

Superseded

Technical Specification

**Transport and Main Roads Specifications
MRTS85 Repainting Steel Bridges**

June 2009

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1 Introduction

This Specification applies to the repainting of steel bridges which have an existing red lead or other prime coat well adhering to the steelwork and an existing micaceous iron oxide top coat.; in urban areas or areas with a significant number of pedestrians on or under the bridge, less than 1% of the paint system broken down; or in other areas, less than 10% of the paint system broken down.

This specification is based on encapsulation of the red lead prime coat, where applicable. Abrasive blast cleaning which removes the red lead primer is not permitted.

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.

The requirements for the repainting steel bridges 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
5.7	Micaceous Iron Oxide Paint Systems

Registered suppliers and products for the above items are listed in the relevant clauses in Annexure MRTS85.1

For further information regarding registered suppliers and products for the above items refer to:

Queensland Department of Transport and Main Roads
 Bridge and Marine Engineering
 GPO Box 1412
 Brisbane Qld 4001

2 Definition of terms

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

3 Referenced documents

Table 3 lists documents referenced in this technical specification

Table 3 – Referenced documents

Reference	Title
AS 1580	<i>Paints and related materials – Methods of test – Introduction and list of methods</i>
AS 1580.301.1	<i>Paints and related materials – Methods of test – Non-volatile content by mass</i>
AS/NZS 1580.401.1	<i>Paints and related materials – Methods of test – Surface dry condition</i>
AS/NZS 1580.404.1	<i>Paints and related materials – Methods of test – Recoating properties</i>
AS 2855	<i>Paints and related materials – Micaceous iron oxide pigment</i>
AS 4361.1	<i>Guide to lead paint management – Industrial applications</i>

Reference	Title
ISO 8501	<i>Visual Assessment of Surface Cleanliness;</i>
ISO 8503	<i>Surface Roughness Characteristics of Blast-Cleaned Substrates; and</i>
ISO 8504	<i>Surface Preparation Methods.</i>
NOHSC:1012	<i>National Standard for the Control of Inorganic Lead at Work</i>
NOHSC:2015	<i>National Code of Practice for the Control and Safe Use of Inorganic Lead at Work</i>
NOHSC:1003	<i>National Exposure Standards</i>

4 Quality system requirements

4.1 Hold Points, Witness Points and Milestones

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

The Hold Points and Milestones applicable to this Standard are summarised in Table 4.1. There are no Witness Points defined.

Table 4.1 – Hold Points and Milestones

Clause	Hold Point	Milestone
5.1	1. Approval of paint system	Submission of proposed paint system (21 days)
5.5	2. Acceptance of paint	
6.6	3. Classification of repaint areas	
10.1	4. Approval of painting procedure	Submission of painting procedure (28 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 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
10	Painting procedures

4.3 Conformance requirements

The conformance requirements which apply to lots of work covered by this Specification are summarised in Table 4.3

Table 4.3 – Conformance requirements

Clause	Procedure
5	Properties of paint
7	Acceptance of paintwork

4.4 Testing frequency

The minimum testing frequency for work covered by this Specification is specified in Clauses 5.4 and 7.6.

4.5 Inspection

The Administrator will carry out examination of the work and shall be given reasonable access to the Site for this purpose. Hold points for inspection shall be agreed between the Administrator and the Contractor before work commences. The Administrator may refer to the Contractor's records of other jobs as the basis for inspection. Defects shall be marked with school grade chalk, adhesive inspection labels or masking tape.

5 Materials

5.1 General

Paint shall not contain lead or chromium. Paint with lead or chromium compounds exceeding 0.2% of the dried paint mass shall not be used.

The paint system shall consist of a zinc phosphate primer and a micaceous iron oxide top coat in accordance with Clauses 5.2 and 5.3.

The Contractor shall submit the proposed paint system with full technical data sheets to the Administrator at least 21 days prior to ordering paint. **Milestone**

Paint shall not be ordered until the product has been approved by the Administrator. **Hold Point 1**

5.2 Zinc Phosphate primer

The Zinc Phosphate primer shall provide maximum durability under extreme weathering conditions where only limited surface preparation is possible. The paint shall be a one-pack product.

The product shall be an anti-corrosive primer containing a non-toxic zinc phosphate. The binder shall be a urethane alkyl resin.

The product shall also contain corrosion inhibitors. The paint shall be suitable for application by brush, roller or spraying (conventional and airless).

The paint shall comply with the requirements of Table 5.2.

Table 5.2 – Zinc Phosphate primer

Test Method	Requirement
Non-volatile % AS 1580.301.1	70% minimum
Drying time AS/NZS 1580.401.1	2 hours
Re-coating time	24 hours

5.3 Micaceous iron oxide

Micaceous iron oxide shall be supplied in Natural Steel Grey and Silver Grey colours. The paint shall be a one-pack product.

The top coat shall be a micaceous iron oxide pigmented paint for the protection of steel. The paint shall be suitable for application by brush, roller or spraying (conventional or airless). The pigment content of the paint shall be greater than 50%.

The micaceous iron oxide shall contain not less than 85% of iron oxide expressed as Fe₂O₃. When viewed under a microscope at 100 to 200 magnification, it shall appear as flat translucent platelets capable of forming interleaved structures.

Each component shall comply with the requirements of Table 5.3.

Table 5.3 – Micaceous iron oxide paint

Test Method	Requirement
Drying time AS/NZS 1580.401.1	2 hours
Re-coating time AS/NZS 1580.404.1	16 hours
Non-volatile % AS 1580.301.1	80% minimum
Pigment content of paint	64% minimum by weight Natural Steel Grey 50% minimum by weight Silver Grey
Micaceous iron oxide content of pigment	90% minimum Natural Steel Grey 70% minimum Silver Grey

5.4 Test certificate

The manufacturer shall supply a test certificate for each production batch of heavy duty anti-corrosive primer and micaceous iron oxide.

The testing regime shall include:

- a) non-volatile % by mass
- b) pigment content %
- c) lead % by mass of dry paint
- d) iron oxide in micaceous iron oxide % by mass Fe₂O₃ of pigment, and
- e) chromium % by mass of dry paint.

The content of micaceous iron oxide shall be tested in accordance with the requirements of AS 2855.

5.5 Acceptance

Paint shall not be used until the production batch has been accepted by the Administrator.

Hold Point 2

5.6 Dry film thickness and curing time

The dry film thickness and curing times shall be in accordance with Table 5.6.

Table 5.6 – Dry film thickness and curing time

Coating	Application Rate for each Coating	Typical Curing Time
Zinc phosphate	75 microns dry film thickness	24 hours
Micaceous iron oxide	50 microns dry film thickness (each colour)	16 hours

5.7 Registration of Micaceous Iron Oxide Systems

Micaceous Iron Oxide Paint Systems shall be a registered system (refer Clause 1)

Registered systems are listed in Clause 1 of Annexure MRTS85.1. Alternative products, including full technical details of the alternative formulation, may be submitted to the Administrator for approval.

6 Paintwork

6.1 General

The scope of the work to be undertaken under the Contract shall be as stated in Clause 2 of Annexure MRTS85.1.

6.2 Defective steelwork

Prior to preparation for repainting, the Contractor shall notify the Administrator of any defective steelwork and propose corrective action [refer to Hold Point 3].

6.3 Preparation of surface prior to painting

6.3.1 General

The method of specifying and assessing the degree of surface preparation prior to painting shall be in accordance with the requirements of the following standards:

- a) ISO 8501 *Visual Assessment of Surface Cleanliness*
- b) ISO 8503 *Surface Roughness Characteristics of Blast-Cleaned Substrates, and*
- c) ISO 8504 *Surface Preparation Methods.*

6.3.2 Preparation required

All rusty steel shall be prepared back to sound metal using a needle gun. All surfaces shall be blasted with potable water at 3,000 psi pressure and water flow of 22 L/min to remove all dirt, grease and loose metal. An “St 3” surface preparation classification is required in accordance with the requirements of ISO 8504.

Surface preparation grades are defined in ISO 8501 as follows:

St 2 Thorough hand and power tool cleaning

When viewed without magnification, the surface shall be free from visible oil, grease and dirt, and from poorly adhering mill scale, rust, paint coatings and foreign matter.

St 3 Very thorough hand and power tool cleaning

As for St 2, but the surface shall be treated much more thoroughly to give a metallic sheen arising from the metallic substrate.

All other surfaces to be painted shall be washed down with high pressure water cleaning equipment to remove all surface contamination and loose and under-bound existing coatings.

All existing coatings that are removed or dislodged by this process shall be chased back with the cleaning nozzle to a point where the coating is well adhered and sound.

All edges of the remaining coating shall be scraped back with a painter's scraper to ensure that the coating is well adhered. The leading edges of the original coating shall be sanded smooth to feather out the leading edge of the paint film.

The area where the paint has delaminated shall be abraded before applying the new coating. The degree of surface preparation shall depend on the condition of the surface.

If degreasing detergents have been used to assist in the cleaning process, the surface shall be fully rinsed with potable water as the final process of the cleaning work.

6.4 Water blaster

A water blaster is defined as a specialist purpose-built item of plant. Spraying equipment is not permitted to be used as a water blaster.

6.5 Assessment of substrate

The Contractor shall use ISO 8501 to assess, classify and record the grade of preparation and surface profile and roughness characteristics of the newly prepared surface. The following procedure from Clause 5, Note 2 of ISO 8501 shall be used:

For previously painted surfaces that have been prepared for renewed painting, only photographs (in ISO 8501) with rust grade designations D or C may be used for the visual assessment. The choice depends on the degree of pitting.

ISO 8503 shall be used to define the surface roughness.

A record of these assessments shall be provided to the Administrator [refer to Hold Point 4].

6.6 Categories for repainting

Prior to preparing for repainting, the existing steel work shall be classified by the Contractor and accepted by the Administrator as one of the categories listed in this clause. **Hold Point 3**

a) Full re-coating

Full re-coating shall include

- i. all areas where the steelwork is rusty
- ii. areas where the paintwork is crazed, cracked or delaminating, and
- iii. all areas previously painted with non-micaceous iron oxide paint

b) Top Coating Only

Top Coating Only includes only existing paintwork (micaceous iron oxide) which is in good condition.

6.7 Repainting

6.7.1 Micaceous Iron Oxide full re-coating

The surfaces to receive a full re-coating shall be painted with:

- a) 1 coat of zinc phosphate primer (red oxide colour)
- b) 1 coat of Natural Steel Grey micaceous iron oxide, and

- c) 1 coat of Silver Grey micaceous iron oxide.

6.7.2 Micaceous Iron Oxide top coating

The surfaces to receive a top coating only shall be painted with:

- a) 1 coat of Natural Steel Grey micaceous iron oxide, and
- b) 1 coat of Silver Grey micaceous iron oxide.

6.8 Manufacturer's certificate

It is essential that all coatings are compatible with the adjacent paint systems. Written confirmation of such compatibility shall be obtained from the paint supplier.

7 Application of paint

7.1 General

All coatings shall be applied in accordance with the Manufacturer's recommendations. All coatings shall be thoroughly mixed and thinners shall not be used without the approval of the Administrator.

Each coat of paint shall be applied at the application rate stated in Clause 3 of Annexure MRTS85.1.

The curing time for each coat shall be strictly adhered to.

Coatings shall be applied so as to produce a smooth, even coating free of lumps, ripples, sags, air holes and other defects.

A digital electronic paint thickness gauge shall be used. Instruments shall be calibrated in accordance with Method 108.1 of AS 1580 using non-magnetic shims on polished steel.

7.2 Condition of steelwork

All steelwork shall be dry, clean and free of any loose or flaky material prior to the application of each coat.

7.3 Coatings applied above road level

All coatings shall be applied with a brush. Spray painting is not permitted because of problems of overspray drifting onto the traffic.

7.4 Coatings applied below road level

Airless or conventional sprays may be permitted below road surface level if it can be shown that overspray is not drifting onto the river, a road or pedestrian traffic. Otherwise brush application shall be used.

7.5 Weather conditions

All coatings shall be applied to a dry metal surface. Coatings shall not be applied when the temperature of the ambient air or the receiving surface is less than 10°C nor when the temperature of the receiving surface is greater than 55°C nor when the humidity is greater than 85%. Paint shall not be applied if adverse weather conditions are likely to occur before it has cured.

The coating shall not be applied when the surface temperature of the metal is within 3°C above the dew point or when the surface is in direct strong sunlight.

The ambient temperature, metal temperature, relative humidity and dew point shall be recorded:

- a) at the commencement of work each day
- b) at 9.00 am
- c) at 12.00 noon
- d) at 3.00 pm
- e) at finishing time of work, and
- f) with each weather change.

Maximum and minimum temperatures each 24 hours shall be measured and shall be recorded by placing a maximum and minimum temperature thermometer adjacent to the work.

7.6 Acceptance criteria

The average dry film thickness shall not be less than the specified thickness.

The actual minimum thickness shall not be less than 90% of the specified thickness.

The number of readings taken shall be determined as follows:

- a) for pipe work, the following readings shall be taken
 - i. for pipes less than 150 mm diameter, two readings shall be taken evenly around the circumference per linear metre
 - ii. for pipes 150 mm to 300 mm diameter, four readings shall be taken evenly around the circumference per linear metre, and
 - iii. for pipes 300 mm to 600 mm diameter, six readings shall be taken evenly around the circumference per linear metre
- b) for beams and angles where the face is less than 300 mm wide, one reading on each flat face for every linear metre, and
- c) for all other areas, a minimum of three readings per square metre shall be taken.

7.7 Repair

To reinstate a damaged coating system or to rebuild the dry film thickness, the following procedure shall be followed:

- a) any sharp edges of the damaged coating shall be feathered or tapered
- b) any oil, grease, dirt or other contaminants shall be removed from the surface with a suitable solvent or oil emulsifier and degreaser and the surface abraded by use of a suitable tool, emery cloth or by whip blasting
- c) the appropriate coating system shall be applied as specified to the damaged area
- d) foreign particles shall not be permitted within the coating, and
- e) areas of low thickness shall be rebuilt to that specified, by applying the appropriate coating.

7.8 Storage of paint

Paint shall be stored in sealed containers in a lock-up store and shall not be exposed to extreme temperature. The temperature of the store shall be kept between 4°C and 35°C. Any special storage conditions recommended by the manufacturer shall be observed.

Paint which has not been used within the shelf life period specified by the manufacturer or within 18 months of manufacture shall be replaced.

8 Red lead waste

8.1 Collection of waste

All red lead waste shall be collected in accordance with the requirements of AS 4361.1.

8.2 Disposal of waste

The Principal will be responsible for the disposal of the red lead waste.

8.3 Storage of waste

The Contractor shall transport all waste to the location designated in Clause 4 in Annexure MRTS85.1. All waste shall be contained in 200 litre steel drums. The drums shall be in good sound condition and the lids welded closed. The drums shall be marked by permanent waterproof means with the following information:

- a) Job Name and Job Number
- b) Description of Contents, and
- c) Toxic Characteristic Leaching Procedure test value in pH 7 solution. (The test shall be undertaken by a laboratory registered by NATA for the test).

9 Statutory requirements

9.1 General

In most cases, the bridge shall have been previously painted with toxic red lead paint. Special procedures shall be implemented to protect all personnel and the environment.

9.2 Legislation

All relevant Acts and Regulations shall be observed.

Table 9.2 summarises the role of Government Departments administering various aspects of the handling of red lead.

Table 9.2 – Departmental responsibilities

Department	Role
Department of Employment and Industrial Relations	<ul style="list-style-type: none"> • Health of site staff • Safety
Department of Natural Resources and Water	<ul style="list-style-type: none"> • Responsible for all red lead deposited on ground • Definition of contaminated ground • Responsible for all red lead deposited in air or water, as well as any red lead likely to be washed from the land into a stream • Responsible if water from the stream is used for domestic drinking • Definition of toxic level for stream or air • Approval of disposal method
Department of Primary Industries and Fisheries	<ul style="list-style-type: none"> • Shall be consulted if water from the stream is used for irrigation • Shall be consulted if red lead debris falls onto crops or grazing land

Department	Role
Port Authority or Harbour Board	<ul style="list-style-type: none"> • Shall be consulted if bridge is located in an area under their authority

9.3 *Worksafe Australia Standard*

All procedures on the Site shall conform to the following Worksafe Australia Standards:

- a) *National Standard for the Control of Inorganic Lead at Work* (NOHSC:1012)
- b) *National Code of Practice for the Control and Safe Use of Inorganic Lead at Work* (NOHSC:2015), and
- c) *National Exposure Standards* (NOHSC:1003).

10 Compliance

10.1 *Painting procedure*

The Contractor shall submit a procedure and an Inspection and Test Plan at least 28 days prior to commencing painting. **Milestone** No painting shall be undertaken prior to acceptance of the procedure by the Administrator. **Hold Point 4**

The procedure shall cover at least the topics described in Clauses 10.2 to 10.6, inclusive.

10.2 *Health of workers*

The painting procedure shall address the following:

- a) clothing for site personnel (e.g. overalls, toxic masks, gloves)
- b) washing and shower facilities
- c) hygiene
- d) blood testing of workforce for lead levels
- e) medical supervision of workforce
- f) induction training for site personnel
- g) work history of site personnel
- h) adequate ventilation
- i) "No Smoking" and "Flammable Liquid" signs
- j) First Aid kits, and
- k) training program.

10.3 *Waste*

The painting procedure shall address the following:

- a) collection, storage and disposal system for toxic debris
- b) monitoring system to determine percentage of red lead collected
- c) monitoring system for lead content in ground and stream, and
- d) sampling of waste.

10.4 Competent Person

Within 14 days of being awarded the Contract, the Contractor shall nominate in writing, to the Administrator, a Competent Person for the project. This person shall always be present on the Site when any activity involving lead is taking place and shall have the authority to act and implement all procedures required to conform with the Contract.

The duties of the Competent Person include:

- a) testing and issuing of safety equipment
- b) training staff
- c) reviewing blood lead levels
- d) liaising with the Administrator, and
- e) monitoring lead levels on the Site.

10.5 Regulated Area

The Contractor shall define a regulated area within which all lead related activities shall be contained.

10.6 Painting

The Contractor shall be responsible for ensuring that the standard set for surface preparation is maintained, the dry film thickness of paint is as specified, the finish of all paint coats is of a high standard and any areas that may require repairs are reported.

The Contractor shall have a monitoring and recording system for at least the following:

- a) condition of existing paintwork
- b) surface preparation
- c) paint system adopted
- d) thickness of existing paint
- e) dry film thickness of each paint coat
- f) batch number of paint used for each layer
- g) quantity of paint used
- h) method of application, and
- i) weather.

11 Supplementary requirements

The requirements of MRTS85 *Repainting Steel Bridges* are varied by the Supplementary requirements given in Clause 5 of Annexure MRTS85.1.

Superseded