



**STANDARD FOR  
MECHANICAL EXPANSION JOINTS**

**Produced by**

**THE BRIDGE JOINT ASSOCIATION**

**(Issued May 2003)**

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## OBJECTIVES OF THE BRIDGE JOINT ASSOCIATION

The effectiveness of bridge expansion joints may be very significant in the life expectancy of bridges. Recognition of the need for high standards of waterproofing to prevent the ingress of water, chlorides and other waterbound contaminants into bridge structure has focussed attention on the importance of effective bridge expansion joints.

The Bridge Joint Association members are the leading United Kingdom specialist manufacturers and installers whose primary aim is to raise and maintain standards within the industry.

The Association's main objectives are:

- To foster research and technical development
- To maintain and improve standards of design, manufacture and installation
- To co-operate with Government Departments and Agencies, Public Authorities and others who are concerned with the use of bridge joints
- To represent the interest of the UK bridge expansion joint industry in the preparation of British Standards, European Standards and other developments within the European Union.

### Notes:

- a) *In furthering the objects of the Association, as set out above, neither Members nor the Association shall be required or are recommended to observe any restriction, act or practice which would or might make this Association registerable under the Restrictive Trades Practices Act or The Competition Act.*
- b) *The Bridge Joint Association wishes to emphasise that the contents of this report are the collective views of members and are believed to be accurate. However, all readers and users of this publication should carry out any necessary checks on each specific project or contract in terms of technical relevance and health and safety issues as BJA cannot accept any liability however caused.*

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# **BJA POLICY STATEMENT**

## **MECHANICAL EXPANSION JOINTS**

### **1. GENERAL**

1.1 The Bridge Joint Association (BJA) incorporates the main manufacturers and installation contractors of Mechanical Expansion Joints as defined by the PIARC heading for such joints adopted by the Highways Agency in the “Type Approval List” SA1. Whilst every mechanical joint system varies in detail, an overall design criteria is adopted by each individual member of our Association and is adhered to through the principles of the BJA.

### **2. APPROVAL AND INFORMATION**

2.1 All Mechanical Joint Systems will be registered by the Highways Agency in their Manual of Contract Documents for Highway Works SA1/98 or any superseded editions. They will further conform to the published requirements of the List of Approved and Registered Products.

2.2 All BJA members will issue either a method statement for a particular installation or contract or a general technical publication of their product to cover its uses and design parameters.

### **3. DESIGN**

3.1 The particular joint offered is to suit all the known or calculated recoverable and non-recoverable movements. It will be capable of pre-setting to ensure installation is completed at a calculated measurement to prevent stress during the working life of the joint. Alternatively, the elastic capacity within the joint module will be sufficient to accommodate all design movements without the necessity to pre-set.

3.2 All decks should incorporate sub-surface drainage during design. Nevertheless all mechanical joints should have a capacity to incorporate their own drainage when it is required. Discharge is to be made into the existing structural drainage or to a point which will not present a hazard or contamination to any part of the structure.

3.3 When called for by the designer, mechanical joints should be capable of incorporating a secondary waterproof system of continuous membrane beneath the expansion joint modules.

3.4 The mechanical joints are to meet the General Requirements of Highways Agency in their Design Manual for Roads and Bridges, Section 3 part 6, Reference BD33/94.

### **4. MATERIALS**

4.1 Materials selected and used in the construction and installation of joints must be of sound and reliable quality, meeting the appropriate British Standard for those

products. They must be capable of ensuring that the installed joint will function correctly without the need for excessive maintenance during its working life.

- 4.2 Materials used or permanently incorporated in joint systems should be non-corrosive, plated or painted with corrosive resistant products. Such products should be identified in the suppliers method statement or technical publication together with the relevant conforming British Standard.

## 5. **INSTALLATION**

- 5.1 The wearing surfaces of mechanical joints will be finished slightly below the completed road surfacing. Within the tolerances of surfacing, the installation may be permitted to be flush with the surfacing but never proud of it.
- 5.2 The existing air gap of the structure must be kept clear of any debris arising as a result of the preparation or construction of the gap. Where it is practical to do so, any temporary fillers will be removed.
- 5.3 During installation mechanical joints must not be directly trafficked until all of the encapsulating resins or concrete have attained sufficient strength. When instructed, some of the systems can be subject to artificial heating. (It is essential to refer to the individual manufacturer or supplier for information if this is under consideration). During setting the installation must be protected or isolated by plating.
- 5.4 Installation is to be conducted by an approved contractor of the BJA or directly under the supervision of the Agent or supplier of the joint type.

# BJA STANDARD FOR MECHANICAL EXPANSION JOINTS

## FOREWORD

This standard is one of a series of standards that cover the range of proprietary bridge expansion joints that are approved and installed in the United Kingdom.

The performance of bridge joints is affected by temperature and traffic volume, together with the nature of the traffic. Both must be determined prior to selection of a type of mechanical joint. Different joints will have advantages and disadvantages. When selecting a joint type the user or specifier should take into reasonable account the “whole life costing” of a joint system and the necessity of regular or long-term maintenance.

When considering the design of a bridge, the Engineer should make provision to be able to inspect the movement joint and bearings. Provisions must be made for general deck drainage and, where practical, a linkage provided between the drainage to the immediate joint area and the deck drainage. Water and contaminants should be collected and discharged so that they feed into the general drainage of the structure.

This standard is sub-divided into sections of mechanical expansion joints and defined by their generally recognised generic categories as follows in accordance with BA26/94:

- Type 3/4 N - Nosings
- Type 5 REJ - Reinforced Elastomeric
- Type 6 EMR (CI) - Elastomeric with metal runners. Cast into the deck
- Type 6 EMR (RE) - Elastomeric with metal runners. Resin encapsulated or bolted on
- Type 7 CT - Cantilever Comb or Tooth

*(Note: Type 2 is included in the companion Standard for Asphaltic Plug Joints)*

## DESIGN INFORMATION

The following criteria require consideration by the design engineer prior to the selection of the mechanical movement joint:

- Cyclical movement
- Non-recoverable movement
- Temperature range
- Traffic flow
- Speed limit
- HGV count
- Cyclists and pedestrian traffic
- Skew angle of joints
- Noise and environmental considerations
- Gradients and cross falls
- Configuration of joint - depth/width/length
- Linkage with deck waterproofing
- Drainage
- Services

## **INFORMATION PROVIDED BY JOINT SUPPLIER**

The supplier shall provide the following printed information for each type of joint system:

- Description and proprietary name of joint
- Horizontal movement capacity
- Vertical movement capacity
- Size of units or combined modular parts
- Minimum size of recess required to place joint
- An assessment of the time for protection of installation until serviceable.

## **STRUCTURAL DESIGN AND DECK PREPARATION**

### **Adjoining Surfaces**

The joint system should be surrounded by solid materials, asphalt surfacing or reinforced concrete. With certain systems the verges and central reserve can contain granular fill. Advice should be obtained from the joint supplier.

### **Concrete Surfaces**

All concrete should be reinforced and minimum Grade 30. New concrete must be fully cured with hessian and polythene for at least 7 days. Any additives included must not be incompatible with the joint system or affect the bond of resins, adhesives or other fixing materials used for the installation.

### **Air Gap**

There must be a continuous uninterrupted separation in the structure below the bridge joint.

### **Kerbs and Verges**

The joint is to be taken through the kerb and verge to terminate at the front edge of the parapet or into the parapet wall. A box-out section equivalent to the overall size of the selected joint must be left for this purpose.

### **Service Ducts and Kerb Drainage**

Service ducts and kerb drainage must be so designed that they do not interfere with the installation and moving parts of the selected joint. All ducts and drainage units must include sleeves which are adequately sealed to prevent resin migration.

Ducts will normally be fed under the joint. Resins, beds and transition materials associated with the joint installation will encapsulate an inflexible section of duct. Sufficient room must be left under ducts to ensure proper consolidation of the resins, bed or transition sections. Where ducts are placed into a purpose built channel or trough, provision must be made to support the selected mechanical joint in this area.

## **Deck Repairs**

Most minor spalls or damage on bridge decks or to the top of abutment walls can be repaired with the resin beds or encapsulation resins of the selected joint. Any major repairs within the area of the expansion joint must be rectified structurally, and if necessary include additional resin or concrete. Separate repairs are to be undertaken following the principles outlined in The Concrete Society Technical Report No 26.

## **SPECIFICATION**

### **SCOPE**

This standard provides separate requirements, conditions and testing for each of the individual generic categories of Mechanical Bridge joints.

### **REFERENCES**

- |         |  |
|---------|--|
| BA26/94 | Expansion joints for use in highway bridge decks<br>Highways Agency departmental advice note |
| BD33/94 | Expansion joints for use in highway bridge decks<br>Highways Agency departmental standard.   |

# NOSING JOINT (N)

## FOREWORD

The standard for nosings on bridge joints is prepared by the Bridge Joint Association and is based on the experience of products installed by their members. Nosings are plinths constructed at the edges of movement and fixed end joints with their top surfaces level with the finished surfacing and their base adhering directly to the structural bridge deck, curtain wall or to integral reinforced concrete plinths cast with the deck.

The inside faces of the nosings receive either flexible compression seals or suitable flexible sealants and must be suitable to receive vehicular traffic and resist contamination.

## DEFINITIONS

### Reactive Resins

These will consist of two or three components pre-weighted and graded into their separate components of a) Resin; b) Hardener; c) Fillers. These components will be mixed on site in accordance with the manufacturer's particular instructions but always mechanically in an approved forced action mixer. Materials will be laid in pre-prepared trenches formed centrally over a movement joint and constructed such that the air gap follows the line of the structural joint and is adjusted by removable shuttering to suit the movement accommodation and seal to be inserted between the nosings.

### Cementitious Resins

These will be a blend of cements, aggregates and modifiers all pre-batched in quality controlled conditions and filled into waterproof containers. Mixing on site will be in accordance with the particular manufacturer's conditions but with an approved forced action mixer. Materials will be laid in prep-prepared trenches formed centrally over a movement joint and constructed such that the air gap follows the line of the structural joint and is adjusted by removable shuttering to suit the movement accommodation and seal to be inserted between the nosings.

### Caulking

A compressible foam or sisal placed in the structural air gap to prevent bridging during placement.

### Shuttering

Collapsible purpose built components constructed so as to form the required configuration of the completed nosings.

### Priming or Tanking

The coat of resin placed to all surfaces which are to be permanent adhesive faces for the completed nosing.

### Deck Joint Gap

The gap between the adjacent spans in the bridge decks or deck and adjacent curtain wall.

## **Expansion Joint Gap**

The gap formed between the nosings dictated by the calculated movement of the structure, the date of construction and time/temperature of the installation.

## **Drainage**

- i. Tubes placed in the deck at construction immediately in front of the movement gap or formed by diamond drilling in a completed deck
- ii Channels placed through the base of the nosings transverse to the joint and taken through the air gap (optional)
- iii. Perforated channels placed longitudinally at the base of the nosing towards the deck waterproofing and connected at the verges to devices for purging (optional).

## **Surfacing**

All composite materials placed on the structural concrete to form the finished level of the bridge deck.

## **Material Requirements for the Permanent Works**

These will conform to the manufacturer's stated requirements, be stored in dry conditions in waterproof containers and used within their stated shelf life. All resins, aggregates and fillers will be the best of respective kind and conform to the appropriate British Standards or revised equivalent European Community Standards.

## **Seals and Sealants**

All compression seals will be of sound materials with load bearing capacities sufficient to meet the traffic conditions without deformation, collapse or dislodgement for their working life. Seals must be resistant to hydrocarbon and chloride contamination. All poured sealants will be fuel resistant and conform to BS5212 or revised equivalent European Community Standards.

## **Drainage**

All components used in drainage must be non-ferrous or galvanised and compatible with any construction product of the permanent works.

## **Temporary Constructions Products**

All materials required for caulking and constructing the nosings or forming the gaps must be of sound proven quality, clean and not contaminate the permanent works. No temporary materials will be re-used unless they can first be shown to meet these conditions.

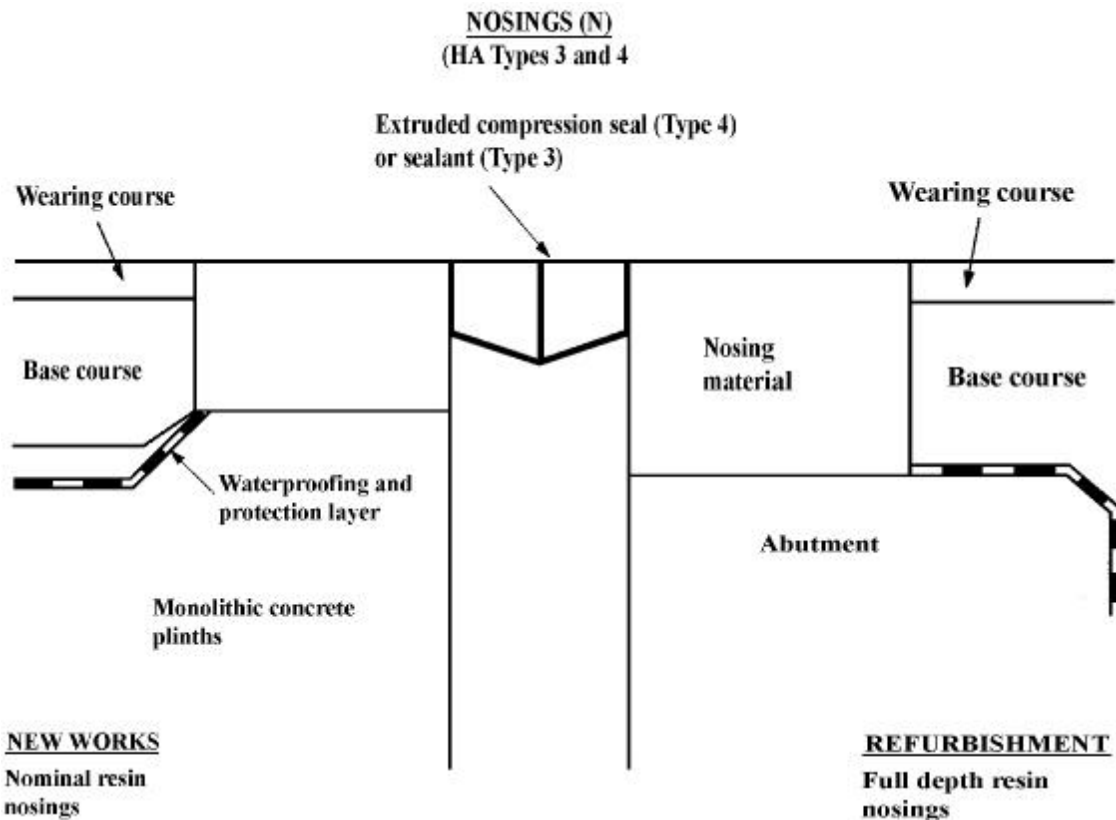
## **Quality Control**

The manufacturer, agent or distributor for the materials will operate quality assurance procedures to ensure that the products meet the requirements of this standard and any statutory standard required by the Industry. The installer will ensure that the products are placed in the works in a competent and efficient manner and in accordance with relevant Codes of Practice. They will also be required to follow the installation instructions issued by the manufacturer, including the stated width/depth ratio determined by the supplier of the bridge joint system selected.

## Information Provided by the Supplier

The supplier of the proprietary nosing material or their Agent will provide the following information:

- Definition of the product and its name
- Movement capability of the sealant or seals used
- Outline description of the chemical base of the resins and fillers used in the product
- Requirements for the Control of Substances Hazardous to Health (COSHH)
- Method Statement.



### Description

In situ resins or modified cementitious mixtures placed either side of the bridge deck air gap to produce firm edges and protect the surfacing. Complete with watertight extended compression seal or sealant.

### Movements

Up to 50mm with preformed seals  
Up to 12mm with poured sealant to BS5212

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# REINFORCED ELASTOMERIC (RE)

## FOREWORD

Elastomeric movement joints must be designed to fulfil the design conditions of BD33/94 whilst being structurally robust to withstand the traffic loads, these are summarised below.

1. The imposed vertical loading taking a nominal load as a single wheel load of 100kN or a 200kN axle with a 1.8 metre track. The load from each wheel shall be uniformly distributed over a circular area assuming an effective pressure of  $1.1\text{N/mm}^2$  (ie 340mm diameter). Horizontally a nominal traffic load shall be taken as a uniformly distributed load of 890kN/m run of joint.
2. BS5400 should be used to determine the accumulative range of movements imposed by:
  - Expansion and contracting caused by temperature cycles using BS5400 Part 2 implemented by BD37.
  - Residual creep and shrinkage and its relationship with the setting dimensions at time of installation using BS5400 Parts 4 and 5 implemented by BD24.
3. Rotation caused by deflection under loading.
4. Braking forces transmitted to deck structure.
5. Elastic shortening due to compression following expansion of structure.
6. Good riding quality and have skid resistant wearing surface at road level.

Low resistant to extension and compression is provided by the neoprene body deforming in shear which minimises the transmission of loads to the abutment through the holding-down bolt system. The top riding or bridging surface must provide a hard wearing skid resistant surface with durable wearing characteristics for long service life from wheel loads.

## DEFINITIONS

### Elastomeric Joint

Segmental joints comprising natural or synthetic rubber with reinforcing angles and plates bolted to the structure to provide a riding plate capable of taking the traffic loadings and movement ranges.

### Bedding Mortar

Bedding mortars, either resin or polymer modified cementation, are to be impermeable to water and used to provide the correct line and level from the finished road level.

### **Resin Capsules and Studding**

Polyester or epoxy resin capsules and galvanised, zinc plated or stainless steel studding placed in drilled or formed pockets to the concrete deck to fasten segmental joints.

### **Drainage Membrane**

Elastomeric drainage sheet with drainage pipes fastened under the segmental joints and caulked with sealant to collect and discharge percolated water safely to a collection point.

### **Transition Joint**

Resin mortars which provide a protection to the Elastomeric joint and improve ride characteristics.

### **Bolt-Hole Sealant**

Durable elastic plug to protect the fixings from corrosion and minimise traffic wear on the rubber body of the module.

### **Pre-fabricated Kerbs**

Factory produced kerb units to suit the bridge profile, cross-falls and skews.

### **Cover Plates**

Galvanised steel or aluminium plates of appropriate thickness to suit joint width and traffic loadings to protect kerbs subject to wheel attrition on tight radius curves or to cover skewed kerbs where a simpler fabrication is required. Also used for footpaths to cover rebates in joint profiles.

### **Sub-surface Drainage**

Unless the system can be shown to be continuous and watertight in its final position, a system for draining water from within the surfacing which is independent of the bridge joints should be provided.

### **Surfacing**

Carriageway or footway wearing course and base course materials.

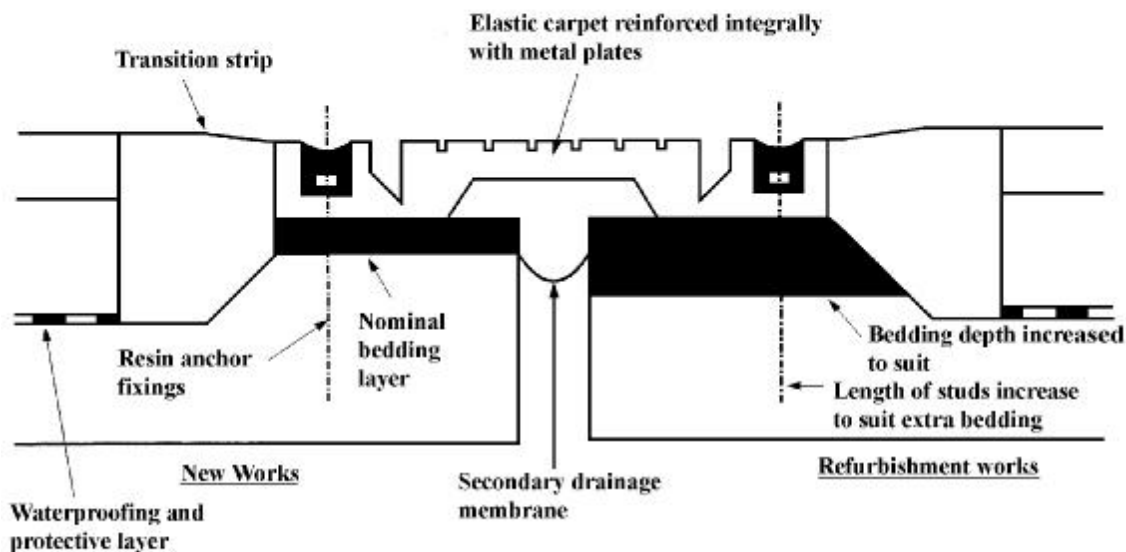
## **MATERIAL REQUIREMENTS OF PROPRIETARY JOINT MATS**

### **Generally**

Each proprietary mat section is manufactured to an individual design of the named supplier. The rubber, steel or aluminium inserts, bedding material, washers, fixings, bed, transition strips and secondary seals are registered with the Highways Agency. Information on the component parts of the composite mat sections or other associated materials used in the installation will be contained in the technical brochures of the manufacturers, or can be supplied on request.

## REINFORCED ELASTOMERIC (RE)

(HA Type 5)



### Description

A joint prefabricated to exact widths and lengths, comprising of rubber surrounding metal elements, bearing plates and reinforcement. Placed onto flat beds with resin transition strips either side as protection and to provide a smooth running surface. Bolted directly to the structural concrete.

### Movement Range

Up to 350mm. Different widths of carpet impose limitations on movement accommodation. Consult supplier.

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# ELASTOMERIC WITH METAL RUNNERS - CAST-IN (EMR-CI)

## FOREWORD

Elastomeric in metal runners - cast-in expansion joints must be designed to fulfil the design requirements of BD33-94 and be structurally robust to withstand the traffic load. In particular the safe transmission of traffic loads from the edge beam into the structure concrete via anchors connected to the edge beam. Low resistance to extension, compression and articulated movement is provided by the pre-formed neoprene strip seal, whilst also providing a watertight connection. Under the Highways Agency, Highways and Traffic Departmental Standard BD33/94 Mechanical Expansion Joints must be capable of accommodating the following:

1. **Loads - Vertical**

The nominal load shall be taken either as a single wheel load of 100kN or 200kN axle with a 1.8 metre track. The load of each wheel shall be uniformly distributed over a circular area assuming an effective pressure of  $1.1\text{N/mm}^2$  (ie 340mm diameter).

2. **Loads - Horizontal**

The nominal traffic load shall be taken as a uniformly distribution load of 80kN run of joint.

3. BSEN5400 should be used to determine the accumulative range of movements imposed by:

Expansion and contraction caused by temperature cycles as per BSEN5400 Part 2 as implemented by BD37.

Residual shrink and creep and its relationship with the setting dimensions at the time of installation using BSEN5400 Parts 4 and 5 as implemented by BD24 and BD16.

4. Rotation caused by deflection under loading.

5. Braking forces transmitted to the deck structure.

6. Elastic shortening due to compression following expansion of structure.

7. Good ride quality .

## **DEFINITIONS**

### **Elastomeric Joint in Metal Runners**

Joint assemblies comprising of a watertight elastic seal in steel runners with anchors welded to same, comprising of a plate and loop cast into the structure concrete.

### **Fabrication**

The edge beam/rails are factory produced to suit the bridge profile, cross-falls, skews and kerbs. The completed assemblies then have a protected paint system applied in accordance with the relevant Highways Specification.

### **Cover Plates**

Galvanised durbar steel plates of the required thickness to satisfy the accidental wheel loading requirements can be used for footpaths to minimise tripping hazards for pedestrians.

### **Sub-surface Drainage**

A system of drawing water from within the surfacing which is independent of the bridge joint should be installed.

### **Waterproof Membrane**

A structure waterproof system that is carried over from the bridge deck and sealed on the joint edge beam flange.

### **Surfacing**

Carriageway and footway wear course and base materials.

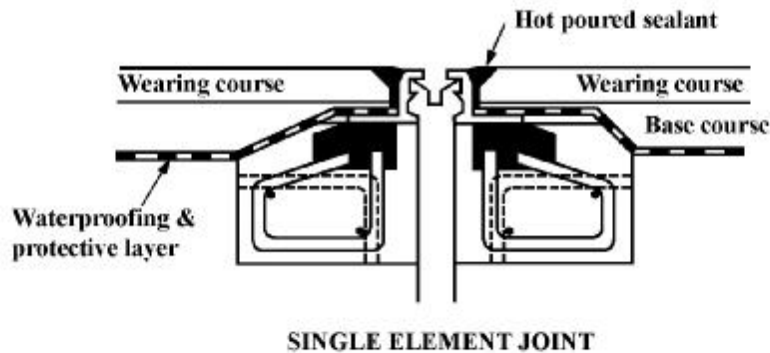
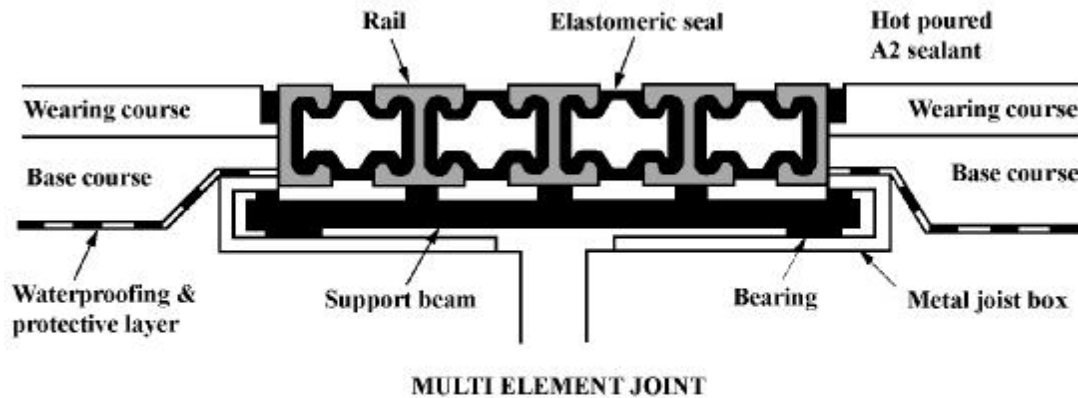
#### **4. Material Requirements**

- 4.1 Edge beam steel rails
- 4.2 Elastomeric profile or gland seal
- 4.3 Steel anchor loops
- 4.4 Equalising elements between rails

#### **1. Additional Requirements**

- 5.1 Craneage for unloading and positioning
- 5.2 Additional rebar and fixing
- 5.3 Setting jacks (installation crew kit)
- 5.4 Quality infill concrete
- 5.5 Waterproofing to edge of joint
- 5.6 Surfacing to edge of joint
- 5.7 Transition sealant to edge of rail.

**ELASTOMERIC WITH METAL RUNNERS CAST INTO DECK (EMR-C1)  
(HA Type 6)**



**Description**

A combination of prefabricated machine extruded rails with rubber seals between them. Can be a single element or multi-element. Fixed to the reinforcement of the structure and cast into insitu concrete.

**Movement Range**

Up to 80mm Single element  
Up to 100mm Multi-element

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# ELASTOMERIC ELEMENT WITH METAL RUNNERS RESIN ENCAPSULATED (EMR-RE)

## FOREWORD

The standard for Elastomeric Element in Metal Runner RE Type is based on the experience of products installed by their members. Resin Nosing encapsulating a metal carrier rail are plinths constructed at the edges of movement and fixed end joints with their top surfaces level with the finished surfacing and their base adhering directly to the structural bridge deck, curtain wall or to integral reinforced concrete plinths cast with the deck.

The inside face of the nosing encapsulating the metal carrier rail receives a flexible EPDM load bearing seal that can operate in both tension and compression, and be suitable to receive vehicular traffic and resist contamination.

The flexible EPDM sealing element is provided in different sizes as required to accommodate the anticipated movement criteria.

In principle EMR RE joints of various manufacturers utilise a metal carrier rail firmly anchored into the resin nosing with either stud connectors or sinusoidal reinforcement. The carrier rail produced by each supplier is constant for each manufacturers product range.

The dimensions of the encapsulation resin or nosings either side of the rails will have a minimum depth and width. These are specified by the supplier or manufacturer of the joint system. Maximum depths and widths are generally not restricted and the appropriate resin will be used to fill the void surrounding the surfacing and structure.

## DEFINITIONS

### Reactive Resins

These will consist of two or three components pre-weighted and graded into separate components of a) Resin; b) Hardener; c) Fillers. These components will be mixed on site in accordance with the manufactures particular instructions but always mechanically in an approved forced mixer. Materials will be laid in pre-prepared trenches formed centrally over a movement joint and constructed such that the air gap follows the line of the structural joint and is adjusted by removable shuttering to suit the movement accommodation and seal to be inserted between the nosings.

### Carrier Rails

Mild steel\* corrosion protected extruded profile rails, shop welded prior to despatch to site.

*\*NB: Some manufacturers are able to offer carrier rails extruded from stainless steel.*

**Flexible Insert**

Synthetic, natural rubber or EPDM extrusion supplied in up to 60 metre lengths with positive locating lugs to facilitate fixing into the metal carrier rails.

**Shuttering**

Collapsible purpose built components constructed so as to form the required configuration of the completed nosings.

**Priming or Tanking (if required)**

The coat of resin placed to all surfaces which are to be permanent adhesive faces for the completed nosing.

**Deck Joint Gap**

The gap between the adjacent spans in the bridge decks or deck and adjacent curtain wall.

**Expansion Joint Gap**

The gap formed between the nosings dictated by the calculated movement of the structure, the date of construction and time/temperature of the installation.

**Drainage**

- i. Tubes placed in the deck at construction immediately in front of the movement gap or formed by diamond drilling in a completed deck.
- ii. Channels placed through the base of the nosings transverse to the joint and taken through the air gap (optional).
- iii. Perforated channels placed longitudinally at the base of the nosing towards the deck waterproofing and connected at the verges to devices for purging (optional).

**Surfacing**

All composite materials placed on the structure concrete to form the finished level of the bridge deck.

**Material Requirements for the Permanent Works**

These will conform to the manufacture's stated requirements, be stored in dry conditions in waterproof containers and used within their stated shelf life. All resins, aggregates and fillers will be the best of respective kind and conform to the manufacturer's published data.

**Seals**

All seals will be of sound materials with load bearing capacities sufficient to meet the traffic conditions without permanent deformation, collapse or dislodgement for their working life. Inserts must be resistant to hydrocarbon and chloride contamination.

**Drainage**

All components used in drainage must be non-ferrous or galvanised and compatible with any construction product of the permanent works.

### **Temporary Construction Products**

All materials required for temporary works and constructing the nosings or forming the gaps must be of sound proven quality, clean and not contaminate the permanent works. No temporary materials will be re-used unless they can first be shown to meet these conditions.

### **Quality Control**

The manufacturer, agent or distributor for the materials will operate quality assurance procedures to ensure that the products meet the requirements of this standard and any statutory standard required and/or specified.

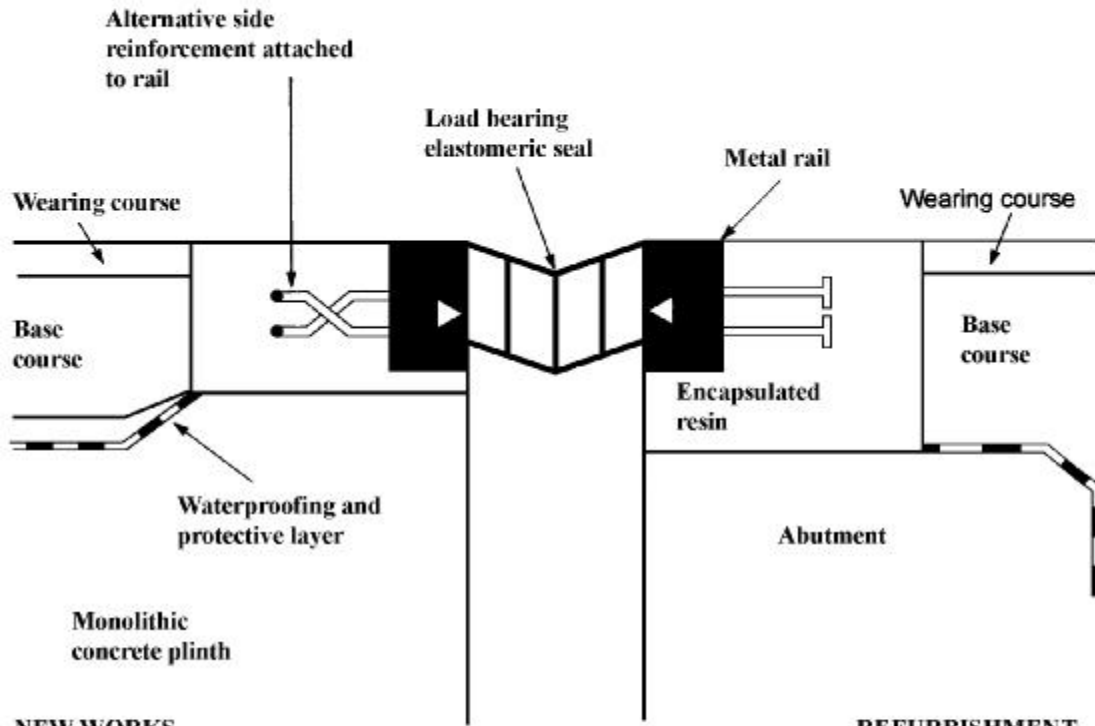
The installer will ensure that the products are placed in the works in a competent and efficient manner and in accordance with the relevant codes of practice. They will also be required to follow the installation instructions issued by the manufacturer.

### **Information Provided by the Supplier**

The supplier of the proprietary EMR-RE system or their agent will provide the following information:

- Definition of the product and its name
- Movement capability of the seals used
- Outline description of the chemical base of the resins and fillers used in the product
- Requirements for the Control of Substances Hazardous to Health (COSHH)
- Method Statement.

**ELASTOMERIC WITH METAL RUNNERS**  
**RESIN ENCAPSULATED (EMR-RE)**  
 (HA Type 6)



**NEW WORKS**

Nominal resin nosings

**REFURBISHMENT**

Full depth resin nosings

**Description**

Precision extended metal rails set between special resins forming combined nosings and bed, stuck down to the structural concrete and to the surfacing. Incorporating varying sizes of watertight seals fitted between the rails.

**Movement Range**

Up to 150mm

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# CANTILEVER COMB OR TOOTH (C/T)

## FOREWORD

Comb/tooth (gap bridging) joints must be designed to fulfil the design conditions of BD33/94 and be structurally robust to withstand the traffic loads. These design conditions and loads are summarised below:

1. Vertical loading - the imposed vertical nominal load shall be taken either as a single wheel load of 100kN or 200kN axle with a 1.8m track. The load from each wheel shall be uniformly distributed over a circular area assuming an effective pressure of  $1.1\text{N/mm}^2$  (ie 340mm diameter).
2. Horizontal loading - the imposed horizontal nominal load shall be taken as a uniformly distributed load of 80kN/m run of joint.
3. Movement range - BS5400 shall be used to determine the accumulative range of movements imposed by:

Expansion and contraction caused by temperature cycles as per BS5400: Part 2 as implemented by BD37.

Residual creep and shrinkage and its relationship with the setting dimensions at time of installation using BS5400: Parts 4 and 5 as implemented by BD24.

4. Rotation caused by deflection under loading.
5. Braking forces transmitted to the deck structure.
6. Elastic shortening due to compression followed by expansion of the structure.
7. Good ride quality and skid resistance at road level.

## DEFINITIONS

### Comb/Tooth Joint

Segmental joint comprising two main elements of matching geometrical shape - a male element and a female element - which ensure bridging of the gap. The segments are placed end to end and fastened to the structure using prestressed tie bolts.

### Drainage Membrane

An elastomeric/neoprene membrane is installed continuously beneath the length of the joint to provide water tightness. This is used to collect and discharge surface water to the bridge deck drainage system.

## **Fabrication**

The main elements are usually fabricated in sections from either suitably coated mild steel or weathering steel, cast aluminium alloy or vulcanised rubber/steel composite. The design and installation can be detailed to accommodate straight or skewed structures.

## **Resistance to Environmental Aggression**

The elements of the joint are either manufactured from resistant materials or specifically corrosion protected. This includes resistance to oil, grease, petrol, de-icing salts or other similar aggressive materials.

## **Footway/Kerb Joints**

Purpose designed kerb and footway units, using a simplified system of gap bridging involving cover plates, are provided as necessary.

## **Fixing Bolts**

The main elements are connected to the deck using (prestressed) fixing bolts to allow a long service life of the joint. The bolts are permanently accessible such that the joints can be easily dismantled, replaced or adjusted as necessary.

## **Transition/Joint fixing**

Resin mortar/concrete used to fix the joint into the rebate.

## **Running Surface**

The running surface is designed to give an acceptable ride quality. To accommodate bicycles it may be necessary to provide purpose designed inserts to avoid wheels entering the tooth gaps.

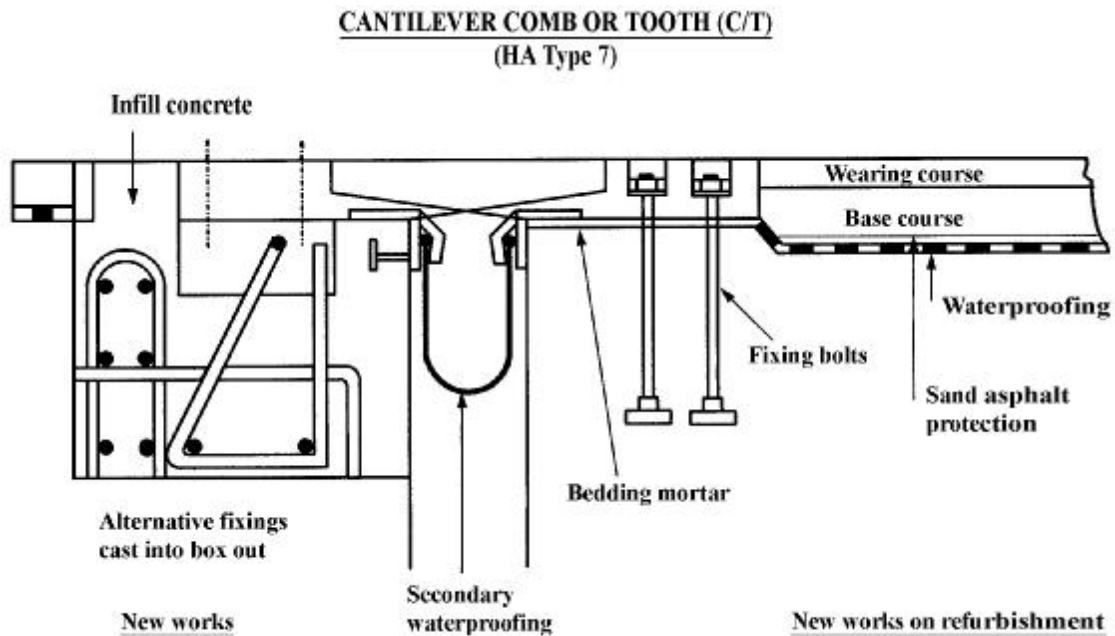
## **MATERIALS**

- Male and female main elements
- Footway/kerb units (if required)
- Fixing anchor/bolts
- Resin mortar/concrete for rebate filling

## **INSTALLATION**

- Preparation of the rebates - if necessary Asphaltic surfacing to be cut back from either side of the joint axis, risings removed together with any formwork or joint formers.
- Rebate is cleaned and joint sub-grade surface restored as necessary.
- Place additional bar and shutter the joint gap.
- Pre-assembled joint elements, together with their fixings, are installed into the rebate and adjusted with the aid of a positioning jig.

- Rebates are concreted.
- Once the concrete has cured and strengthened sufficiently to support the joint the temporary positioning jigs are removed together with joint elements.
- Waterproofing membrane installed.
- Joint elements replaced and fixings permanently tightened to the required torque.



#### Description

A prefabricated precision made joint consisting broadly of two sets of finger plates set or fixed across the joint gap with a separate flexible waterproof membrane sheet clamped beneath the plates.

#### Movements

Standard 440  
Non standard 1000

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# BJA CODE OF PRACTICE FOR THE INSTALLATION OF MECHANICAL JOINTS

## FOREWORD

Installation in accordance with this code of practice and any additional requirements specified to the supplier is essential for optimum performance of the joints. This Code of Practice therefore requires that the installation is by operatives approved and trained by the supplier of the joint system.

### 1. **Scope**

This code of practice is for the installation of mechanical joints, complying to BJS2 for highway bridges and parking structures.

### 2. **References**

BJS/S2/MEJ - BJA Standard for mechanical joints

### 3. **Definitions**

3.1 **Operative:** Any person involved in the installation of an elastomeric joint.

3.2 **Approved Operative:** An operative who has received training and has reached satisfactory and repeatable standard certified by the company supplying the joint materials. The operative will have a minimum CSCS skilled operators certificate.

3.3 **Joint Materials:** A collection of various materials used to bed, fasten, seal and encapsulate the mechanical joint over its whole length.

3.4 **Installation:** The process of placing the individual component of the joint shall be in accordance with the working drawings produced by the company supplying the mechanical joints. These drawings should acknowledge all the pertinent features such as cross falls, as-built dimensions, skewes, service ducts and parapet details.

### 4. **Installation Procedure**

#### 4.1 **Storage and Delivery**

All materials should be stored correctly and protected from deterioration prior to delivery and whilst stored on site.

#### 4.2 **Setting Out**

The main contractor, in consultation with the supervising engineer should mark out the bridge joint position and arrange for a supporting shutter board to be

fixed in position prior to laying the road surfacing. This will allow easy removal of the surfacing over the appropriate width of the joint including the transition strips so that dense well consolidated surfacing is produced adjacent to the box-out.

In the case of the Elastomeric in Metal Runners Cast-in Joints, the design box-out is to be left in the structure and the reinstatement applied after fixing the joint rails and bridge reinforcement. All line and levels to be provided to the joint installer.

The exact width of the box-out should be determined from the design movement range taking into account the bridge deck temperature at the time of installation related to the mean bridge deck temperature.

#### **4.3 Concrete Preparation**

The concrete surface within the box-out should be mechanically scabbled in order to remove surface laitance and bituminous materials or other contaminants that may be adhering to the concrete. This operation is followed by removal of all loose material using a brush or airline fitted with oil filter at discharge point.

#### **4.4 Placing the Joint**

The placements of the mechanical joint will be in accordance with the individual method statement of the joint supplier. The joint must be placed to a line and level supplied to the joint installer and laid so that it is slightly below the finished level of the selected surfacing.

#### **4.5 Deck Joint Gap Treatment**

The deck joint air gap must be completely free from any hard materials and caulked to prevent detritus entering the gap during laying or preparation for laying of the selected joint.

#### **4.6 Quality Control**

The joint supplier shall operate a quality assurance procedure in accordance with ISO 9000:2000 and illustrate in QA forms and submissions his procedures and checks to the contractor and/or engineer.

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**STANDARD FOR MECHANICAL  
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