



Monitoring & Services

# mageba repair and replacement services for modular expansion joints



## “Box in box” method

minimal encroachment, quick installation, reduced cost



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# Concept and planning

## Repair and replacement of old or damaged modular expansion joints

In the course of routine structural inspections, damage to expansion joints and deterioration due to age is often observed, which may require a joint to be replaced.

If the bridge structure is otherwise in good condition, it is desirable to minimise the effort required and only replace the expansion joint itself, without any impact on the bridge's structure.

To make this possible, mageba has developed a method which enables the substructure of the old joint to be left in place, saving the need to break it out. The new expansion joint is placed onto the old substructure, after the carrying out of any required repair works.

In doing this, the design of the new joint can be optimised to take account of the fact that deck shrinkage and creep, which had to be considered in the design of the original joint, has already taken place. This may allow a joint with a lower movement capacity to be installed, reducing costs.

## mageba - an innovative partner for renovation works

Because such a replacement method is not governed by any norm or standard, mageba ensures that the design is based as closely as possible on existing expansion joint design standards and national approvals.

To satisfy this self-imposed requirement, we use only parts and components which are used as standard in joints which have been awarded national approvals.

The construction methodology is adapted to suit the old joint type and the prevailing circumstances, with the support bar boxes of the new joint being concreted into the retained support bar boxes of the old joint.

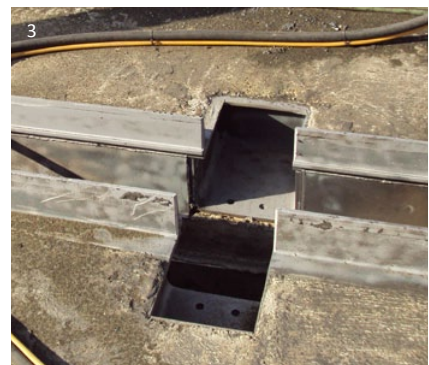
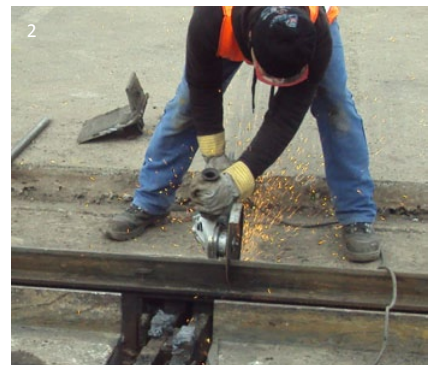
### Preparatory works

Before commencing work, the necessary road/lane closures and traffic management are arranged in discussion with the bridge owner, to enable the work to be carried out in one or more phases.

In order that the existing substructure can be treated with new corrosion protection, the asphalt and road waterproofing membrane are removed to a distance of 1 m from the joint. This also enables any rutting of the asphalt to be addressed.

Since the substructures of some joint types have only a shear pin instead of a support bar in the deck shoulder, it may be necessary to create a recess for a new support bar in this area.

To improve access, it may also be necessary to erect scaffolding at the edge of the bridge and to remove safety rails and fencing.



### Highlights – mageba “Box in box” method

- Experienced and qualified personnel
- Carrying out of the complete joint renewal project
- Design, fabrication, installation, maintenance and inspection services
- No impact on the load-bearing structure
- No delay to construction while concrete hardens
- Quicker joint replacement, less impact on traffic and lower costs

- 1 Old 3-gap expansion joint after removal of asphalt and waterproofing membrane at each side
- 2 Cutting to enable the support bars of the old joint to be lifted out
- 3 Substructure after cleaning
- 4 Lifting in of the new structure, consisting of a lamella beam and connected support bars, complete with boxes



# Joint replacement

## Procedure

To optimise the work for all concerned, it is carried out in steps as described below.

### Step 1:

Removal of the old elastomeric sealing profiles and lamella beams (centerbeams), and the steel edge profiles at each support bar location. The top of each support bar box is then cut away, enabling the old support bars to be removed. This also clears the way for the support bar boxes of the new joint to be inserted.

### Step 2:

All parts which are to be retained are first cleaned of rust by hand, to enable their condition to be evaluated, and then cleaned by sandblasting. A primer coat is then applied to the entire remaining sub-structure, and intermediate and surface coats to those parts which will not be welded.

### Step 3:

The new joint, consisting of lamella beams and pre-connected support bars and support bar boxes, is lifted into place and precisely positioned, with the new support bar boxes inside the open boxes of the old joint. Because existing expansion joints sometimes develop rotations, a height difference between the bridge deck and the abutment may become apparent at this stage, which may require the support level within some existing support bar boxes to be adapted. The new support bar boxes are then welded all around into the existing boxes. After this, the welds are cleaned by blasting and given a primer coat.

### Step 4:

Shuttering can now be placed, enabling the spaces between old and new boxes to be filled with fast-drying grout. This ensures that no voids will remain beneath the carriageway, which could later lead to rutting.

### Step 5:

After removal of shuttering, the existing steel edge profiles (including waterproofing membrane connection flanges) are reinstated where removed, and equipped with new connection steel for the elastomeric sealing profiles of the joint.

### Step 6:

Corrosion protection is now applied as necessary, after blasting clean of the welds.

### Step 7:

Finally, the elastomeric sealing profiles of the new joint are inserted and minor cosmetic works are carried out, before the expansion joint can be handed over.

## Replacement in phases

If the expansion joint is to be replaced in two or more phases (e.g. one traffic lane at a time to reduce impact on traffic), then the lamella beams of each phase must be welded together on site using the Secheron process. mageba's installation team has the required certification.

## Final works

To complete the works, the waterproofing membrane is reinstated and the road surfacing is placed at each side of the joint. The support bar boxes in the deck shoulder are also concreted, and the shoulder geometry re-established.

## Acceptance

The works can now be inspected, together with the bridge owner, and handed over.

With the successful completion of the works, mageba demonstrates again and again its competence and innovative spirit in the field of expansion joint renewal.



- 1 View of a support bar box of the new joint, placed inside the larger support bar box of the old joint and welded all around
- 2 View of one new support bar and its boxes, following placing of mortar to fill out the voids between new and old boxes
- 3 New expansion joint during installation, after connection to the structure
- 4 Application of waterproofing to bridge deck at each side of the new joint



# Suggested text for tender requests

## Renewal of an existing modular expansion joint.

Removal of all load-bearing and moving parts of the existing joint, and replacement with a new watertight modular expansion joint of proven quality and durability.

Retention of the existing substructure (concreted-in parts) to support the new expansion joint.

All necessary surface treatment and corrosion protection works are to be included in the pricing. Target thickness of corrosion protection to be 390 µm. All voids between existing and new support bar boxes to be filled with non-shrinking grout, and the deck waterproofing membrane reinstated.

Movement capacity of joint: ... mm.

Price per metre in the direction of the joint's longitudinal axis.

Option: Including cover plates for deck shoulder and parapet in stainless steel (grade 1.4571 or as agreed).

Option: Including noise-reducing surface plates (e.g. "sinus plates") in the carriageway.



- 1 Renewal of a 2-gap modular joint (installed in phases) almost completed
- 2 Traffic management during renewal of a joint in phases (one lane at a time)

## Project references – expansion joint renewals



Inn Bridge Simbach (DE)



Ohrntal Bridge Öhringen (DE)



A8 Wendlingen (DE)



Rhine Bridge Frankenthal (DE)



Hindenburg Bridge (DE)

## mageba Monitoring & Services



Structural Monitoring



Inspection



Testing

