USL
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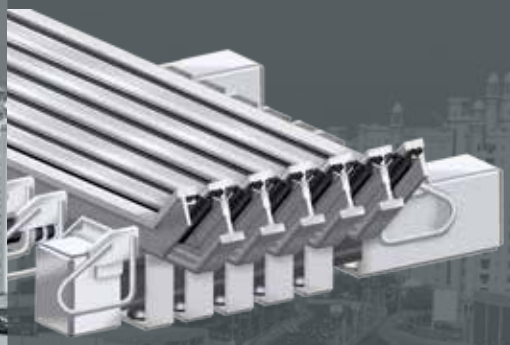
Modular Expansion Joint System



A USL Company

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 960mm. However, our joints can be modified to accommodate larger movements.

The division also manufactures and applies Bridex MDP and PmB waterproofing systems which are BBA approved.

All of USL's expansion joint systems have a proven track record and comply with BD33/94 standards.

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.

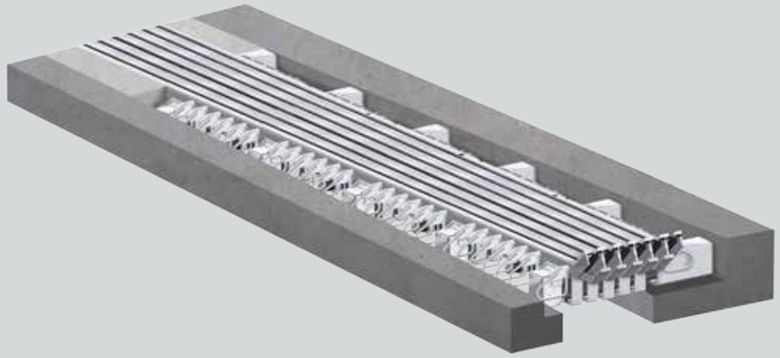
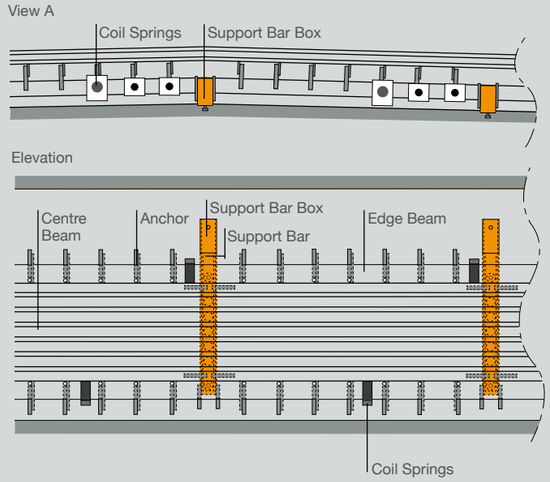


Figure 1 - Modular Expansion Joint System (MEJS)



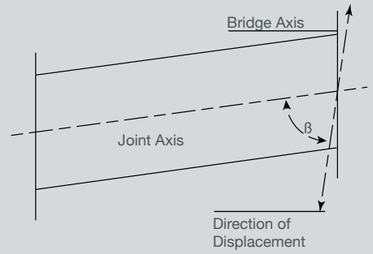


Figure 2 - Skewed Direction of Movement

Note: The direction of movement does not, in each case, have to be identical to the movement of the bridge axis.

The System

The Modular Expansion Joint System (MEJS) is a mechanical device installed in bridge expansion joint openings.

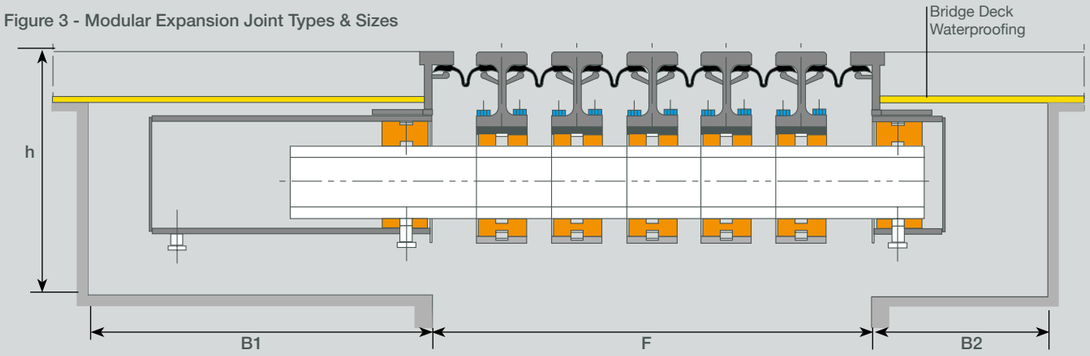
The primary function of the MEJS is to allow vehicle traffic to travel smoothly across large expansion joint openings. It does this by dividing the large expansion joint openings into a series of smaller openings called cells. These cells work together to accommodate the necessary thermal bridge movement (expansion and contraction) while providing a smooth riding surface for bridge vehicle traffic. The MEJS is normally used for expansion joints with a movement range exceeding 75 mm.

The MEJS also has the secondary function of protecting the surrounding bridge superstructure and substructure. All MEJS cells are equipped with watertight sealing elements that prevent debris, water and corrosives such as de-icing chemicals from passing through bridge expansion openings and damaging superstructure and substructure components (See Figure 1).

Expansion Joints with Skew

Because bridge expansion joints open and close in the direction of traffic, a bridge skew or radius creates movement that is not parallel to the normal movement of the MEJS. If the direction of movement of the MEJS is not perpendicular to the joint axis but skewed with the angle (Figure 2).

Figure 3 - Modular Expansion Joint Types & Sizes



Type	B1 (mm)	B2 (mm)	H (mm)	F(min) (mm)	F60 (mm)	F70 (mm)	F80 (mm)	G(WT) (kg/m)
LG2	400	400	400	140	260	280	300	150
LG3	480	300	400	220	400	430	460	210
LG4	560	300	400	300	540	580	620	250
LG5	640	300	400	380	680	730	780	290
LG6	720	300	400	460	820	880	940	410
LG7	800	300	420	540	960	1030	1100	500
LG8	880	300	440	620	1100	1180	1260	596
LG9	960	300	450	700	1240	1330	1420	745
LG10	1040	300	460	780	1380	1480	1580	1060
LG12	1200	300	500	940	1660	1780	1900	1340

Support System & Components

Physical Data
Movement Range – The movement range of the MEJS is accommodated by the planned operating range of the neoprene seal and by the number of seals.

That is, if the planned operating range of the neoprene seal equals 80 mm, the LG12 MEJS achieves a movement range of 960 mm (12 × 80 mm = 960 mm).

Joint Width – The joint width "F" (Figure 3) is variable. It changes with MEJS movement. Joint width f (min) is the width of a closed joint. Joint widths F60, F70, and F80 are the widths of the fully open joint.

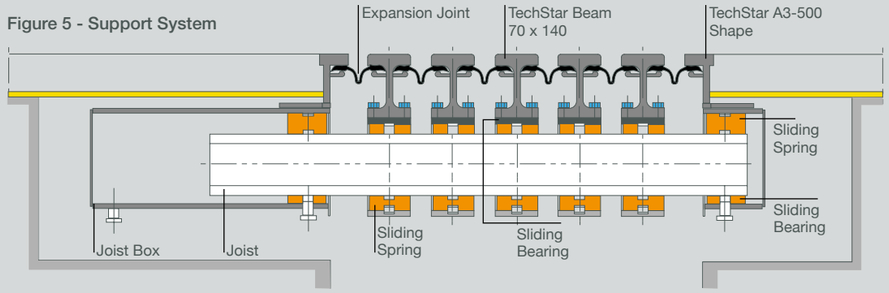
Each element has a gap of 60 mm, 70 mm & 80mm according to the planned operating range. Thus for an LG6 MEJS, there is a difference between fmin and f80 of 480 mm (6 × 80 mm = 480 mm).

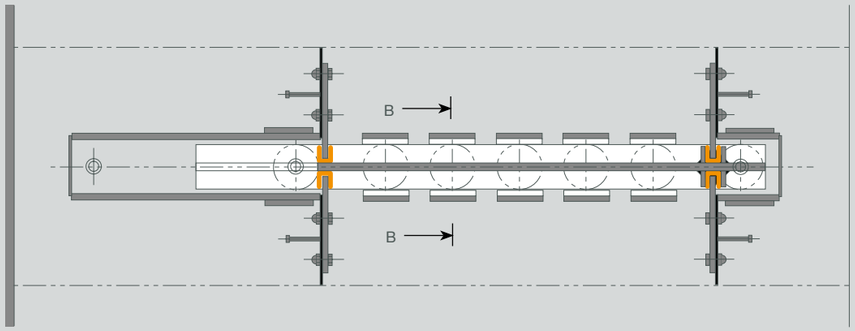
Weight – The MEJS weights "G" shown in Figure 3 are mean values that vary, depending on design details.

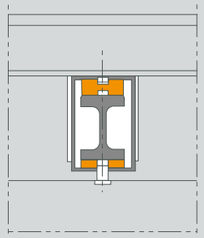
Figure 4 - Modular Expansion Joint Components and Construction Materials

Component								
Description	Centre Beam/ Support Bar	Edge Beam	Slide Spring	Slide Bearing	Support Bar Box	Control Spring	Strip Seal Gland	Centre Beam Bracket
Material	ASTM A 572 A 588 DIN ST52-3	ASTM A 572 A 588 DIN ST52-3	Natural Rubber/PTFE	Nylatron	ASTM A 500 A 36 A 572	Polyurethane Foam	Neoprene ASTM D 2628	ASTM A 36 A572 DIN ST52-3

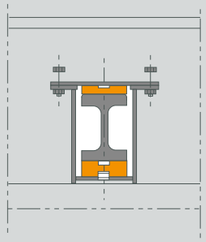
Figure 5 - Support System







Section B-B
Welded Bracket Option



Section B-B
Bolted Bracket Option

Standard Single Bar – LG

Support System
In the Single Bar – LG MEJS design, all centre beams are supported by a single support bar. Elastic, prestressed sliding elements are contained by brackets / stirrups welded to the centre beam at a spacing based on the design code applied. The same elastic, prestressed sliding elements are used inside the support bar boxes.

This support system permits an optimum load transmission while attaining the flexibility to provide movement in three different directions (See Figure 5).

Control System
Along with the elastomeric profiles, elastomeric control springs coordinate the individual movements to form a dynamic system that simultaneously absorbs braking and accelerating forces. The reaction of these controlling forces on the joint edges can be assumed to act in the direction of displacement with the following maximum values: Tension – max. 3 KN/m; Compression – max. 4 KN/m (See Figure 6).

Figure 6

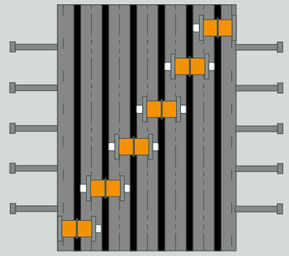


Figure 7

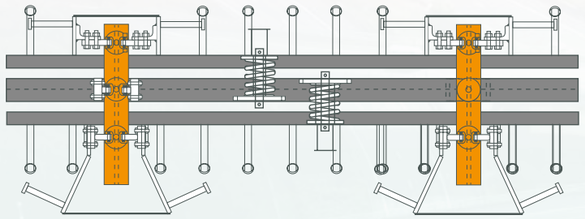
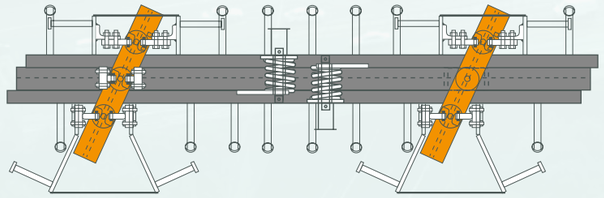


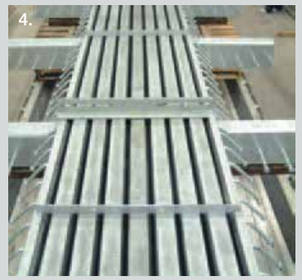
Figure 8



Swivel Capable Expansion Joint

Transverse Movement
TechStar's Swivel Joint is designed to minimise any potential damage at the expansion joints from earthquake displacements. Often these anticipated seismic displacements are beyond the normal thermal longitudinal movement capacity of the expansion joint and also anticipate transverse movements (sideways) and vertical rotations (See Figure 7 and 8).

By utilising "swiveling-capable" modular expansion joints, designers are able to mitigate these problems. The extent of the swiveling (pivoting) and rotating of an expansion joint is a function of the geometry of the support bar boxes which permit movement of the support bars, trumpeting them to permit the required additional movements, and use of spherical bearings for vertical rotations. Extra-long support bars which extend beyond the normal thermal movement requirements are used to accommodate any longitudinal seismic movements. Modifications needed by these designs from normal modern modular expansion joint systems are relatively minor. Any "Single Bar" modular expansion joint is capable of swiveling.



Design and Physical Strengths

1. Quality Control (MEJS Birth Certificate) – Tight tolerances permit long term success. USL develops a "checklist" of tolerances to be recorded for each joint. This checklist is like a birth certificate, it describes every step of production, every critical measurement is recorded and this document is provided to the client as proof of complete quality control.

2. Elastic Connection – Modular Expansion Joint Design does not weld the Centre Beam to the Support Bar, instead using Elastic components, USL's design creates an Elastic Connection. This eliminates a fatigue problem of welds and permits damping of the modular joints through the elastomeric component.

3. Corrosion Resistance – All exposed steel components of each MEJS are protected against corrosion through sand blast cleaning and being either hot dipped galvanized or painted with an inorganic zinc paint system. Method depends on the specifications of each individual project.

4. Parallel Support Bars – MEJS design has Parallel Support Bars that can be aligned with the wheel lanes. Parallel Support Bars provide sufficient clearance for concrete and reinforcing steel. Support bar spacing can be reduced for larger truck loading conditions.

5 Outside the Box – MEJS design accommodates easy replacement of all the smaller components such as Slide Bearings and Slide Springs. This is due to these smaller components being outside of any restrictive box, allowing accessibility for quick and easy replacement when necessary.


Benica Martinez Bridge


Mohammed Hanif Flyover


Hyderbad Outer Ring Road


Lusail Bridge to the Pearl

Project References

Project:
Benica Martinez Bridge

Location:
Martinez, California, USA

Product:
80 metres (4 joints of 8-cell modular)

Project:
Mohammed Hanif Flyover

Location:
Dhaka, Bangladesh

Product:
312 metres (31 joints of 8-cell modular)

Project:
Hyderbad Outer Ring Road

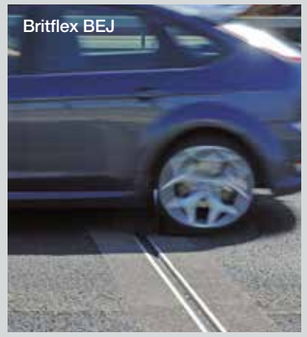
Location:
Hyderbad, India

Product:
300 metres (30 joints of 2-cell modular)

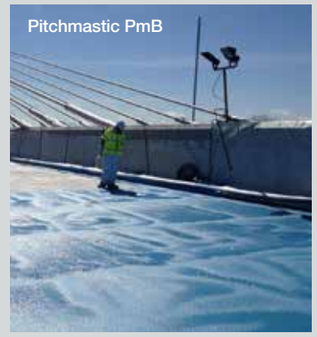
Project:
Lusail Bridge to the Pearl

Location:
Doha, Qatar

Product:
314 metres (31 joints of 3-cell modular)


Britflex BEJ


Installation of Britflex BEJ on Westminster Bridge, London, UK


Pitchmastic PmB


FEBA


Transflex


Britflex UCP


Britdex MDP

Additional Products

USL BridgeCare offer their clients a range of UK Highways Agency registered bridge expansion joints along with high performance waterproofing systems:

- Uniflex - Buried Joint
- FEBA - Asphaltic Plug Joint
- Bridflex NJ - Nosing Preformed Compression Seal
- Britflex BEJ - Elastomeric In Metal Runners
- Britflex UCP - Footbridges and Elevated Structures
- Transflex - Reinforced Elastomeric Joints
- Britdex MDP & CPM Tredseal - Methyl Methacrylate (MMA) Spray Applied Waterproofing
- PmB - Polyurethane Spray Applied Waterproofing

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