

# Main Roads Technical Standard

## **MRTS75**

### **Supply and Erection of Prestressed Concrete Girders**

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# Supply and Erection of Prestressed Concrete Girders

## 1 INTRODUCTION

This Standard applies to the supply and/or erection of prestressed concrete I girders and prestressed concrete T girders for a bridge superstructure.

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

This Technical Standard forms part of the Main Roads Specifications and Technical Standards Manual.

## 2 DEFINITION OF TERMS

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

## 3 REFERENCED DOCUMENTS

Table 3 lists documents referenced in this Technical Standard.

**Table 3 – Referenced Documents**

Reference	Title
AS 1214	<i>Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)</i>
AS 3972	<i>Portland and blended cements</i>
AS/NZS 4680	<i>Hot-dip galvanized (zinc) coatings on fabricated ferrous articles</i>
	<i>Transport Operations (Road Use Management) Act and Regulations 1995</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 Standards*.

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

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

Clause	Hold Point	Witness Point	Milestone
5.4.1	1. Approval of procedure for handling transport and storage of girders.		Submit handling, transport and storage procedure (14 days).
7.1	2. Approval of erection procedure.	Erection of girders.	Submit erection procedure (21 days).
7.2.3	3. Installation of 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
5.4.1	Handling transport and storage of girders.
7.1	Erection of girders.

## 5 PRESTRESSED CONCRETE GIRDERS

### 5.1 Not Used

### 5.2 Manufacture of Prestressed Concrete Girders

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

### 5.3 Not Used

### 5.4 Handling, Transport and Storage

#### 5.4.1 General

Girders shall at all times during handling, transport and storage, be kept in such a position that the lifting loops are uppermost and the girder is vertical.

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 its 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**

#### 5.4.2 Lifting

Prestressed concrete girders are provided with in-built lifting devices. Girders shall be lifted only by these lifting devices and no other means of lifting shall be used at any stage during handling unless details have been submitted and released in accordance with Clause 5.4.1 **[Refer Hold Point 1]**.

Cranes shall work within their rated capacity. If requested by the Administrator, the Contractor shall make available for inspection the crane manufacturer's load chart for the crane which is proposed for handling and/or erection with details of counterweight, jib length and rigging.

#### 5.4.3 Transport

##### 5.4.3.1 General

The Contractor shall assess the route from the place of manufacture to the Site and, in its submission to the Administrator in accordance with Clause 5.4.1, shall include full details of the transport arrangements, including means of limiting torsional forces on the units 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.

Girders shall be transported only after all inspections required by the Administrator have been satisfactorily completed.

##### 5.4.3.2 Certification of Vehicles

Prime movers shall display a current Certificate of Inspection issued by the Queensland Department of Transport.

Prime movers and trailing equipment shall display a current Licence to Hire issued by the Queensland Department of Transport.

### 5.4.3.3 Mass of Loads

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

### 5.4.3.4 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.

### 5.4.3.5 Support of Girders During Transport

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

## 5.4.4 Support of Girders During Storage

Girders shall be stored on timber support bearers positioned one at each end vertically under the lifting devices. The contact surface between girders and bearers shall have a minimum plan area of 0.1 m<sup>2</sup>. The bearers shall be sufficiently high to store the girders clear of the ground even if subsidence occurs. The ground beneath the girders shall be levelled so as to maintain the same clearance as at the supports. Girders shall be independently braced laterally to prevent overturning.

## 6 MATERIALS

### 6.1 Cement Mortar

#### 6.1.1 Cement

Cement shall be Type GP or Type HE complying with the requirements of AS 3972.

#### 6.1.2 Sand

Sand shall consist of sharp, coarse, clean siliceous sand, free from dust, clay, organic matter or other deleterious substances. Grading and fineness shall be such that the mortar produced shall be impervious to moisture.

#### 6.1.3 Water

Water shall be free from matter injurious to concrete, mortar and embedded items.

#### 6.1.4 Proportions

Mortar shall consist of a mixture of 1 part of cement to 3 parts of sand uniformly mixed so that no segregation occurs.

The water/cement ratio shall be the minimum required, to allow placement as specified for the particular application.

### 6.2 Epoxy Putty

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

A certificate from the manufacturer shall be provided to verify the suitability of the product for the intended purpose.

### 6.3 Bearings

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

### 6.4 Girder Restraint Angles

Girder restraint angles shall be fabricated to the details shown on the Drawings.

Fabrication shall be in accordance with the requirements specified in MRTS78 *Fabrication of Structural Steelwork*.

Girder restraint angles shall be hot-dipped galvanised after fabrication in accordance with AS/NZS 4680.

## 6.5 Tapered Plates

Tapered plates to take out the hog in the girders shall be fabricated to the details shown on the Drawings.

Fabrication shall be in accordance with the requirements specified in MRTS78 *Fabrication of Structural Steelwork*.

Tapered plates shall be hot-dipped galvanised after fabrication in accordance with AS/NZS 4680.

## 6.6 Girder Restraint Fasteners

Girder restraint to girder fastening bolts, nuts and washers shall be supplied and fabricated as shown on the Drawings. Fastener bolts and nuts to be hot dip galvanised in accordance with AS 1214 and washers to 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 such erection **Milestone**.

For a structure incorporating T girders, 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 shall not compromise the structural adequacy or the long term durability of the completed structure. The Administrator may request such a certificate up to 7 days after the receipt by the Administrator of 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 2**

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

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

Girders shall not be placed on reinforced concrete headstocks until the concrete in the headstock and bearing pedestals has attained a compressive strength of 70% of the characteristic strength.

## 7.2 Installation of Bearings

### 7.2.1 Preparation of Bearing Seat

The bearing seat shall be thoroughly cleaned prior to installation of the 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 seat.

### 7.2.3 Installation of Pot-Type Bearings

Prior to installation, pot-type bearings, including sliding surfaces, where applicable, shall be inspected and, notwithstanding any previous approval, the bearing shall not be installed until approved by the Administrator.

### **Hold Point 3**

The PTFE surface shall be coated with an approved release agent prior to installation of the bearing.

Unless shown otherwise on the Drawings, sliding bearings shall be set central to the range of movement.

Sockets for holding down bolts shall be installed in the bearing pedestal as shown on the Drawings to a tolerance of  $\pm 2$  mm of the dimensions relative to the bearing pedestal.

Pot-type bearings shall be seated on epoxy putty or cement mortar as shown on the Drawings.

Where the bearings are seated on cement mortar, wedges shall be used to temporarily support the bearings at the correct level. Wedges shall be removed when the mortar has cured and the remaining voids shall be filled with cement mortar.

Surplus epoxy putty or cement mortar squeezed out during placement of bearings shall be removed immediately before it has set.

### **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.

All holding down bolts and cored holes shall be carefully aligned during placing of prestressed concrete girders.

#### **7.3.2 Seating Girders on Laminated Elastomeric Bearings**

Steel tapered plates complying with Clause 6.5 bolted to the underside of the girders shall be used to take out the hog in the girders as shown on the Drawings.

The prestressed concrete girder shall be lowered carefully until it just touches the bearing.

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

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

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

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

After the epoxy putty has reached strength, the temporary packers shall be removed.

#### **7.3.3 Seating on Pot-Type Bearings**

Steel tapered plates complying with Clause 6.5 bolted to the underside of the girders shall be used to take out the hog in the girders as shown on the Drawings.

The prestressed concrete girder shall be lowered carefully until it just touches the bearing.

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

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

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

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

After the epoxy putty has reached strength, the temporary packers shall be removed.

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

#### **7.3.4 Girder Restraints**

The fixed ends of prestressed concrete 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.

The nuts and washers shall be assembled on the girder restraint holding-down bolts, and the girder restraint to girder fastener bolts, nuts and washers shall be installed. All nuts shall be securely tightened before removing the load on the lifting gear.

### **7.3.5 Temporary Bracing**

When no restraint angles are shown on the Drawings, before fully removing the load from the lifting gear, prestressed concrete girders shall be braced independently so that they cannot be overturned accidentally.

## **8 LOADING OF T GIRDERS**

Constructional Plant or vehicles of any type shall not be placed on the surface of T girders prior to casting the concrete deck.

## **9 ASSOCIATED REFERENCES**

A cast in situ reinforced concrete deck shall be constructed in accordance with the requirements of MRTS77 *Bridge Deck*, and load limitations on newly cast bridge decks will be in accordance with MRTS77 Clause 20.1