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The certificate holder is in possession of a confirmation certificate attesting to his status.

Subject **Thormajoint® Bridge Deck Expansion Joint System**

Certificate holder
Bridge Jointing & Rehabilitation Contractors (Pty) Ltd
[BJRC]

P O Box 8593 EDENGLLEN 1613
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Quick guide

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Description and use

The Thormajoint® bridge deck expansion joint system, partly pre-manufactured and partly blended on site and installed under licence to Prismo UK, consists of bridging plates and rubber or EPDM de-bonding strips and where specified, cover plates and an elastomer-modified bitumen mixed on site with uniquely specified aggregate to form plug expansion joints.

The Thormajoint® system is assessed as being suitable for bridge deck expansion joints in all areas of South Africa.

This certificate and Agrément South Africa's assessment set out in detail in Part 2, Table 1, apply only to the Thormajoint® Bridge Deck Expansion Joint System, manufactured and installed by Messrs BJRC or licensees appointed by BJRC, as described and illustrated in this certificate and where the terms and conditions of certification are adhered to

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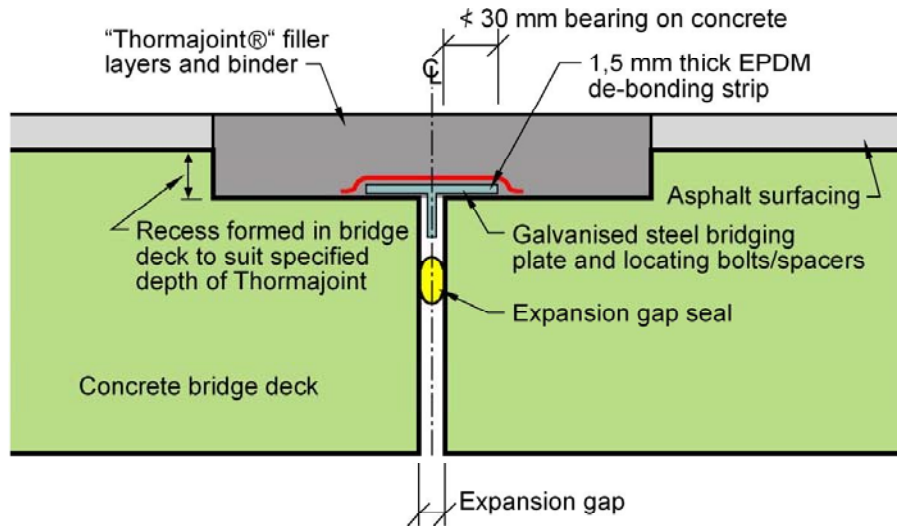
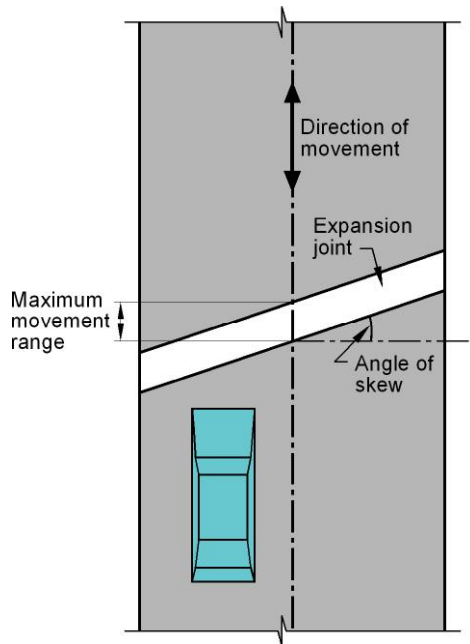


Figure 1 Typical Thormajoint® Bridge Deck Expansion Joint



Definition of movement range and angle of skew

Criteria for application of the Thormajoint® System®

The Thormajoint® system is suitable for use on bridge deck joints where:

- maximum movement range is 30 mm
- skew angles of joints are not greater than 45 degrees
- sudden movements in any direction are not greater than 1 mm
- slopes do not exceed 4 percent in any direction.

Four different sizes of joint cater for the following movement ranges:

- Type 1 – 5 mm maximum
- Type 2 – 15 mm maximum
- Type 3 – 25 mm maximum
- Type 4 – 30 mm maximum

Movement range - combination of contraction and expansion in the direction of movement.

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PREAMBLE

This certificate is issued by Agrément South Africa in terms of the powers granted to it by the Minister of Public Works. This certificate:

- has been granted after a technical appraisal of the performance of the Thormajoint® bridge deck expansion joint system for the [uses](#) covered by the certificate,
- is independent of any patent rights that may or may not subsist in the subject of the certificate,
- does not relieve the certificate holder of the obligation to obtain the prior approval of the appropriate roads authority for the use of the subject.

Agrément South Africa considers that the quality and performance of the Thormajoint® bridge deck expansion joint system will be satisfactory provided that the requirements stipulated in this certificate are adhered to. However, Agrément South Africa does not on behalf of itself, or the State, or any of its employees or agents, guarantee such quality or performance.

Responsibility for the proper exercise of the quality management system and compliance with the requirements of this certificate resides with the certificate holder.

No action for damages, or any other claim whatsoever lies against Agrément South Africa, its members, the State or any of its employees should the said components and materials fail to comply with the standard set out in the certificate issued by Agrément South Africa.

Interested parties who are in any doubt about any detail or variation should contact Agrément South Africa.

This certificate is subject to a validity review every 3 years. The certificate shall remain valid for so long as Agrément South Africa is satisfied that:

- the certificate holder complies with the general and specific conditions of certification as stipulated in the certificate;
- the performance-in-use of the subject is acceptable
- any changes in relevant standards or Agrément criteria have not invalidated the technical assessment which formed the basis of certification.

Agrément South Africa reserves the right to withdraw the certificate at any time, should reasonable cause exist

Notices affecting the validity of this certificate will be published on Agrément South Africa's web site and in the *Government Gazette*

PART 1: CONDITIONS OF CERTIFICATION

This certificate covers only Thormajoint® bridge deck expansion joints that comply strictly with:

- the description set out in Part 3 of this certificate, including figures 1 to 4 and Table 3
- The certificate holder's drawing numbered BJRC/TJ 4/1, BJRC/TJ 4/2, BJRC/TJ 4/3 and BJRC/TJ 4/4
- BJRC's specifications and quality system,
- the requirements of this certificate,

and installed by:

- the certificate holder
or
- a licensee appointed and trained by the certificate holder and registered as such with Agrément South Africa,

Licensee –any person or company appointed and trained by the certificate holder and registered with Agrément South Africa to manufacture and install Thormajoint® bridge deck joints in accordance with the certificate and authorized by him to claim compliance with the certificate. It is the certificate holder's responsibility to ensure that a licensee carries out the works in compliance with this certificate and in accordance with the approved quality system.

This certificate does not apply to any other product marketed, manufactured or installed by Bridge Jointing & Rehabilitation Contractors (Pty) Ltd or by any other entity.

Any person needing to check on details of construction must refer to the documentation listed above, which is available from the certificate holder.

A change to any one aspect of the Thormajoint® bridge deck expansion joint system could result in changes in the performance of installed joints. For this reason, no change may be made to the Thormajoint® bridge deck expansion joint system as described and illustrated in this certificate unless any such change is approved in writing by Agrément South Africa before it is implemented.

General conditions


The validity of this certificate is subject to the continued participation of the certificate holder in Agrément South Africa's post-certification quality assurance scheme.

An identification plate having a minimum size of 65 mm by 100 mm, as illustrated below, must be attached to the bridge balustrade.

Agrément South Africa's logo as shown in the lower part of the plate, is to be printed on all Thormajoint® promotional material.

Reappraisal

- must be requested by the certificate holder prior to implementing changes to materials or the method of installation
- will be required by Agrément South Africa if there are changes to Agrément criteria or if deemed necessary for any other reason.

| | |
|--|-------------|
| ○ ○ BRIDGE EXPANSION JOINT | |
| BRIDGE No | |
| INSTALLATION DATE | |
| TYPE | Thormajoint |
| REF. No | |
| TEL. No | 011 4523672 |
| BJRC | |
| <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <p style="text-align: center;">Thormajoint Certificate 2004/ </p> </div> | |
| ○ ○ | |

This certificate may be withdrawn if the certificate holder or a registered licensee fails to comply with these requirements.

On behalf of the Board of Agrément South Africa

Chairman
February 2004

PART 2: ASSESSMENT

Scope of assessment

Guidelines - Steyn, Silbernagl and Nordengen. *Guideline document for evaluation of bridge deck joints*. CSIR Transportek, May 2001

The assessment is based on guidelines for the evaluation of bridge deck joints adopted by Agrément South Africa, as applicable to flexible asphaltic plug expansion joints. The joint has been assessed as an integral part of a bridge deck structure and road surface, as described and illustrated in this certificate. Aspects of the bridge deck or road surface affected by the installation or performance of this joint, where applicable, have also been assessed.

Assessment

In the opinion of Agrément South Africa, when the materials, manufacture and installation of the Thormajoint® Bridge Deck Expansion Joint System, complete with bridging plates and rubber or EPDM de-bonding strips and where specified, cover plates complies with all the requirements of this certificate, they are suitable for the uses specified.

Agrément South Africa's comments on the properties of materials used and the various aspects of performance of the Thormajoint® System are set out in Table 1 below. Each aspect of performance was assessed by experts in that field.

Table 1 Assessment

| Aspect of assessment | Opinion of Agrément South Africa | Explanatory notes |
|---|----------------------------------|---|
| Binder | | Minimum value set by the licensor (Prismo UK) and test method |
| Ductility (cm) @ 15 °C | Satisfactory | >60 DIN 52013 |
| Elastic recovery % @ 15 °C | Satisfactory | >80 Sabita Manual |
| Softening point (°C) | Satisfactory | >80 ASTM D36 |
| Flow (mm) | Satisfactory | <1 mm BR 4T |
| Aggregate - particle shape and grading | Satisfactory | Observations of current installations and test reports indicate that where aggregates are used as specified, movement ranges are within the capacity of the joint. The load-bearing capacity of Thormajoint® system depends on the use of suitable aggregates. Compliance with the aggregate specification is essential. |

| Aspect of assessment [Table 1 continued] | Opinion of Agrément South Africa | Explanatory notes |
|--|---|---|
| Bridge deck joint | | |
| Durability | Satisfactory | Based on evidence to date, the useful life of Thormajoints will be in excess of 10 years |
| Maintenance plan | Satisfactory | The maintenance plan submitted is satisfactory; the specified inspection interval of two years is considered adequate. |
| Movement range | Satisfactory | Thormajoint® system has been assessed as fit-for-purpose for applications where joint movements fall within the specified range. |
| Strength | Satisfactory | Thormajoint® system is not to be used where traffic-control measures result in the wheels of stationary vehicles coinciding with joints, or where wheel-tracks and longitudinal joints coincide. |
| Fatigue | Satisfactory | Tests carried out overseas and current in-service performance in South Africa indicate that the fatigue behaviour of Thormajoint® system, for the movement type and range specified will be fit for purpose over the service life. |
| Adjusting forces | Not significant | Given the visco-elastic nature of the joint, the instantaneous joint movements specified (less than 1 mm in any direction), and normal diurnal movements, no significant adjusting forces will develop. |
| Shape stability | Satisfactory | Thormajoint® system is not to be used where traffic-control measures result in the wheels of stationary vehicles coinciding with joints or where wheel-tracks and longitudinal joints coincide. Precautions may be necessary on sidewalks to prevent damage from stiletto heels |
| Environmental resistance | Satisfactory | In-service performance of joints up to five years old indicates that the environmental resistance of the binder (to solar radiation, rainwater and pollutant gases) is deemed adequate for the certified application. The steel bridging plate, treated as specified and embedded in binder will be effective for the service life of the joint. |
| Water-tightness | Satisfactory | Joints are required to be watertight within acceptable limit for permeability and this is determined by test in each project. |

| Aspect of assessment [Table 1 continued] | Opinion of Agrément South Africa | Explanatory notes |
|---|---|--|
| Skid resistance | Satisfactory | Given the nature of the Thormajoint® system surface and the narrow width of the joint, skid resistance is not deemed to be an issue for concern. |
| Quality management <div style="border: 1px solid green; padding: 2px; margin-top: 5px;"> SANS 9001 <i>Quality management systems – Requirements</i> </div> | Satisfactory | The quality system is based on SANS 9001 and, if properly applied to the selection, blending and installation of Thormajoint® system, will ensure that the quality will be consistently satisfactory. |
| Constructability | Satisfactory | Observations of installations in progress indicate that, given adequate training of staff, the presence of suitable supervisory staff and suitable equipment, and adherence to established quality procedures, joints can be readily and successfully installed. |

PART 3: TECHNICAL DESCRIPTION

General description

The Thormajoint® bridge deck expansion joint system, partly pre-manufactured and partly blended on site and installed under licence to Prismo UK, consists of bridging plates and rubber or EPDM de-bonding strips and where specified, cover plates, and an elastomer-modified bitumen mixed on site with uniquely specified aggregate to form plug expansion joints.

BJ Super is manufactured by Prismo limited in the United Kingdom and locally in South Africa by Messrs DSC Zendon under license from the patent holder when it is known as BJ Super SA. Either the imported or local material may be used.

The Thormajoint® bridge deck expansion joint system utilises BJ Super SA and the specified aggregate together with galvanised steel bridging and cover plates and rubber or EPDM de-bonding strips to form bridge deck expansion joints.

The binder and aggregate are heated and mixed on site and laid and compacted in continuous layers in a prepared recess in the asphalt road surfacing. The joints extend the full depth of the asphalt down to the structural deck concrete which may require to be recessed to accommodate the specified depth of Thormajoint® system.

The type and dimensions of the Thormajoint® system are determined by the nature and the extent of the anticipated movement range. Four types of joint cater for the following movement ranges:

Type 1 – 5 mm maximum

Type 2 – 15 mm maximum

Type 3 – 25 mm maximum

Type 4 – 30 mm maximum

The Thormajoint® system is suitable for use where:

- movement ranges (a combination of contraction and expansion in the direction of movement) do not exceed 30 mm
- sudden movements are not greater than one millimetre in any direction
- the skew angles of the joints are not greater than 45%
- slopes in any direction do not exceed 4,0%. This is particularly important on roads carrying large numbers of heavy slow-moving vehicles
- joints are not in close proximity to junctions and traffic lights where there is likelihood of a build-up of stationary traffic, or on structures with tight curves
- wheel tracklines do not coincide with longitudinal joints

Materials

The materials, manufacture and installation of the Thormajoint® Bridge Deck Expansion Joint System, complete with bridging plates and de-bonding strips, complies with all the requirements of the relevant clauses of Sections 6600, 6700, 6800 and 8400 of the Colto standard specifications and the following:

- The binder used in the Thormajoint® bridge deck expansion joint systems is an elastomer-modified bitumen binder known as BJ Super SA, supplied by DSC Zendon cc, and/or BJ Super, supplied by Prismo Ltd UK (hereafter referred to as BJ Super SA only). During installation, BJ Super SA has a 6-8 hour safe working time at 140 – 180 °C. Overheating damages the binder and continuous temperatures over 200 °C are avoided. Should the temperature of the binder exceed 220 °C, it is decanted and discarded.
- The maximum temperature of the binder is contained within the specification set by the supplier of the binder.
- The binder used for the construction of the Thormajoint should be treated within the specification of the binder manufacturer. Further, only the amount of binder required for a day's work should be heated during that specific day, thus no reheating should take place of the binder that was already heated during the previous day. The binder temperature should be kept within a range of 110 °C to 190 °C while waiting to apply the binder to the aggregate in the joint. Note, no reheating of the binder that has cooled down to a temperature of less than 110 °C will be allowed.
- Aggregates used are uniquely specified, clean, single-size crushed roadstone complying with SANS 1083. For Thormajoint® Systems 75 mm and less deep, a 13,2 mm nominal-size stone is used; for joints deeper than 75 mm a 19 mm nominal-size stone may be used. Table 2 below indicates the relevant aggregate properties.

SANS 1083 *Aggregates from natural sources – Aggregates for concrete.*

TABLE 2 Aggregate properties

SANS 5845 Bulk densities and voids content of aggregates.
Technical Methods for Highways: TMH 1: Standard methods of testing road construction materials, National Institute for Transportation and Road Research, CSIR, Pretoria, 1986.
SANS 5841 Aggregate crushing value of coarse aggregates.

| Property | Nominal size of stone 13,2 mm | Nominal size of stone 19 mm |
|---|----------------------------------|-----------------------------|
| Void content (SANS 5845) | Min 40% | Min 40% |
| Flakiness index (TMH1 method B3) | Max 30% | Max 30% |
| Grading % passing sieve sizes (mm) (SANS SM 5841) | 19,0 mm | 100% |
| | 13,2 mm | 85 – 100% |
| | 9,5 mm | 0 – 30 % |
| | 6,7 mm | 0 – 5% |
| Aggregate crushing value (ACV) dry, % (SANS 5841) | 25% max | 25% max |

SANS 1431 Weldable structural steels.
SANS 121 Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods

The steel bridging plates, cover plates and spacers (refer to Table 3 and figures 2, 3 and 4) are manufactured from grade 300W steel complying with the requirements of SANS 1431. After manufacture, plates are hot-dip galvanized in accordance with SANS 121 to a zinc coat thickness of not less than 85 microns, or coated with Carbo Weld 11 in accordance with manufacturer’s recommendations.

The width of the bridging plates must ensure a minimum bearing of 30 mm on the concrete on each side of the joint.

The gap between the de-bonding strip and the edge of the joint is never less than 70 mm.

The de-bonding strips are of 1,5 mm thick rubber or EPDM. These are cut to a width that ensures that they overlap the bridging plates on each side, by at least 25 mm.

Dimensions and limiting factors for the Thormajoint® bridge deck expansion joint system [Drawings to be read with Table 3 below]

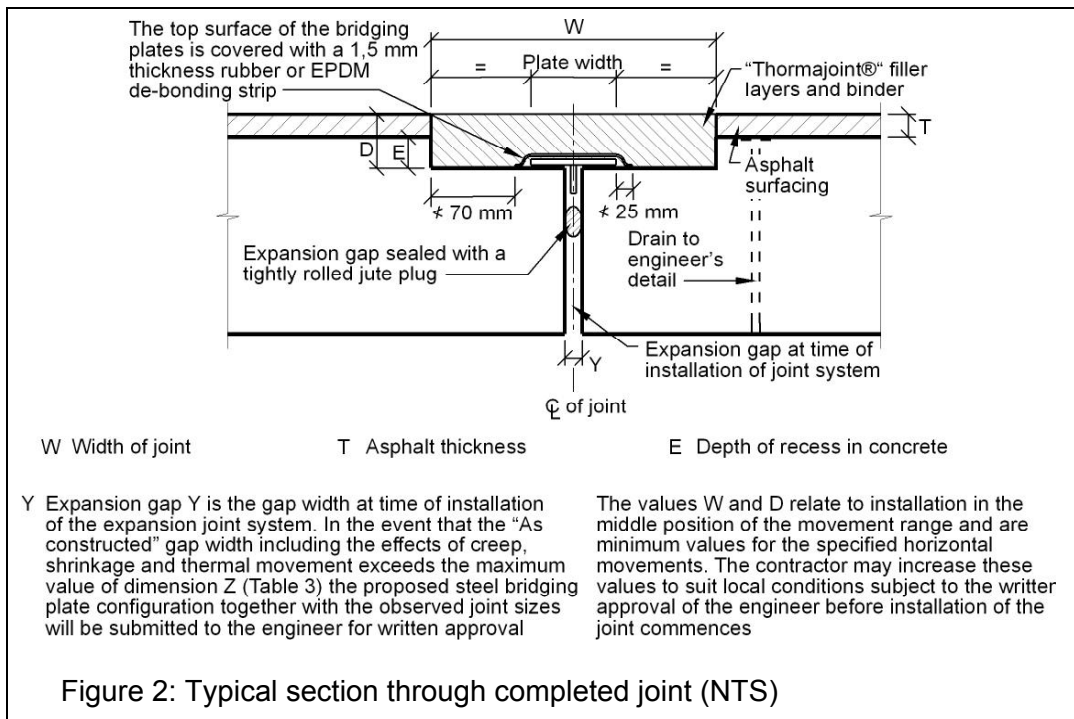


Table 3 (Key to figure 2)

| Joint type | Thormajoint® | | | Depth of Thormajoint mm | Depth of concrete recess mm | Width of de-bonding strip | Steel bridging plate | | |
|------------|---------------------------------------|------------------|------------------|-------------------------|-----------------------------|---------------------------|-----------------------------------|----------------------|---|
| | Total max horiz movement range (M) mm | Min width (W) mm | Min depth (D) mm | T ≥ D | T < D | | Bridging plate (width x thick) mm | Locating bolt/spacer | Expansion gap (Z) mm min-max (see figure 2) |
| 1 | 5 | 300 | 55 | T | D - T | 150 | 100 x 3 | M6 bolt | 11 - 34 |
| 2 | 15 | 400 | 80 | T | D - T | 165 | 115 x 3 | M6 bolt | 11 - 34 |
| | | | | | | | | 25 spacer | 30 - 55 |
| 3 | 25 | 500 | 80 | T | D - T | 175 | 125 x 4 | M6 bolt | 11 - 34 |
| | | | | | | | | 25 spacer | 30 - 55 |
| 4 | 30 | 500 | 100 | T | D - T | 200 | 150 x 5 | M6 bolt | 11 - 34 |
| | | | | | | | | 25 spacer | 30 - 55 |
| | | | | | | | | 45 spacer | 50 - 65 |

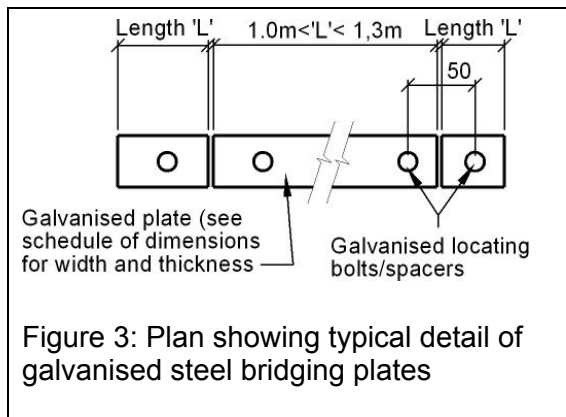


Figure 3: Plan showing typical detail of galvanised steel bridging plates

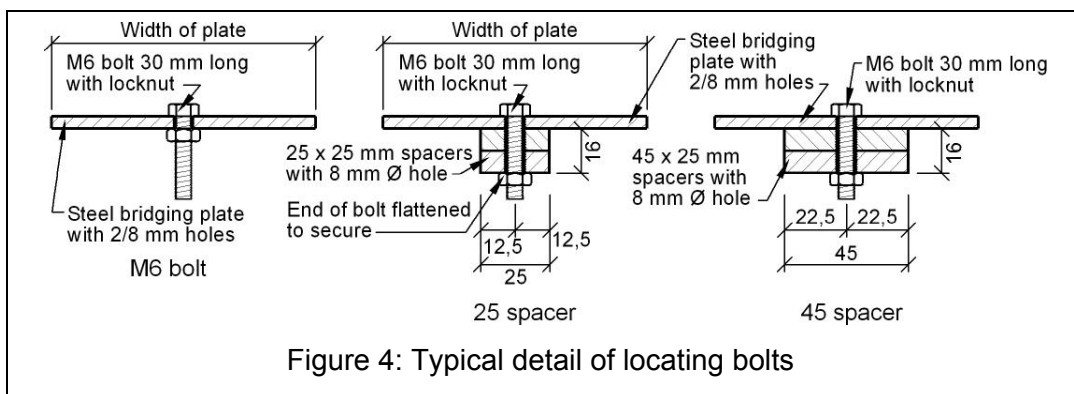


Figure 4: Typical detail of locating bolts

Joint recesses in the concrete bridge deck

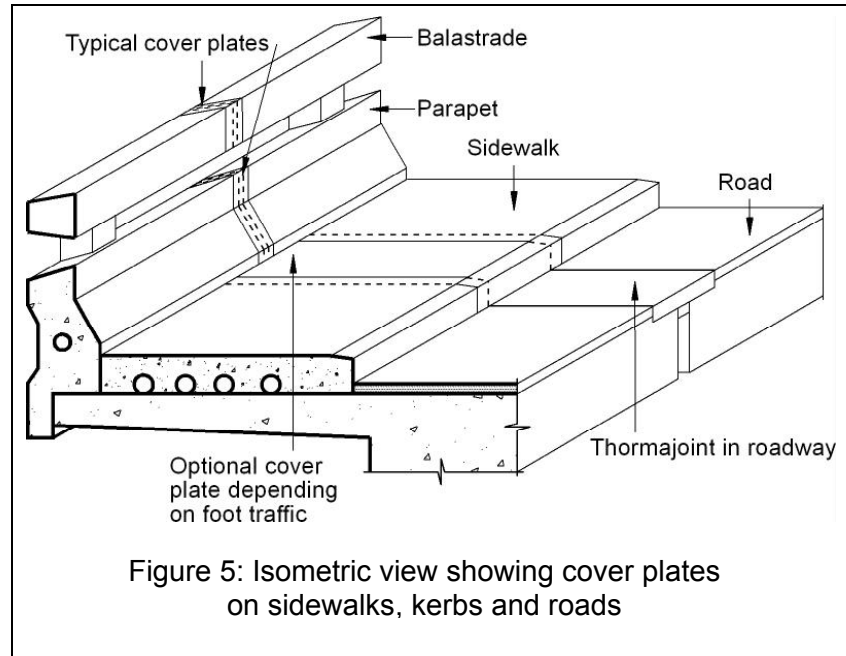
Recesses for Thormajoint® bridge deck expansion joints are formed to the prescribed width and depth into the concrete abutments, bridge deck ends, sidewalks and raised medians, where possible these are formed while casting the structural elements. In existing bridge decks the recess are cut and damaged surfaces made good with epoxy cement.

Drainage

The Thormajoint bridge deck expansion joint is watertight and can act as a dam for water present in the adjacent premix. It is good practice to drain this water away. Drainage is not part of the Thormajoint system. The bridge engineer is responsible for the drainage design requirements.

Sidewalks and kerbs

Joints together with bridging and cover plates in sidewalks and kerbs are constructed in accordance with the requirements of the engineer and the joint manufacturer



Joint installation (New installations)

Prior to the installation of the Thormajoint® system, the expansion gap and the joint recess in the concrete is temporarily filled to the level of the concrete deck surface. The filling is carried out using well-compacted crusher run, sand or weak concrete. The surface asphalt is then laid in a conventional manner onto the bridge deck and continuously over the filled recess.

Once asphaltting has been completed the temporary recess filling with asphalt overlay is removed by saw-cutting it to the specified width and depth of the joint.

Any high spots or other irregularities on concrete surfaces along each side of the joint onto which the bridging plate will rest are scabbled and depressions filled with epoxy mortar to ensure even bearing for the bridging plate.

Any damage to the corners of the abutting bridge decks that could affect the expansion joint's performance, is reported to the supervising engineer and this damage is repaired to his satisfaction before proceeding further.

Thormajoint® bridge deck expansion joints are installed under constant supervision by technically trained and experienced staff, in accordance with the requirements of this certificate and as described and illustrated below.



The concrete surfaces of the other side of the joint are prepared to ensure that they are flat and level to provide a firm base for the bridging plate

Following the preparation of the concrete surfaces along the joint, the expansion gap is sealed with a tightly rolled jute cloth.

Dust and dampness, if any, are removed from the bottom and sides of the joint recess and surfaces heated using a hot-air lance, prior to coating with BJ Super SA Binder.

The process is repeated after any delay in the placement of the Thormajoint® binder.



A coat of hot BJ Super SA Binder, between 140 and 180 °C is applied to the bottom and sides of the joint recess.



Bridging plates are placed in position, in firm contact with the surface on the other side of the joint. The plates are checked to ensure that they cannot be rocked in either a longitudinal or transverse direction.

The 1.5 mm thick rubber or EPDM de-bonding strips are then placed in position prior to placing additional binder and aggregate.

Hot aggregate, between 110 and 180 °C, is placed in the joint recess and spread out along the length of the joint in 40 mm thick layers. The aggregate is immediately flooded with hot BJ Super SA Binder and raked, to ensure that aggregate is fully coated and all voids filled.

This process is repeated until the recess is filled to 15 to 20 mm below the surrounding road surface.



A top layer of hot pre-mix, between 90 and 120 °C, consisting of BJ Super SA Binder and aggregate, is prepared outside the joint prior to placing, and spread to a level of 5-10 mm above that of the surrounding road surface.



The top layer is compacted level with the adjacent road surface.

After compaction any dust and/or moisture on the surface of the Thormajoint® System and surrounding road surface is removed using compressed air, and a screed coat of hot BJ Super SA is applied, using a screed applicator, to the surface of the Thormajoint®, overlapping the adjacent asphalt surfacing by 25 mm.

Traffic is not permitted to pass over the completed joint, with surface screed, until the joint has cooled to below 50 °C.



Finished Thormajoint® bridge deck expansion joint.

Joint installation (Refurbishment/replacement and maintenance)

Total replacement of Thormajoint

Where maintenance or replacement of a Thormajoint® system is to be carried out prior to the resurfacing of the surrounding road surface, a strip of asphalt at least 1 m on each side of the joint is removed and replaced. The new surfacing is carried over the existing joint and is subsequently removed after saw-cutting. The existing joint material is partially or totally removed, as required, and the Thormajoint® system installed as described for a new joint installation.

Refurbishment

Where only small sections of Thormajoint® system need to be replaced, and resurfacing of the surrounding road surface is not considered necessary, joint material may be removed, replaced and topped up to road surface level and finished as indicated above, without resurfacing over the joint

Resurfacing of roadway and Thormajoint

Where resurfacing of the surrounding road surface, which may include milling, is carried out, the resurfacing process is carried out over the existing Thormajoint® system. The new surfacing is then removed by saw-cutting along the edge of the Thormajoint® system and the Thormajoint® system topped up and finished as for the final stages of a new joint installation.

