

# TRANSPORT FOR NSW (TfNSW)

## QA SPECIFICATION M783

### BRIDGE BEARING REPAIRS - CONSTRUCTION

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This document is a Transport for NSW QA Specification. It has been developed for use with roadworks and bridgeworks contracts let by Transport for NSW or by local councils in NSW. It is not suitable for any other purpose and must not be used for any other purpose or in any other context.

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#### REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 0		First edition	GM, IC	14.05.13
Ed 1/Rev 1	4.8.4 Annex M	References to “B220”, “B240” and “B241” replaced by “B201”. M.1 - Referenced documents updated. M.3 – definitions for “Engineer” and “Structural Engineer” updated.	DCS	27.10.17
Ed 1/Rev 2	Global	References to “Roads and Maritime Services” or “RMS” changed to “Transport for NSW” or “TfNSW” respectively.	DCS	22.06.20



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## QA SPECIFICATION M783

### BRIDGE BEARING REPAIRS - CONSTRUCTION

#### GUIDE NOTES

The following guide notes on the Specification are provided for use by TfNSW personnel. They do not form part of the Specification, Contract or Agreement.

#### USING M783

This Specification has been specifically developed for TfNSW maintenance works. It must not be used without a review of its suitability for the application and in the contractual environment.

M783 is a QA specification. The use of QA specifications requires the implementation of a quality system by the service provider which meets the quality system requirements specified in TfNSW Q4M.

#### EDITION 1

This is the first issue of the Specification. Suggestions for improvement and amendments on technical issues following use of the Specification in the field should be directed to the Supervising Bridge Engineer (Rehabilitation Design), Bridge & Structural Engineering. Any other comments or suggestions should be forwarded to the Contracts Quality Manager, Commercial Services Branch.

#### Specifications for Bridge Bearing Repairs

Two specifications apply to the repairs of bridge bearings, as follows:

Number	Title	Description
M782	Bridge Bearing Repairs - Design	Pre-construction activities including field inspection and assessment of existing bearings and related bridge members, survey and measurements, and preparation of a project-specific design for the bridge bearing repairs.
M783	Bridge Bearing Repairs - Construction	Repair of bridge bearings in accordance with the design produced under TfNSW M782. Specifies material procurement, fabrication and erection activities and all site requirements for the repair works.

#### OUTLINE OF M783

M783 covers the repair of existing bridge bearings either by refurbishment or replacement in accordance with the repair design prepared under TfNSW M782.

This Specification covers typical bearing repairs and can be customised for specific projects.

Bearings and related bridge elements may need to be repaired following deterioration, damage, distress or displacements caused by many factors including the original bridge or bearing design, traffic loads and the environment.

The main activities to be executed under TfNSW M783 include:

- Traffic management;
- Survey set out, control and verification;
- Demolition/dismantling of bridge and bearing components;
- Provision and installation of temporary works;
- Lifting of bridge members and spans;
- Refurbishment or replacement of bearings; and
- Reinstatement of bridge elements.

## SECTION 2 PLANNING

The Principal should review the Project Quality Plan (PQP) and seek clarifications as required.

Where hazardous materials are identified, the Contractor must provide a WHS Management Plan conforming to TfNSW G22.

Use vehicle actuated signals for traffic control if the bridge is left on temporary supports outside working hours or left on permanent bearings not yet fixed in the final position.

The Principal should provide the Contractor with all the available bridge information. The Contractor must examine the information provided to verify that the information critical to the Work is correct.

## SECTION 3 RESOURCES

All components and materials supplied for the Work must comply with the Specification.

All equipment used for temporary supports, bridge lifting, hoisting and jacking must be used within their specified working ranges.

Use experienced personnel to supervise and certify the Works, install temporary supports, remove/recover bearing components or whole faulty bearings, and replace or refurbish bearings.

Surveyors may be used to verify the location, level and inclination of bearings and temporary supports.

## SECTION 4 EXECUTION

### **General**

The Contractor is responsible for the integrity and safety of the bridge during repairs, and accordingly may propose changes to posted bridge load and speed limits.

The Contractor must submit procedures for carrying out the repairs, including dismantling of existing components, storage of new and existing components, temporary works, jacking and bridge lifts, applying restrictions and controls, refurbishment of bearings, removal and erection of bearings and reinstatement of related bridge elements.

### **Dismantling**

All bridge elements which may be damaged by bridge lifting operations must be dismantled, loosened or otherwise protected before moving, using an appropriate procedure and/or a prescribed sequence. Where the dismantling sequence is not shown on the Bearing Repair Drawings or the Bearing Repair Specification, the Contractor must submit the procedure for approval before use.

## **Temporary Works**

Assemble proprietary shoring systems in accordance with the manufacturer's instructions. Secure shims, packers and other inserts in position and prevent from working loose.

Design temporary supports to avoid permanent modifications to the bridge. Where bridge modifications are necessary, provide details on the Bearing Repair Drawings. The Contractor must not change the Bearing Repair Drawings unless the changes are approved by the Principal following consideration of demonstrated benefits.

Approval to cutting, breaking out material, drilling holes or other activities that affect bridge members should not be given without careful assessment by the repair design engineer of consequent impacts on the bridge's structural capacity and durability.

## **Jacking and Bridge Lifts**

The need for safety during bridge lifts cannot be over-emphasised. Use only fail-safe jacks for jacking. Fit all hydraulic systems with pressure-rated connections and prevent the oil pressure from exceeding specified limits.

Where jacking is required, specify whether or not calibrated jacking is to be used and, if so, outline the reasons, i.e. control of displacements or forces, etc. on the Bearing Repair Drawings.

The requirements for calibration in Clause 3.3.1 strictly apply to calibrated jacking operations but are also recommended where calibrated jacking is not required.

Most bridge superstructures can safely accommodate only limited lifts, depending on the stiffness, articulation and geometry of the superstructure and its supports. The bridge articulation has considerable influence on the safe vertical displacements and the required lateral and longitudinal restraints. The Contractor must conform to the Bearing Repair Drawings and the Bearing Repair Specification or otherwise develop, submit and use its own bridge lifting procedure and specify the permissible vertical displacements to ensure the safety and integrity of the bridge.

The Contractor must nominate the applicable controlling dimensions, record their initial values before lifting the bridge and monitor the change in the dimensions until the completion of the bearing repairs.

Bridge lifting should be gradual and controlled. Use approved lifting procedures. When carrying out simultaneous multiple jacking, use uniform lifts unless differential lifts are required by the design or it is verified by the design engineer that differential lifts will not overstress the superstructure.

## **SECTION 5 CONFORMITY**

The Contractor must submit a conformity report addressing as a minimum the activities highlighted in Clause 5 of the Specification.

## **ANNEXURES**

ANNEXURES A.1, A.2 and A.3 must be completed by the Principal to scope the Work, supply the information required for the Work and to specify the Loading Regime for the repairs. The Loading Regime must be based on the Bearing Repair Drawings, the Bearing Repair Specification and the Bearing Repair Brief and must be approved by the Principal before commencement of the Work.





# BRIDGE BEARING REPAIRS - CONSTRUCTION

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VERSION FOR: DATE:
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## FOREWORD

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### REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification TfNSW M783 Edition 1 Revision 1.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

### PROJECT SPECIFIC CHANGES

Any project specific changes have been indicated in the following manner:-

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. *Additional Text*.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. ~~Deleted Text~~.

## TRANSPORT FOR NSW (TfNSW)

### QA SPECIFICATION M783

#### BRIDGE BEARING REPAIRS - CONSTRUCTION

## 1 GENERAL

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- 1.1 The Work under this Specification comprises the repair or upgrading of deteriorated bridge bearings by refurbishment or replacement, including repairs to related bridge elements and public utilities, and temporary works and interim repairs as required. **Scope**
- This Specification does NOT include the inspection and assessment of the existing bridge bearings and preparation of the bearing repair design, drawings and specification which is covered by TfNSW M782.
- 1.2 Details of the Work are specified in: **Details of Work**
- ANNEXURE A.1; and
  - The Bearing Repair Drawings and Bearing Repair Specification.
- 1.3 Payment for the activities associated with completing the Work detailed under this Specification will be made using the pay items listed in ANNEXURE B.2. **Measurement and payment**
- 1.4 Provide the Identified Records (refer to TfNSW Q4M) summarised in ANNEXURE C.2 **Records**
- 1.5 The standards, specifications and test methods referred to in this Specification are referenced using an abbreviated form (e.g. AS 1234). The titles are given in ANNEXURE M.1. **Reference documents**
- 1.6 Some words and phrases have special meanings in this Specification. In some cases, the defined meaning is different from the meaning that the word or phrase might have in ordinary use. In order to understand the Specification, You need to take these special meanings into account. **Defined terms**
- Defined terms have the special meanings set out in ANNEXURE M.2. All defined terms are indicated by using small capitals (e.g. DEFINED TERM) unless they are one of the following basic terms, which appear too often for small capitals to be used:
- Principal
  - You / Your
  - Specification
  - Work
  - Bridge Site
  - Contractor
- 1.7 Some technical words or abbreviations have a special meaning in this Specification and are also defined in ANNEXURE M.3. **Definitions/ abbreviations**

- |     |   |                         |
|-----|---|-------------------------|
| 1.8 | Unless otherwise specified, the issue of an Australian Standard or TfNSW Test Method to be used is the issue current one week before closing date of tenders. The TfNSW specification to be used is the issue contained in the contract documentation.  | <b>Applicable issue</b> |
| 1.9 | You are responsible for all activities, actions, works and supply of materials, unless specifically stated otherwise. Accordingly, this Specification does not generally use wording such as "You shall ..." or "You must ..." because this is the underlying requirement. However, such wording is used where actions in a clause involve both You and the Principal and the roles need to be unambiguous. | <b>Interpretation</b>   |

## 2 PLANNING

### 2.1 PROJECT QUALITY PLAN

<p><b>Process Held:</b> Commencement of work.</p> <p><b>Submission:</b> Submit the PROJECT QUALITY PLAN (PQP) at least 5 BUSINESS DAYS prior to commencing work.</p>	<b>HOLD POINT</b>
--	-------------------

- |       |   |                                |
|-------|---|--------------------------------|
| 2.1.1 | The requirements of the PROJECT QUALITY PLAN are defined in TfNSW Q4M.  | <b>PROJECT QUALITY PLAN</b>    |
|       | In addition, address the HOLD and WITNESS POINTS in this Specification, as summarised in ANNEXURE C.1. The Principal will consider the submitted documents prior to releasing the HOLD POINT. | <b>Hold and Witness Points</b> |
| 2.1.2 | Address each item of the PROJECT QUALITY PLAN listed in ANNEXURE D.1, including:  | <b>Processes</b>               |
| .1    | Procedures for bearing repairs and for removing and reinstalling bearings in conformity with Clause 4.2.  | <b>Repair procedures</b>       |
| .2    | Full details of proposed replacement bearings.  | <b>Bearings</b>                |
| .3    | Full details of equipment for bridge lifting, including jacking.  | <b>Lift equipment</b>          |
| .4    | Survey systems and procedures.  | <b>Survey</b>                  |
| .5    | Your supervisory, structural engineering, and survey personnel's qualifications and experience.   | <b>Personnel</b>               |
| .6    | The routine submission of data and documents certifying the conformity of all work and materials.   | <b>Conformity data</b>         |

### 2.2 OTHER PLANS

- |       |  |                    |
|-------|--|--------------------|
| 2.2.1 | Develop for the Principal's approval the TRAFFIC CONTROL PLAN (TCP) for the Work in accordance with: | <b>Develop TCP</b> |
| .1    | TfNSW's Traffic Control at Work Sites Manual; and  |                    |
| .2    | The APPROVED LOADING REGIME in conformity to Clause 4.6.1.3.   |                    |

- 2.2.2 Provide the WORK HEALTH AND SAFETY (WHS) MANAGEMENT PLAN for the Works in accordance with TfNSW G22. **WHS Management Plan**

## **2.3 DOCUMENTS**

- 2.3.1 Details of the Work are provided in ANNEXURE A.1. **Work details**
- 2.3.2 The Principal will provide the information listed in ANNEXURE A.2. **Information**
- 2.3.3 Do not assume the information supplied by the Principal is correct. Assess the accuracy of the information supplied by the Principal before commencing the Work. **Verify information**

## **3 RESOURCES**

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### **3.1 PERSONNEL**

- 3.1.1 Manage the Work using an Engineer with the following experience: **Project Engineer**
- .1 Understands the structural design of bridge bearings.
  - .2 Has at least 1 year of experience with bridge bearing repair projects including planning, construction and site inspection.
- 3.1.2 Designers and design checkers must be Structural Engineers with the following experience: **Designers and design checkers**
- .1 At least 5 years structural analysis and bridge design experience.
  - .2 Participation on at least 5 bridge bearing repair projects, including site inspections.
- 3.1.3 Draftspersons must be competent and have relevant structural drafting qualifications and experience. **Drafting**
- 3.1.4 Surveyors must have qualifications conforming to TfNSW Q4M. You may propose Surveyors who do not meet this requirement but have relevant experience. **Surveyors**
- 3.1.5 Supervise the Work on-site using a Site Supervisor with at least 5 years supervisory experience, and at least 10 years of relevant experience, including repair of bridge bearings. **Site Supervisor**

- 3.1.6 .1 Provide as a minimum the following on-site personnel, each with at least 5 years experience in the rehabilitation and repair of bridges, including bridge jacking and bearing repairs: **Personnel at the bridge site**
- (a) One team leader with delegated authority.
  - (b) One trade-qualified bridge and wharf or civil construction carpenter, with the capability to be the team leader.
  - (c) One additional person.
- .2 Provide the following additional on-site personnel:
- (i) One person with a current NSW Workcover Intermediate Rigging Certificate during work on temporary supports.
  - (ii) One person with a current NSW Workcover Advanced Scaffolding Certificate during erection and dismantling of scaffolding (including suspended scaffolds).
- 3.1.7 Document Your personnel's names, qualifications, experience and role in the PROJECT QUALITY PLAN. **Personnel list in PQP**

### **3.2 MATERIALS AND COMPONENTS**

- 3.2.1 New bearings and components must conform to the Bearing Repair Drawings, Bearing Repair Specification and/or the relevant TfNSW QA bridgeworks specifications. **Bearings**
- 3.2.2 Provide all temporary bearings and supports with means for adjusting locations and levels to the specified positions. **Temporary supports**
- 3.2.3 Bolts, nuts, screws and washers must conform to Specification TfNSW B240. **Fasteners**
- 3.2.4 Protective treatments must conform to the Bearing Repair Drawings, the Bearing Repair Specification or be as approved by the Principal. **Protective treatment**
- 3.2.5 Materials used for repairing damaged concrete members and mortar pads must conform to the Bearing Repair Drawings, Bearing Repair Specification or be as approved by the Principal. **Cementitious materials**

### **3.3 EQUIPMENT**

- 3.3.1 Each jack and pressure gauge combination used for calibrated jacking operations must have a calibration certificate not more than six months old with gauge pressure versus load curves and tables for loading and unloading of the jack over the full working range. **Calibration of jack and gauge combinations**

Only use jacks with variations in load of no more than  $\pm 2\%$  for pressure readings within the working range.

Any jack may be combined with any pressure gauge provided each jack and gauge combination has the relevant calibration certificate.

- 3.3.2 Hydraulic jacks must: **Hydraulic jacks**
- .1 Have a securely attached durable tag showing clearly the rated capacity, maximum stroke, jack identification (ID) number, corresponding gauge identification number, and the most recent calibration and expiry dates.
  - .2 Be designed and installed to prevent movement of the ram beyond the designed maximum travel or the rated capacity.
  - .3 Have a fail-safe device, e.g. mechanical stops or automatic holding devices, to maintain the load if the jack malfunctions.
  - .4 Have grooved or roughened contact surfaces to prevent slip.
- 3.3.3 Pressure gauges must: **Pressure gauges**
- .1 Comply with AS1349.
  - .2 Have a dial not less than 150 mm in diameter or allow visual readings to at least 0.5 MPa.
  - .3 Have pulsation dampeners or snubbers fitted to control pressure variations and maintain reading accuracy.
  - .4 Be replaced immediately with another calibrated gauge following hydraulic or other type of shocks.
  - .5 Measure loads with an accuracy of  $\pm 2\%$ .
  - .6 Be selected so that when the jack is loaded to 75% of its rated capacity the gauge reads between 50% and 75% of its full scale.
  - .7 Be selected so that the maximum jack force corresponds to a gauge pressure between 60 % and 90 % of the gauge capacity.
- 3.3.4 **Hydraulic equipment**
- .1 Hydraulic pumps must minimise pressure fluctuations and hydraulic transients while operating or be fitted with suppressors.
  - .2 Hydraulic lines and connections must:
    - (a) Be adequately pressure-rated.
    - (b) Be fitted with adjusted and maintained bypass valves to limit hydraulic pressure within rated capacities.
    - (c) Have self-seating couplings and not be bent or kinked.
  - .3 Select pumps, gauges, lines, connections, valves, controls and manifolds to ensure smooth operations, adequate speed and responsiveness over full working range of the jack.

## 4 EXECUTION

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### 4.1 GENERAL

- |        |  |   |
|--------|--|---|
| 4.1.1  | Carry out all bearing repairs in conformity to the Bearing Repair Drawings, Bearing Repair Specification and/or BEARING REPAIR BRIEF. Use the specified repair sequence, jacking points, temporary supports, extent of bridge lifts and bearing types.<br><br>Submit proposals for variations to the Bearing Repair Drawings to the Principal and do not implement the changes until approved. | <b>Repair according to design and approved procedures</b> |
| 4.1.2  | YOU are responsible for all structural engineering aspects of the Work, such as design of temporary supports, bridge capacity assessment and Engineer's certifications.  | <b>Structural engineering responsibilities</b>            |
| 4.1.3  | Keep the bridge and temporary works suitable for the APPROVED LOADING REGIME during the Work (refer to ANNEXURE A.3).  | <b>Responsibility for bridge safety</b>                   |
| 4.1.4  | When any part of the bridge is open to traffic when repairs are being carried out, control traffic in accordance with the TRAFFIC CONTROL PLAN.  | <b>Repairs under traffic</b>                              |
| 4.1.5  | Certify that the Principal's APPROVED LOADING REGIME is appropriate, or propose with justification an alternative Loading Regime.  | <b>Certify Approved Loading Regime</b>                    |
| 4.1.6  | Do not damage protective coatings. Repair any damage at Your expense.  | <b>Damaged coatings</b>                                   |
| 4.1.7  | On completion of repairs reinstate any damaged or disturbed bridge members, fasteners and utilities.   | <b>Reinstatement at completion</b>                        |
| 4.1.8  | Remove all spare and loose materials from the site and restore work areas to their original condition, including grass, bushes, gravel, etc.   | <b>Original condition</b>                                 |
| 4.1.9  | Replace all loose, disconnected or missing bolts, nuts, screws and washers with new ones.  | <b>New for old fasteners</b>                              |
| 4.1.10 | Establish and submit the BRIDGE SURVEY CONTROL for setting out and for verification of bearing positions and levels.   | <b>Bridge Survey Control</b>                              |
| 4.1.11 | Only carry out bearing surveys when the bridge is not moving.  | <b>Survey conditions</b>                                  |



## **4.2 REPAIR PROCEDURES**

4.2.1	Prior to commencing the Work, submit the proposed repair procedure(s) including:	<b>Repair procedures</b>
.1	Repair sequence.	<b>Sequence</b>
.2	Protection of integrity of bridge members and utilities to be dismantled or left in place.	<b>Protection of components</b>
.3	All temporary works including accesses, scaffolding, temporary bracing, clamping and formwork.	<b>Temporary works</b>
.4	Set-up of jacks and other lifting/braking equipment, including sketches. Where no Bearings Repair Drawings are provided submit bridge lift proposals.	<b>Equipment set up</b>
.5	Calculated jacking loads and reactions, and required capacity of supports and foundations.	<b>Jacking loads</b>
.6	Restraints to stabilize and locate bridge elements being lifted.	<b>Restraints</b>
.7	Dimensions to be monitored during the repairs, and required frequency and accuracy of measurements.	<b>Monitoring dimensions</b>
.8	Removal/recovery of bearings.	<b>Bearing recovery</b>
.9	Repairs to other bridge components and elements.	<b>Other components</b>
.10	Welding and bolting.	<b>Welding</b>

## **4.3 TRAFFIC CONTROL**

4.3.1	Manage traffic in accordance with the TRAFFIC CONTROL PLAN and the Bearing Repair Drawings.	<b>Traffic control</b>
	Where the bridge is left on temporary supports outside working hours, use vehicle actuated traffic signals to control vehicle speed.	

## **4.4 CERTIFICATION**

4.4.1	Provide an Engineer's certification for the structural adequacy of:	<b>Engineer's certification</b>
.1	Equipment for bridge lifting.	
.2	Accesses, temporary supports and formwork.	
.3	Method for installing bearings.	

## **4.5 DISMANTLING COMPONENTS**

4.5.1	Loosen, dismantle and/or remove all bridge components which could be damaged during lifting operations, including expansion joints, traffic barriers, railings and utilities.	<b>Protection</b>
4.5.2	Store with care all dismantled and/or removed components until reinstatement.	<b>Storage</b>

- |       |  |                               |
|-------|--|-------------------------------|
| 4.5.3 | Dismantle bridge components in the sequence specified on the Bearing Repair Drawings. Identify components with suitable markings and document their removal to enable correct re-assembly. | <b>Systematic dismantling</b> |
| 4.5.4 | Do not dismantle any more of the bridge than specified unless otherwise approved by the Principal.   | <b>Limit to dismantling</b>   |

## **4.6 TEMPORARY WORKS**

### **4.6.1 Approved Loading Regime**

- |         |  |   |
|---------|--|---|
| 4.6.1.1 | The APPROVED LOADING REGIME for the repairs is specified in ANNEXURE A.3.  | <b>Approved Loading Regime</b>            |
| 4.6.1.2 | Review the APPROVED LOADING REGIME for the Work specified in ANNEXURE A.3 for its appropriateness for the repair.  | <b>Review Approved Loading Regime</b>     |
| 4.6.1.3 | The TRAFFIC CONTROL PLAN (TCP) must be consistent with the APPROVED LOADING REGIME and the Bearing Repair Drawings. Include the limits on loads and dimensions and the restrictions on traffic and pedestrians on the TCP. Address in the TCP encroachments by temporary works that may affect safety.<br><br>The TCP must be approved by the Principal. | <b>TCP consistent with Loading Regime</b> |
| 4.6.1.4 | Maintain the:<br><br>.1 Structural integrity of temporary supports and bridge members.<br>.2 Bridge condition no worse than at the start of the Works.<br>.3 Bridge deck condition suitable for vehicle and pedestrian use.  | <b>Maintain bridge safety</b>             |

### **4.6.2 Variations to Loading Regime**

- |         |   |  |
|---------|---|--|
| 4.6.2.1 | Immediately advise the Principal of structural damage or deficiency.  | <b>Advise damage</b>                   |
| 4.6.2.2 | Immediately or when directed by the Principal implement load limits, closures, propping or other measures to minimise hazards to traffic.   | <b>Additional measures</b>             |
| 4.6.2.3 | The Principal may vary the APPROVED LOADING REGIME at any time.<br><br>If you consider that the APPROVED LOADING REGIME is inadequate, submit to the Principal a revised Loading Regime with justification. | <b>Varying Approved Loading Regime</b> |

### **4.6.3 Packing, Shoring and Bracing**

- |         |   |                                 |
|---------|---|---------------------------------|
| 4.6.3.1 | Secure all steel packing plates, shims and similar items to prevent dislodgement.   | <b>Secure temporary packers</b> |
| 4.6.3.2 | Assemble proprietary shoring systems in accordance with the manufacturer's instructions. Where a manual for the shoring system is not provided, provide a certified design for its use at the site. | <b>Proprietary shoring</b>      |

- 4.6.3.3 Install bracing and other restraints in accordance with the Bearing Repair Drawings and the specified construction sequence. **Bracing**

#### **4.6.4 Repair Access and Modifications**

- 4.6.4.1 Provide sufficient access at the temporary supports for the repairs. **Repair access**
- 4.6.4.2 Do not permanently alter the bridge except as specified on the Bearing Repair Drawings or as approved by the Principal. **Permanent bridge modifications**
- 4.6.4.3 Do not remove, demolish, dismantle, cut, drill or otherwise disturb existing bridge members except as detailed on the Bearing Repair Drawings or as approved by the Principal. **Disturbance to existing bridge elements**
- 4.6.4.4 Use only diamond coring for drilling into concrete elements. Use only annular cutters for drilling of steel elements. **Holes**

- 4.6.4.5 **Process Held:** Erection of scaffolding and other accesses. **HOLD POINT**
- Submission Details:** Submit details of scaffolding and/or accesses including design calculations and Engineer's certification, at least 5 BUSINESS DAYS prior to erection.

#### **4.7 LIFTING AND LATERAL MOVEMENTS**

- 4.7.1 Lift in accordance with the Bearing Repair Drawings at the specified jacking locations within the specified tolerances. **Lifting to be within tolerances**
- Stop traffic while lifting. Lifting may be carried out under traffic provided traffic control, safety and structural integrity are certified by the Engineer and approved by the Principal.
- 4.7.2 Locate the BRIDGE SURVEY CONTROL marks to ensure uninterrupted monitoring of deflections and deformations. **Uninterrupted monitoring**
- Take initial level readings from these marks prior to any lifting.
- 4.7.3 Set jacks to apply vertical or horizontal forces only, with limited deviations only allowable as specified by the manufacturer. **Jacking direction**
- 4.7.4 When jacking, apply only axial loads in the direction of ram movement, with perpendicular loads only allowable within the limits specified by the manufacturer. **Axial loading**
- 4.7.5 Only use identical jacks on the same manifold where loads on each jack are within  $\pm 5\%$  of the averaged value, within calibration limits. **Multiple jacks with equal loads**
- Fit hose lines between the manifold and each jack with separate calibrated pressure gauges.
- 4.7.6 During simultaneous multiple jacking with unequally loaded jacks, ensure synchronised lifts by using: **Multiple jacks with unequal loads**
- .1 Jacks of different capacities proportional to the load with

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	separate simultaneously operated pumps and gauges; or	
	.2 Identical jacks connected to a manifold using individual lines, pressure gauges and flow control valves to control individual ram movements; or	
	.3 A computerised digitally controlled synchronous system.	
4.7.7	When restraints to lateral movements need to be released or replaced, provide temporary restraints with capacity not less than the original for the duration of the Work.	<b>Restrained bearings</b>
4.7.8	Unless specified or approved by the Principal, plan lifts so that no bridge members are on temporary supports outside working hours.	<b>Plan lifts</b>
4.7.9	Where bridge members are temporarily supported for more than one day, provide restraints against transverse wind and earthquake loads.	<b>Temporary supports</b>
4.7.10	Bridge jacking and lifting must not damage or cause permanent deformations of the bridge.	<b>Limits of lifting operations</b>
	Do not exceed the maximum specified jacking forces or lift heights. Comply with the constraints specified on the Bearing Repair Drawings, Bearing Repair Specification and relevant Bridge Technical Directions.	
4.7.11	When lifting spans with expansion joints, control longitudinal movements to keep joint displacements within design limits.	<b>Joint gaps</b>
	Monitor and record expansion joint gaps on both sides and centreline of the deck and the corresponding ambient shade air temperatures:	
	.1 Before commencing repairs;	
	.2 During repairs, i.e. before and after every lift;	
	.3 After completion of repairs.	
4.7.12	Limit steps at deck joints to less than 20 mm when lifting decks.	<b>Deck steps</b>
4.7.13	Provide provisions for sliding at temporary supports where support is required for extended periods, e.g. use PTFE faced pads. In such instances maintain lateral and longitudinal stability of the bridge and provide for slip of at least double the nominal movement.	<b>Provision for sliding at supports</b>
	Apply the above provisions where jacks act as temporary supports.	
4.7.14	Where specified on the Drawings or required for the repairs, carry out lateral realignments using successive horizontal and vertical cycles. Control movement and ensure safety, e.g. by using anchors or brakes.	<b>Lateral realignment</b>
	Where bridge movement is only possible on a grade due to site constraints, design and submit for approval a suitable system for this purpose.	

- |        |   |                                       |
|--------|---|---------------------------------------|
| 4.7.15 | Accurately monitor and control lifts and deflections within applicable tolerances, using suitable techniques.<br><br>Specify the accuracy and rate of lifting in the PQP, including details of lifting cycles and frequency of monitoring controlling dimensions. | <b>Monitoring and control</b>         |
| 4.7.16 | Inspect hydraulic hoses for flaws, leaks or bubbles after each operation. Immediately replace damaged hoses.<br><br>Inspect the hydraulic system regularly for oil leaks and damage and rectify any faults.   | <b>Inspect connections</b>            |
| 4.7.17 | Determine the jacking force from the calibration certificate for the specific jack and gauge combination.<br><br>Do not exceed 85% of the rated jack capacity at any time.  | <b>Determination of jacking force</b> |
| 4.7.18 | Use jacks in accordance with the manufacturer’s instructions, using base plates to ensure stability and load distribution as required.  | <b>Manufacturer’s instructions</b>    |
| 4.7.19 | Jack evenly, release gradually and lift with precision by carefully controlling the ram.<br><br>When simultaneous multiple jacking is specified, ensure that the lifts are synchronised.  | <b>Gradual and uniform jacking</b>    |
| 4.7.20 | Insert packers and shims during jacking as required until the specified vertical lift is achieved.<br><br>Unless otherwise specified, do not exceed 10 mm during each increment of the lift before inserting more packing.  | <b>Incremental packing</b>            |

4.7.21	<b>Process Held:</b> Bridge jacking/lifting and transverse movements  <b>Submission Details:</b> Submit Engineer’s certificates, sketches, reports, designs and calculations verifying conformity with Clause 4.7, at least 5 BUSINESS DAYS before commencing jacking/lifting or transverse movements of the bridge.	<b>HOLD POINT</b>
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#### **4.8 BEARING INSTALLATION AND REPAIRS**

- |       |  |                              |
|-------|--|------------------------------|
| 4.8.1 | <b>Process Held:</b> Bearing installation<br><br><b>Submission Details:</b> Submit certificates verifying conformity of the replacement bearings at least 5 BUSINESS DAYS prior to installation, including the Engineer’s certification verifying that the proposed erection/installation methods conform to this Specification and the 2011 NSW Work Health and Safety Act and Regulations. | <b>HOLD POINT</b>            |
| 4.8.2 | Install bearings in conformity with the PROJECT QUALITY PLAN, the Bearing Repair Drawings and the Bearing Repair Specification.  | <b>Bearing installation</b>  |
| 4.8.3 | When accessing bearings and components, clear and clean using wet mopping rather than blowers or similar methods.  | <b>Clearing and cleaning</b> |

- 4.8.4 Protective treatment must conform to TfNSW B201 for all components and fasteners, unless otherwise specified. **Protective treatment**
- Match the colour of the protective treatment to the existing colour, unless otherwise specified.
- Determine if the existing coatings contain lead or other dangerous substances, and act in conformity to the WHS Management Plan.
- 4.8.5 Repair other bridge members or components as specified in the Bearing Repair Drawings and Bearing Repair Specification. **Other repairs**
- Where other repairs are required, submit Your proposals for these repairs but do not commence work without the Principal’s approval.
- 4.8.6 On completion of the Work: **Completion of Work**
- .1 Remove all temporary works.
  - .2 Verify and document all control dimensions.
  - .3 Prepare Work-As-Executed Drawings showing all changes to the bridge, including bearings, using the original bridge design Drawings and the Bearing Repair Drawings as appropriate.

## 4.9 WARRANTY PERIOD

- 4.9.1 Provide a minimum 12 months guarantee or warranty from the DATE OF COMPLETION on the durability and serviceability of the repairs. Rectify all defects within this period at no cost to the Principal. **Warranty**
- Transfer all guarantees or warranties to the Principal in accordance with Clause 39 of TfNSW G2.

## 5 CONFORMITY

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- 5.1 Certify in a summary report that all the Work conforms to the Bearing Repair Drawings and Bearing Repair Specification, with supporting documentation as required. **Conformity summary report**

Include the following in the summary report:

Item	Reference	Conformity
Bearing Conformity	Clause 3.2.1 & 4.8.1	Certificate of conformity
Survey control	Clauses 4.7.2 & 4.8.6.2	Surveyor’s report
Restrictions on bearing replacement	Clause 4.7.10	Certificate of conformity
Work-As-Executed Drawings	Clauses 4.8.6.3	WAE Drawings
Non-conformities	TfNSW Q4M	List of NCR’s issued and

		dispositions
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## ANNEXURE A – DETAILS OF WORK

### A.1 WORK SUMMARY – BEARING REPAIRS

Contract Reference					
Bridge Name and Location					
TfNSW Bridge No					Year Built
Bearing Location	Total Number of Bearings for Repair	Number of Bearings to be Refurbished	Number of Bearings to be Replaced	Type of Replacement Bearing	Related Bridge Elements to be Repaired
Abutment A					
Pier 1					
Pier 2					
Pier 3					
Pier ...					
Abutment B					

NOTE: Entries to this Table are based on the Bearing Repair Design provided by the Principal under TfNSW M782 unless otherwise indicated.

### A.2 INFORMATION SUPPLIED BY THE PRINCIPAL

Documentation	Paper copy (*)	Electronic copy (*)	Document Reference and Date (dd-mm-yyyy)
BEARING REPAIR BRIEF.	YES	YES	
Bearing assessment report produced under M782.	YES / NO	YES / NO	
Bearing Repair Drawings.	YES / NO	YES / NO	
Bearing Repair Specification.	YES / NO	YES / NO	
Original bridge design drawings.	YES / NO	YES / NO	
Most recent Work-As-Executed Drawings	YES / NO	YES / NO	
Most recent construction drawings	YES / NO	YES / NO	
Drawings of modifications to the bearings.	YES / NO	YES / NO	
BIS bridge condition inspection reports.	YES / NO	YES / NO	
Structural assessments and reports relating to the bearings, superstructure, substructure and foundations.	YES / NO	YES / NO	
BRIDGE SURVEY CONTROL.	YES / NO	YES / NO	



<b>Documentation</b>	<b>Paper copy(*)</b>	<b>Electronic copy (*)</b>	<b>Document Reference and Date (dd-mm-yyyy)</b>
Records of application or presence of toxic or hazardous chemicals on or in vicinity of the bridge.	YES / NO	YES / NO	
Other documents: Future utilisation of bridge, forward planning, etc. _____	YES / NO	YES / NO	

(\*) Delete one option

### **A.3 LOADING REGIME**

Design live loads or load limit (#)	
Traffic and pedestrian restrictions (#)	
Other loading conditions	
Construction sequence #	
Temporary support arrangements (#)	

(#) To conform to the Bearing Repair Drawings and Bearing Repair Specification or to suit the proposed bearing repairs in the proposed BEARING REPAIR BRIEF.

### **A.4 BRIEF FOR BEARING REPAIRS**

The BEARING REPAIR BRIEF is attached.

## ANNEXURE B – MEASUREMENT AND PAYMENT

### B.1 GENERAL

B.1.1	Pay items are identified in ANNEXURE B.2.	<b>Pay Items to be used</b>
B.1.2	Pay items with a quantity of work in the schedule must be priced making due allowance for the cost of the activity.  Include the cost of any pay item with a quantity of work that is not priced in the priced pay items.	<b>Prices</b>
B.1.3	Distribute overheads between the priced pay items.	<b>Overheads</b>
B.1.4	Pay items with a quantity of work specified must not be tendered as a lump sum.	<b>No Lump Sum</b>
B.1.5	You will not be paid for work that does not conform to the Specification.  You will not be paid for events that include: .1 Removing and replacing nonconforming material. .2 Rework to achieve conformity. .3 Warranty repairs.	<b>No payment</b>

### B.2 SCHEDULE OF PAY ITEMS

Pay Item	Item Name and Description	Unit
<b>783</b>	<b>Bridge Bearing Repairs - Construction</b>  Executing a bearing repair design produced under M782.	
<b>783.01</b>	<b>Reset bearing</b>  Resetting misaligned or dislodged bearing to the original position, including all temporary works and lifting and moving operations.	<b>Each</b>
<b>783.02</b>	<b>Refurbish bearing</b>  Restoring a deteriorated bearing to its original condition, including all temporary works and lifting and moving operations.	<b>Each</b>
<b>783.03</b>	<b>Replace bearing</b>  Replacing a deteriorated bearing with a new bearing, including all temporary works and lifting and moving operations.	<b>Each</b>
<b>783.04</b>	<b>Bearing, other specific maintenance</b>  All other works associated with the bearing repairs, including temporary repairs, traffic control, etc.	<b>Each</b>

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## **ANNEXURE C – SCHEDULES OF HOLD AND WITNESS POINTS AND IDENTIFIED RECORDS**

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### **C.1 SCHEDULE OF HOLD AND WITNESS POINTS**

<b>Clause</b>	<b>Type</b>	<b>Process Held or Witnessed</b>
2.1	Hold	Commencement of work.
4.6.4.5	Hold	Erection of scaffolding and other accesses.
4.7.21	Hold	Bridge jacking/lifting and transverse movements.
4.8.1	Hold	Bearing installation.

### **C.2 SCHEDULE OF IDENTIFIED RECORDS**

<b>Clause</b>	<b>Description of Identified Record</b>
2.1	PROJECT QUALITY PLAN.
2.2.1	TRAFFIC CONTROL PLAN.
2.2.2	WORK HEALTH AND SAFETY MANAGEMENT PLAN
3.3.1	Calibration certificates.
4.2.1	Repair procedure.
4.4.1	Engineer's certification.
4.6.3.2	Certified design for proprietary shoring system where no manual is provided.
4.8.6.3	Work-As-Executed Drawings.

## **ANNEXURE D – PLANNING DOCUMENTS**

### **D.1 INFORMATION TO BE INCLUDED IN THE PROJECT QUALITY PLAN**

The information to be supplied in the PROJECT QUALITY PLAN must include, but not be limited to the following:

<b>Clause</b>	<b>Process</b>	<b>Details</b>
3.3	Use of hydraulic equipment	Safety of jacks and connections.
4.1.3	Safety and integrity of bridge	Maintain integrity of bridge and user safety under specified loads.
4.1.10	BRIDGE SURVEY CONTROL	Verification of bearing position set out and control measurements.
4.3.1	Vehicle actuated signals	Where bridge is left on temporary supports overnight.
4.4.1	Engineer's Certification	Structural adequacy of equipment, bearings, temporary works and repair procedures.
4.5	Dismantling components	Highlight and outline components to be dismantled as detailed on the Bearing Repair Drawings.
4.6.4	Making permanent modifications	Proceed only when approved by the Principal.
4.7.9	Providing lateral restraints	When bridge is on temporary supports for an extended time.
4.7.13	Provisions for sliding	When bridge is on temporary supports for an extended time.
4.7.19	Controlled jacking	Precise control of ram movement.
4.7.20	Incremental use of packers	For lifts of more than 10 mm.

## **ANNEXURE E TO L – (NOT USED)**

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## **ANNEXURE M – REFERENCED DOCUMENTS AND DEFINITIONS**

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### **M.1 REFERENCED DOCUMENTS**

#### **Australian Standards**

AS/NZS 1349 Bourdon tube pressure and vacuum gauges

#### **TfNSW Specifications**

TfNSW G22 Work Health and Safety (Construction Work)

TfNSW G71 Construction Surveys

TfNSW Q4M Quality Management System (Type 4)

TfNSW B201 Steelwork for Bridges

TfNSW B240 Steel Fasteners

TfNSW M782 Bridge Bearing Repairs - Design

#### **TfNSW References**

TfNSW Traffic Control at Work Sites Manual

#### **NSW Legislation**

Work Health and Safety Act 2011

Work Health and Safety Regulation 2011

### **M.2 DEFINED TERMS**

APPROVED LOADING REGIME	The live loads that will apply during the Work, including the following: <ul style="list-style-type: none"><li>– Design live loads or load limit;</li><li>– Traffic and pedestrian restrictions, including lateral lane positions on deck;</li><li>– Other loads applied during the Work;</li><li>– Construction sequence;</li><li>– Temporary supports.</li></ul>
BEARING REPAIR BRIEF	Document provided by the PRINCIPAL to scope the bearing repair work (refer ANNEXURE A.4).
Bridge Site	The bridge being repaired and immediate precinct specified in ANNEXURE A.1.
BRIDGE SURVEY CONTROL	The survey control for the bridge and the bearing repairs (refer TfNSW G71). Where appropriate, adapt the control shown on the original design drawings.
BUSINESS DAY	Any day other than a Saturday, Sunday or public holiday in NSW or 27, 28, 29, 30 or 31 December.
DATE OF COMPLETION	Refer to Clause 4.9.1.
Hold Point	A point beyond which a work process must not proceed without the Principal's express written authorisation (refer TfNSW Q4M).
Principal	Means Transport for NSW.
PROJECT QUALITY	Refer Clause 2.1.

PLAN

Specification	Means M783.
TRAFFIC CONTROL PLAN	Refer to Clause 2.2.1.
WARRANTY PERIOD	Refer to Clause 4.9.
Work	The bearing repair works specified under the Contract (refer to ANNEXURE A.1 and TfNSW Q4M).
You	Means the Contractor, including subcontractors, employees and agents.

### **M.3 DEFINITIONS**

Bearing Repair Design	Bearing Repair Drawings, Bearing Repair Design Report and Bearing Repair Specification for the repair of bridge bearings and related bridge members, including public utilities.
Bearing Repair Drawings	Design drawings detailing the design for the repair of bridge bearings and related bridge members, components and utilities.
Bearing Repair Specification	Contract documents applying to the bearing repairs detailed on the Bearing Repair Drawings.
Bridge Information System (BIS)	The TfNSW bridge inspection and condition rating system and database.
Bridge Lifting	Lifting or moving a bridge or individual members in any direction from or to a given position to facilitate bridge repairs and/or to allow access to bearings.
Calibrated jacking	Jacking operations where the jacking forces are assessed from readings on calibrated pressure gauges connected to hydraulic hoses attached to the jacks.
Engineer	Chartered Engineer with membership of Engineers Australia practising in the field of civil or structural engineering (or equivalent). An equivalent to membership of Engineers Australia would be an Engineer registered on the National Engineering Register (NER) in the general area of practice of Civil or Structural Engineering.
Installation	Fixing at the specified location, level and inclination.
Original Drawings	The original bridge design drawings or original bridge Work-As-Executed Drawings.
Simultaneous multiple jacking	Jacking of a bridge or individual member by operating a number of jacks at various locations at the same time to lift or move the bridge or member.
Structural Engineer	An Engineer listed as a structural engineer on the National Engineering Register (NER).
Temporary/ interim repairs	Repairs required before undertaking the bearing repair works, which may or may not form part of the completed bearing repairs.
Temporary works	All works not part of the bearing repairs but which are required to complete the bearing repairs including, but not limited to, temporary repairs, accesses, scaffolding, temporary supports, e.g. supplementary bearings, bracing, shoring, blocking and cribbing.
Work-As-Executed Drawings	Drawings submitted on completion of the Work that record the changes made from the Bearing Repair Drawings.

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