried out by full-surface adhesion. A two-component bituminous mass (solvent-free, inorganic-bonding) or a two component PU adhesive is suggested. Roughly 1.0 kg adhesive per m² side mat is applied.

Optionally, side mats can be fastened with a Z-profile (see picture on the first page).

Please note: Butt joints of side mats are not sealed with geotextile strips due to the much lower loads acting on them.



Guideline for the Installation of Under Ballast Mats



3.6 Supply of ballast

If Getzner UBM are glued to the substructure, vehicles with rubber tyres supplying ballast are able to drive at slow speed on the UBM, but not bulldozers (and other tracked vehicles) and vehicles with sharp-edged treaded tyres.

Sudden breaking or acceleration must be avoided.
The installation supervision team of Getzner shall be consulted before any driving on top of UBM.



3.7 Continuation of works

After graveling, superstructure works can continue like on any other railway construction site.

This also means that bulldozers and other heavy construction machinery are permitted to drive over the ballast bed at this stage of construction.

Guideline for the Installation of Under Ballast Mats



4. Recycling

Unused UBM or pieces thereof can be recycled in standard plastics waste containers.

At the end of the lifetime of the superstructure the UBM can be mechanically removed from the substructure and thermally recycled. All our materials are non-hazardous to the environment.

5. Disclaimer

This guideline only serves to support the customer or his authorised specialist in the installation of Getzner UBM. Getzner Werkstoffe draws the attention to known design errors and problems. This guideline was compiled with the utmost care based on Getzner's current knowledge.

Getzner Werkstoffe assumes no warranty or liability for the accuracy, completeness, topicality or quality of this guideline. The customer is not entitled to any claims whatsoever arising from the use of this guideline. In particular, Getzner Werkstoffe is not responsible for the proper installation of Getzner UBM and the resulting negative effects on the condition / quality of Getzner UBM or its performance. This guideline is merely intended as a strict recommendation and it is recommended that the installation is carried out by a specialist.

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