

**Technical Specification**

**Transport and Main Roads Specifications  
MRTS75 Supply and Erection of Prestressed Concrete  
Girders**

**November 2018**

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## 1 Introduction

This Technical Specification applies to the supply and erection of prestressed concrete I-Girders and prestressed concrete Super T-Girders for bridge superstructures.

This Technical Specification shall be read in conjunction with MRTS01 *Introduction to Technical Specifications*, MRTS50 *Specific Quality System Requirements* and other Technical Specifications as appropriate.

This Technical Specification forms part of the Transport and Main Roads Technical Specifications Manual.

## 2 Definition of terms

The terms used in this Technical Specification shall be as defined in Clause 2 of MRTS01 *Introduction to Technical Specifications*.

In addition, terms listed in Table 2 are applicable to this Technical Specification.

**Table 2 – Definition of terms**

| Term                                  | Definition   |
|---------------------------------------|--|
| Prestressed concrete I-Girders        | Precast I shaped girders made from prestressed concrete.   |
| Prestressed concrete Super T- Girders | Precast Super-T girders made from prestressed concrete.  |
| Surface tolerant epoxy coating        | A two-component epoxy coating for providing corrosion protection and abrasion-resistant to steel.            |
| Wet-to-dry epoxy                      | A two-component epoxy adhesive for bonding fresh wet cementitious concrete or mortar to existing substrates. |

## 3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

**Table 3 – Referenced documents**

| Reference   | Title  |
|-------------|--|
| AS/NZS 1214 | <i>Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)</i> |
| AS 3972     | <i>General purpose and blended cements</i>   |
| AS/NZS 4680 | <i>Hot-dip galvanized (zinc) coatings on fabricated ferrous articles</i>                   |
| MRTS01      | <i>Introduction to Technical Specifications</i>  |
| MRTS50      | <i>Specific Quality System Requirements</i>  |
| MRTS73      | <i>Manufacture of Prestressed Concrete Members and Stressing Units</i>                     |
| MRTS77      | <i>Bridge Deck</i>   |
| MRTS78      | <i>Fabrication of Structural Steelwork</i>   |
| MRTS78A     | <i>Fabrication of Structural Stainless Steelwork</i>                                       |
| MRTS81      | <i>Bridge Bearings</i>   |

| Reference                                     | Title  |
|---|--|
| MRTS81A                                       | <i>Stainless Steel Bridge Bearings</i>                                     |
| Registered suppliers and proprietary products | <i>TMR Product Index for Bridges and Other Structures</i>                  |
| Queensland Legislation                        | <i>Transport Operations (Road Use Management) Act 1995 and Regulations</i> |

## 4 Quality system requirements

### 4.1 Hold Points, Witness Points and Milestones

General requirements for Hold Points, Witness Points and Milestones are specified in Clause 5.2 of MRTS01 *Introduction to Technical Specifications*.

The Hold Points, Witness Points and Milestones applicable to this Technical Specification are summarised in Table 4.1.

**Table 4.1 – Hold Points, Witness Points and Milestones**

| Clause                           | Hold Point  | Witness Point          | Milestone  |
|----------------------------------|---|------------------------|--|
| 5.2.1<br>(referenced from 5.2.2) | 1. Approval of procedure for handling, transport and storage of girders |                        | Submit handling, transport and storage procedure (14 days) |
| 5.2.3.1                          | 2. Transport of girders   |                        |  |
| 7.1                              | 3. Approval of erection procedure                                       | 1. Erection of girders | Submit erection procedure (21 days)                        |
| 7.2.3                            | 4. Installation of pot-type bearings                                    |                        |  |

### 4.2 Construction procedures

The Contractor shall prepare documented procedures for all construction processes in accordance with the quality system requirements of the Contract.

Construction procedures for those activities listed in Table 4.2 shall be submitted to the Administrator in accordance with the quality system requirements of the Contract.

**Table 4.2 – Construction procedures**

| Clause | Procedure                                  |
|--------|--|
| 5.2.1  | Handling, transport and storage of girders |
| 7.1    | Erection of girders                        |

## 5 Prestressed concrete girders

### 5.1 Manufacture of prestressed concrete girders

Prestressed concrete girders shall be of the lengths and dimensions shown on the project drawings and shall be manufactured in accordance with the requirements of MRTS73 *Manufacture of Prestressed Concrete Members and Stressing Units*.

## **5.2 Handling, transport and storage**

### **5.2.1 General**

Girders shall, at all times during handling, transport and storage, be kept in such a position that the lifting loops (if used) are uppermost and the girders are upright.

The method of handling, transport and storage shall be such as to avoid the danger of fracture by impact, undue bending, twisting and whipping. Girders shall be moved only while fully suspended. In no case shall they be moved by dragging across the terrain.

The Contractor shall submit a procedure for the handling, transport and storage of girders to the Administrator not less than 14 days prior to commencement of any such activities. **Milestone**

Handling, transport and / or storage of girders shall not proceed until the procedure has been approved by the Administrator. **Hold Point 1**

The Contractor shall be responsible for the stability of the girders at all times including during storage, handling and transport.

### **5.2.2 Lifting**

Prestressed concrete girders are provided with in-built lifting devices. Girders shall be lifted only by using these lifting devices and in accordance with the rigging diagram shown on the project drawings. No other means of lifting shall be used at any stage during handling of girders unless details have been submitted and approved by the Administrator in accordance with Clause 5.2.1

**[Refer Hold Point 1].**

Cranes shall work within their rated capacity. The Contractor shall provide the following details of the proposed crane for handling and / or erection of girders in the procedure for handling and transport of girders **[Refer Hold Point 1]**:

1. crane manufacturer's load chart, and
2. details of counterweight, jib length and rigging.

### **5.2.3 Transport**

#### **5.2.3.1 General**

The Contractor shall assess the route from the place of manufacture of girders to the Site and provide the detail in handling, transport and storage procedure addressed in Clause 5.2.1. The procedure shall also include full details of the transport arrangements, including means of limiting torsional forces on the girders during transport to prevent torsional cracking. The Contractor shall also supply details of anticipated arrival time of the girders on the Site and the planned rate of delivery.

Transport of girders shall not proceed until all inspections required by the Administrator have been satisfactorily completed. **Hold Point 2**

#### **5.2.3.2 Certification of vehicles**

Prime movers shall display a current Certificate of Inspection issued by the Department of Transport and Main Roads or be currently registered in the National Heavy Vehicle Accreditation Scheme maintained by the National Heavy Vehicle Regulator.

### 5.2.3.3 Mass of loads

All road transport shall comply with the vehicle limits prescribed by the *Transport Operations (Road Use Management) Act 1995* and Regulations.

### 5.2.3.4 Escorts and pilots

All road transport shall comply with the relevant clauses of the traffic regulations pertaining to provision of pilot vehicles and / or police escorts.

### 5.2.3.5 Support of girders during transport

During transport, girders shall be supported at their ends on bearers placed under the lifting devices and they shall be braced against overturning and lateral whipping.

## 5.2.4 Support of girders during unloading and storage

The storage area shall be cleared of rocks, tree stumps etc., and brought to an even grade to ensure that the girders are supported as described in this clause. This requirement also applies to where girders will be placed on the ground temporarily, for example, when unloading from rail or road transport.

Girders shall be stored on timber support bearers positioned one at each end under the lifting devices. The size of the bearers shall be adequate to provide sufficient bearing capacity for all ground conditions. The contact surface between girders and bearers shall have a minimum plan area of 0.1 m<sup>2</sup>. The ground shall have sufficient bearing capacity to support the girders. The bearers shall be sufficiently high to store the girders clear of the ground even if subsidence occurs. The ground beneath the girders and at the end supports shall be levelled, so as to maintain the same clearance as at the supports, and to ensure that the girders do not develop a twist during storage. Girders shall be independently braced laterally to prevent overturning.

## 6 Materials

### 6.1 Registered suppliers and proprietary products

Work Operations that require the use of registered suppliers and proprietary products are listed in Table 6.1.

**Table 6.1 – Item requiring use of registered suppliers and proprietary products**

| Clause                   | Category of Work  |
|--------------------------|---|
| 7.3.2, 7.3.3 and 7.3.4.2 | Application of epoxy paste for seating of girders on bearings and girder restraint angles on substructure |

Clause 1 of Annexure MRTS75.1 lists the registered proprietary products to be used for the project.

Registered suppliers and proprietary products are listed in *Transport and Mains Roads Product Index for Bridges and Other Structures*. Access to this document can be via the link below:

<https://www.tmr.qld.gov.au/business-industry/Business-with-us/Approved-products-and-suppliers/Bridges-and-other-structures-approved-products-and-suppliers>

### 6.2 Epoxy paste

Epoxy paste shall be a registered proprietary product.

Epoxy putty shall consist of a proprietary two-part epoxy product capable of gap filling between the girder restraint angles and the headstock, and between the bearing and the bearing restraint plate on the girder soffit.

Epoxy paste shall have a minimum compressive strength of 50 MPa.

Clause 1 of Annexure MRTS75.1 lists the registered products to be used for the project.

### **6.3 Bearings**

Laminated elastomeric bearings and pot-type bearings shall comply with the requirements of MRTS81 *Bridge Bearings* or MRTS81A *Stainless Steel Bridge Bearings*.

### **6.4 Girder restraints, bolts, nuts and washers**

Girder restraints, girder restraint wedges, bolts, nuts and washers shall be fabricated to the details shown on the project drawings and in accordance with the requirements specified in MRTS78 *Fabrication of Structural Steelwork* or MRTS78A *Fabrication of Structural Stainless Steelwork*.

Non-stainless steel girder restraints and wedges shall be hot-dipped galvanised after fabrication in accordance with AS/NZS 4680.

Non-stainless steel bolts, nuts and washers shall be hot-dipped galvanised after fabrication in accordance with AS/NZS 1214.

### **6.5 Bearing restraint plates**

Bearing restraint plates and screws shall be fabricated to the details shown on the project drawings.

Fabrication shall be in accordance with the requirements specified in MRTS78 *Fabrication of Structural Steelwork* or MRTS78A *Fabrication of Structural Stainless Steelwork, as applicable*.

Non-stainless steel bearing restraint plates shall be hot-dipped galvanised after fabrication in accordance with AS/NZS 4680.

## **7 Erection of prestressed concrete girders**

### **7.1 General**

The Contractor shall submit its procedure for the erection of girders not less than 21 days prior to commencement of erection. **Milestone**

The Contractor may be required to submit to the Administrator, a certificate, signed by a Registered Professional Engineer of Queensland, certifying that the Contractor's proposed construction methods do not compromise the structural adequacy or the long-term durability of the completed structure. The Administrator may request such a certificate up to seven days after receiving the Contractor's erection procedure. The certificate shall be considered to be part of the Contractor's erection procedure.

Erection of girders shall not proceed until the erection procedure has been approved by the Administrator. **Hold Point 3**

Erection of girders shall be a Witness Point. **Witness Point 1**

The Administrator shall have the right at all times to stop any handling deemed damaging to the girders.



Girders shall not be placed onto bearings until the concrete in the headstocks and bearing pedestals has attained a compressive strength of at least 70% of the specified 28 day characteristic strength.

Before releasing the load from the lifting gear, the girders shall be supported such that they cannot be overturned or slide. Methods to prevent overturning or sliding shall include, but not limited to, installation of independent bracings or use of girder restraints. Consideration shall also be given to overturning moments from formwork and other items attached to the girders.

## **7.2 Installation of bearings**

### **7.2.1 Preparation of bearing seats**

Bearing seats shall be thoroughly cleaned prior to installation of bearing. If a curing compound has been applied to the bearing seat, it shall be removed by grinding or sandblasting then cleaned of dust and laitance with clean water.

### **7.2.2 Installation of laminated elastomeric bearings**

Elastomeric bearings shall be placed within  $\pm 3$  mm of the correct plan position on the bearing pedestals.

### **7.2.3 Installation of pot-type bearings**

Prior to installation, pot-type bearings, including sliding surfaces, shall be inspected and, notwithstanding any previous approval, the bearings shall not be installed until inspected and approved by the Administrator. **Hold Point 4**

Pot-type bearings shall be seated on the bearing pedestals as shown on the drawings. Unless shown otherwise on the project drawings, sliding bearings shall be set central to the range of movement.

## **7.3 Installation of prestressed concrete girders**

### **7.3.1 General**

Unless shown otherwise, prestressed concrete girders shall not be seated at any position other than at the bearing points.

### **7.3.2 Seating girders on laminated elastomeric bearings**

Bearing restraint plates shall be attached to the cast-in top attachment plates on the underside of the girders as shown on the project drawings.

The girder shall be lowered carefully until it just touches the bearings.

If the gap between the top surface of the bearing and the bearing restraint plate (measured at any point along the interface) is less than 1 mm, the girder shall be placed directly on the bearing.

If the gap between the top surface of the bearing and the bearing restraint plate is greater than 1 mm, the girder shall be lifted, the bearing restraint plate shall be cleaned of dust and oil, and the top surface of the bearing shall be coated with epoxy paste.

Epoxy paste material shall be a registered product in accordance with Clause 6.2.

The girder shall be lowered and supported on temporary packers. The periphery of the bearings shall be checked to ensure that the entire interface between the girder and bearings is filled with epoxy paste. Surplus epoxy paste squeezed out shall be removed immediately before it has set.

If the epoxy paste sets before completion of this operation, the girder shall be lifted and all contact surfaces cleaned before repeating the process.

After the epoxy paste has fully cured over a period of not less than 48 hours and has achieved a minimum compressive strength of 40 MPa, the temporary packers shall be removed without dislodging the girders.

### **7.3.3 Seating on pot-type bearings**

Bearing restraint plates shall be attached to the top attachment plates on the underside of the girders as shown on the project drawings.

The girder shall be lowered carefully until it just touches the bearings.

If the gap between the top surface of the bearing and the bearing restraint plate (measured at any point along the interface) is less than 1 mm, the girder shall be placed directly on the bearing.

If the gap between the top surface of the bearing and the bearing restraint plate is greater than 1 mm, the girder shall be lifted, the bearing restraint plate shall be cleaned of dust and oil, and the top surface of the bearing shall be coated with epoxy paste.

Epoxy paste material shall be a registered product in accordance with Clause 6.2.

The girder shall be lowered and supported on temporary packers and the periphery of the bearings shall be checked to ensure that the entire interface between the girder and bearings is filled with paste. Surplus paste squeezed out shall be removed before it has set.

If the epoxy paste sets before completion of this operation, the girder shall be lifted and all contact surfaces cleaned before repeating the process.

After the epoxy paste has fully cured over a period of not less than 48 hours and has achieved a minimum compressive strength of 40 MPa, the temporary packers shall be removed without dislodging the girders.

The girder shall be placed squarely on the bearings and the attaching bolts inserted. Bolts shall not be tightened until both ends of the girder have been placed in their correct positions on their respective bearings.

### **7.3.4 Girder restraint angles**

Where girder restraint angles are specified in the project drawings, the girder erection shall meet the requirement of this clause.

#### **7.3.4.1 Initial positioning**

The fixed end of the girders shall be lowered slightly ahead of the expansion end to ensure that the holes in the girders align with the corresponding holes in the girder restraints.

Nuts and washers shall be installed onto the girder restraint holding-down bolts. Girder restraint wedges, bolts, nuts and washers shall be installed to the girder restraints. All nuts shall be securely tightened before removing the load in the lifting gear.

#### **7.3.4.2 Final positioning**

At least seven days after casting the bridge deck slab, the girder restraint angles shall be permanently fixed. The restraint angles at one end only shall be able to be adjusted at any time for final positioning.

The girder restraint angles shall be completely bedded on epoxy paste.

Epoxy paste material shall be a registered product in accordance with Clause 6.2.

At the fixed end of the girder, the girder restraint angles shall be installed in such a manner that the girder engages the wedge of the girder restraint angles. The thickness of the epoxy paste shall be such that the girder restraint bolt touches the top of the hole in the girder restraint angles.

At the expansion joint end of the girder, the girder restraint angles shall be installed in such a manner that the girder restraint bolt is located mid-way along the length of the slotted hole in the girder restraint angles. The thickness of the epoxy paste shall be such that the girder restraint bolt touches the top of the slot in the girder restraint angles.

The girder restraint angles shall be supported in the correct positions until the epoxy paste has fully cured over a period of not less than 48 hours. After the epoxy paste has fully cured, all nuts shall be securely tightened.

If the bridge is located on a vertical grade, care shall be taken to ensure that no shear deflection is induced in the bearings and the deck and girders do not move downhill during the above operations.

### **7.3.5 Temporary bracing**

Girders shall be adequately braced prior to removing the load from the lifting gear after erection of the girder.

## **8 Cutting of lifting loops from girders**

Lifting loops (if used) shall be cut off flush with the top surface of the girders. If gas cutting is used, the operation shall be performed quickly to ensure minimal heat transfer into the girders from the cutting.

## **9 Miscellaneous requirements**

### **9.1 Drilling or coring of holes**

Drilling or coring of holes into the girders is not permitted for construction purposes such as installation of formwork and working platforms. **Nonconformance**

### **9.2 Provision for attachment of services**

Special fitments may have been cast into the girders for supporting services such as pipelines and cables.

Such fitments shall not be used for construction purposes without the Administrator's approval and shall be restored to a satisfactory condition if damaged in any way during construction.

### **9.3 Cast-in sockets for cross girders**

Where cast-in sockets for cross girders have been provided in the girders, the sockets shall be kept covered by plastic caps to prevent ingress of mortar, water or foreign matters.

## **10 Loading of girders**

Construction plants or vehicles of any type shall not be placed on the erected girders prior to the completion of the bridge concrete deck.

Load limitations on the newly cast bridge decks shall be in accordance with the requirements of MRTS77 *Bridge Deck*.

## **11 Supplementary requirements**

The requirements of MRTS75 *Supply and Erection of Prestressed Concrete Girders* are varied by the supplementary requirements given in Clause 2 of Annexure MRTS75.1.

