CURRENT PRACTICE SHEET

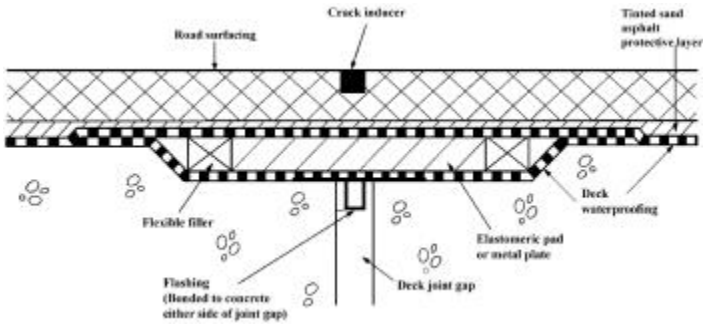
INTRODUCTION

An expansion joint can be defined as a device to support the surfacing, or to provide a running surface, across the expansion gap, ie the area between adjacent spans of a bridge deck or the bridge deck and abutment.

TYPES OF BRIDGE EXPANSION JOINT (as BD33/94)

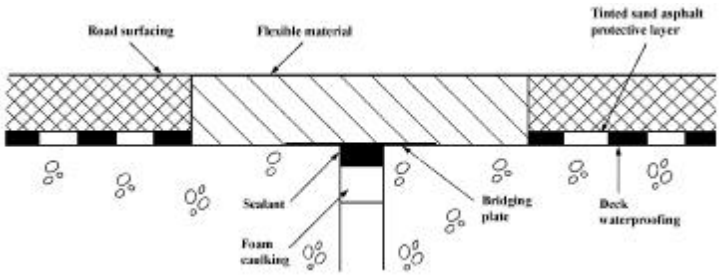
Buried Joint -Type 1

An in-situ joint consisting of an Elastomeric pad or flashing placed across the expansion gap to support the surfacing which is then laid continuously over the joint. Sub types are Buried Flashing (BF) and Buried Pad (BP). Movement range ± 10mm.



Asphaltic Plug Joint - Type 2

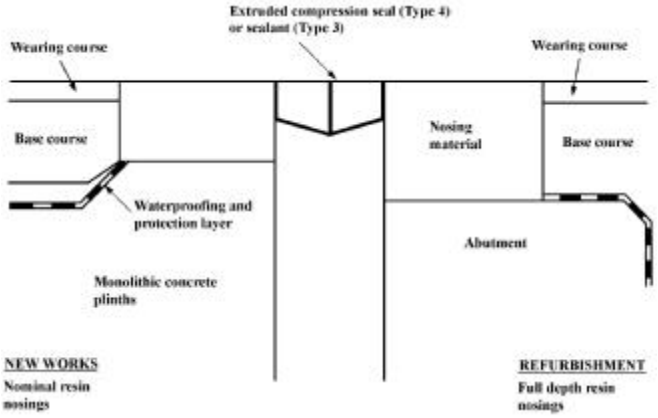
An in-situ joint consisting of a band of specially formulated binder plus aggregate, typically 500mm wide and 100mm deep, running across the road above the expansion gap. They accommodate movement of ± 20mm without cracking at low temperatures and resist tracking under wheel loading at high temperatures.



Nosing Joint (N) - Type 3 and 4

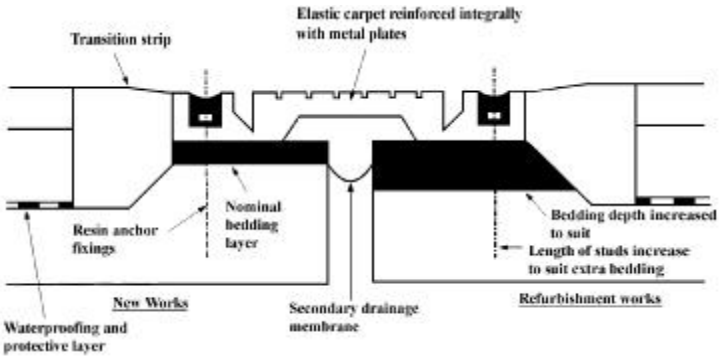
Consists of a section of nosing material bonded to the deck of either side of the expansion gap, with a compression seal bridging the gap. The purpose of the nosing material is to

support the adjacent surfacing, and provide an edge which will resist the effects of vehicle wheel loads. Movement range ± 20mm as the maximum joint gap is not permitted to exceed 65mm as per BD33/94.



Reinforced Elastomeric Joint (RE) - Type 5

A sectional prefabricated joint consisting of an elastomer bonded to metal plates which are bolted to the deck, with additional metal reinforcing plates embedded in the elastomer. Movement range ± 165mm.



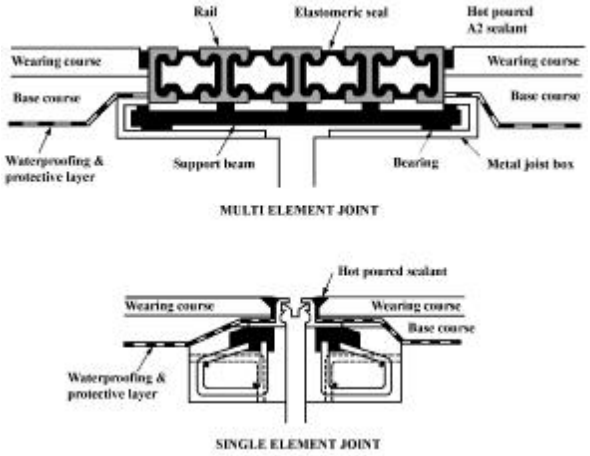
Elastomeric in Metal Runners (EMR) - Type 6

A prefabricated joint comprising an elastomeric seal fixed between metal rails or runners.

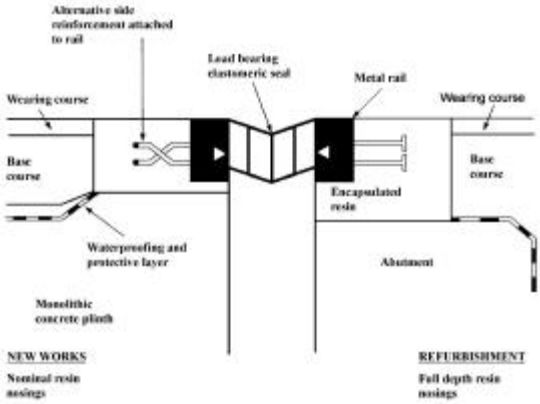
There are two types of EMR joint depending on how the metal runners are attached to the deck, either Cast-In (CI) or Resin Encapsulated (RE).

The CI type is available in both single and multi-element form with a movement capacity of 75mm (single) to 1 metre (multi), whilst the RE type is a surface mounted Elastomeric single-sealing element fixed between carrier rails embedded in resin nosing material fully bonded to structural deck concrete. Movement rage 30mm - 150mm dependent on Elastomeric sealing element.

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

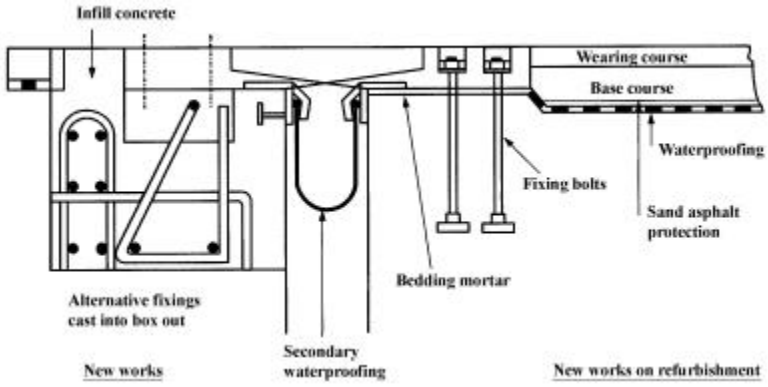


ELASTOMERIC WITH METAL RUNNERS RESIN ENCAPSULATED (RE)
(HA Type 6)



Cantilever Comb or Tooth Joint (CT) - Type 7

A pre-fabricated joint consisting of mating metal comb or sawtooth plates which bridge the expansion gap. Movement range ± 300mm.



JOINT PERFORMANCE

The performance requirements of a joint are as follows:

- Withstand traffic loads and accommodate movements of the bridge arising from temperature, creep, shrinkage, settlement and dynamic loading without inducing unacceptable stresses in the joint or other parts of the structure.

- Have a good riding quality and not cause inconvenience to any class of road user (including cyclists, pedestrians and animals where they have access).
- Maintain an acceptable level of skid resistance.

- Avoid the generation of excessive noise or vibration during the passage of traffic.

- Be watertight, or include provision for carrying away water and detritus so structural damage is prevented.

- Be easy to inspect and maintain preferably from underneath the deck and have parts liable to fail easily replaceable.

- Avoid sudden deterioration likely to cause a hazard to traffic.

SELECTION OF JOINT

The bridge designer must clearly set out the desired operating standards and define the total movement related to the imposed loadings, temperature range, deck shortening and rotation. The manufacturer or supplier can then provide the correct technical solution at an early stage.

Apart from these technical issues, whole life costings must be taken into consideration along with a method of procurement which will ensure performance requirements are met and service life obtained.

DURABILITY AND WHOLE LIFE COSTING

It is important that the service life of an expansion joint should equal the life expectancy of the adjacent surfaces in order to avoid unnecessary disruption to traffic and the cost of repair or replacement. Only approved materials of proven durability and registered as per Highways Agency SAI, should therefore be used and clients must ensure that total costs of a joint throughout its service life are taken into account rather than just initial costs.

WATER MANAGEMENT

Adequate design and detailing of deck drainage is essential to enhance structural durability. The removal of water from within and below the surface is very important and should include the possibility of leakage from a joint. Ideally, the drainage system adopted for the joint should overlap the deck waterproofing system used, with combined sub-surface drainage outlets to discharge water and prevent a build-up behind the joint. Through-drainage units in the decks and the provision of rodding points to clear blockages are recommended.

INSTALLATION OF JOINTS

The installation process should be a team effort between the engineer, main contractor and the installer. They should have access to all information and design details as well as sufficient time to complete the process, including curing, in a competent and professional manner.

INSPECTION AND MAINTENANCE

The design of bridge decks should make provision for inspection of the joints from the underside of the deck. Regular inspection of both carriageway surfacing and the joint is necessary to ensure satisfactory performance throughout its service life. Early detection of

faults, such as blocked drainage or rutted surfacing is necessary if major remedial work is to be avoided. The inspector should be familiar with the joint type used and its potential defects.

Maintenance should be programmed, to coincide with other maintenance work on the carriageway to reduce traffic management and delay cost, at intervals not exceeding 12 months.

References

Highways Agency BD 33/94
Highways Agency BA 26/94
Manual of Contract Documents for Highways Works SA1 Volume 0 Section 3 Annex C (Registration)
TRL Report 236 (1997): Improving the Performance of Bridge Expansion Joints
Bridge Joint Association Standards (APJ and MEJ)

Further Reading

TRL Report SR479 (1979): Bridge temperatures for setting bearings and expansion joints
TRL Report PR9 (1993): Research into the condition and performance of bridge deck expansion joints
D J Lee (1994): Bridge Bearings and Expansion Joints (E & FN Spon)
TRL Report LR1104 (1984): The Performance in service of bridge deck expansion joints
TRL Report PA2138/92: Draft Design for Durability: Expansion joints and continuity.