

Technical Specification

**Transport and Main Roads Specifications
MRTS62 Bridge Substructure**

November 2023



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1 Introduction

This Technical Specification applies to the construction of the substructure of bridge including abutments and piers from foundations to bearing pedestals.

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 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 – Definitions of terms

Term	Definition
Substructure	That section of a structure from the top of the bearing pedestal (or underside of bearing) to the base of the foundations.

3 References

Table 3 lists documents referenced in this Technical Specification.

Table 3 – Referenced documents

Reference	Title
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS03	<i>Drainage Structures, Retaining Structures and Embankment Slope Protections</i>
MRTS04	<i>General Earthworks</i>
MRTS50	<i>Specific Quality System Requirements</i>
MRTS51	<i>Environmental Management</i>
MRTS63	<i>Cast-In-Place Piles</i>
MRTS64	<i>Driven Tubular Steel Piles (with reinforced concrete pile shaft)</i>
MRTS65	<i>Precast Prestressed Concrete Piles</i>
MRTS66	<i>Driven Steel Piles</i>
MRTS68	<i>Dynamic Testing of Piles</i>
MRTS70	<i>Concrete</i>
MRTS71	<i>Reinforcing Steel</i>
MRTS72	<i>Manufacture of Precast Concrete Elements</i>
MRTS78	<i>Fabrication of Structural Steelwork</i>
MRTS78A	<i>Fabrication of Structural Stainless Steelwork</i>
MRTS79	<i>Fabrication of Aluminium Components</i>

Reference	Title
MRTS81A	<i>Stainless Steel Bridge Bearings</i>
MRTS83	<i>Anti-graffiti Protection</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. Where reference to other Technical Specifications are made, these may require additional Hold Points, Witness Points or Milestones.

Table 4.1 – Hold Points, Witness Points and Milestones

Clause	Hold Point	Witness Point	Milestone
6		1. Setting out	
9.4	1. Inspection of bearing recess		
10.1	2. Headstock support frames		
13	3. Embankment construction		Submission of procedure for construction of embankment (14 days)

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 Clause 1 of Annexure MRTS62. 1 shall be submitted to the Administrator in accordance with the quality system requirements of the Contract.

4.3 Testing frequency

The minimum testing frequency for work covered by this Technical Specification shall be as stated in the relevant Technical Specifications.

5 Materials

5.1 Registered proprietary products

Work Operations that require registered proprietary products are listed in Table 5.1.

Table 5.1 – Items requiring use of registered suppliers and proprietary products

Clause	Category of work
10.2	Use of proprietary shrinkage compensated grout or shrinkage compensated micro-concrete.

For information regarding registration of suppliers and products for the above items refer to the [Approved Products and Registered Suppliers](#) page on the departmental website.

Registered suppliers and products for the above items are listed in Clause 2 of Annexure MRTS62.1.

6 Construction

Bridge abutments and piers shall be located as shown in the Project Drawings.

Abutments and piers shall be set out on the site by a surveyor experienced in bridge construction.

Witness Point 1 During the setting out process, the Contractor shall be deemed to have checked the location and details of abutments and piers in relation to the dimensions of any precast superstructure members. If an error in the details shown in the Project Drawings is detected, the Administrator shall be notified immediately.

No extension of time for practical completion will be granted by the Administrator for delays caused in relation to the setting out process undertaken by the Contractor.

The Construction of piles, footings, pile caps, headstocks, abutment and pier structures, bearing pedestals, bearing recesses, and restraint blocks shall be carried out to the details shown in the Project Drawings and this Technical Specification.

Care shall be taken when constructing piers in waterways to ensure that the specified environmental constraints described in MRTS51 *Environmental Management* or elsewhere in the Contract, are not compromised. Construction of permanent or temporary earth bunds to assist in the construction of piers shall be permitted only where specifically stated in the Contract.

7 Piling

Piling shall be carried out in accordance with the following Technical Specifications, as appropriate:

- a) MRTS63 *Cast-In-Place Piles*
- b) MRTS64 *Driven Tubular Steel Piles (with reinforced concrete pile shaft)*
- c) MRTS65 *Precast Prestressed Concrete Piles*
- d) MRTS66 *Driven Steel Piles*, and
- e) MRTS68 *Dynamic Testing of Piles*.

8 Excavation

Excavation for footings and pile caps shall be in accordance with the requirements of Clause 13.3.4 of MRTS04 *General Earthworks*.

9 Reinforced Concrete

The supply and construction of concrete shall be in accordance with MRTS70 *Concrete*.

Steel reinforcing shall be supplied and installed in accordance with the requirements of MRTS71 *Reinforcing Steel*.

The top surface of footings, pile caps, headstocks and piers shall be steel trowel finished.

General concrete cross section and positional dimensional tolerances shall be in accordance with MRTS70. The specific tolerances for substructure elements are provided in Clause 9.1 to 9.4 of this Technical Specification.

9.1 Headstock

The top level of the headstock shall be constructed to achieve a tolerance of ± 5 mm from the level shown on the Project Drawings.

9.2 Bearing pedestals

Bearing pedestals shall be constructed separately from the headstock construction. The top surface of bearing pedestals shall be finished with a wood float to a coarse sandpaper-like finish and shall be accurate to the tolerances set out in Table 9.2

Table 9.2 – Tolerances for bearing pedestal

Dimension	Tolerance
Position (including height) of pedestal (from position shown in the Project Drawings)	± 5 mm
Slope of bearing surface	± 1 in 300
Surface planarity (straight-edge)	1 mm
Verticality of bearing pedestal	2%

Embedded items shall be supplied and installed, and holes cored or formed, in the locations and to the details shown in the Project Drawings. Such items include, but are not limited to:

- a) holes for deck unit holding down bolts and dowels
- b) holes for holding down bolts for girder restraints
- c) holes for bearing holding down bolts or locating dowels, and
- d) support brackets and or anchorages for future services.

9.3 Restraint block, vertical dowels, and cap

Reinforced concrete girder restraint blocks with or without vertical dowels shall be constructed to the details shown on the Project Drawings. Girder restraint blocks shall be cast before placing the girders. Tolerance for the vertical dowels and cap are provided in Table 9.3. Tolerances for the verticality of restraint block shall be the same as for bearing pedestals as per Clause 9.2.

Table 9.3 – Tolerances for vertical dowels of restraint block

Dimension	Tolerance
Plan Position	± 5 mm
Plan angle ¹	$\pm 1^\circ$
Verticality of dowel	1%

Note 1: Plan angle is the angle between the centre line of restraint block towards the span and the centre line of the dowels along the headstock. Not applicable for single dowel situation.

9.4 Bearing recess

For deck unit and winged plank bridges, elastomeric bearings including strip bearings as detailed on the project drawings shall be installed in a 10 mm deep recess in the headstock or in the concrete pedestal to prevent it from walking. Depth of the recess shall be measured from the adjacent finished top surface of the headstock. The recesses may be initially constructed to a greater depth and then filled with cementitious grout or mortar to achieve a finished recess depth of 10 mm. The initial constructed recess depth shall be such that the minimum thickness of the cementitious mortar or grout as recommended by the manufacturer that can be placed to achieve the final recess depth however maximum recess depth shall be limited to 20 mm. The base of the recess as cast may require roughening or texturing to achieve a satisfactory bond with the cementitious grout or mortar used to fill the recess. The base of the finished bearing recess shall match the longitudinal and transverse fall of the headstock. The top surface of recess shall be finished with a wood float to a coarse sandpaper-like finish. Finished recess shall be constructed to the tolerances set out in Table 9.4 on all sides of the recess. Recess depth shall be inspected by the project Administrator prior to placing the bearings in the recess. **Hold Point 1**

The gap between top of the headstock and deck unit/ winged plank/ super T-girder soffit shown on the project drawing shall be achieved at completion of placement of the deck unit/ winged plank/ super T-girder.

The bridge designer will need to provide calculated minimum gap between the top of the headstock and the soffit of the deck unit/ winged plank at the completion of landing the deck unit on the bearings that corresponds to a final minimum gap of 15 mm at the completion of construction of the bridge including superimposed dead loads.

Table 9.4 – Tolerances for bearing recess

Dimension	Tolerance
Plan Position	+/- 3 mm
Dimensions	+/- 3 mm
Recess depth ¹	+0, -3 mm

Note 1: Recess depth is measured from the finished top surface of the headstock and perpendicular to the headstock finish surface. A positive tolerance implies a deeper recess.

10 Precast concrete headstocks

Materials, manufacture, handling, storing and transporting of precast concrete headstocks shall conform to the requirements of MRTS72 *Manufacture of Precast Concrete Elements*. Lifting of headstocks shall be carried out as shown in Project Drawings, using the lifting anchors cast in to the headstocks.

10.1 Support frames

Headstock support frames shall be designed and certified by the Contractor, and approved by the Administrator. **Hold Point 2**

All support frames are to be certified by a Registered Professional Engineer Queensland (RPEQ).

The use of any packers that are permanently left in the works are not accepted.

10.2 Erection of headstocks

Headstocks shall be erected according to the procedures shown on the Project Drawings.

For abutment headstocks, the ground shall be compacted to ensure that no ground settlement occurs due to the weight of the headstock. The top surface of the blinding concrete shall be checked to ensure that the correct grade and the level are achieved after the headstock is placed.

After the headstocks are placed in final position, the voids around piles or columns shall be filled with concrete. Before concreting, the sides of the voids shall be well scabbled.

Voids between top of piles or columns and the precast headstock shall be filled with an approved proprietary shrinkage compensated grout or shrinkage compensated micro-concrete appropriate to the design (Refer Clause 5.1). Registered products are listed in Clause 2 of Annexure MRTS62.1.

Headstock support frames shall be removed no less than seven days after the grout or micro concrete has been placed. Curing shall be in accordance with MRTS70 *Concrete*.

11 Structural steel fabrication

Steel fabrication shall be in accordance with MRTS78 *Fabrication of Structural Steelwork*, MRTS78A *Fabrication of Structural Stainless Steelwork* or MRTS79 *Fabrication of Aluminium Components* as applicable.

12 Backfilling

Following construction, remaining excavations for abutment and pier footings and / or pile caps shall be backfilled in accordance with the requirements of MRTS04 *General Earthworks* and the details shown in the Project Drawings.

13 Embankment construction

The construction of road embankments at abutments shall be undertaken in a manner which:

- a) does not place external loads on any piles or the abutment structure, and
- b) complies with any notes shown in the Project Drawings.

Where an embankment is placed after the abutment has been constructed, the Contractor shall submit to the Administrator, at least 14 days before commencement of construction of the embankment, a procedure to be used to place and compact the embankment material. **Milestone** The procedure will be subject to the approval of the Administrator. **Hold Point 3** Where appropriate, embankments shall be constructed against abutments in accordance with the requirements of MRTS04 *General Earthworks*. Embankments shall not place loads on abutment structures for a period of 28 days from the date on which the most recent concrete was placed, unless approved by the Designer and the Administrator. Approval will not be granted if the concrete is less than 14 days old or has not achieved the design concrete strength.

14 Abutment protection

Abutment protection shall be constructed as shown in the Project Drawings and in accordance with the requirements specified in MRTS03 *Drainage Structures, Retaining Structures and Embankment Slope Protections*.

15 Anti-graffiti protection

Anti-graffiti protection coatings shall be applied in accordance with the requirements of and in the locations specified in MRTS83 *Anti-graffiti Protection*.

16 As constructed records

As constructed records shall be provided in accordance with the requirements of MRTS50 *Specific Quality System Requirements*.

17 Supplementary requirements

The requirements of MRTS62 *Bridge Substructure* are varied by the supplementary requirements given in Clause 3 of Annexure MRTS62.1.

