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INTRODUCTION

Railway bridges like bridges in general have one critical point; joining the gaps between individual parts of the structure or elements and components.

The Ekspan T-Mat system has become the standard for solving the problem of sealing and bridging of gaps.

The Principles:

• Absolutely watertight
• High stability under load, which minimises the need to tamp the ballast
• Extra-long durability due to the property designed dimensions and high quality chloroprene materials
• Standardised internal quality control (ISO 9001)
**TECHNICAL**

*Design Criteria*

1. Technical Documents

- Shop Drawings Ekspan T-Mat DB/ST 30 to 260 for Bridges of Section

2. Structural Performance

The Expansion Joints System Ekspan T-Mat DB/ST is designed to satisfy all requirements as specified in the above Functional Specifications. These are in particular (but not limited to):

- Provision for longitudinal movement between adjacent bridge decks.

  Note: The Ekspan T-Mat DB/ST Expansion Joint consists of a solid armoured expansion mat made of a high quality chloroprene with metal reinforcements (T-bars). The material is moulded and not extruded. The T-bars allow the installation of the expansion mat on a steel substructure which has been built into the bridge superstructure parallel to the expansion gap. The steel reinforcements are spaced in such a way that they guarantee great flexibility. The internal design of the Expansion Joints system Ekspan T-Mat DB/ST is such that due to the discontinuous steel reinforcement combined with the elasticity of the material (chloroprene) the expansion joint will not only allow for horizontal movement on either side of the joint, but will also allow for transverse and vertical relative movements of adjacent bridge decks).

- Structural safety during operation is guaranteed by the fact that the design of the expansion joint allows to carry and absorb the combined forces of load and traffic.

- The expansion joint is designed to be installed in such a way to ensure that its surface is flush with the bridge structure in order to guarantee a monolithic structure. For Railways structures ballast can be put directly on top of the joint without any additional protection or treatment required. The surface of the expansion joint is flush with the surface of the protection layer and ballast mats.

- The internal design as described above will also allow for vertical movement due to differential settlement of 5mm and more (up to ±70mm vertical and ±200mm transversal) without losing any of its other functional properties (see table below for movement capacities of each T-Mat type).

- This also applies to its ability to cope with distortions or other displacements of the structures.

3. Performance Fulfilment

The Expansion Joint Systems Ekspan T-Mat DB/ST perform as designed especially (but not limited) under the following conditions:

- There will be no negative influence of corrosion, since the corrosion protection specifications of all metal parts are imbedded in the chloroprene mat.

- The high quality chloroprene material is resistant against chlorides, oil, ozone, the sun under all climatic conditions. It also allows for vulcanisation on site to properly connect individual joints at joining gaps or at any interval for longitudinal joints so that there is always a homogenous and continuous seal. The materials of the actual expansion band do not age measurably.
Note: Expansion Joints System Ekspan T-Mat DB/ST and their steel sub-structures have been installed on bridges in the UK and Europe for more than 25 years. None of these installations, which were executed in conjunction with the above specifications have neither aged visibly nor corroded. All installations are still in service.

- The Expansion Joint Systems Ekspan T-Mat DB/ST is designed to be waterproof
- Since the system is flush with the bridge deck surface and tied into the bridge waterproofing system, it has no effect at all on the overall drainage systems of the bridge decks.
- The Expansion Joint Systems Ekspan T-Mat DB/ST does not generate any noise or vibration during traffic operation.
- Movements in all directions are possible: Short term vertical movements due to different loads on the individual superstructures, long term vertical movements due to differential settlements, long term horizontal movements due to creep, shrinkage and temperature.
- Deflections caused by dynamic actions during traffic operation are absorbed as well

4. Maintenance

- The elastomeric component (T-Mat) as a whole or even in individual segments is replaceable without any impact on the embedded substructure.
- Thus it will at no time and under no circumstances create any danger for the maintenance staff. All materials used are well known in the industry and have been used either individually or in combination for many years.
- Once installed, Expansion Joint Systems Ekspan T-Mat DB/ST is practically maintenance free.

5. Materials

- Expansion Joint Systems Ekspan T-Mat DB/ST is designed for a technical life of ≥50 years. As discussed above these systems have been used for more than 25 years without showing any signs of neither aging nor damage to the joint which is limited to normal wear of the running surface.
- The elastomeric materials are of the highest quality chloroprene rubbers. The T-Mats are moulded and not extruded.
- All design, manufacture and installations of the Expansion Joint Systems Ekspan T-Mat DB/ST are made in accordance with the EN ISO 9001 2008.
APPLICATION

The T-Mat expansion joint transition is available in four different types. The T-Mat 30, 80 and 130 models have a single joint arrangement. The T-Mat 160 and 260 models have a double joint arrangement.

Ekspan T-Mat 30 Expansion Joint

Dimensions

<table>
<thead>
<tr>
<th>Joint</th>
<th>Width</th>
<th>Depth</th>
<th>Secondary Seal Thickness</th>
<th>Width of Bolt Centres</th>
<th>Fixings</th>
<th>Expansion Joint Gap Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Mat 30</td>
<td>214mm</td>
<td>55mm</td>
<td>2mm</td>
<td>176mm</td>
<td>M12</td>
<td>50mm</td>
</tr>
</tbody>
</table>

Movement Capacity

- Longitudinal (X Axis): +/- 15mm
- Transverse (Y Axis): +/- 40mm
- Vertical (Z Axis): +/- 30mm
Ekspan T-Mat 80 Expansion Joint

Dimensions

<table>
<thead>
<tr>
<th>Joint</th>
<th>Width</th>
<th>Depth</th>
<th>Secondary Seal Thickness</th>
<th>Width of Bolt Centres</th>
<th>Fixings</th>
<th>Expansion Joint Gap Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Mat 80</td>
<td>356mm</td>
<td>55mm</td>
<td>2mm</td>
<td>318mm</td>
<td>M12</td>
<td>50mm</td>
</tr>
</tbody>
</table>

Movement Capacity

Longitudinal (X Axis): +/- 40mm
Transverse (Y Axis): +/- 60mm
Vertical (Z Axis): +/- 40mm
Ekspan T-Mat 130 Expansion Joint

Dimensions

<table>
<thead>
<tr>
<th>Joint</th>
<th>Width</th>
<th>Depth</th>
<th>Secondary Seal Thickness</th>
<th>Width of Bolt Centres</th>
<th>Fixings</th>
<th>Expansion Joint Gap Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Mat 130</td>
<td>439mm</td>
<td>65mm</td>
<td>2mm</td>
<td>414mm</td>
<td>M12</td>
<td>70mm</td>
</tr>
</tbody>
</table>

Movement Capacity

- Longitudinal (X Axis): +/- 65mm
- Transverse (Y Axis): +/- 100mm
- Vertical (Z Axis): +/- 70mm
Ekspan T-Mat 160 Expansion Joint

**Dimensions**

<table>
<thead>
<tr>
<th>Joint</th>
<th>Width</th>
<th>Depth</th>
<th>Secondary Seal Thickness</th>
<th>Width of Bolt Centres</th>
<th>Fixings</th>
<th>Expansion Joint Gap Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Mat 160</td>
<td>728mm</td>
<td>55mm</td>
<td>2mm</td>
<td>318mm</td>
<td>M12</td>
<td>130mm</td>
</tr>
</tbody>
</table>

**Movement Capacity**

- Longitudinal (X Axis): +/- 80mm
- Transverse (Y Axis): +/- 120mm
- Vertical (Z Axis): +/- 5mm
Ekspan T-Mat 260 Expansion Joint

Dimensions

<table>
<thead>
<tr>
<th>Joint</th>
<th>Width</th>
<th>Depth</th>
<th>Secondary Seal Thickness</th>
<th>Width of Bolt Centres</th>
<th>Fixings</th>
<th>Expansion Joint Gap Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Mat 260</td>
<td>908mm</td>
<td>65mm</td>
<td>2mm</td>
<td>414mm</td>
<td>M12</td>
<td>180mm</td>
</tr>
</tbody>
</table>

Movement Capacity

- Longitudinal (X Axis): +/- 130mm
- Transverse (Y Axis): +/- 200mm
- Vertical (Z Axis): +/- 5mm
**INSTALLATION**

1. Install T-Mat joint sub-structure steel rails into abutment and bridge deck reinforcement
2. Line and level steel rails to engineer’s requirement
3. Weld steel rails to reinforcement
4. Cast concrete encasing reinforcement and steel rail shear studs
5. Allow concrete to cure to manufacturers requirement
6. Install expansion joint secondary seal
7. Install secondary seal down pipe drain
8. Install steel bridge plate (if installing T-Mat 160 and 260 expansion joint types)
9. Install the T-Mat joints to the pre-drilled M12 fixing locations
10. Apply clamp bars, washers and nuts to M12 fixing locations
11. Torque fixings to required setting
12. Within the location to the transition strips (voids adjacent to the T-Mat) apply steel primers to steel surfaces; and concrete primers to concrete surfaces
13. Allow primers to cure to manufactures requirement
14. Install Britflex Nosing Mortar (including antiskid) to pre-primed transition strips
15. Allow Nosing Mortar to cure to manufacturer’s requirement
QUALITY

T-Mat joint transitions are manufactured in accordance with strict quality requirements. Our production processes and procedures are registered and certified in accordance with ISO 9001.

In terms of the mechanical properties of the elastomer, T-Mat joint transitions satisfy the following requirements:
PROJECTS

Project: Crewe Green Rail Bridge
Location: Crewe, UK
Client: Morgan Sindall
Designer: Mott Macdonald
Date: April 2015
Brief: Supply and installation of Ekspan T-Mat 130 expansion joint on the west abutment of a new rail bridge

Ekspan Subcontract Value: £70,000.00

Ekspan T-Mat 130 expansion joint installed below ballast level
Project: Bermondsey Dive Under
Location: London, UK
Client: Skanska
Designer: Ramboll
Date: February 2015
Brief: Supply and installation of Ekspan T-Mat 80 expansion joints on the new east abutment and central pier of the dive under link

Ekspan Subcontract Value: £60,000.00

Bermondsey Dive Under, London
Project: Blackfriars Rail Bridge
Location: London, UK
Client: Volkerlaser
Designer: Arup
Date: March 2014
Brief: Supply and installation of Ekspan T-Mat 80 expansion joints on the south abutment of the new refurbished rail bridge

Ekspan Subcontract Value: £70,000.00