TRANSPORT FOR NSW (TfNSW)

TfNSW SPECIFICATION D&C B284

INSTALLATION OF BRIDGE BEARINGS

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REVISION REGISTER

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INSTALLATION OF BRIDGE BEARINGS

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IC-DC-B284

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FOREWORD

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BASE SPECIFICATION

This document is based on Specification TfNSW B284 Edition 3 Revision 1.
TfNSW SPECIFICATION D&C B284
INSTALLATION OF BRIDGE BEARINGS

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the installation of bridge bearings.

1.2 STRUCTURE OF THE SPECIFICATION

This Specification includes a series of annexures that detail additional requirements.

1.2.1 (Not Used)

1.2.2 (Not Used)

1.2.3 Schedules of HOLD POINTS and Identified Records

The schedules in Annexure B284/C list the HOLD POINTS that must be observed. Refer to Specification TfNSW D&C Q6 for the definition of HOLD POINTS.

The records listed in Annexure B284/C are Identified Records for the purposes of TfNSW D&C Q6 Annexure Q/E.

1.2.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure B284/D and must be implemented.

1.2.5 Referenced Documents

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure B284/M.

1.3 DEFINITIONS

The terms “you” and “your” mean “the Contractor” and “the Contractor’s” respectively.

The following definitions apply to this Specification:

Cement Mortar

A mixture of cement, water and fine aggregate, with or without the addition of chemical admixtures or other materials, proportioned to produce a plastic mixture without segregation of the constituents.

Engineer

A Professional Engineer who is a member of Engineers Australia and experienced in the type of work nominated.
Erection

Process whereby bridge structural members are lifted, aligned, and placed in their final positions as shown in the Design Documentation drawings. It includes all temporary supporting and bracing measures required to keep the member stable at all times until it takes up the correct final position in the permanent structure.

Grout

A mixture of cement and water, with or without the addition of fine sand or chemical admixtures and other materials, proportioned to produce a pourable liquid without segregation of the constituents.

Installation (of bearings)

Fixing of a bearing to the position and level which ensures its correct functioning in accordance with the design of the bridge.

Girder

Structural member, forming part of the bridge superstructure, spaced at intervals as shown in the Design Documentation drawings. The term “girder” here includes precast concrete planks.

Surveyor

As defined in Specification TfNSW D&C G71.

2 MATERIALS

2.1 Grout

Materials for grouting, both as individual components and when combined, must conform to Specification TfNSW D&C B80, with a compressive strength at 28 days of not less than 32 MPa when sampled and tested in accordance with Test Method TfNSW T375.

2.2 Mortar

2.2.1 General

Materials for mortar pads, both as individual components and when combined, must conform to TfNSW D&C B80, with a compressive strength at 28 days of not less than 40 MPa.

Mortar for use to construct mortar pads, including the proprietary products stated in Clauses 2.2.2 and 2.2.3, must be approved by the Principal.

2.2.2 Mortar Pads for Elastomeric Bearings

Use cement mortar to construct mortar pads for elastomeric bearings, containing sufficient coarse sand to provide a rough texture on the contact face, conforming to Clause 4.4, to ensure frictional restraint to the installed bearing.

Do not use pre-mixed proprietary mortars to construct mortar pads for elastomeric bearings, unless a trial mortar pad has been first constructed demonstrating that the mortar pad is securely bonded to the concrete substrate. Do not use pre-mixed proprietary grouts to construct mortar pads for elastomeric bearings.
2.2.3 Mortar Pads for Bearings with Steel Attachment Plates

Use cement mortar to construct mortar pads for bearings that have steel attachment plates between the bearing and the concrete substrate (under the bearing), or the girder (above the bearing), and where the steel plates are fixed by mechanical means (using studs or anchor bolts).

You may also use suitable proprietary pre-mixed bedding grouts or mortars to construct such mortar pads, subject to the approval of the Principal.

3 GENERAL INSTALLATION REQUIREMENTS

3.1 STORAGE OF BEARINGS

Until the time of installation, store the bearings such that they are protected from direct sunlight, dirt, dust, wind, rain, running water and any other effects likely to cause damage.

3.2 PRE-ASSEMBLED BEARINGS

Do not dismantle pre-assembled bearings without the prior approval of the Principal. If so approved by the Principal, carry out the dismantling of a bearing only under the supervision of the bearing manufacturer.

3.3 SUPERVISION

Bearing installation must be supervised by an Engineer.

3.4 INSTALLATION

3.4.1 Maintain Stability

At all times prior to and during the installation operation, maintain every bridge member in a stable and safe condition.

3.4.2 Avoid Damage

Carry out installation of bearings without any damage to the bridge member, the bearings, or any other element of the structure.

3.4.3 Adjustments of Position and Level

For all bearings and temporary supports, make provisions for final adjustments in order to achieve the required position and level shown on the Design Documentation drawings.

3.4.4 Loading of Bearings

Do not place girders directly on top of pot, spherical, roller and rocker bearings, but support the girders using temporary supports before subsequently transferring the girder load onto the bearings.

Provide a certification by an Engineer certifying that the method of subsequently transferring the girder load onto the permanent bearings is safe.
4 CONSTRUCTION OF MORTAR PADS

4.1 CHOICE OF MORTAR TYPE

Where the type of mortar, minimum 28 day compressive strength, minimum strength at transfer of loads and other requirements are not specified on the Design Documentation drawings, choose a mortar type that is capable of transmitting the design loads to the structure without damage, by taking into consideration the following factors:

(a) type and size of the bearing;
(b) dowelling arrangement;
(c) load on the bearing;
(d) strength and setting time;
(e) friction requirements;
(f) size of the gap to be filled;
(g) mortar shrinkage characteristics;
(h) access around the bearing;
(i) method of bearing installation;
(j) construction sequence and timing.

The mortar chosen must be compatible with the concrete substrate surface.

<table>
<thead>
<tr>
<th>HOLD POINT</th>
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<tbody>
<tr>
<td>Process Held: Construction of mortar pads.</td>
</tr>
<tr>
<td>Submission Details: Details of materials and procedures for construction of mortar pads.</td>
</tr>
<tr>
<td>Release of Hold Point: The Nominated Authority will examine the submitted documents prior to authorising the release of the Hold Point.</td>
</tr>
</tbody>
</table>

4.2 SURFACE PREPARATION

Clean and otherwise prepare the surface adequately prior to casting the mortar pad on it.

4.3 MORTAR PAD SIZE AND SURFACE FINISH

4.3.1 Size of Pads

Construct mortar pads to the size shown on the Design Documentation drawings.

Where a mortar pad supports a bearing with steel attachment plates, extend the pad at least over the whole plan area of the attachment plate plus a minimum of 25 mm outside the edge of the plate.

In the case of an elastomeric bearing held in position by friction alone (i.e. without dowels), extend the mortar pad beyond the edge of the bearing a minimum of 50 mm outside the edge of the bearing.
4.3.2 Thickness

The thickness of mortar pads must be as shown on the Design Documentation drawings, but may be slightly altered where required during construction to achieve the intended levels, provided that the adjusted thickness is not more than 50 mm or less than 20 mm.

Where keeping the thickness below the upper limit is not possible, seek advice from the designer.

4.3.3 Surface Finish

The contact face of the mortar pad for elastomeric bearing must be flat, with a surface roughness no smoother than Grade 40 sandpaper.

In the area outside these minimum extents specified above, the mortar pad top surface must slope away from the bearing.

The edges of the mortar pad must be inclined at an angle of less than 45° to the supporting surface.

4.4 Constructed Pads

The constructed mortar pads must be sound, free of voids, hard spots or cracks, and well bonded to the concrete substrate.

Do not transfer loads onto the bearings or remove temporary supports until the mortar pads have developed their specified design strength, and have been successfully tested for drumminess to ensure they are sound.

Fill any voids left upon removal of the temporary supports with the same mortar.

Where this requirement is not met, carry out rectification to achieve conformity with this Specification.

5 Bearing Placing and Fixing

5.1 General

Where applicable, make suitable arrangements to accommodate movements of the incomplete superstructure due to elastic deformation, temperature, etc during installation.

Firmly fix bearings while they are on temporary supports to prevent disturbance during subsequent operations.

5.2 Positions and Levels

During positioning of the bearings, allow for any change in dimensions of the structure under dead and erection loads and for an ambient temperature during installation which is different to that assumed on the Design Documentation drawings.

The positions and levels of installed bearings must be within the tolerances specified in Clauses 6.1.1 and 6.1.2, unless shown otherwise on the Design Documentation drawings.
5.3 **SURVEY**

<table>
<thead>
<tr>
<th>HOLD POINT</th>
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<tbody>
<tr>
<td><strong>Process Held:</strong></td>
</tr>
<tr>
<td><strong>Submission Details:</strong></td>
</tr>
<tr>
<td><strong>Release of Hold Point:</strong></td>
</tr>
</tbody>
</table>

Carry out verification of positions and levels of all permanent bearings and temporary supports as a joint survey in accordance with TfNSW D&C G71.

Conform to TfNSW D&C G71 for Product Conformity Survey for certification of the positions and levels of installed bearings.

The associated Hold Points in TfNSW D&C G71 apply.

5.4 **ELASTOMERIC BEARINGS**

5.4.1 **Joints and Holes in Bearing Strips**

Minimise the number of joints in elastomeric bearing strips. You may use individual lengths of bearing strips not shorter than 1.2 m to make up to the required length, unless shown otherwise on the Design Documentation drawings or approved by the Principal.

Where not shown on the Design Documentation drawings, submit and obtain the Principal’s approval of the details of any proposed joints and/or holes (if any) in bearing strips, prior to work.

The minimum edge distance for holes in bearing strips is 50 mm, unless specified otherwise on the Design Documentation drawings.

5.4.2 **Fixing to Concrete Substrate**

Elastomeric bearing strips may be placed directly onto a concrete substrate provided that its surface has been finished with a wooden float, and meets the tolerances in Clause 6.1.1 and any other requirements detailed on the Design Documentation drawings.

Elastomeric bearing pads may be fixed directly onto a concrete substrate provided that its surface meets the tolerances specified in Clause 6.1.1, and the surface finish and other requirements specified in Clause 4.3.

Do not use epoxy to fix elastomeric bearings to concrete surfaces.
5.4.3 Recesses for Anchor Bolts and Studs

Unless specified otherwise, make the diameter of the recesses for anchor bolts or studs within the concrete at least 50 mm larger than the diameter of the bolts.

Clean the recesses and set and fix the bolts, then fill the recesses with an approved grout capable of withstanding the design loads prior to construction of the mortar pads.

5.5 All Other Types of Bearings

Where applicable, remove temporary clamping devices before bearings are required to accommodate any movement. Fill holes exposed on the removal of temporary clamps with an approved material.

Where bearings are installed prior to forming a cast-in-place concrete deck, seal the formwork around the bearing to prevent leakage of the concrete. Do not tilt, displace or distort bearings during concreting operations. Protect bearings during concreting operations. Remove any mortar that could contaminate the bearings completely and immediately.

6 Conformity

6.1 Tolerances

Unless nominated otherwise on the Design Documentation drawings, tolerances for installation of bridge bearings must be in accordance with Clauses 6.1.1 and 6.1.2.

6.1.1 Elastomeric Bearings

For plain elastomeric strips and pads or laminated elastomeric bearings, the tolerances in Table B284.1 apply.

For steel plates in contact with elastomeric bearing, the flatness tolerance specified in Specification TfNSW D&C B201 applies.
Table B284.1 – Tolerances for Elastomeric Bearing Strips and Pads

<table>
<thead>
<tr>
<th>Bearing Type</th>
<th>Characteristic</th>
<th>Tolerance</th>
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<tr>
<td>Elastomeric strip</td>
<td>Transverse(^{(1)}) position</td>
<td>± 5 mm</td>
</tr>
<tr>
<td></td>
<td>Longitudinal(^{(1)}) position</td>
<td>± 15 mm</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>± 2.5 mm</td>
</tr>
<tr>
<td></td>
<td>Flatness of top surface</td>
<td>0.5 mm over a 1.2 m straight edge</td>
</tr>
<tr>
<td></td>
<td>Transverse(^{(1)}) slope</td>
<td>± 0.0005 radians</td>
</tr>
<tr>
<td></td>
<td>Longitudinal(^{(1)}) slope</td>
<td>± 0.005 radians</td>
</tr>
<tr>
<td>Plain and laminated elastomeric pad bearing</td>
<td>Transverse(^{(1)}) position</td>
<td>± 3 mm</td>
</tr>
<tr>
<td></td>
<td>Longitudinal(^{(1)}) position</td>
<td>± 3 mm</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>± 2.5 mm</td>
</tr>
<tr>
<td></td>
<td>Difference in level between adjacent bearings</td>
<td>± 2.5 mm</td>
</tr>
<tr>
<td></td>
<td>Flatness of top surface</td>
<td>1.0 mm over a 1.2 m straight edge</td>
</tr>
<tr>
<td></td>
<td>Transverse(^{(1)}) slope</td>
<td>± 0.002 radians</td>
</tr>
<tr>
<td></td>
<td>Longitudinal(^{(1)}) slope</td>
<td>± 0.002 radians</td>
</tr>
</tbody>
</table>

**Note:**

\(^{(1)}\) “Transverse” and “longitudinal” refers respectively to the directions across and along the alignment of the bridge.

### 6.1.2 All Other Types of Bearings

#### (a) Position

Bearings must be located such that the bearing centreline in each direction is within 3 mm of the location shown on the Design Documentation drawings.

#### (b) Level

For bridges comprising simply supported girders, bearings must be set to the levels shown on the Design Documentation drawings within a tolerance of ± 5 mm.

For bearings supporting continuous superstructures, bearings must be set to the level shown on the Design Documentation drawings with a tolerance of ± 0.0001 times the sum of the length of the adjacent spans, but not exceeding ± 5 mm.

The bearing inclination including any attachment plates which form part of the bearing must be within 1 in 200 of that shown on the Design Documentation drawings.

### 6.2 Other Requirements for Elastomeric Bearings

For elastomeric bearings, the top and bottom faces of the bearings must be in full contact respectively with the superstructure element being supported, and with the underlying support surface, prior to opening the bridge to traffic.
Where this requirement is not met, carry out rectification works to achieve conformity with this Specification.

6.3 CERTIFICATION

After installation of the bearings and removal of temporary supports, submit a certificate from an Engineer stating that the bearing installation, including their final positions and levels, complies with this Specification and the Design Documentation drawings.
ANNEXURES B284/A AND B284/B – (NOT USED)

ANNEXURE B284/C – SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS

<table>
<thead>
<tr>
<th>Clause</th>
<th>Description</th>
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<tr>
<td>4.1</td>
<td>Submission of details for mortar pad construction</td>
</tr>
<tr>
<td>5.3</td>
<td>Submission of Engineer’s certificate on proposed method of installation, and Survey Report on conformity of positions and levels of temporary supports</td>
</tr>
</tbody>
</table>

The Hold Points in TfNSW D&C G71 also applies.

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of TfNSW D&C Q6 Annexure Q/E.

<table>
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<tr>
<th>Clause</th>
<th>Description of Identified Record</th>
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<tr>
<td>5.3</td>
<td>Survey Report verifying conformity of positions and levels of temporary supports</td>
</tr>
<tr>
<td>6.3</td>
<td>Certificate of conformity of installed bearings</td>
</tr>
</tbody>
</table>
ANNEXURE B284/D – PLANNING DOCUMENTS

Refer to Clause 1.2.4.

In addition to the information to be provided in accordance with other associated specifications, provide the following information on bearing installation in the PROJECT QUALITY PLAN:

(a) Details of the proposed equipment:
   (i) Type, capacity and set up of equipment used to move the bearings, including relevant plan and elevation sketches, supports and clearances (refer to Clause 3.4); and
   (ii) Certificate and calculations by an Engineer verifying that the equipment nominated will be used within safe working capacities (refer to Clause 3.4).

(b) Details of the proposed method:
   (i) Details of bearing storage and measures taken to prevent damage to the bearings before and during installation (refer to Clause 3.1);
   (ii) Method of lifting, positioning and aligning the bearings (refer to Clause 3.4);
   (iii) Method and order of fixing bearings including any temporary fixing and timing for the removal of transit clamps (refer to Clause 5.1); and
   (iv) Type of mortar to be used in the mortar pad (if required) (refer to Clause 4.1).

(c) Certificate from an Engineer verifying that the proposed installation methods conform to the requirements of this Specification.

ANNEXURES B284/E TO B284/L – (NOT USED)

ANNEXURE B284/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.5.

TfNSW Specifications

TfNSW D&C G71 Construction Surveys
TfNSW D&C Q6 Quality Management System (Type 6)
TfNSW D&C B80 Concrete Work for Bridges
TfNSW D&C B201 Steelwork for Bridges

TfNSW Test Method

TfNSW T375 Sampling and Testing of Grout