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Britflex BEJ Expansion Joints

Elastomeric In Metal Runners

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Britflex BEJ
Expansion Joints

Market Leaders in Expansion Joint Technology

USL BridgeCare provides a complete service to the civil engineering industry for bridge deck protection which includes the supply and installation of expansion joints and spray applied bridge deck waterproofing membranes.

The bridge expansion joint range of products caters for movements from 20mm through to 330mm and includes the “Britflex BEJ” which is the most popular joint used on the UK’s motorway and trunk road network with over one hundred thousand linear metres currently in use.

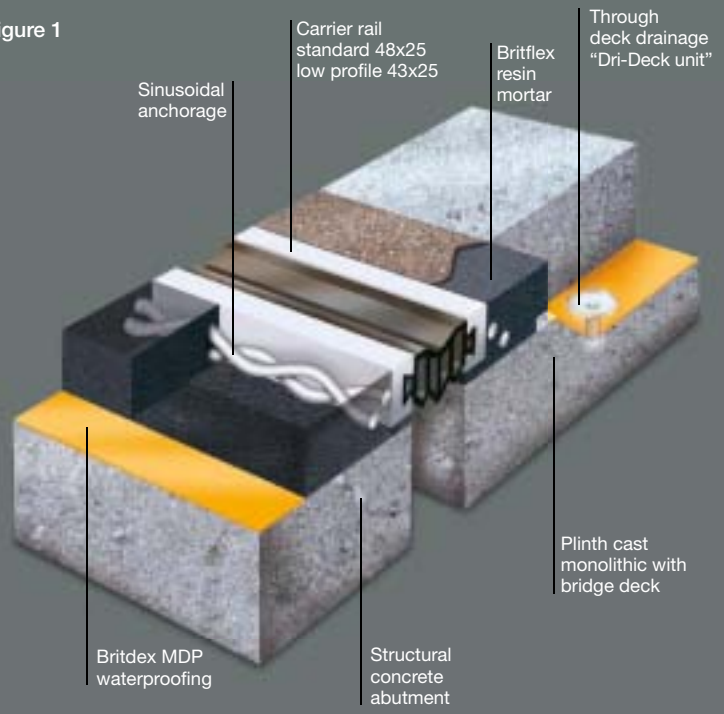
The division also manufactures and applies their Britdex MDP waterproofing system which is a rapid curing, spray applied methyl methacrylate membrane. All of USL’s products have a proven track record and comply with the latest Highways Agency requirements.

Through their technical department USL BridgeCare are able to offer a complete package of services to clients and will review a particular application from initial design to final installation to ensure the selection of the most appropriate and cost effective solution.

HAPAS
Roads and Bridges

FM11022

Figure 1



A close up of the BEJ expansion joint system not normally seen by the travelling public.

The product in brief

The Britflex ‘BEJ’ for Maintenance

The ‘BEJ’ Expansion Joint is a surface mounted mechanical system, with an elastomeric insert between two metal runners or carrier rails. It is unique in that the rails which house the insert are set into a rapid curing elastomeric resin compound known as Britflex Resin Mortar (See figure 1).

Anchorage to the deck is achieved through the excellent bonding qualities of the polyureide resin, without the need for any mechanical fixings. The system has an unrivalled worldwide track record of in service-performance in excess of 30 years.

The ’BEJ’ system is registered with the UK Highways Agency for use on highway bridge decks on all classes of roads and motorways. (Department of Transport BD 33/94: Joint Type 6 refers). The Britflex ’BEJ’ system is included in the Highways Agency list of approved products SA1. Britflex Resin Mortar is also included in SA1 as an approved transition strip material for types 5 and 7 expansion joints. ‘BEJ’ Expansion Joints incorporate cellular elastomeric inserts which are load bearing enabling a range of movement to be accommodated up to 150mm.

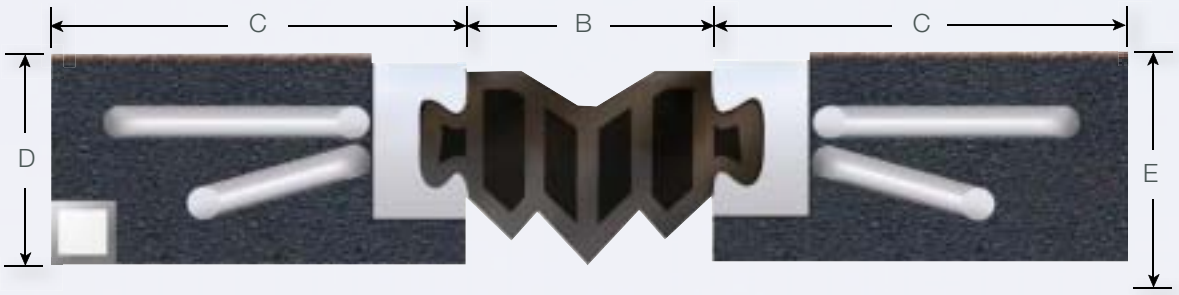
The Britflex ‘BEJ’ is ideally suited for maintenance schemes to replace other failed joint systems. The benefits of rapid on site assembly allow phased working outside peak traffic hours resulting in minimum traffic disruption which results in a significant saving of associated traffic management costs. The track record of the system ensures that future maintenance costs are minimised.

Table 1 - Design detail

BEJ	Movement[4] Capacity		Minimum Nosing Sizes		Norminal[1] Nosing Gap	Minimum Nosing Gap	Maximum Nosing Gap	Cover to[2] Services	Kerb Upstand[5] Clearance	Optional Kerb[3] Detail
	Horizontal	Vertical	C	D	B	B.Min	B.Max	E	X	W
3	35	±12	100	60	45	25	60	70	125+125 tan a	225
5	50	±15	120	60	55	30	80	70	125+135 tan a	270
8	80	±15	140	70	70	30	110	85	125+145 tan a	310
10	100	±15	160	70	90	40	140	105	123+160 tan a	365
13	130	±15	180	70	115	45	175	165	125+170 tan a	405
15	150	±20	200	70	125	50	200	180	125+180 tan a	445

Note: Elastomeric insert changes according to foint size

All dimensions in **mm**



Notes

1. Nominal nosing gap is that selected at average design effective bridge deck temperatures and does not take movement into account other than temperature movements.
2. This is the standard design. Please refer to USL Technical and Advisory Service if a ‘special’ is required.
3. For optional kerb detail based on minimum nosing widths – see figure 8 and specification paragraph xi.
4. For skew movements, greater than ±15mm, please refer to USL Technical and Advisory Service.
5. For clarification of kerb upstand clearance (x) see figure 2 and 3.

Figure 2 Plan on skewed joint

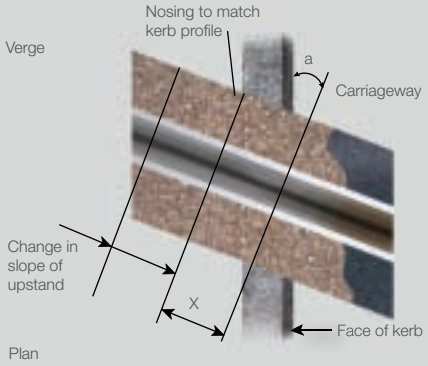
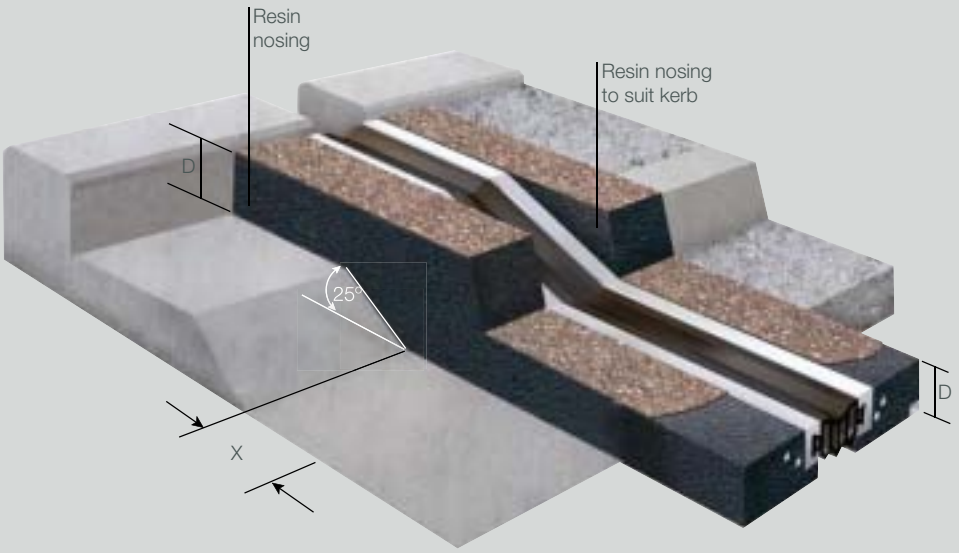


Figure 3 Kerb detail
Note: Upstand plinth reinforced and formed as part of Bridge Deck



Design guidelines

The 'BEJ' is a high performance expansion Joint system which is easy to detail at design stage. The USL's Technical and Advisory Service is however able to assist and advise on all detailing matters, from the most simple to the most complex installations.

Simplicity
Based on essentially three component materials, the 'BEJ' system is flexible and may be adapted in numerous different configurations.

The standard method of installation for new works is to cast the resin nosings directly onto the structural concrete that forms the bridge deck and abutment. Should the deck end and / or abutment require alteration to suit the joint system, the elevation or plinth must be cast monolithically with both.

At the kerbline, the deck and ballast wall should be ramped to deal with the change in level. Details are indicated in Figure 3.

Alternatively the nosing depth may be increased to match the depth of the bridge deck surfacing, both in the carriageway and the verges. However in so doing, attention must be paid to the aspect ratio of the nosing, the passage of any service ducts through the resin mortar and the drainage of the surfacing upstream of the joint.

Flexibility
Britflex resin mortar exhibits excellent bond strength to steel as well as concrete. Therefore the 'BEJ' system may also be placed onto metal deck plates or into a recess provided by metal shelf angle supports. Alternatively the steel carrier rails of the 'BEJ' system may actually be welded directly to the lower steel substrate. (See figure 6) Steelwork should be clean and free from rust. Advice should be taken prior to undertaking this application.

Standard nosings for new works have an aspect ratio of nominally 2:1 in width to depth. When using nosings of the same depth as surfacing, the appropriate width will depend on the joint type, class of road and extent of trafficking but never less than an aspect ratio of 1.25:1 width to depth, if in our doubt please contact our Technical and Advisory Service.

When placing Britflex Resin Mortar around services, the designer should give consideration to the spacing around them.

A minimum clearance of 25mm is required beneath services/sleeves and the top clearance (E) is given in Table 1. This is to accommodate the insert which dips between the nosings at maximum compression. A spacing of 125mm between each duct is required to enable proper construction of the joint. It is normally sufficient to provide a debonding/sleeving arrangement on the abutment side.

Hydraulic Relief
A hydraulic relief may be used to relieve hydrostatic pressure in the surfacing which may occur at the surfacing / nosing interface.

The channel is attached to a flexible tube which is routed either down the expansion gap or into pipework, cast into the deck within the area of the joint.

The channel is not usually required when the expansion joint is at the high end of the bridge deck.

It is recommended that the use of a more positive and larger capacity 'Dri-Deck' drainage system is considered, either in conjunction with or in place of the in joint relief. If this is adopted and the expansion joint is built onto a structural concrete up stand as per figure 1, in-joint hydraulic relief may be considered to be unnecessary.

In order to provide a satisfactory junction to the bridge deck waterproofing system, the membrane should be brought 50mm into the joint area on both sides of the joint.

This is subsequently removed during the installation of the 'BEJ' Expansion Joint and the free edge of the waterproofing sealed with resin at the priming stage.

Movement
Table 1 indicates the basic movement capacity of each joint in the system.

Figure 4 Alternative at kerbline or int parapet recess

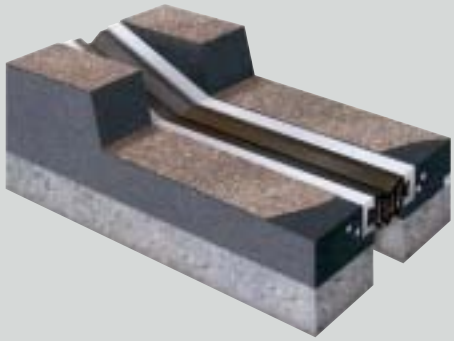
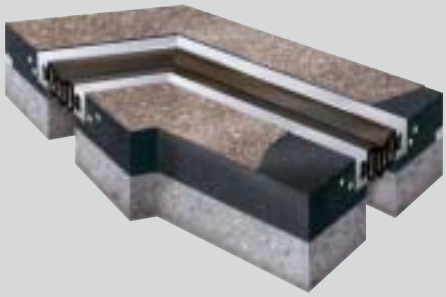


Figure 5 Alternative at change on plan



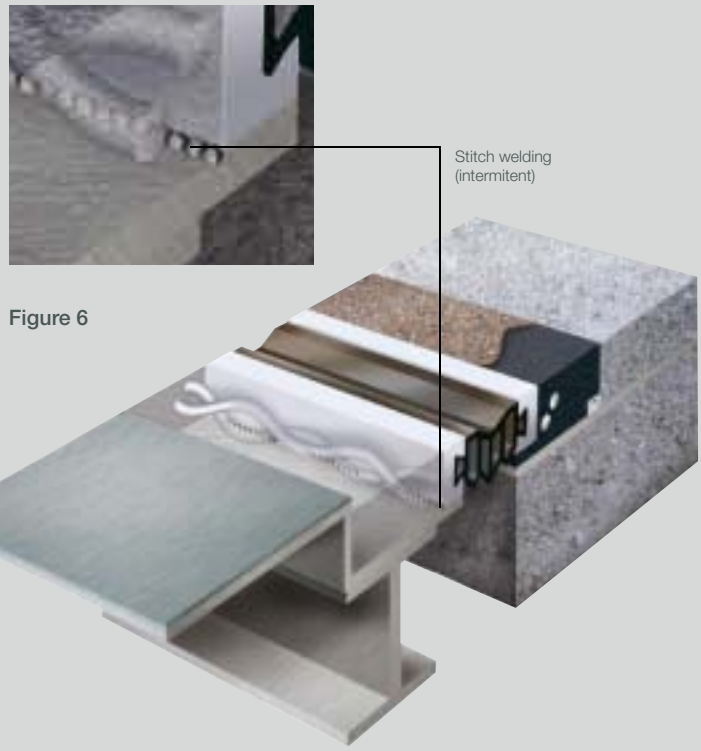


Figure 6

Design detail

a) Carriageway
In new works or when re-surfacing in maintenance schemes, it is necessary to temporarily cover the expansion gap to prevent ingress of materials into the deck expansion gap. Any such coverings should be easily removed when the trench is excavated for the joint.

Temporary saw-cuts into the newly laid surfacing above the deck expansion gap may be required if appreciable deck movement is predicted after surfacing and before joint installation. This may not be necessary when the joint is installed shortly after the surfacing is laid.

b) Verges
Granular verge and central reserve construction immediately adjacent to the joint is not recommended.

A concrete verge infill is recommended adjacent to the joint and a trench should be formed to accommodate the required joint width.

If flexible surfacing is required over any verge concrete the prepared trench may be temporarily backfilled and the position of the trench referenced on the kerb and parapet by the main contractor.

Any newly placed concrete should be nominally seven days old and cured in accordance with the contract. Concrete of at least grade 30 is recommended.

c) Service Ducts
Any service ducts passing through the joint should be properly sleeved to prevent leakage and articulated to the Engineers details.

Ducts and sleeves may be in uPVC or other similar materials provided they do not appreciably soften below 80ºC. Cables should not be drawn until after the joint is installed, if at all possible.

Ducts/sleeves through the 'Britflex BEJ' require a minimum of 50mm clearance above the deck and spaced 125mm between each other to allow continuity of the resin mortar material. Where there are 4 or more ducts present in any one verge/footway further advise should be sought from a USL technical advisor.

d) Kerbs
Kerbs should be laid starting flush with and working away from the expansion gap. The kerbs are saw cut to the appropriate trench width and removed during the joint installation.

Proprietary continuous kerbline side entry gully systems may be used in conjunction with the BEJ Expansion Joint. Expansion units are available which are compatible with the BEJ system. Advice should be sought from USL or the manufacturers of the side entry gullies at the design stage.

e) Footway Areas
Kerb cover plates or footway cover plates can be provided as an optional addition. The USL Technical and Advisory Service should be consulted regarding their inclusion.

Other Applications

i) As an improvement over asphaltic plug joints for low movement joints in heavily trafficked areas. On heavily skewed joints or steeply graded carriageways, however the NJ system may prove to be more suitable (see NJ literature for more information).

ii) As a longitudinal joint between two deck halves, however the LJ system may be more suitable (see LJ literature for more information).

iii) On building structures, car parks and elevated ramps with a need for heavy duty expansion systems.

iv) On marine quayside structures

v) On footbridges, however the UCP system may be more suitable.

vi) Britflex Resin Mortar may be used for new and replacement transition strips to elastomeric joints and general carriageway ironmongery. It may also be used as a transition to the metalwork of existing proprietary expansion joints where the adjacent surfacing is distressed.

Figure 7

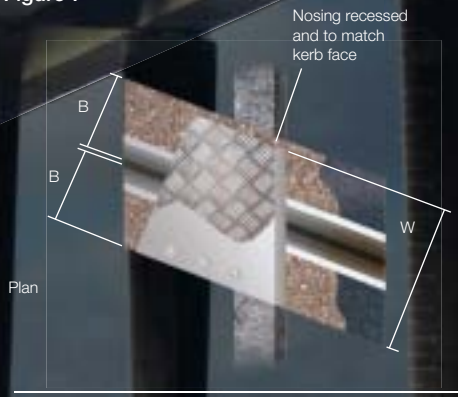
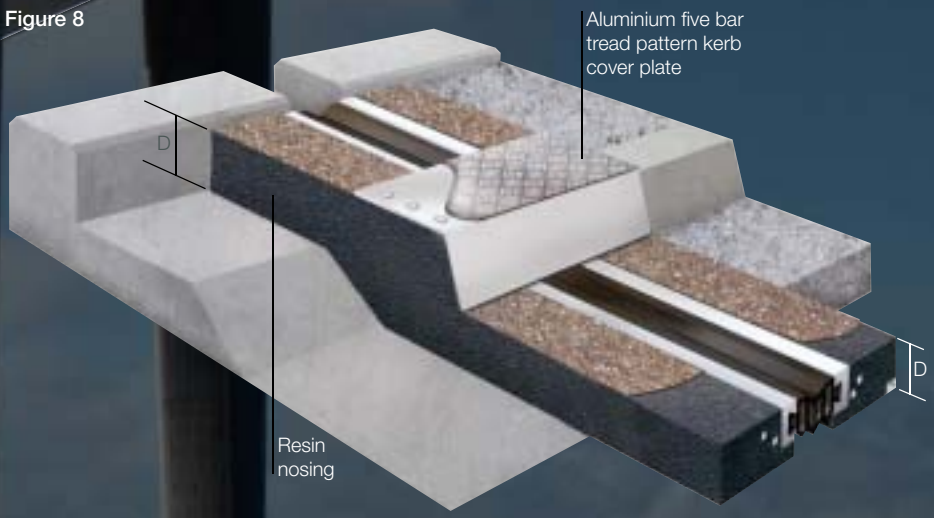


Figure 8



Specification for The 'BEJ' Expansion Joint

Materials

i) **Polyureide Resin**
The Britflex Polyureide Resin is a two part liquid system comprising one clear component (Base) and one black (Hardener). Packed in colour coded drums.

ii) **Aggregate**
The aggregate is a graded mix supplied in 20kg sealed plastic bags.

iii) **Carrier Rails**
The metal rails are supplied in either mild steel to EN10025:2004 Grade S355J0 with factory applied corrosion protection. Stainless steel rails are available at an additional cost. The rails are nominally 25mm wide x 48mm deep with welded sinusoids to provide anchorage into the Britflex Resin Mortar. The rails are generally delivered in 7500mm lengths and cut to length on site.

For special applications a 25mm wide x 43mm deep carrier rail is available.

iv) **Kerb Units**
The metal carrier rails are cut, mitred and welded on site, to suit the kerb upstand detail.

v) **Elastomeric Insert**
The extruded EPDM insert is available in various sizes, each capable of accommodating a different range of movement. The inserts are supplied in coils of lengths between 25 to 60m.

vi) **Hydraulic Relief**
Standard hydraulic relief channel is 20 x 20mm square aluminium tubing, in 5 metre lengths. The channel has 11mm diameter holes drilled on one face at 90mm nominal centres.

If specified, the channel is installed to the deck side of the joint along the carriageway length.

vii) **Discharge Tube**
When an in-joint hydraulic relief channel is specified, this is terminated with a braided PVC flexible tube with a 25mm internal diameter (32mm external diameter), discharging to a suitable collection point.

viii) **Polystyrene**
25mm and 50mm sheets of expanded polystyrene are cut to size to form a temporary shutter in the expansion gap between the nosings and also in the kerb area.

ix) **Spacer Plates**
The spacer plates set the rails at the appropriate gap setting during installation.

They are available in 5mm increments.

x) **Strongbacks/Hangers**
The spacer plates are connected to the hangers which suspend the rails over the expansion gap at carriageway level.

xi) **Kerb/Footway Cover Plates** (Optional Additions)
These may be supplied fabricated from 4.5mm thick aluminium plate with five bar tread pattern.

iv

viii

x

xiv

Installation

a) General steps in the installation of the 'BEJ' Expansion Joint

i) The two resin components are warmed in oil jacketed gas/diesel fired heaters and maintained at 65° - 85°C

ii) The width is marked out on the asphalt surfacing and saw cut to provide a trench in the carriageway. The trench width will depend on the selected nosing width, type of joint and the required gap setting.

iii) The surfacing or the existing failed joint is broken out and removed.

iv) The concrete deck and any previously formed recess in the verge/central reserve is lightly scabbled and/or wire brushed and substandard asphalt/ concrete removed.

v) All loose arisings and any standing water are removed with compressed air.

vi) All exposed surfaces should be dried before priming, by using compressed air and/or hot air depending upon the weather conditions.

vii) If hydraulic relief is specified, prime beneath the position of the drainage channel with a mix of the two resin components. (See section xi). The channel is fixed with masonry nails into the surfacing and protected from the resin ingress with masking tape. The flexible discharge tube is then fitted at the low end of the channel and routed appropriately.

viii) The polystyrene shutter is cut to size and placed in the expansion gap, ensuring it is firmly in the gap. The complete trench is then primed with the resin mix (See section xi).

ix) The carrier rails are cut and welded to suit any general changes in level or direction.

x) The rails are positioned on spacer plates of the selected size, attached to the hangers/ strongbacks, positioned over the expansion gap and set for line and level.

xi) The polyureide resin is batched from calibrated jugs of the two components and mixed with a powered paddle until homogeneous and streak free.

xii) The resin mortar is batched by first pre-heating one 20kg bag of aggregate to approximately 70°C in a powered mixer. One batch of the resin compound (see (xi)) is then added and mixed until homogeneous.

xiii) If required a measure of 'Aerosil' may be added towards the end of the mixing cycle to stiffen up the mix for placing in steeply graded areas.

xiv) The resin mortar is placed into the prepared trench in the carriageway and trowelled flush with the rails and surfacing.

xv) Apply an anti skid aggregated scatter to the resin mortar prior to full cure.

xvi) Once a suitable length of joint has been poured curing hoods may be erected over the joint and hot air applied.

xvii) The resin mortar will cure after two to three hours at approximately 70°C. It is then allowed to cool before the spacer splates, hangers and polystyrene shuttering are removed.

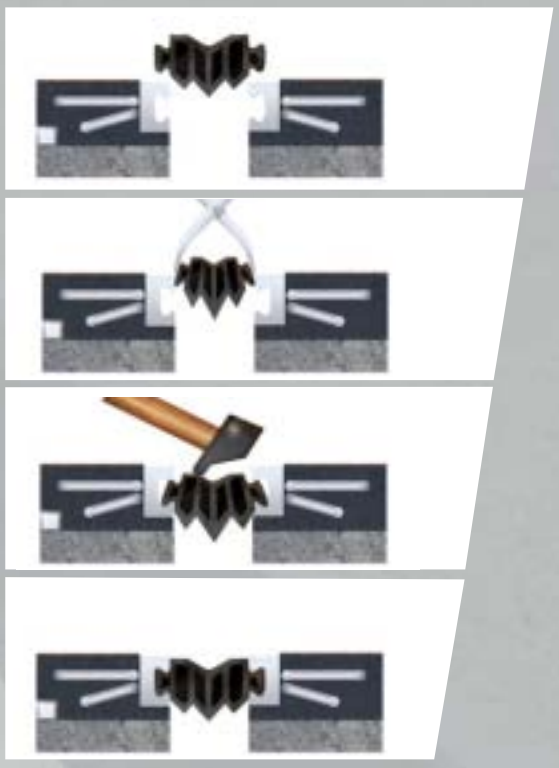
xviii) The sections of joints in the verges/central reserve are installed in a similar manner.

xix) The elastomeric insert is installed using compression tongs into the carrier rails.

xx) If specified, any kerb cover, footway or parapet plates are fitted.

xv

xix



Installation

b) Weather and Temperature Criteria

The polyureide resin may be installed in temperatures of up to 50°C. It is not affected by freezing, but care must be taken to ensure the substrate is frost free and sufficiently dry before the priming stage.

Once the exposed surfaces have been primed, the joint is effectively sealed. At temperatures below 5°C the resin will be dormant until heat is applied. At warmer temperatures, the resin will cure unaided.

Britflex Polyureide Resin does not emulsify in water. Consequently the resin mortar may be placed with care in periods of rain, provided the resin is placed in such a way as to prevent water from being trapped in the trench.

The preliminary operations of saw cutting and breaking out can be undertaken during inclement weather.

c) Time lag after completion and before opening to traffic

Once the resin mortar has cured the elastomeric element can be inserted and the joint opened to traffic. During phased working the joint can be opened to traffic after curing with or without the elastomeric element in place to suit the sequence of installation and minimise traffic disruption.

d) Other Notes

When the 'BEJ' system is bonded to steel, this should be prepared by grit blasting or mechanically abrading just prior to the priming operation.

The 'BEJ' insert should be protected from white-lining materials, e.g. with sand.

Additional Information

Notes
The colours used in the illustrations may not be indicative of the finished product.

USL BridgeCare reserve the right to update and improve the 'BEJ' Expansion Joint and its specification without notice and Engineers and Contractors should satisfy themselves that they have full and up to date information.

Britflex is a registered trade mark of Universal Sealants (UK) Limited.

Technical & Advisory Service
Further technical information may be obtained on request and consultation is encouraged to ensure choice of materials selected and detailing are optimised to suit in-service performance requirements and economic solutions.

Health & Safety
USL BridgeCare operate a strict policy on health and safety and details are available on request.

The Britflex 'BEJ' System is also approved in the following countries

- Ireland
- Hong Kong
- Singapore
- China
- Brunei
- Philippines
- Russia
- Malaysia
- Indonesia
- Kuwait
- Denmark
- Greece
- Switzerland
- Australia
- South Africa

USL Product Range

Expansion Joints

- **Uniflex Expansion Joint**
  (BD33/94: Type 1: Buried Joint Under Continuous Surfacing)
- **FEBA HM**
  (BD33/94: Type 2: Asphaltic Plug Joint)
- **NJ Expansion Joint**
  (BD33/94: Type 4: Nosing joint with Preformed Compression Seal)
- **Transflex, Waboflex & Euroflex**
  (BD33/94: Type 5: Reinforced Elastomeric)
- **LJ**
  Longitudinal Joint System
- **UCP**
  Footbridge/Pedestrian Joint System

Bridge Deck Waterproofing

- **Britdex MDP**
  Methyl Methacrylate (MMA) Waterproofing Membrane
- **Britdex CPM**
  Combined Waterproofing and Anti Skid Surfacing
- **Britdex CPM Tredseal**
  Combined Waterproofing and Wearing Course

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