MAURER

# MAURER Betoflex®

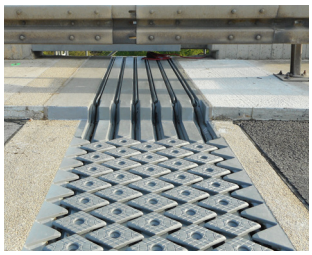
Since 1982, expansion joints with Betoflex® anchorage have been successfully used worldwide, and over 20,000 linear metres have now been installed. The application type is a product line especially developed for rehabilitation measures on expansion joints. The edge profiles are anchored in the structure using the polymer concrete Betoflex®. This has excellent adhesion properties with the adjacent contact areas.

The properties have proved to be highly effective in numerous tests at the Technical Universities of Munich and Innsbruck. Betoflex® adheres to both formed or cracked concrete surfaces as well as steel surfaces.

## Design Variants of MAURER Expansion Joints

- Single-Seal Expansion Joint D1-B
- Low-Noise Single-Seal Expansion Joint XC1-B
- Compact Expansion Joint K30-B / K50-B
- Connection of a Betoflex®-transition beam and stiffening ribs

XC1-B



Transition beam at a multi-seal modular expansion joint

Stiffening ribs

Compact expansion joint with Betoflex®

## Fields of Application

- Rehabilitation of existing expansion joints within an extremely short construction period
- Installation of expansion joints with limited installation space
- Prevention of wheel ruts in expansion joint header
- Noise reduction
- Level connection of surfaces according to ZTV-ING 6-6 No. 3.1 (2)

## Characteristics of the Anchorage with Betoflex®

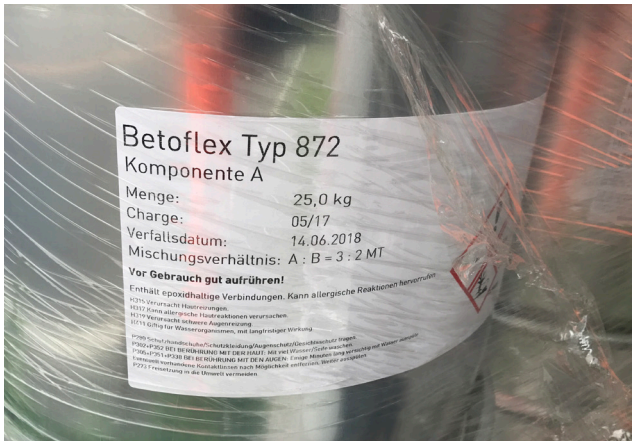
- Excellent adhesion
- Low recess depth
- No need for additional reinforcement or composite anchors
- Crack-free joint header
- Anti-skid and noise dampening surface
- Low installation height tolerances
- Watertight connection to both expansion joint and bridge deck waterproofing

# MAURER Betoflex®

Betoflex® is a high-grade, cold-processable polymer concrete providing the same excellent adhesive properties to steel and concrete as those of conventional epoxy resins. It also exhibits elastoplastic behaviour across the entire temperature range at a relatively low elastic modulus.

## Material Characteristics

- Two-component polymer concrete (cold curing)
- Open to traffic after a short setting time
- Excellent adhesion
- Wear-resistant surface
- Resistant to chemically aggressive substances such as de-icing salt solutions, petrol, oils and acids

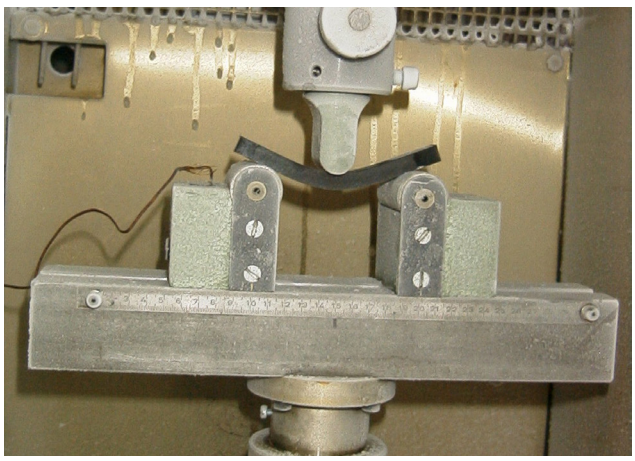



## Material Properties

The material properties of Betoflex® are separately disclosed in the technical data sheet type 872.

Investigated the following properties have been proven:

- Flexural tensile strength
- Watertightness
- Compressive strength
- Elastic modulus
- Adhesion to steel, concrete and asphalt




Testing of the material properties

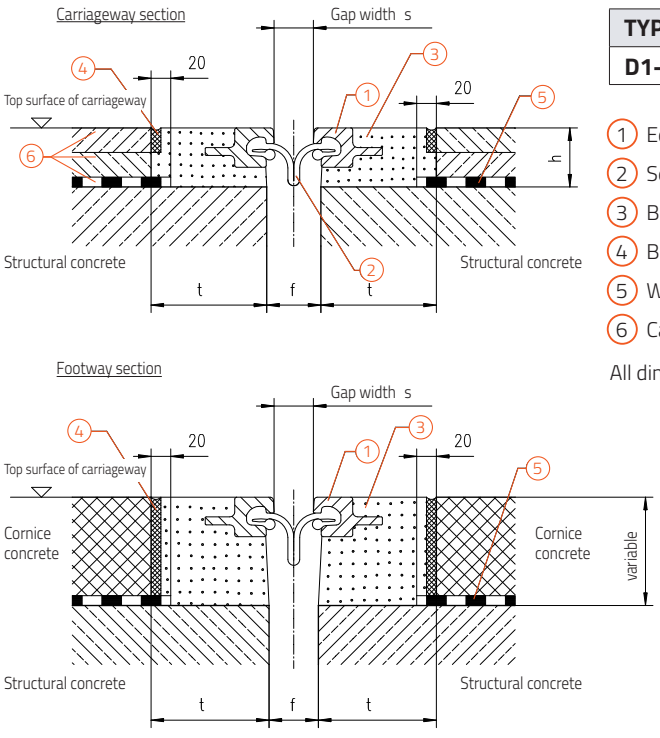
# Single-Seal Expansion Joint D1-B

The edge profiles are equipped with a continuous anchoring flange and anchored in Betoflex® headers to the height of the existing roadway surface. No additional recess is required in the structure, which is beneficial for pre-stressing cables, dense reinforcement layers or thin bridge deck slabs.

## Characteristics

- Permissible movements up to 100 mm (depending on the applicable regulations)
- Frictional and interlocking connection of sealing elements to the edge profile
- Watertight
- Meets the requirements of EAD 120109-00-0107 "Expansion joints for carriageway bridges with one sealing element" and of the approval TL/TP-FÜ

D1-B




| TYPE | s | h | f | t |
|---|---|---|---|---|
| D1-B | 5 -70 | ≥ 60 | s + 15 | 120 + 0,2h < t ≤ 160 |

1. Edge profile with continuous anchoring flange
2. Sealing element (EPDM)
3. Betoflex® header anchorage
4. Bituminous filler
5. Waterproofing system
6. Carriageway surfacing

All dimensions in mm.

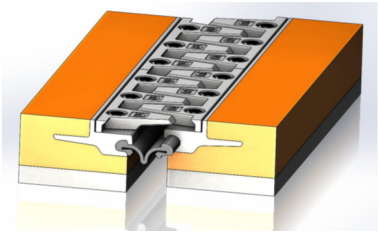
The D1-B expansion joint can be adapted to all bridge sections. This applies, for example, to road cross slope, barrier upturns, T-connections, junctions and vertical expansion joints. The Betoflex® D1-B expansion joint can also be used in the area of footways. The sealing element for footways or coverplates can be applied.

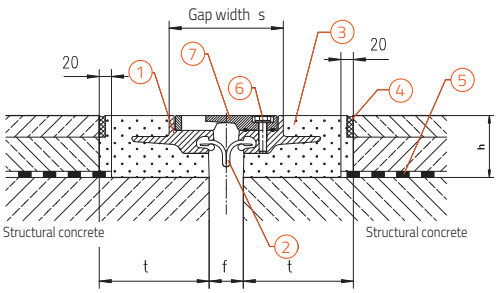
# Single-Seal Expansion Joint XC1-B

The XC1-B expansion joint is a low-noise variant of the single-seal expansion joint with Betoflex®-anchorage. The steel profile has a continuous anchoring flange and bolted on finger plates not only limit emission of noise but also protect against snow plow blade impacts.

## Characteristics

- Permissible movements up to 100 mm (depending on the applicable regulations)
- Frictional and interlocking connection of sealing elements to the edge profile
- Reduced noise from traffic
- Watertight
- Meets the requirements of EAD 120109-00-0107 "Expansion joints for carriageway bridges with one sealing element" and of the approval TL/TP-FÜ

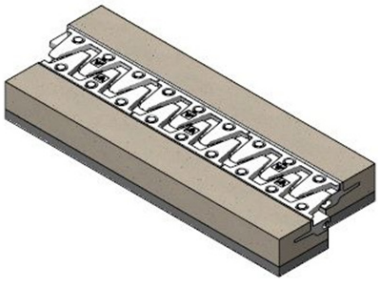





1. Edge profile
2. Sealing element (EPDM)
3. Betoflex® header anchorage
4. Bituminous filler
5. Waterproofing system
6. Screwed connection
7. MAURER edge plates

| TYPE | s | h | f | t |
|---|---|---|---|---|
| **XC1-B** | 150 - 245 | ≤ 100 | s - 129 | 180 + 0,2h < t ≤ 220 |

All dimensions in mm.



XC1-B joint installation examples

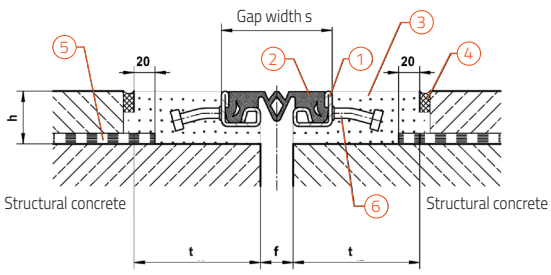
# Compact Expansion Joint K30-B / K50-B

MAURER Compact Expansion Joints are used for car parks, ramps, pedestrian and bicycle bridges, warehouses and light live load applications. The expansion joint can be crossed by snowploughs, forklift trucks, pallet lifting trucks, shopping trolleys and other transport vehicles in the aforementioned fields of application. The maximum possible loading of the expansion joint depends on the crossing wheel geometry. The sealing elements are formed as elastomeric mats in order to achieve a closed surface. The waterproofing overlaps with the Betoflex® header anchorage which guarantees a watertight connection.

## Characteristics

- Permissible movements of 30 mm (K30) and 50 mm (K50)
- Adjusts to the contours of the joint
- Interlocking connection of the sealing elements to the edge profile
- No bolted connections
- Anchoring through adhesion between Betoflex® material and adjacent structural concrete
- Edge profiles made of corrosion-resistant stainless steel (1.4301)
- Sealing element replaceable without special tools
- Watertight expansion joint resisting de-icing salt, oil and fuel

K50-B

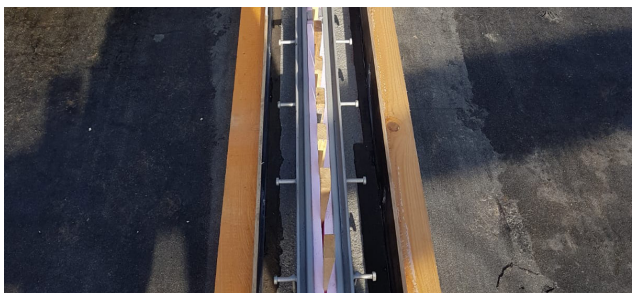



| TYPE | s | h | f | t |
|---|---|---|---|---|
| **K30-B** | 90 - 120 | ≥ 50 | s - 74 | 70 - 100 |
| **K50-B** | 95 - 145 | ≥ 50 | s - 74 | 70 - 100 |

1 Edge profile (V2A)
2 Sealing element (chloroprene)
3 Betoflex® header anchorage
4 Bituminous filler
5 Waterproofing system
6 Headed stud Ø10x50

All dimensions in mm.

The Compact Expansion Joint with Betoflex®-anchorage is also suitable for longitudinal joints between two separate superstructures. Both Betoflex® headers are prepared directly adjacent to the longitudinal joint.



Compact Expansion Joint with Betoflex®-anchorage as longitudinal joint between two superstructures

Design of the longitudinal joint between separate superstructures

# Connection of a Betoflex®-Transition Beam and Stiffening Ribs

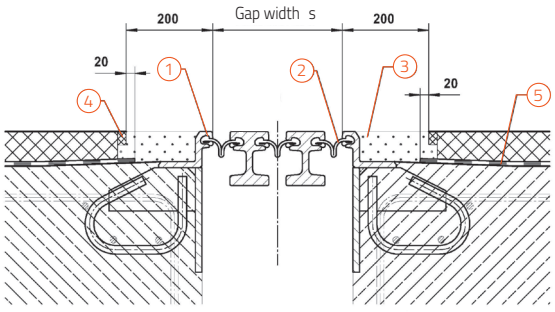
According to ZTV-ING Part 6 Structure Equipment, Paragraph 6 "Expansion joints made of steel and elastomer", the surface connecting to the expansion joint must be prepared without super-elevation in order to prevent unnecessary noise emission due to the crossing of expansion joints lying too low. To prevent wheel ruts, "Measures for preventing deformations" are to be installed in front of and behind the expansion joint. To that end, polymer concrete beams connecting to the edge profiles can be arranged facilitating precise installation in terms of height. The installation of these beams can be made prior to or following the preparation of the asphalt surface. Alternatively, stiffening ribs can be prepared following asphalting.

**Transition header made of Betoflex®**

- Wheel ruts and a height offset between edge profile and surface are avoided
- No super-elevation of surface necessary
- Load transfer without permanent deformation
- Watertight

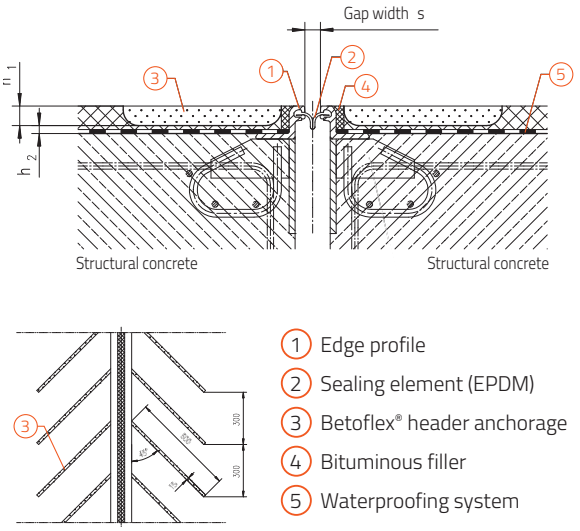
**Stiffening ribs made of Betoflex®**

- Wheel ruts and a height offset between edge profile and surface are avoided
- No super-elevation of surface necessary
- Connection angle typically 45° to the direction of traffic
- Existing waterproofing system is unaffected
- Strengthens the asphalt roadway surface at expansion joint



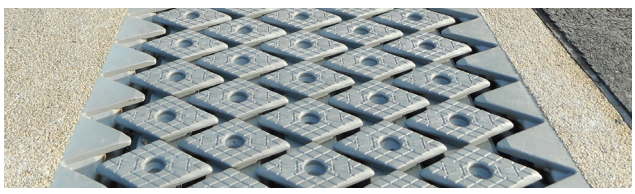

1 Edge profile
2 Sealing element (EPDM)
3 Betoflex® header anchorage
4 Bituminous filler
5 Waterproofing system

All dimensions in mm.



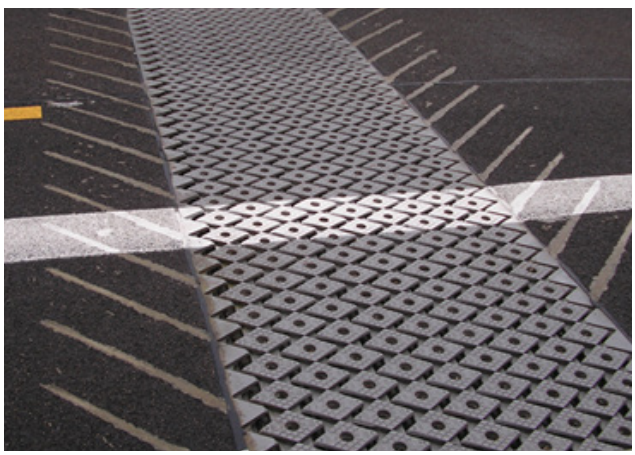

1 Edge profile
2 Sealing element (EPDM)
3 Betoflex® header anchorage
4 Bituminous filler
5 Waterproofing system

All dimensions in mm.



Noise-reduced multi-seal modular expansion joint with polymer concrete Betoflex®

Noise-reduced XW1 expansion joint with polymer concrete Betoflex®



Betoflex®-stiffening ribs at a multi-seal modular expansion joint

## Processing of Betoflex®

The polymer concrete is prepared on site by mixing the two components, resin and hardener, with the mineral aggregate. Unlike most polymer concretes, Betoflex® components are only heated to room temperature. This facilitates short setting times in a controlled manner, thus ensuring high quality. The temperature must be at least 3 °C higher than the dew point and in any case higher than 5 °C during the whole installation.

Mixing of Betoflex® on site

Installation of Betoflex®

## Installation of Betoflex®

The adjacent concrete surface must have a minimum pull-off strength of 1.5 N/mm² (according to ZTV-SIB). Concrete and steel surfaces must be cleaned with a solid abrasive prior to installation in order to expose the grain structure and to obtain a bare steel surface. All contaminants must be removed to ensure sufficient adhesion. The structure temperature must be at least 5 °C, the mortar temperature must be at least 20 °C. A dry surface must be ensured during installation of Betoflex® material.

Aligning of the expansion joint

Abrasive blasting of the connection surfaces


Measurement of adhesion

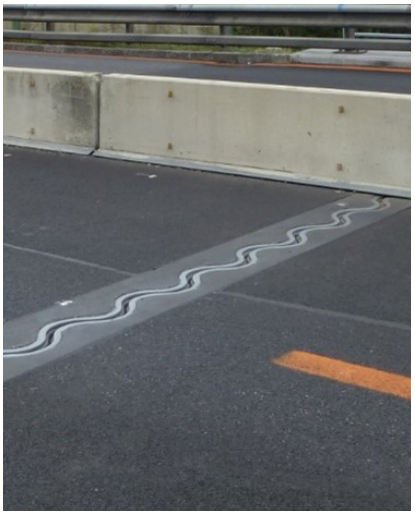
Fixing the gap width

Header grouted on one side

Finished D1-B

# References

Viaduct Großenmoor:
8 expansion joints D1-B (125 m)



Motorway A21 Heiligenkreuz:
Expansion joint XW1 with Betoflex® header

Expansion joint XD2 with transition Betoflex® header

Boekelo Bridge in Hengelo, NL

L264, Salzach Bridge Uttendorf, Austria:
Expansion joints D1-B and XW1 with Betoflex® header

Expansion joint XC1-B

Expansion joint XD4 with stiffening ribs and Betoflex® header

Elbepark Dresden:
Compact expansion joint K30-B and D1-B with Betoflex®-anchorage for a car park

# Possible Tender Texts

## Watertight Expansion Joints with Polymer Concrete Anchorage for Carriageway Bridges

Installation of waterproof expansion joints made of steel and anchorage with polymer concrete on an epoxy resin basis pursuant to EAD 120109-00-0107 (expansion joints for carriageway bridges with one sealing element) according to the client's documentation taking account of static and constructional requirements including kerb and footway design. Billing is based on the length of the expansion joint in the profile axis.

Installation in recess sizes of 120 x 80 mm on both sides.
The polymer concrete surface has to be sprinkled to ensure skid resistance.
The existing waterproofing must bind approx. 2 cm into the polymer concrete. Formwork must be factored in.
Edge profiles are to be manufactured and formed from steel S 235 JR+N with a continuous anchoring flange and a rolled claw profile.
The minimum pull-off strength of 1.5 N/mm2 between polymer concrete and surface must be verified. The steel edge profiles and installation areas that come into contact with the polymer concrete must be treated with abrasive blasting prior to installation.
Protection tents must be factored in.
The sealing element made of EPDM must be installed in a watertight manner.
Tightness is to be achieved through the clamping effect of the steel edge profile. Subsequent grouting of the sealing element is not permitted.

Corrosion protection according to ZTV-ING, 4-3, Tab. A4.3.2.

MAURER D1-B type (Betoflex®) or equivalent
Total movement up to 65 mm / 80 mm / 100 mm

## Watertight, Low-Noise Expansion Joints with Polymer Concrete Anchorage for Carriageway Bridges

Installation of waterproof, low noise expansion joints made of steel and anchorage with polymer concrete on an epoxy resin basis pursuant to EAD 120109-00-0107 (expansion joints for carriageway bridges with one sealing element) according to the client's documentation taking account of static and constructional requirements including kerb and footway design. Billing is based on the length of the expansion joint in the profile axis.

Installation in recess sizes of 200 x 80 mm on both sides.
The polymer concrete surface has to be sprinkled to ensure skid resistance.
The existing waterproofing must bind approx. 2 cm into the polymer concrete.
Formwork must be factored in.
Edge profiles are to be manufactured and formed from steel S 355 J2+N with a continuous anchoring flange and a rolled claw profile.
The minimum pull-off strength of 1.5 N/mm² between polymer concrete and surface must be verified.
The steel edge profiles and installation areas that come into contact with the polymer concrete must be treated with abrasive blasting prior to installation.
Protection tents must be factored in.

The sealing element made of EPDM must be installed in a watertight manner.
Tightness is to be achieved through the clamping effect of the steel edge profile. Subsequent grouting of the sealing element is not permitted.

Corrosion protection according to ZTV-ING, 4-3, Tab. A 4.3.2

MAURER XC1-B type (Betoflex®) or equivalent
Total movement up to 95 mm / 100 mm (at right angles to the joint axis).

## Compact Expansion Joint with Polymer Concrete Anchorage

Installation of waterproof, de-icing salt-, oil- and petrol-resistant expansion joints made of stainless steel, material 1.4301 according to the client's documentation taking account of static and constructional requirements including edge design. Billing is based on the length of the expansion joint in the profile axis. The sealing element must be made of non-ageing chloroprene rubber and be insertable without using clamping bars, screws or similar.

Expansion joint made of stainless steel (edge profile material 1.4301)
Optional:
Total movement 30 mm (± 15 mm), vertical offset up to ± 15 mm
MAURER Compact Expansion Joint K30-B or equivalent
Total movement 50 mm (± 25 mm), vertical offset up to ± 25 mm
MAURER Compact Expansion Joint K50-B or equivalent
Anchorage with polymer concrete on an epoxy resin basis.
Installation in recess sizes of 120 x 80 mm on both sides.
The polymer concrete surface has to be sprinkled to ensure skid resistance.
The existing waterproofing must bind approx. 2 cm into the polymer concrete.
Formwork must be factored in.
The minimum pull-off strength of 1.5 N/mm$^2$ between polymer concrete and surface must be verified.
The steel edge profiles and installation areas that come into contact with the polymer concrete must be treated with abrasive blasting prior to installation.
Protection tents must be factored in.
Necessary site butt joints must be connected by vulcanisation in a waterproof manner.
The entire expansion joint design must be watertight.
Larger reaction forces during deformation of the sealing element must be avoided.

MAURER K30N-KB type or K50N-KB
Total movement 30 mm or 50 mm

## Preparation of Polymer Concrete Stiffening Ribs

Preparation of polymer concrete stiffening ribs pursuant to ZTV-ING 6-6 No. 3.1 (2) adjacent to the expansion joint in the area of the carriageway taking account of the client's documentation.
Cutting of the joint gap with a forcibly guided floor saw at an angle of 45 degrees to the axis of the structure.
Cleaning of the joint gap with compressed air and drying if necessary. Backfilling of the joint space with polymer concrete (Betoflex®) or equivalent to the top edge according to the manufacturer's execution instructions.

Installation on the superstructure and abutment side
Distance of stiffening ribs = 300 mm (perpendicular to the expansion joint axis)
Width of stiffening ribs = 15 mm
Length of stiffening ribs = 600 mm
Depth of stiffening ribs = maximum 80 mm, up to approx. 10 mm above the damp-proof membrane
Billing is based on the length of the expansion joint in the carriageway area.

## Preparation of Polymer Concrete Headers

Installation of polymer concrete on an epoxy resin basis according to ZTV-ING 6-6 No. 3.1 (2). Supply of unreinforced two-component polymer concrete on an epoxy resin basis.

Betoflex® or equivalent
Material properties:

- Compressive strength according to DIN EN 196-1 min. 44 N/mm²
- Elastic modulus according to DIN EN 13412 min. 3,300 N/mm²
- Flexural tensile strength according to DIN EN 196-1 min. 16 N/mm²
- Bond strength on steel according to DIN EN 1542 > 2.5 N/mm²
- Bond strength on concrete according to DIN EN 1542 > 3.5 N/mm²

Preparation of a polymer concrete beam alongside the expansion joint on both the superstructure and abutment side.
Header width is 12 cm and height is 7 cm.
The recess for the polymer concrete header is treated with abrasive blasting and cleaned beforehand.
Protection tents must be factored in this position.
Grouting of the polymer concrete in the area of the carriageway on both sides of the expansion joint.
Sprinkling of the surface with suitable material.
Billing is based on the length of the recess.