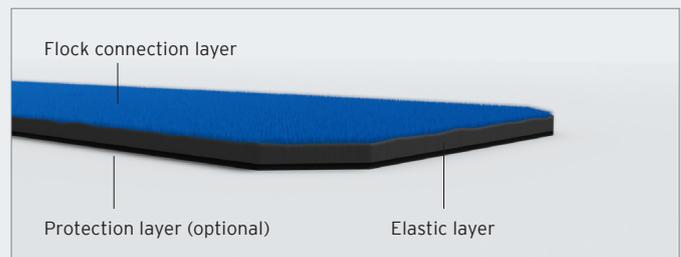


Guideline for the Installation of Under Sleeper Pads for Concrete Sleepers

1. Transport and Storage of Under Sleeper Pads (USP)

- Always transport in original packaging
- Damaged packaging shall be immediately repaired (using plastic foil and adhesive tape)
- Storage should be in a dry environment in original packaging
- Protection from direct sunlight is preferred
- Once the original packaging is removed, USP must be kept dry
- Temperatures below -20°C and above $+50^{\circ}\text{C}$ should be avoided
- Do not stack pallets and parcels
- USP are subject to normal thermal expansion/shrinking. This physical effect is completely reversible
- Storage conditions (and temperature) should match installation conditions; in case of big temperature differences between storage and production area, it's recommended to condition/temper USP for at least 24 h
- Shelf life of Getzner USP is not limited: if stored correctly, the USP can stay in storage for years to be installed at any later point in time.

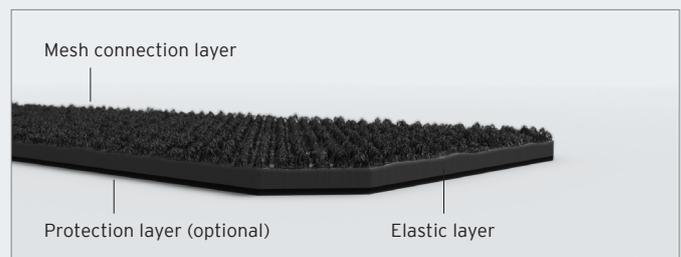


2. Assembly of USP During the Production of Padded Sleepers

2.1 Production of padded concrete sleepers

Sleeper manufacturing methods (e.g. instant demoulding, late demoulding, etc.) vary greatly between different sleeper producers and factories. The experts at Getzner Werkstoffe have vast experience with these different production methods. Prior to the first production of padded sleepers it is recommended to coordinate with Getzner to assist in the first trials to achieve the best possible results. Getzner uses two different connection layers for its USP:

1. Flock connection layer
2. Mesh connection layer

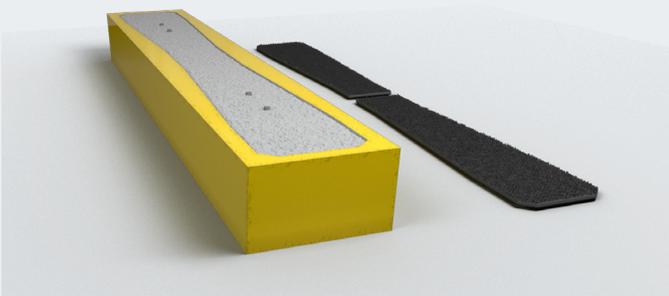


The two connection layers are exchangeable, nevertheless, if producing padded sleepers for the first time with any of the two connection methods, it is recommended to execute some trial productions.

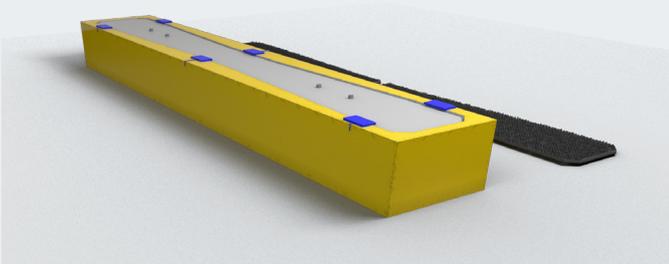
The following steps shall serve as a guideline, the list of steps is non-exhaustive and depending on actual production methods:



Firstly the sleeper mould is filled with concrete.

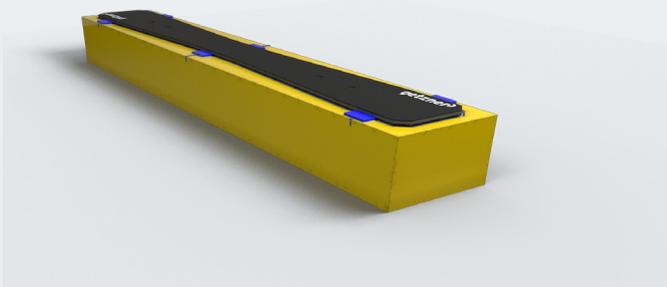


The concrete is compacted by means of electric concrete vibrators, either placed at the bottom or on top of the mould. The method depends on the actual sleeper manufacturing process.

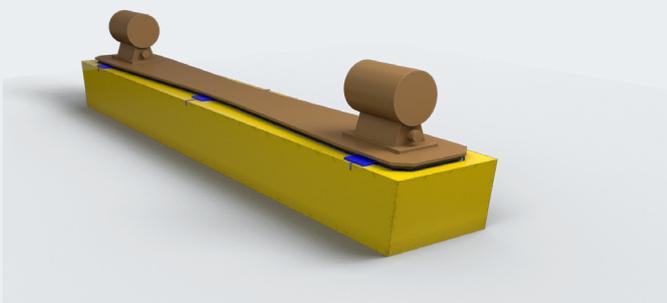


Spacers or centering pins (optional, depending on production method) are placed in order to prevent USP from being completely embedded into the concrete and to keep USP in correct position. It is up to the sleeper manufacturer to ensure proper placement maintaining the correct distances to the outer contour of the sleeper.

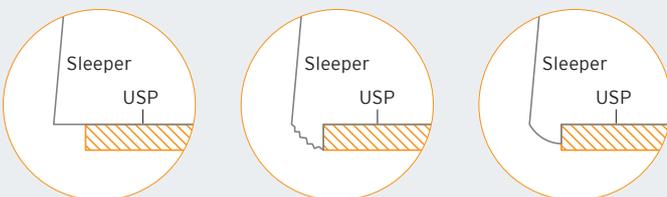
Under no circumstances shall the USP be longer/wider than the sleeper!



Two USP are placed onto the flat concrete surface with the connection layer (mesh or flock) facing downwards, being in direct contact with the wet concrete.



By means of a stiff load distribution plate, covering the whole surface of the pad, the connection layer (mesh or flock) is fully embedded into the fresh concrete. It is recommended to use vibrating motors on the load distribution plate to enable the best connection between USP and sleeper.



Execution of fillet depending on production method

Due to the different consistencies of the concrete, the USP can be embedded in slightly varying depths. We recommend to fully embed the connection layer plus 2–4 mm of the elastic layer to ensure the best connection between USP and concrete sleeper.



Then, after the appropriate concrete curing time, the padded sleeper can be installed in track.

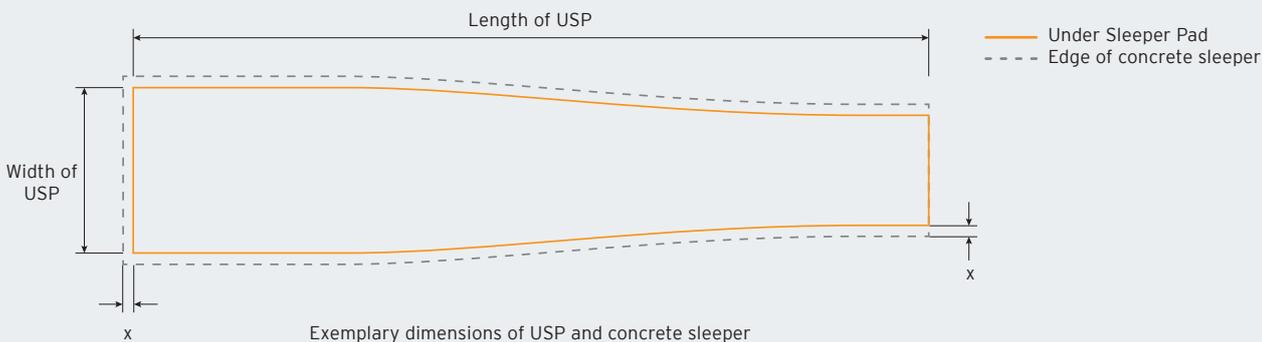
2.2 Quality control of the assembly

- High concrete coverage of the USP: after placing the USP on the wet concrete and vibrating once more (preferably from the top), the USP is lifted to check the concrete coverage: USP surface covered in concrete versus total USP surface. A concrete coverage of $\geq 70\%$ is desirable.
- Concrete coverage shall be documented with photos during trial productions.

- The edge distance between outer contour of sleeper and outer contour of USP is jointly agreed upon with the client (refer to illustration below). This ensures that USP are not damaged during tamping.
- Testing the quality of the connection is done by pull-out testing. The test is executed according to the standard EN 16730.
- The quantity of sleepers that has

to be tested depends on the daily production quantity of the sleeper manufacturing plant, Deutsche Bahn (German federal railways) standard requires the following:

- 1) 1% of the daily production quantity
- 2) If daily quantity is < 150 sleepers: one sleeper per day
- 3) If daily quantity is < 250 sleepers: two sleepers per day
- 4) For turnout sleepers: 1 sleeper per 80 running metres



3. Adhesive Bonding of Under Sleeper Pads

In the case of already produced sleepers, the USP can be retrofitted by bonding them to the sleeper. For this application, the USP are exclusively delivered without mesh or flock.

3.1 Adhesive

The adhesive is provided together with the USP by Getzner Werkstoffe. Please follow the safety data sheet and instructions for use to ensure correct handling.

3.2 Sleeper

The bonding surface of the sleeper has to be dry and clean. It should be

rather level and smooth (the rougher, the more adhesive is required). The surface may not have depressions.

3.3 Bonding

Sleeper is placed upside down and the surface is cleaned if necessary. Prepare the adhesive as described in the instructions for use. Please mind temperature and pot life of the adhesive. The prepared adhesive is put on the ballast side of the sleeper. If the pad is divided in parts, the joints also have to be bonded. The required amount of adhesive is determined by the roughness of the concrete surface.

Typically an amount of 0.5–2 kg of adhesive is used per sleeper. The USP is then placed centrally on the sleeper. During curing time the pad shall be evenly loaded on the whole surface with at least 50 kg. After bonding, there should be no cavities, which are not filled up with adhesive. The total thickness of the adhesive layer should not exceed 5 mm because the stiffness of the system could be influenced.

4. Storage of Padded Sleepers

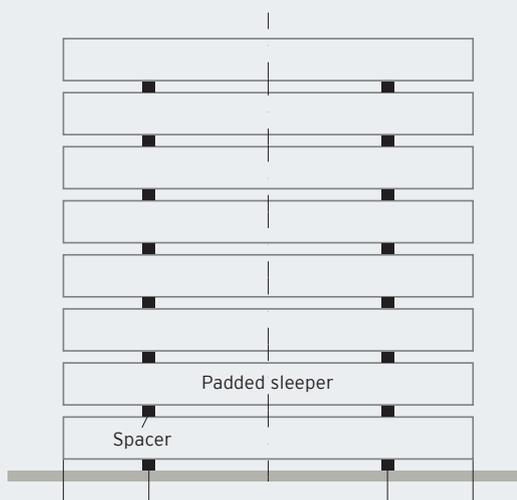
Usually padded concrete sleepers are stacked on top of each other and stored outside.

The stacking capacity of padded sleepers is generally limited by the static load limit of the material. The maximum amount of sleepers to be stacked is determined by a laboratory test procedure (according to the standard EN 16730).

Specific values for the maximum number of stacked sleepers are dependent on the sleeper weight and the size of the spacer that is used between the sleepers because both determine the specific load on the elastic material. The wooden spacers resting on the rail seats between any two sleepers should be as wide as possible, a minimum of 100 mm is absolutely required. The exact amount of sleepers that can be stacked depends on the USP type and the sleeper type.

**USP types with max. number of stacked sleepers:
(assumed sleeper weight: 300 kg)**

- SLS: max. 15 sleepers
- SLN: max. 15 sleepers
- SLB: max. 15 sleepers





5. Transport of Padded Sleepers

Attention has to be paid during transportation to avoid mechanical damage.

6. Lifetime and Recycling

USP made from Sylomer® and Sylodyn® materials are long-lasting elastomers. The lifetime of the USP matches the lifetime of the sleeper, which means: no USP has to be exchanged prior to the exchange of the sleeper.

At the end of the lifetime of a padded concrete sleeper the USP can be peeled off the sleepers mechanically and be thermally recycled. Unused USP or pieces thereof can be recycled in standard plastics waste containers. All our materials are non-hazardous to the environment.

