

**Technical Specification**

**Transport and Main Roads Specifications  
MRTS86 Widening, Strengthening and Rehabilitation of  
Bridges**

**July 2017**

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## 1 Introduction

This Technical Specification applies to the operations required to be carried out in widening, strengthening and rehabilitation of a bridge.

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.

Refer to MRTS96 *Management and Removal of Asbestos* for investigation, testing for identification, management and removal of Asbestos Containing Materials (ACM) in bridge widening and rehabilitation works.

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

The requirements for preparation for bridge widening, strengthening and rehabilitation shall 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
7.2	Surface tolerant epoxy coating
9.2.2	Chemical fastener products
10.2.1	Bonding agent

Registered products for the above items are listed in the relevant clauses in Annexure MRTS86.1.

For further information regarding registered suppliers and products for the above items refer to the departmental website, [www.tmr.qld.gov.au](http://www.tmr.qld.gov.au) or:

Department of Transport and Main Roads  
 Engineering & Technology  
 Structures (Technical Governance)  
 GPO Box 1412  
 Brisbane Qld 4000

## 2 Definition of terms

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

**Table 2 – Definition of terms**

Term	Definition
Chemical fasteners	Chemical fasteners (chemical anchors) are post-installed fasteners that includes a steel element (threaded rod, reinforcing bar or steel dowel bar) and bonding compound that transmits loads from the embedded steel element into the base material.

## 3 Referenced documents

Table 3 lists documents referenced in this Technical Specification.

**Table 3 – Referenced documents**

Reference	Title
AS/NZS 3678	<i>Structural steel - Hot-rolled plates, floorplates and slabs</i>
AS/NZS 3679	<i>Structural steel - Hot-rolled bars and sections</i>
SA TS 101	<i>Standards Australia Technical Specification: Design of post-installed and cast-in fastening for use in concrete</i>
MRTS01	<i>Introduction to Technical Specifications</i>
MRTS14	<i>Road Furniture</i>
MRTS50	<i>Specific Quality System Requirements</i>
MRTS78	<i>Fabrication of Structural Steelwork</i>
MRTS96	<i>Management and removal of asbestos</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 Witness Points applicable to this Technical Specification are summarised in Table 4.1. There are no Hold Points or Milestones defined.

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

Clause	Hold Point	Witness Point	Milestone
7.2		1. Breaking back concrete	
9.3		2. Installation of steel reinforcing bars	

## 5 Traffic restrictions during construction

Notwithstanding any other provision of the Contract regarding traffic restrictions during construction, the requirements of this clause shall apply where traffic is allowed on the existing bridge during widening, strengthening and rehabilitation works.

During placing of concrete in abutment and pier extensions and for a period of one day afterwards, the speed of traffic on the existing bridge shall be restricted to a maximum of 60 km/hr unless directed otherwise by the Administrator or Designer.

During placing of concrete in cross girders and the bridge deck and for a period of three days afterwards, traffic shall not be permitted to use the lane adjacent to the work and the speed of traffic shall be restricted to a maximum of 60 km/hr unless directed otherwise by the Administrator or Designer.

## 6 Removal of existing bridge rails and posts

### 6.1 General

This clause describes the work to be carried out where existing bridge rails and posts are to be removed under the Contract.

## **6.2 Construction**

Where specified in the drawings, the Contractor shall remove the bridge rails from the existing bridge superstructure and demolish the existing posts. The Contractor shall ensure that no damage is caused to the railing, or to any existing reinforcing steel which is to be retained.

Where specified in the drawings, bridge rail shall be re-erected under the Contract. If the bridge rail is not to be re-used, it shall be stockpiled, in good order and condition.

Demolished materials and rubbish shall be removed from the Site in accordance with the requirements of Clause 10 of MRTS01 *Introduction to Technical Specifications*.

## **7 Breaking back of existing concrete**

### **7.1 General**

This clause describes the work to be carried out where existing concrete is to be broken back under the Contract.

### **7.2 Construction**

Where specified in the drawings, existing concrete shall be broken back to the extent shown. Before demolition commences, the extremity of the proposed break back of concrete, including the underside of decks, shall be saw cut on all faces to the depth specified in the drawings, but not less than 20 mm.

Care shall be exercised during demolition work to prevent damage to the existing reinforcing bars which are to be incorporated into the new work.

Breaking back of concrete shall be a **Witness Point 1**

Explosives shall not be used for breaking back the existing concrete.

Where concrete has been broken back and it is not being extended, reinforcing bars shall be cut off and coated with a minimum of three coats of a registered surface tolerant epoxy coating (refer Clause 1). Each coating shall have a minimum dry film thickness of 125 microns.

Surface tolerant epoxies shall have following properties:

- a) high performance coating over lower grade of surface preparation such as hand or power tool cleaned surface
- b) excellent corrosion protection characteristics
- c) thick film coating that can be readily applied by one application
- d) high solids (minimum 80% volume solids) and high build
- e) excellent recoatability, and
- f) high abrasion resistance characteristics.

Approved products are listed in Clause 1 of Annexure MRTS86.1. Alternative products, including full technical details of the alternative formulation, may be submitted to the Administrator for approval.

Demolished materials and rubbish shall be removed from the Site in accordance with the requirements of Clause 10 of MRTS01 *Introduction to Technical Specifications*.

## **8 Removal of existing rubble masonry at abutments**

### **8.1 General**

This clause describes the work to be carried out where existing rubble masonry at abutments is to be removed under the Contract.

### **8.2 Construction**

Where specified in the drawings, existing rubble masonry at abutments shall be removed to the extent specified in the drawings and/or to the extent necessary to allow construction of the new work to proceed.

Where specified in the drawings, rock from demolition shall be stored on the Site for re-use under the Contract.

If the rock is not to be re-used, it, together with all other demolished materials and rubbish, shall be removed from the Site in accordance with the requirements of Clause 11 of MRTS01 *Introduction to Technical Specifications*.

## **9 Installation of steel reinforcing and dowel bars**

### **9.1 General**

This clause describes the work to be carried out where steel reinforcing bars and dowel bars are required to be installed in existing concrete under the Contract.

### **9.2 Materials**

#### **9.2.1 Dowel bars and reinforcing bars**

Dowel bars and reinforcing bars shall be steel reinforcing bar in accordance with MRTS71 *Reinforcing Steel*. The diameter, length, grade and coating (if applicable) of dowel bars and reinforcing bars shall be specified in the drawings.

#### **9.2.2 Chemical fastener products**

Chemical fastener products used to install dowel bars and reinforcing bars shall be a registered product (refer Clause 1) capable of forming a superior adhesion to concrete and steel. Chemical fastener products shall have minimum design bond strength of 4.5 MPa in uncracked concrete at temperature range of 20 – 40°C.

Chemical fasteners shall be designed and tested considering all modes of failures in accordance with Technical Specification SA TS 101.

Approved chemical fastener products are listed in Clause 2 of Annexure MRTS86.1. Alternative products, including full technical details of the alternative formulation, may be submitted to the Administrator for approval.

Chemical fastener products shall have high bond strength properties to achieve the required anchor capacity with shorter effective anchor embedment lengths. In comparison with bond strength between cast-in reinforcement and concrete (32 MPa or higher), minimum design bond strength of 4.5 MPa have been specified.

Design bond strength should be calculated using characteristic bond strength and appropriate capacity reduction factors. Characteristic bond strength and capacity reduction factors are product-dependant and depends on various factors. Performance of chemical anchors is influenced by: characteristics of concrete (strength cracked/uncracked), drilling method, hole cleaning, hole condition (dry/wet/submerged), temperature (at installation during service life), hole diameter (large holes have lower bond strength than smaller holes) and so on.

Therefore the chemical fastener product supplier should provide the characteristic bond strength and reduction factors used to derive design anchor capacities.

### **9.3 Installation of steel reinforcing bars**

Installation of reinforcing bars shall be a **Witness Point 2**

Chemical fastener installers shall be competent and suitably experienced in chemical fastener installation. They shall be certified for chemical fastener installation under *Australian Engineered Fasteners and Anchors Council (AEFAC)* or have received the required installation training from the product supplier. AEFAC certified anchor installers list can be found from: <http://www.aefac.org.au/>.

Where reinforcing bars are specified in the drawings, holes shall be drilled into the existing concrete, using hole size and the drilling technique required by the chemical fastener manufacture's installation instructions. Anchor hole depth and angle shall be as specified in the drawings.

Non-destructive method such as Ground Penetration Radar (GPR) or a Concrete Cover Meter shall be used to locate existing reinforcing bars to avoid damage to them during installation of new anchors. Only drilled holes are permitted. Coring to make holes are not permitted because coring can quickly cut through existing reinforcement.

Holes shall be cleaned out using a blow-brush sequence using oil-free dry air to remove dust and loose particles in accordance with anchor manufacture's installation instructions.

Chemical fastener products shall be mixed and applied using the proprietary components supplied by manufacture in accordance with the manufacture's installation instructions.

Sufficient chemical fastener products shall be placed in each drilled hole before insertion of the steel reinforcing bar, to completely fill the space remaining after insertion of the bar.

The reinforcing bar shall be free from oil and residue. The chemical anchor product shall be injected from the bottom of the hole with the nozzle being progressively retracted so as to avoid air entrained in the chemical. The metal component (reinforcing bar) shall be inserted in a slow rotational motion to promote egress of any air that has become entrained in the chemical.

Reinforcing bars shall not be disturbed or have any load applied until the curing time specified on the manufactures instructions has lapsed.

### **9.4 Construction of dowel bars**

Dowel bars shall be installed to details specified in the drawings.

Dowel bars shall be set true to the locations specified in the drawings and shall be held firmly in position so that they are not displaced during placement of concrete.



## **10 Scabbling concrete faces**

### **10.1 General**

This clause describes the work to be carried out where existing concrete faces are required to be scabbled under the Contract.

### **10.2 Material**

#### **10.2.1 Bonding agent**

Bonding agent used between existing and new concrete shall be a registered product (refer Clause 1).

Bonding agent shall be an epoxy resin primer with high bond strength between concrete substrates.

The bond strength of the epoxy bonding agent shall exceed the characteristic principal tensile strength of the host concrete. Bonding agent shall have sufficient minimum overlay time to suit the particular application.

Approved bonding agent products are listed in Clause 3 of Annexure MRTS86.1. Alternative products, including full technical details may be submitted to the Administrator for approval.

### **10.3 Construction**

The contact area between the existing concrete and new concrete shall be well scabbled to expose the existing aggregate and remove laitance. The scabbled face shall be cleaned with a water blast to remove all dust and loose particles.

When specified in the drawings, epoxy primer bonding agent shall be applied on prepared existing surface before placing the new concrete for widening. Bonding agent shall remain tacky when new concrete is applied on to it.

## **11 Temporary barrier guardrail**

### **11.1 General**

This clause describes the work to be carried out where temporary guardrail is required to be erected under the Contract to act as a barrier during bridge widening, strengthening and rehabilitation.

### **11.2 Materials**

#### **11.2.1 Posts**

Posts for temporary barrier shall be fabricated as specified in the drawings.

Steel plate shall conform to the requirements of AS/NZS 3678 and rolled steel channel shall conform to the requirements of AS/NZS 3679.

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

#### **11.2.2 Steel beam guardrail**

Steel beam guardrail panel, fittings and fixings shall conform to the requirements of Clause 13 of MRTS14 *Road Furniture*.

#### **11.2.3 Anchor bolts**

Anchor bolts shall consist of proprietary chemical fasteners of the size specified in the drawings.

#### **11.2.4 Cement mortar**

Cement mortar shall consist of one part of Type GP cement and three parts of clean sharp sand with just sufficient water added to form a dry packing mortar.

### **11.3 Construction**

#### **11.3.1 Erection and dismantling sequence**

Where an erection and/or dismantling sequence or other requirements are stated in Clause 3 of Annexure MRTS86.1, such sequence and/or requirements shall be followed by the Contractor.

#### **11.3.2 Installation of anchor bolts**

Holes for anchor bolts shall be drilled in the existing deck or kerb using hole size and the drilling technique required by the chemical fastener product manufacture's installation instructions.

Chemical fasteners shall be installed strictly in accordance with the manufacturer's installation instructions.

The temporary barrier shall be assembled and installed in accordance with the details specified in the drawings after curing of the chemical fasteners are complete.

The base plates of the posts shall be packed with cement mortar.

#### **11.3.3 Dismantling**

Following completion of the work behind the barrier or at the appropriate time during construction, the temporary barrier shall be dismantled and removed.

The anchor bolts shall be cut off level with the surface of the concrete. If gas cutting is used, the operation shall be carried out by a competent operator who shall ensure that the cutting is performed quickly to reduce to a minimum the heat transfer in the concrete along the anchor bolt.

After cutting off the anchor bolts, a liberal coating of bitumen shall be applied over the exposed steel to prevent corrosion.

## **12 Supplementary requirements**

The requirements of MRTS86 *Widening, Strengthening and Rehabilitation of Bridges* are varied by the supplementary requirements given in Clause 4 of Annexure MRTS86.1.

