

# Main Roads Technical Standard

## **MRTS76**

### **Supply and Erection of Steel Girders**

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# Supply and Erection of Steel Girders

## 1 INTRODUCTION

This Standard applies to the supply and/or erection of steel 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 Standard forms part of the Main Roads Specifications and Technical Standards Manual.

The requirements for the erection of steel girders include the use of suppliers and products for the items listed in Table 1 that are registered by Transport and Main Roads.

**Table 1 – Items Requiring Use of Registered Suppliers and Products**

Clause	Category of Work
8	Cold Galvanising Paint

For further information regarding registered suppliers and products for the above item refer to –

Director (Bridge Design)  
 Structures Division  
 Queensland Department of Transport and Main Roads  
 GPO Box 1412  
 Brisbane Qld 4001

## 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	Erection of girders.	Submit erection procedure (21 days).

Clause	Hold Point	Witness Point	Milestone
	procedure.		
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 Requirements**

Clause	Procedure
5.4.1	Handling transport and storage of girders.
7.1	Erection of girders.

## 5 STEEL GIRDERS

### 5.1 Not Used

### 5.2 Manufacture of Steel Girders

Steel girders, cross bracing and/or expansion bearings shall be of the lengths and dimensions shown on the Drawings and shall be manufactured in accordance with the requirements of MRTS78 *Fabrication of Structural Steelwork*.

### 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 girder is vertical.

The method of handling, transport and storage shall be such as to avoid damage due to 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

Steel girders shall be lifted with webs vertical and the top flange uppermost. Care shall be taken to ensure that protective coatings are not damaged.

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. The Contractor shall also supply details of anticipated arrival time of the girders and other steelwork on the Site and the planned rate of delivery.

Girders, cross members and expansion bearings 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**

Steel girders, cross bracing and/or expansion bearings shall be supported in such a manner that the items shall not suffer any distortion and shall be kept clean and free from damage to protective treatment coatings.

Girders 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. 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.

Cross bracing shall be stored clear of the ground. Expansion bearings shall be stored under cover.

Supports and bracing shall be carefully placed so as not to damage protective coatings.

### **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 and mortar.

##### **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 Bearings**

Expansion bearings for rolled steel girders shall be in accordance with the details shown on the Drawings.

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

### 6.3 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.

### 6.4 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 STEEL 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**.

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 for Fabricated Plate Girders

#### 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 Steel Girders**

#### **7.3.1 General**

Unless shown otherwise, steel 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 steel girders.

When no restraint angles or other positive fixings are provided, before fully removing the load from the lifting gear, steel girders shall be braced independently so that they cannot be overturned accidentally.

#### **7.3.2 Installation of Rolled Steel Girders**

The rolled steel girder and bearings shall be installed as a single unit in accordance with the details shown on the Drawings.

The bearing shall be held in position with steel wedges. A cement mortar, of smooth creamy consistency, shall be placed on the surface of the headstock or bearing pedestal in sufficient quantity to maintain the required minimum thickness of mortar under the entire surface of the bearing base plate. The bearing base plate shall be supported at the correct level and in the correct plane on steel wedges.

After the mortar bedding is cured, wedges shall be removed, the resulting cavities shall be filled with cement mortar and the holding-down bolts shall be tightened firmly.

#### **7.3.3 Installation of Fabricated Steel Plate Girders**

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

Where the Drawings show that the steel girder is to be seated on a laminated elastomeric bearing, the top surface of the bearing shall be coated with epoxy putty.

The steel girder shall be placed on the bearing and the periphery of the bearing checked to ensure that the entire interface between the steel 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.

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

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

##### **7.3.3.3 Girder Restraints**

During placing of girders care shall be taken 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 (if specified). All nuts shall be securely tightened before removing the load on the lifting gear.

## **8 ERECTION OF STEEL CROSS BRACING**

Steel cross bracing shall be erected in accordance with the details shown on the Drawings.

Welding shall comply with the requirements of MRTS78 *Fabrication of Structural Steelwork*.

Welding to hot-dipped galvanised steel shall be minimised. Any welding shall be treated with two coats of a registered cold galvanising paint (Refer Clause 1) in accordance with the manufacturer's recommendations.

## **9 ASSOCIATED REFERENCES**

A cast insitu 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.