

Technical Specification

Transport and Main Roads Specifications MRTS88 Protective Coating for New Work

July 2025

(ATS 5343 Coating of Concrete, Ed 1.0 January 2020)

(ATS 5450 Protection of Steelwork by the Use of Paint Coatings, Ed 1.0 October 2023)

(ATS 5451 Supply of Paint for Steelwork, Ed 1.0 October 2023)



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About this document

The document adopts and modifies specified clause content from Austroads Technical Specifications ATS 5343 *Coating of Concrete*, ATS 5450 *Protection of Steelwork by the Use of Paint Coatings* and ATS 5451 *Supply of Paint for Steelwork* as part of national harmonisation. It sets out the requirements for the supply and application of coatings.

Relationship table of modified content

| Austroads Technical Specification | ATS clause | MRTS clause |
|--|-------------------|--------------------|
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 7 | 6 |
| <i>ATS 5343 Coating of Concrete</i> | 6 | 9.1 |
| <i>ATS 5343 Coating of Concrete</i> | 7 | 9.2 |
| <i>ATS 5343 Coating of Concrete</i> | 8 | 9.3 |
| <i>ATS 5343 Coating of Concrete</i> | 9 | 9.4 |
| <i>ATS 5343 Coating of Concrete</i> | 10 | 9.5 |
| <i>ATS 5343 Coating of Concrete</i> | 11 | 9.6 |
| <i>ATS 5343 Coating of Concrete</i> | 12 | 9.7 |
| <i>ATS 5343 Coating of Concrete</i> | 13 | 9.8 |
| <i>ATS 5343 Coating of Concrete</i> | 14 | 9.9 |
| <i>ATS 5343 Coating of Concrete</i> | 15 | 9.10 |
| <i>ATS 5343 Coating of Concrete</i> | 16 | 9.11 |
| <i>ATS 5343 Coating of Concrete</i> | 17 | 9.12 |
| <i>ATS 5343 Coating of Concrete</i> | 18 | 9.13 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 15 | 9.14 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 9 | 11.1 |
| <i>ATS 5451 Supply of Paint for Steelwork</i> | 6 | 11.1 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 8 | 11.2 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 10 | 11.3 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 11 | 11.4 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 12 | 11.5 |
| <i>ATS 5450 Protection of Steelwork by the Use of Paint Coatings</i> | 13 | 11.6 |

How to use this document

This document includes the national guidance and Queensland-specific advice.

As this Technical Specification is not a one-to-one alignment with harmonisation, there is no ancillary document supplied.

Terminology

The following general amended definitions apply when reading this document.

| Reference to... | Means |
|------------------------|--|
| Shall | Denotes mandatory requirements. |
| Must | Denotes mandatory requirements. |
| Principal | The State of Queensland acting through the Department of Transport and Main Roads. |
| Administrator | The Administrator will be responsible for the overall administration of this Contract. |

Contents

- About this document.....i
- How to use this document.....i
- Terminologyii
- 1 Introduction1**
- 2 Definition of terms1**
- 3 Referenced documents3**
- 4 Standard test methods4**
- 5 Quality system requirements4**
 - 5.1 Hold Points, Witness Points and Milestones 4
 - 5.2 Construction procedures..... 5
 - 5.3 Quality plan 5
- 6 Competency and accreditation6**
 - 6.1 Contractor 6
 - 6.2 Coating inspector 6
 - 6.3 Competence of tradesperson 7
- 7 Design and selection of coating system7**
 - 7.1 Aspects to be included..... 8
 - 7.1.1 *Consideration of repair and maintenance*8
 - 7.2 Substitution of coating system 8
 - 7.3 Modification of coating system..... 8
- 8 Coating system9**
 - 8.1 Composition 9
 - 8.2 Designation 9
 - 8.3 Application 9
- 9 Coatings for concrete.....9**
 - 9.1 Materials 9
 - 9.2 Performance requirements – general 10
 - 9.3 Performance requirements for decorative and anti-carbonation coatings..... 12
 - 9.4 Performance requirements for moisture and chloride resistance coatings 12
 - 9.4.1 *General*..... 12
 - 9.4.2 *Tidal zone* 13
 - 9.4.3 *Splash zones* 13
 - 9.4.4 *Special applications*..... 13
 - 9.4.5 *Coatings applied to retaining walls*..... 13
 - 9.4.6 *Coatings applied to parapet walls* 14
 - 9.5 Equipment..... 14
 - 9.6 Time constraints..... 14
 - 9.7 Trial application..... 15
 - 9.8 Protection of the works and property 15
 - 9.9 Surface preparation 16

| | | |
|-----------|---|-----------|
| 9.10 | Environmental constraints | 16 |
| 9.11 | Application of coatings | 17 |
| 9.12 | Testing and inspection | 18 |
| 9.13 | Coating repairs..... | 19 |
| 9.14 | Records..... | 19 |
| 10 | Coatings for timber..... | 19 |
| 10.1 | Performance requirements | 19 |
| 10.2 | Trial application..... | 19 |
| 10.3 | Protection of the works and property | 20 |
| 10.4 | Surface preparation | 20 |
| 10.5 | Testing and inspection | 20 |
| 10.6 | Coating repairs..... | 20 |
| 10.7 | Records..... | 20 |
| 11 | Coatings for steelwork | 21 |
| 11.1 | Coating products..... | 21 |
| 11.1.1 | <i>Performance requirements</i> | 21 |
| 11.2 | Materials | 22 |
| 11.2.1 | <i>Abrasive</i> | 23 |
| 11.2.2 | <i>Other materials</i> | 23 |
| 11.3 | Preparation of steel surfaces | 24 |
| 11.3.1 | <i>General</i> | 24 |
| 11.3.2 | <i>Surface preparation and surface profile (plain steel substrate)</i> | 25 |
| 11.3.3 | <i>Surface preparation and surface profile (galvanised steel substrate)</i> | 26 |
| 11.3.4 | <i>Cleaning after blasting</i> | 26 |
| 11.3.5 | <i>Surface cleanliness</i> | 26 |
| 11.3.6 | <i>Records</i> | 26 |
| 11.4 | Special areas | 27 |
| 11.5 | Paint application | 27 |
| 11.5.1 | <i>General</i> | 27 |
| 11.5.2 | <i>Painting trials</i> | 28 |
| 11.5.3 | <i>Pre-painting inspection</i> | 29 |
| 11.5.4 | <i>Application conditions</i> | 29 |
| 11.5.5 | <i>Tools and equipment</i> | 29 |
| 11.5.6 | <i>Mixing paints</i> | 29 |
| 11.5.7 | <i>Application of primer</i> | 30 |
| 11.5.8 | <i>Stripe coats</i> | 30 |
| 11.5.9 | <i>Crevices and gaps</i> | 30 |
| 11.5.10 | <i>Records</i> | 31 |
| 11.6 | Conformity..... | 31 |
| 11.6.1 | <i>General</i> | 31 |
| 11.6.2 | <i>Definition of a lot</i> | 31 |
| 11.6.3 | <i>Measurement of dry film thickness</i> | 32 |
| 11.6.4 | <i>Dry film thickness requirements</i> | 32 |
| 11.6.5 | <i>Adhesion</i> | 32 |
| 11.6.6 | <i>Appearance</i> | 32 |
| 11.6.7 | <i>Disposition of nonconformity</i> | 33 |
| 11.7 | Handling, storage, transport and erection | 33 |
| 11.7.1 | <i>General</i> | 33 |
| 11.7.2 | <i>Handling</i> | 33 |

| | | |
|--|---|-----------|
| 11.7.3 | <i>Storage</i> | 33 |
| 11.7.4 | <i>Transport</i> | 33 |
| 11.7.5 | <i>During construction</i> | 34 |
| 11.7.6 | <i>Repair of damage during construction</i> | 34 |
| 11.8 | Records..... | 34 |
| Appendix A: Registration of coating systems | | 35 |
| A1: | Application..... | 35 |
| A2: | Scope of registration | 35 |
| A3: | Withdrawal of registration | 35 |

1 Introduction

This Technical Specification applies to protective coatings (other than hot dip galvanizing) for new steel, concrete and timber surfaces.

All surface preparation and coating shall be undertaken in accordance with the current Workplace Health and Safety requirements.

All surface preparation, coating and waste disposal shall be undertaken in accordance with the current Environment Acts and Regulations.

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 Department of Transport and Main Roads' Specifications Manual.

For surfaces other than steel, concrete and timber, a Project Supplementary Technical Specification will need to be developed.

Repainting and painting of old surfaces is covered under MRTS85 *Repainting Steel Bridges*.

Hot dip galvanizing is covered by MRTS78 *Fabrication of Structural Steelwork*.

Anti-graffiti coatings are covered by MRTS83 *Bridge Deck Expansion Joints*.

Preservation treatments for timber are not considered protective coatings under this Technical Specification.

This Technical Specification includes modified content from ATS 5343 *Coating of Concrete*, ATS 5451 *Supply of Paint for Steelwork* and ATS 5450 *Protection of Steelwork by the Use of Paint Coatings*.

2 Definition of terms

The terms defined in Clause 2 of MRTS01 *Introduction to Technical Specifications* apply to this Technical Specification. Additional terminology relevant to this Technical Specification is defined in Table 2 below.

Table 2 – Definitions of terms

| Term | Definition |
|---------------------------|---|
| AAMP | Association for Materials Protection & Performance |
| Anti-carbonation coating | Coating applied to concrete and other cement-based substrates to retard their carbonation by atmospheric carbon dioxide |
| APAS | Australian Paint Approval Scheme |
| Coat | A single layer of paint, left to (partially) cure prior to application of any further layers. |
| Decorative coating system | Either film-forming coatings, surface treatments or combinations of these which can improve the aesthetic appearance of a concrete surface. |
| DFT | Dry Film Thickness |

| Term | Definition |
|-----------------------|---|
| Film-forming coating | Viscous materials which form a pinhole-free film on the concrete surface to improve its aesthetic appearance or provide protection by acting as a barrier to the ingress of aggressive agents. Coatings are generally applied in 2 or more layers. Thin coatings have a dry film thickness (DFT) of 100 to 300 micron, high build coatings generally exceed 1 mm, whereas cementitious coatings are generally thick applications ranging from 1 to 20 mm thick. |
| WFT | Wet Film Thickness |
| WMS | Work Method Statement |
| ITP | Inspection and Test Plans |
| Lot | An identifiable quantity (area) of coating from which samples are taken, and about which decisions are made on the basis of tests carried out on the samples. A lot shall consist of a uniform coating system prepared and applied in an essentially uniform manner. |
| Manufacturer | The supplier of the coating products. |
| NACE | National Association of Corrosion Engineers |
| Paint / Painting | The terms 'paint' and 'painting' do not preclude the use of coatings which would not be traditionally classified as paints (e.g. anti-carbonation coatings). |
| Pore-lining penetrant | (Hydrophobic Impregnation): Low viscosity fluids (including silane, silane / siloxane, siloxane, solid silane or silane cream) which react with the available hydroxyl group of the silicate structure of the concrete substrate in the presence of moisture, thus depositing water-repellent silicone resins chemically bonded to the walls of the concrete pore structure. These hydrophobic products can penetrate the concrete by several millimetres and work by repelling water and waterborne chloride ions |
| Primer | The first coat of a coating system applied to an uncoated concrete substrate designed to enhance adhesion of the coating system onto the surface and/or impart a surface binding and toughening effect on the substrate. |
| Reading | Single measurement of coating property (e.g. dry film thickness) |
| Sample Area | Area from which grouped readings are taken |
| Sample Result | Calculated measurement representative of a sample area for the purpose of acceptance/rejection, typically the average of individual readings. |
| Registered | Pre-qualified product or supplier in accordance with departmental registration schemes, such as: <ul style="list-style-type: none"> • Registration Scheme: Suppliers and Products for Bridges and Other Structures • Product Index for Bridges and Other Structures • Construction Materials Testing Supplier Registration Scheme, and • Quarry Registration System (QRS). Registration for certain products and suppliers is a pre-requisite for Administrator approval, not a substitute. |

3 Referenced documents

The requirements of the referenced documents listed in Table 3 below apply to this Technical Specification. Where there are inconsistencies between this Technical Specification and the referenced documents, the requirements specified in this Technical Specification shall take precedence.

Table 3 – Referenced documents

| Reference | Title |
|-------------------|---|
| AS 1580 (Set) | <i>Paints and related materials – Methods of test</i> |
| AS 1627.1 | <i>Cleaning using liquid solvents or alkaline solutions</i> |
| AS 1627.4 | <i>Abrasive blast cleaning</i> |
| AS 2312.1 | <i>Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Paint coatings</i> |
| AS 2700 | <i>Colour standards for general purposes</i> |
| AS 3730 (Set) | <i>Guide to the properties of paints for buildings</i> |
| AS 3894 (Set) | <i>Site testing of protective coatings</i> |
| AS/NZS 2311 | <i>Guide to the painting of buildings</i> |
| AS/NZS 3750 (Set) | <i>Paints for steel structures</i> |
| AS/NZS 4548.5 | <i>Guide to long-life coatings for concrete and masonry</i> |
| AS/NZS 5131 | <i>Structural steelwork – Fabrication and erection</i> |
| AP-S0156 | <i>Epoxy Mastic High Build Two-pack Coating for Rusted Steel – Aluminium</i> |
| AP-S2908 | <i>Inorganic Zinc Silicate Coating for the Long-term Protection of Steel</i> |
| AP-S2916/1 | <i>Organic Zinc-Rich Primer for the Long-term Protection of Steel – Single-pack primer</i> |
| AP-S2920 | <i>Siloxane and Polysiloxane Coatings for the Long-term Protection of Steel and Masonry</i> |
| AP-S2930 | <i>Single Pack Moisture Cure Urethane Coating for the Long-term Protection of Steel</i> |
| AP-S2971 | <i>Durable Two-Pack Epoxy Primer for the Long-term Protection of Steel</i> |
| AP-S2973 | <i>Medium Build Two-Pack Epoxy Coating for the Long-term Protection of Steel</i> |
| AP-S2975 | <i>Ultra-High Build Solventless Two-Pack Epoxy Coating for the Long-term Protection of Steel</i> |
| AP-S2977 | <i>Slow Drying / High Volume Solids Two-Pack Epoxy Mastic Coating for the Long-term Protection of Steel</i> |
| ASTM D 4262 | <i>Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces</i> |
| ATS 5343 | <i>Coating of Concrete</i> |
| ATS 5450 | <i>Protection of Steelwork by the Use of Paint Coatings</i> |
| ATS 5451 | <i>Supply of Paint for Steelwork</i> |
| ISO 11127-6 | <i>Preparation of steel substrates before application of paints and related products – test methods for non-metallic blast-cleaning abrasives</i> |
| MRTS01 | <i>Introduction to Technical Specifications</i> |

| Reference | Title |
|-----------|---|
| MRTS50 | <i>Specific Quality System Requirements</i> |
| MRTS78 | <i>Fabrication of Structural Steelwork</i> |
| MRTS83 | <i>Bridge Deck Expansion Joints</i> |
| MRTS85 | <i>Repainting Steel Bridges</i> |
| MRTS274 | <i>Repair of New Concrete Construction</i> |

4 Standard test methods

The standard test methods stated in Table 4 shall be used in this Technical Specification. Further details of test numbers and test descriptions are given in Clause 4 of MRTS01 *Introduction to Technical Specifications*.

Site testing for compliance shall be conducted and reported by a certified coating inspector (see Clause 6.2).

Table 4 – Standard test methods

| Property to be Tested | Method No. |
|---------------------------------|--|
| Aesthetics | AS 1580.481.1 (Set) |
| Dry Film Thickness | AS 3894.3 Method B (steel) AS 1580.108.2 (concrete) |
| Surface Profile | AS 3894.5 Method A or C AS 1627.4 |
| Residual Contaminants (various) | AS 3894.6 (collection) |
| Climatic conditions | AS 3894.7 |
| Adhesion | AS 3894.9 Method C AS 1580.408.5 |

5 Quality system requirements

5.1 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 5.1.

Table 5.1 – Hold Points, Witness Points and Milestones

| Clause | Hold Point | Witness Point | Milestone |
|--------|-----------------------------------|---------------|--------------------------------------|
| 5.3 | 1. Quality Plan | | Submission of Quality Plan (21 Days) |
| 7.2 | 2. Substitution of coating system | | |
| 7.3 | 3. Modification of coating system | | |

| Clause | Hold Point | Witness Point | Milestone |
|----------------------------|------------------------------------|-----------------------------|-----------|
| Concrete Substrates | | | |
| 9.7 | 4. Trial Application | | |
| 9.9 | 5. Defective Substrates | | |
| 9.12 | | 1. Inspection of coating | |
| 9.14 | 6. Disestablishment | | |
| Timber Substrates | | | |
| 10.2 | 7. Trial Application | | |
| 10.5 | | 2. Inspection of coating | |
| 10.7 | 8. Disestablishment | | |
| Steel Substrates | | | |
| 11.3.1 | 9. Defective Substrates | | |
| 11.5.2 | 10. Trial Application | | |
| 11.6.1 | | 3. Inspection of coating | |
| 11.6.7 | | 4. Rectification of coating | |
| 11.8 | 11. Disestablishment and Transport | | |

5.2 Construction procedures

The Contractor shall prepare and submit, to the Administrator, documented procedures for construction processes in accordance with the quality system requirements of the Contract. Construction procedures shall encompass:

- a) environmental controls
- b) surface preparation
- c) coating application
- d) inspection and testing
- e) repair and rectification
- f) preventative and protective methods against overspray, and
- g) waste clean-up and disposal.

'Construction procedures' may be in the form of Work Method Statements (WMS) and/or Inspection and Test Plans (ITPs).

5.3 Quality plan

The Contractor shall prepare, and implement a quality plan that includes:

- a) evidence of certification under the Painting Contractor Certification Program (PCCP) (refer Clause 6.1)

- b) names, experience and qualifications of the coatings application supervisor and key personnel (refer Clause 6.3)
- c) name, experience and qualifications of the coatings inspector (refer Clause 6.2)
- d) construction procedures (WMS) (refer Clause 5.2)
- e) program of works, and
- f) ITPs.

The inspection and test plan(s) shall indicate what tests are to be performed, the test criteria and what records will be maintained. At a minimum, records equivalent to those provided in AS 3894 *Site testing of protective coatings* Parts 12, 13, and 14 shall be included.

The quality plan shall be submitted to the Administrator for approval at least 21 days prior to the commencement of surface preparation. Work shall not commence until approval has been granted.

Hold Point 1

6 Competency and accreditation

This clause adopts and modifies content from ATS 5450 *Protection of Steelwork Paint Coatings* and applies it to all substrates. Minor edits have been made throughout. Major differences are noted as commentary.

6.1 Contractor

The surface preparation and coating application contractor shall be appropriately accredited under the Painting Contractor Certification Program.

6.2 Coating inspector

The Contractor shall nominate a coating inspector to perform and report on conformance checks. The inspector shall either:

- a) be accredited by the Association for Materials Protection & Performance (AMPP), as a Certified Coating Inspector, or
- b) satisfy the Administrator of sufficient technical knowledge to undertake the inspections.

The Coating Inspector shall independently and impartially monitor the Applicator's activities to verify that the Applicator has complied with this Technical Specification.

Note: The work of this inspector does not replace the oversight and monitoring performed by the Administrator and/or Principal.

A 'Certified Coating Inspector' is equivalent to the old NACE CIP Level 2.

6.3 Competence of tradesperson

The Contractor shall ensure all surface preparation and coating application is performed by tradespeople who are suitably skilled and qualified in the field.

The work shall be supervised by a Coating Supervisor with at least 3 years of experience on projects of a similar size and scope to this work and is qualified to as a AMPP Basic Coating Inspector. The Coating Supervisor shall be on site at all times while painting work is in progress.

The Coating Supervisor shall be an employee or agent of the Applicator and shall not be the Coating Inspector.

Apprentices may be employed under the direct supervision of a qualified person.

A 'Basic Coating Inspector' is equivalent to old NACE CIP Level 1.

Sufficient evidence of competency for applicators could include Certificate III or higher in the application of coatings (e.g. MSM30216 *Surface Preparation and Coating application*, MSA3030, MEM30305) or ACA (Australasian Corrosion Association) certification. See Clause 7.2 of AS 2312.1 *Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Paint coatings*.

7 Design and selection of coating system

The Designer shall be responsible for specifying the coating system, taking into account:

- a) site-specific environment
- b) element to be coated
- c) geometry
- d) materials
- e) assembly
- f) purpose of the coating
- g) appearance, and
- h) ease of inspection and maintenance.

AS 2312.1 provides guidance on coating system selection and the necessary considerations. Where the Structural Designer does not have the capability to perform this task it should be delegated to an appropriately competent engineer for inclusion in the durability design.

7.1 Aspects to be included

The specified system shall include:

- a) the purpose of the coating
- b) system designation
- c) the extent of its application
- d) any colour requirements
- e) the necessary surface preparation
- f) environmental limits (e.g. temperature)
- g) details of each coat required, and
- h) procedures for repairing the coating, both during application and during service life of the element.

7.1.1 Consideration of repair and maintenance

The specified system shall include details for future maintenance and repair, including:

- a) the methods of preparation to be used in the event that re-coating of the coated surface is required
- b) which types of coating, other than the original product, are compatible with the finish coat for re-coating purposes
- c) the technique which can be used to repair local damage to the coating, with particular reference to colour and gloss matching of finish coats applied after a time lapse of 5 years, and
- d) the most appropriate techniques for cleaning of the finish coat to remove surface soiling, with particular reference to ease of removal of graffiti or glued posters, where possible, without damage to the existing finish.

7.2 Substitution of coating system

The Contractor may propose an alternative coating system, subject to advice from the Designer and approval of the Administrator. Alternative systems shall be registered and equivalent to the specified system. **Hold Point 2**

7.3 Modification of coating system

Where site-specific circumstances require modification of the specified system, these modifications shall be submitted to the Administrator for approval. **Hold Point 3** Modifications shall be limited to changes in application technique and splitting of coats into multiple layers.

For example, the specified system may require a top coat to be 150 microns (DFT) thick but the site conditions limit layers to between 100-125 microns (DFT) therefore 2 coats would be required, with an increased overall DFT.

8 Coating system

The coating system shall be registered in accordance with Appendix A.

8.1 Composition

Coating systems shall not contain lead nor chromium compounds.

Systems shall comprise all necessary coats, associated thinners, and methods of surface preparation and application. All coating products are to be supplied by the same Manufacturer.

Individual coats within a system shall be visually distinct from previous coats and the substrate to permit confirmation of coverage.

8.2 Designation

Coating systems shall be designated by the active ingredient in the topcoat. Where possible, the system designation (e.g. PUR5) of AS 2312.1 shall be used. Individual products shall be described, where possible, as per Appendix D of AS 2312.1, AS/NZS 2311 *Guide to the painting of buildings*, or the relevant APAS specification.

Coating products and systems not appearing in these standards should use alternate Standards or commonly accepted terminology.

8.3 Application

Coating systems shall be designated for use on particular substrates for particular purposes, from:

- a) decorative (on concrete, galvanized steel or timber)
- b) anti-carbonation (on concrete)
- c) moisture / chloride resistance (on concrete), and
- d) anti-corrosion (on steel).

9 Coatings for concrete

This clause adopts and modifies specified clauses of ATS 5343 *Coating of Concrete* and ATS 5450 *Protection of Steelwork Paint Coatings*. Minor edits have been made throughout. Major differences are noted as commentary.

9.1 Materials

This sub-clause adopts and modifies content from Clause 6 of ATS 5343.

Materials shall:

- a) be brought to site in the original unopened cans which are clearly labelled with the manufacturer's name, product type, reference and batch numbers
- b) remain in their original, sealed containers until the time of use

- c) be stored in a secure area which is protected from weather and appropriately signed
- d) be free from contamination, gelling, drying out, heavy skin formation and severe segregation of ingredients, and
- e) be used before the recommended shelf-life has expired.

The Contractor shall provide a certificate from the manufacturer for each batch of coating and primer material confirming:

- a) manufacturer's name and address
- b) product reference
- c) batch number / identification
- d) quantity manufactured in the batch, and
- e) date of manufacture.

The Contractor shall maintain records showing which elements were treated with each coating batch and provide these records to the Administrator prior to completion of the work.

9.2 Performance requirements – general

This sub-clause adopts and modifies content from Clause 7 of ATS 5343.

The surface preparation, storage of materials and application of all coatings shall comply with the manufacturer's instructions / recommendations.

All test certificates required by this Technical Specification shall be provided by a laboratory which is accredited under ISO/IEC 17025.

All coats in the system or separate coatings/treatments making up the system shall be physically and chemically compatible with each other.

Each coat shall have the required colour, gloss and opacity. The final surface shall exhibit a uniform colour and texture.

The coating system shall be capable of withstanding cleaning with hot water, in the range of 40°C to 50°C, detergent and scrubbing action without loss of adhesion, softening or changing in colour or gloss.

The coating pigments shall be colourfast, not subject to fading or discolouration and exhibit high resistance to chalking and dirt pick up. The coating system shall demonstrate these abilities through naturally weathered test panels (at 48 months), in accordance with AS/NZS 1580.457.1, and the following criteria.

Table 9.2 – Aesthetic qualities

| Defect | Method of Test | Acceptable rating |
|---------------------|----------------------|-------------------|
| Discolouration | AS/NZS 1580.481.1.2 | ≤ 2 |
| Dirt Retention | AS/NZS 1580.481.1.4 | ≤ 2 |
| Checking | AS/NZS 1580.481.1.7 | 0 |
| Blistering | AS/NZS 1580.481.1.9 | 0 |
| Flaking and peeling | AS/NZS 1580.481.1.10 | 0 |
| Chalking | AS/NZS 1580.481.1.11 | ≤ 1 |
| Colour change | AS/NZS 1580.481.1.12 | ≤ 2 |

This table does not appear in ATS 5343 and is provided to quantify the requirement.

Accelerated weathering tests may be considered as an alternative, with justification provided by the Manufacturer.

Coating systems applied to highly porous and/or relatively soft concrete substrates shall include a high quality pore-filling primer coat or sealer to be applied prior to the application of at least 2 coats of the protective or decorative part of the overall coating system. The primer and/or the coating system as a whole shall also offer surface binding and toughening effect.

Where a primer, undercoat or sealer is required as an integral part of the coating system (i.e. primer coat plus at least 2 coats of the protective or decorative part of the system), the primer, undercoat or sealer shall be a different colour to that of the final nominated colour and shall be in accordance with AS 2700 *Colour standards for general purposes*.

The applied coating system shall satisfy the following requirements:

- a) bond strength greater than 0.75 MPa when tested 14 days after application in accordance with AS 1580.408.5 *Paints and related materials – Methods of test*
- b) ability to bridge cracks up to 0.3 mm wide
- c) ability to be recoated within 24 hours
- d) have minimum pot life of 1 hour
- e) not to sag or run when applied correctly to vertical surfaces, and
- f) compatibility to an alkaline surface in accordance with ASTM D 4262 *Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces*.

9.3 Performance requirements for decorative and anti-carbonation coatings

This sub-clause adopts and modifies content from Clause 8 of ATS 5343.

Where specified, concrete surfaces shall be painted with at least 2 coats of an approved decorative / anti-carbonation coating system and the manufacturer's specification to achieve a uniform colour and texture. The primer which forms an integral part of the coating system shall be applied onto the concrete substrate prior to the application of subsequent coats of the approved decorative / anti-carbonation coating.

Coatings shall satisfy the minimum performance criteria shown in Table 9.3.

Table 9.3 – Performance criteria (decorative / anti-carbonation coatings)

| Property | Symbol | Requirement | Test Method |
|---|--------|---|--------------------------|
| Equivalent Air Layer Thickness | R | > 150 m | AS/NZS 4548.5 Appendix D |
| Equivalent Thickness of Concrete | Sc | > 450 mm | AS/NZS 4548.5 Appendix D |
| CO ₂ Diffusion Co-efficient (protective coatings only) | D | < 2 x 10 ⁻⁷ cm ² /s | AS/NZS 4548.5 Appendix D |
| Water vapour equivalent air layer thickness | Sd | < 4 m | AS/NZS 4548.5 Appendix C |
| Dry film thickness (per coat) | DFT | at least 150 µm | AS 1580.108.2 |

9.4 Performance requirements for moisture and chloride resistance coatings

This sub-clause adopts and modifies content from Clause 9 of ATS 5343.

9.4.1 General

Protective coating systems for moisture and chloride resistance shall be applied in at least 2 coats and, in addition to the other requirements of Clause 9.2, shall satisfy the following minimum performance criteria:

- a) chloride diffusion co-efficient less than 5 x 10⁻⁹ cm²/sec, and carbon dioxide (CO₂) diffusion coefficient less than 2 x 10⁻⁷ cm²/sec after 2000 hours of accelerated ultra-violet (UV) weathering; and
- b) DFT of at least 200 µm.

9.4.2 Tidal zone

In addition to the other requirements of Clause 9.2 and Clause 9.4.1, a coating system for the tidal zone shall satisfy the following requirements:

- a) the coating system shall be formulated for application onto surface dry but saturated concrete such as in the tidal range in a marine environment, and
- b) the coating system shall cure rapidly between the tidal cycles, such that it may be immersed in seawater within 3 hours of application and shall be capable of withstanding hydrostatic penetration of water.

9.4.3 Splash zones

Coating systems for splash zones shall be a dual protective coating system consisting of a pore-lining penetrant (i.e. silane, solid silane or silane cream) and at least 2 coats of a film-forming topcoat.

In addition to the requirements of Clause 9.2 and Clause 9.4.1, the dual protective coating system shall satisfy the following requirements:

- a) Silane pore-lining penetrants shall consist of at least 95% active ingredients and shall be applied in 2 applications at a minimum application rate of 0.3 litres/m² with a minimum interval between coats of at least 6 hours.
- b) Solid silane or silane cream pore-lining penetrants shall consist of at least 80% active ingredients and shall be applied in one thick application at a minimum application rate of 0.4 litres/m².
- c) The amount of penetration of silane, solid silane or silane cream pore-lining penetrants into the concrete, shall be a minimum of 5 mm.
- d) The amount of penetration of silane / siloxane or siloxane pore-lining penetrants, shall be a minimum of 3 mm.
- e) The pore-lining penetrant shall contain a fugitive dye to enable clear differentiation between coated and uncoated areas.
- f) The pore-lining penetrant and film forming coating shall be compatible.
- g) The film-forming topcoat shall satisfy the requirements of Table 9.3 for decorative / anti-carbonation coatings, except that its DFT shall be at least 200 µm per coat.

9.4.4 Special applications

Any protective coatings requirements for special applications shall be as specified on the drawings.

9.4.5 Coatings applied to retaining walls

Where coating systems are applied to the exposed concrete surfaces of retaining walls or other soil retaining structures, adequate waterproofing membranes and/or drainage systems shall be installed behind the retaining wall to prevent the coating system from blistering or peeling off, where applied on exposed concrete surfaces.

9.4.6 Coatings applied to parapet walls

Where coating systems are applied on walls or other vertical concrete components which have exposed top horizontal surfaces, the coating systems shall be taken over the top of the parapet and at least 150 mm down to the back of the wall to prevent the coating system from blistering or peeling off, unless the whole rear wall requires protection.

9.5 Equipment

This sub-clause adopts and modifies content from Clause 10 of ATS 5343.

The Contractor shall be responsible for the supply and maintenance of the surface preparation and application equipment.

The spray equipment shall be suitable for the application of the coatings in accordance with this Technical Specification. It shall be capable of properly atomising the coating material to be applied and shall be equipped with accurate pressure regulators and gauges.

The spray gun, nozzles and needles shall conform to the coating material manufacturer's recommendations for the coating to be applied. The spray equipment shall be kept in such condition to permit efficient and effective coating material application.

An efficient air line filter shall be fitted as close as possible to the pressure pot to eliminate line condensate and oil in the air supply to the spray gun. The air of the spray gun impinging against the surface shall show no condensed water or oils.

9.6 Time constraints

This sub-clause adopts and modifies content from Clause 11 of ATS 5343.

Coating systems shall not be applied until the period specified in Table 9.6 has elapsed after the placement of the concrete. Coating application may be undertaken earlier if it can be established using a commercially available calibrated moisture meter that the concrete moisture content is less than 10%, and that recommended by the coating manufacturer, but no earlier than 50% of the time periods stated in Table 9.6 and provided the concrete surface is dry at the time of application.

Table 9.6 – Elapsed time before application of coating

| Substrate | Elapsed time before application of coating (days) |
|--|---|
| Newly constructed cast in-situ concrete / non-accelerated cured precast concrete | 28 |
| Steam cured concrete | 14 |
| Concrete repair using proprietary cementitious materials | 14 |
| Concrete repair using concrete | 28 |

9.7 *Trial application*

This sub-clause adopts and modifies content from Clause 12 of ATS 5343.

A trial application of the coating system (including surface preparation) shall be conducted on a test area of the actual substrate of not less than 10 m² or a test panel (minimum size 0.5 m²) made from identical substrate. The test area or test panel shall be prepared, coated and tested in an identical manner to the full scale coating system and demonstrate that the coating system will comply with this Technical Specification. If a test panel is used then coats shall be stepped to reveal all intermediate layers.

Actual coverage rates of the coating system shall be recorded in order that due allowance may be made in the full scale application for rough, irregular or highly absorbent concrete substrate. Any additional requirements or observations shall be recorded and considered for the full scale application.

If the trial application does not comply with the requirements of this Technical Specification, the deficiencies shall be rectified (which may include testing of any new materials / methods) and a further trial coating shall be prepared until the performance criteria of this Technical Specification are met.

Coating application shall not continue until approval of the sample panel or test area has been granted by the Administrator. **Hold Point 4**

9.8 *Protection of the works and property*

This sub-clause adopts and modifies content from Clause 13 of ATS 5343.

The Contractor shall:

- a) protect previously painted or galvanized surfaces, services, bearings, joints, painted signs and nameplates during the surface preparation process and during coating application processes
- b) remove all coating drips and droppings, smudges and over spray from all surfaces, including surfaces not being treated, and
- c) ensure that the coated works are protected from adverse conditions, dust and debris during the curing period of the coating system.

Spray painting shall not be carried out within 10 metres of buildings, footpaths, roadways, pedestrians or vehicles without protective measures or methods being used.

At all times while work is underway on site, the Contractor shall regularly remove all waste (including spent abrasive, liquids, packaging and general rubbish) from the site. Waste shall be handled, transported and disposed of in accordance with any environmental requirements and regulations applicable to the works.

9.9 Surface preparation

This sub-clause adopts and modifies content from Clause 14 of ATS 5343.

Prior to treatment, concrete surfaces shall be clean and free from contaminants such as oil, grease, dust, dirt, laitance, loose particles, remnants of curing / release compounds, mould, moss and algae.

The concrete surface shall be prepared by high pressure jetting with potable water, either with or without added abrasive (i.e. up to 20 MPa), steam cleaning, wire brushing, abrasion with angle grinder, or by other means to provide a strong, hard surface. Areas of persistent contamination shall be removed from the surface by the use of appropriate solvents or detergents followed by washing with potable water.

Any abrasive blast cleaning shall be carried out in accordance with AS 1627.4 *Abrasive blast cleaning* and applicable Work Health and Safety and Environmental requirements.

The Contractor shall be responsible for ensuring the substrates are suitable for the application of the coating system. For any defective substrates which require repair, the Contractor shall notify the Administrator of the defective substrate areas and the proposed corrective action to be undertaken. The corrective action shall be approved by the Administrator. **Hold Point 5**

The above paragraph / Hold Point are not in ATS 5343 and is added to allow investigation and notice of potentially defective elements.

Any blow holes, areas of honeycombing, loose surface layers and weak concrete, shrinkage cracks of width less than 0.2 mm or other defects, either revealed by a grinding process or exposed by other surface preparation methods, shall be filled with a suitable fairing coat cementitious repair material in accordance with the requirements of MRTS274 *Repair of New Concrete Construction*.

If the surface of the concrete is weak, more material shall be removed and repaired in accordance with the requirements of MRTS274 *Repair of New Concrete Construction*. Such repairs shall be sufficient to result in a strong, sound substrate suitable for the intended protective or decorative coating system. Projecting fins, rough spots and sudden steps shall be removed by light abrasion with an angle grinder to provide a surface which can be easily coated.

Any cracks shall be treated in accordance with MRTS274 *Repair of New Concrete Construction*. Inactive cracks of width equal to or greater than 0.20 mm shall be sealed by resin injection.

9.10 Environmental constraints

This sub-clause adopts and modifies content from Clause 15 of ATS 5343.

Coating systems shall not be applied under any of the following conditions:

- a) windy conditions where over spray and/or spatter may be generated
- b) when wind-borne debris is likely to contaminate the uncured surface of the freshly applied coating

- c) when the ambient temperature exceeds 35°C or is below 10°C unless otherwise expressed in writing by the manufacturer
- d) when the relative humidity exceeds 85% or where it may be expected to exceed 85% during the subsequent 12-hour curing period
- e) when rain spatter or run-off, including leakage through deck joints, contaminating the surface and adversely affecting the adhesion to the substrate, may occur, and
- f) when the surface temperature of the substrate is less than 3°C above the dew point calculated in accordance with AS 2312.1 or exceeds 40°C.

The environmental conditions shall be measured, recorded and assessed against the above requirements once every 4 hours of each shift or more frequently during periods when the weather is rapidly changing. A calibrated commercially available hygrometer (psychrometer) or electronic climatic measuring gauge shall be used to determine the parameters which require readings.

The Contractor's procedures shall include provisions for the management of adverse environmental conditions, including the suspension of work where appropriate.

The Contractor shall adhere to the manufacturer's instructions regarding drying and curing requirements, and overcoating time intervals, for the prevailing environmental conditions.

9.11 Application of coatings

This sub-clause adopts and modifies content from Clause 16 of ATS 5343.

Unless the coating is specifically formulated for tolerance to moisture during application, the concrete surface shall be dry prior to the application of a coating.

If a moisture tolerant coating is used, the concrete surfaces to receive coating shall be surface-dry at the time of application and any deposits of salt crystals which collect on coated surfaces shall be washed off with potable water and the surface allowed to dry, prior to further coating application.

Coverage rates shall be checked for compliance with the manufacturer's requirements. The surface area of the concrete structure subject to application and the volume of coating used shall be recorded by the Contractor.

The coating system shall be applied as soon as possible (i.e. within 24 hours unless otherwise expressed in writing by the manufacturer) after the preparation of the concrete surface. The prepared surface shall be protected against contamination if it is left uncoated for more than 24 hours.

Where more than one coat is applied, successive coats shall have slightly different colour shades to assist in achieving uniform coverage. The difference in colour shall be such that a coat when either wet or dry shall be clearly distinguishable by means of colour difference, from the preceding coat.

Multi-part coating materials shall not be applied after the pot life has expired.

A coating shall not be applied over any coating which is damaged or has not been applied in accordance with this Technical Specification until that coating has been repaired in accordance with Clause 9.13.

Further to the other requirements of this Clause, any pore-lining penetrants (i.e. silane, silane / siloxane, siloxane, solid silane or silane cream) shall be applied:

- a) to a surface which is dry for a minimum of 24 hours before application commences
- b) using an airless pump system with an operating pressure not exceeding 70 kPa in order to ensure that no atomization or misting of the material occurs
- c) in a series of continuous operations
- d) by a continuous spray technique giving saturation flooding, working from the lowest level and proceeding upward toward higher elevations, and
- e) so that there is a 'wet look' for a few seconds after application.

Coating materials shall not be excessively thinned and any thinners used shall be the correct type as specified by the material manufacturer. The coating material shall be strained as specified by the material manufacturer.

Where quantities of coating material are being applied by spraying successive batches of premixed multi part material, the equipment shall be flushed and purged with clean solvent after two-thirds of the pot life of the material has expired from either the mixing of the first batch or since the last purge and cleaning of the equipment. Coating material ingredients shall be kept properly mixed in the spray pots or container during the application of the material whether by continuous mechanical agitation or intermittent manual agitation as required.

Where brush or roller techniques are used, the brushes or roller heads shall be used for the day only and then discarded. The equipment shall not be cleaned for re use.

Each coat shall have the specified DFT, including edges and corners. Coats which exhibit excessive film builds shall be removed.

Each coat shall be smooth, uniform and free from sags, runs, mud cracking, wrinkling, fat edges, blisters, pinholes, holidays, dry spray, entrapped foreign bodies and heavy brush marks.

9.12 Testing and inspection

This sub-clause adopts and modifies content from Clause 17 of ATS 5343.

Following application of the final coat, the coating shall be tested for compliance with the following:

- a) 85% of DFT measurements (aggregate) shall be more than 90% of the specified thickness
- b) 85% of DFT readings taken in the 1 m² test area shall be more than the specified thickness, and
- c) bond strength, at 14 days, of greater than or equal to 0.75 MPa.

Testing shall be conducted at a rate of one sample per 50 m², with DFT samples consisting of 10 readings. Testing shall be conducted in accordance with AS 1580.108.2.

Testing of coatings shall be a **Witness Point 1**

9.13 Coating repairs

This sub-clause adopts and modifies content from Clause 18 of ATS 5343.

Coatings not complying with this Technical Specification, including those suffering yellowing, loss of adhesion or colour change during the defects liability period shall be rectified in accordance with the approved repair / rectification procedure to meet performance requirements of this Technical Specification.

Repairs to the topcoat shall match the colour of surrounding areas.

9.14 Records

This sub-clause adopts and modifies content from Clause 15 of ATS 5450 *Protection of Steelwork Paint Coatings* to apply to concrete substrates.

Prior to removal of access and/or containment for the span or bay (for field work) or transportation of the members from the painting enclosure (for new work), the Contractor shall submit a report of the following to the Administrator. **Hold Point 6**

- a) surface preparation and inspection records
- b) paint application records, including:
 - i. weather conditions, and
 - ii. coating batch numbers.
- c) DFT of each coat and the total coating thickness for each lot in accordance with Clause 9.12, including measurement locations, and
- d) photographic records of the appearance of the finished surface.

10 Coatings for timber

There is no equivalent Austroads Technical Specification (ATS) for timber substrates. New timber structures are rare on the Transport and Main Roads network, therefore only a brief specification is given here. For substantial works a project specific specification will be required.

10.1 Performance requirements

Coating systems for timber shall comply with the typical performance properties listed in the relevant part of AS 3730 *Guide to the properties of paints for buildings*.

10.2 Trial application

A trial application shall be conducted in accordance with Clause 9.7 before continuing the coating process. **Hold Point 7**

10.3 Protection of the works and property

Protection of the works and property shall be carried out as per Clause 9.8.

10.4 Surface preparation

The surface shall be free of loose material before coating and adequately cleaned. All dust, sawdust, grease and surface deposits of preservative shall be removed. Any pitch pockets and knots shall be scraped and sealed.

Surface preparation and paint application shall be in accordance with the paint supplier's written application instructions.

Damages, defects, unsatisfactory or unfavourable conditions shall be reported to the Administrator before proceeding with work.

Painting shall not be performed when the moisture content of the timber substrate exceeds 12%.

10.5 Testing and inspection

Following application of the final coat, the coating shall be tested for compliance with the following:

- a) 85% of DFT measurements shall be more than 90% of the specified thickness
- b) 85% of DFT measurements taken in the 1 m² test area shall be more than the specified thickness, and
- c) bond strength, at 14 days, greater than or equal to 0.75 MPa.

Testing shall be conducted at a rate of one sample per 50 m², with DFT samples consisting of 10 readings.

Testing of coatings shall be a **Witness Point 2**

10.6 Coating repairs

Coatings not complying with this Technical Specification, including those suffering yellowing, loss of adhesion or colour change during the defects liability period shall be rectified in accordance with the approved repair/rectification procedure to meet performance requirements of this Technical Specification.

Repairs to the topcoat shall match the colour of surrounding areas.

10.7 Records

Prior to removal of access and/or containment for the span or bay (for field work) or transportation of the members from the painting enclosure (for new work), the Contractor shall submit a report of the following to the Administrator: **Hold Point 8**

- a) surface preparation records
- b) paint application records
- c) DFT of each coat and the total coating thickness for each lot in accordance with Clause 10.5, and
- d) photographic records of the appearance of the finished surface.

11 Coatings for steelwork

11.1 Coating products

This sub-clause adopts and modifies content from Clause 9 of ATS 5450 *Protection of Steelwork by the Use of Paint Coatings* and Clause 6 of ATS 5451 *Supply of Paint for Steelwork* with the following differences:

- Designer nomination of the paint system and product registration make initial submissions moot.
- Additional flexibility is given to cater for innovative coating systems.

The paint shall be manufactured and supplied under a suitable Quality Management System as a means of ensuring that the product conforms to this Technical Specification.

The paint shall be manufactured by an APAS Recognised Manufacturing Unit.

The paint system shall be a registered 'product' in accordance with Appendix A.

Note: APAS approval of the specific paint is not required but may be used as evidence of compliance and hence speed up product registration (See Appendix A).

11.1.1 Performance requirements

Individual coating products shall comply with the relevant part of AS/NZS 3750 *Paints for steel structures* and the relevant APAS specification, where applicable (see Table 11.1.1 below and Table 9.9 of AS/NZS 5131 *Structural steelwork – Fabrication and erection* for examples).

For topcoats, where no part of AS/NZS 3750 is immediately applicable the requirements of AS/NZS 3750.6 shall apply. Colour / gloss requirements for primers and intermediate coats do not apply.

Where used as the primary protective coating, systems shall be designed for a durability (years to first maintenance) of at least 25 years.

Table 11.1.1 – AS/NZS and APAS references for common paint types

| Paint type | AS/(NZS) reference | APAS reference |
|--|-------------------------------|----------------------|
| Inorganic zinc silicate paint | AS/NZS 3750.15 Type 3, 4 or 6 | AP-S2908 |
| Organic zinc-rich primer | AS/NZS 3750.9 Type 2 | AP-S2916/1 |
| Epoxy primer (two-pack) | AS/NZS 3750.13 | AP-S2971 |
| Epoxy mastic (two-pack) – for rusted steel | AS/NZS 3750.1 | AP-S2977 AP-S0156 |
| High-build epoxy (two-pack) | AS/NZS 3750.14 | AP-S2973 |
| Full gloss polyurethane (two-pack) | AS/NZS 3750.6 | - |
| Polysiloxane paint | - | AP-S2920 |
| Ultra-high-build epoxy | AS/NZS 3750.2 | AP-S2975 |

| Paint type | AS/(NZS) reference | APAS reference |
|-------------------------|--------------------|----------------|
| Moisture-cured urethane | AS/NZS 3750.18 | AP-S2930 |
| Micaceous iron oxide | AS/NZS 3750.12 | - |

11.2 Materials

This sub-clause adopts and modifies content from Clause 8 of ATS 5450. Minor edits have been made throughout. Major differences are noted as commentary.

Clauses referring to existing coatings have been removed (refer to MRTS85 *Repainting Steel Bridges* instead).

All materials (including thinners) for the coating system shall be supplied by the same paint manufacturer. All paint of a particular type for a topcoat of a particular structure shall be from the same batch.

Audit samples, including samples from the painter's pot, may be collected at any time by the Principal.

At least 5 working days prior to the commencement of work, the Contractor shall submit:

- a) an APAS record of supply for each batch of APAS approved material to be used for protective Treatment, or
- b) evidence that each batch of paint supplied has been manufactured to the same formula as the approved sample.

Paint shall be delivered to the site in the manufacturer's containers, unopened and with the label intact. The following information shall be legibly and durably marked on each container:

- a) the name or registered mark of the manufacturer
- b) the paint type
- c) colour to AS 2700
- d) the contents by volume in litres, or by mass in kilograms
- e) product identification
- f) production or batch numbers on packs of 5 kg capacity, or greater
- g) date of manufacture, and
- h) information required by statutory regulations.

The colour (in accordance with AS 2700) of the external finish shall be as specified in the Contract documents.

The instructions for use, the Technical Data Sheet and the Material Safety Data Sheet shall be kept on site at all times, shall be readily available to the relevant personnel and shall be made available for inspection by the Administrator upon request.

11.2.1 Abrasive

Where required for the Works, the abrasive to be used for dry abrasive blast cleaning shall:

- a) comprise of crushed, sharp angular grit, which may include garnet, staurolite or steel grit abrasive
- b) be clean, dry and free from extraneous material (such as dirt, gravel and organic matter)
- c) not include copper or mineral slag abrasives
- d) not contain free crystalline silica
- e) not contain radioactive substances or recycled materials that have not been treated to minimize respirable dust, and
- f) not be spherical shot or cut wire pellet abrasives.

Only garnet abrasives are to be used for field or on-site work, irrespective of whether or not the work is carried out using full containment.

Prior to their first use, abrasives shall be analysed for water-soluble salts and lead. Water-soluble salt content shall be less than 50 parts per million (ppm) or an upper limit of conductivity of 30 mS/m when assessed in accordance with ISO 11127-6 *Preparation of steel substrates before application of paints and related products – test methods for non-metallic blast-cleaning abrasives*. Total lead content shall be less than 100 ppm.

Blast media shall be delivered to the applicator's premises in the manufacturer's containers, unopened and with the label intact. The following information shall be legibly and durably marked on each container:

- a) material type
- b) batch number
- c) date of manufacture
- d) grading of material, and
- e) manufacturer's name.

The disposal of blast media waste shall be managed in accordance with the applicable environmental regulations and any other environmental management requirements included in the Contract documents.

11.2.2 Other materials

The Contractor shall:

- a) use clean and dry oil-free compressed air for abrasive blast cleaning, blowing down and spraying
- b) fit oil and water traps with their associated in-line filters to all air lines
- c) maintain the filters regularly
- d) install new filters at the start of the work, and
- e) replace filters as recommended by the manufacturer, or earlier if they become ineffective.

Cleaning solutions for the removal of non-water-soluble contaminants (e.g. greases, lifting chain lubricants or road grime) shall be as recommended by AS 1627.1 *Cleaning using liquid solvents or alkaline solutions*.

Water shall be clean, free from chlorides and any other contaminants deleterious to steel surfaces for jet and high-pressure water washing activities.

Any thinners used shall be in accordance with the recommendations of the paint manufacturer. Solvents used for cleaning painting equipment shall not be used as thinners for the paint. Prior to the application of the paint, any residual solvents used for cleaning shall be flushed or otherwise removed from the painting equipment.

For filling crevices and gaps between steel surfaces, two-part solventless epoxy putties recommended by the paint manufacturer shall be used.

11.3 Preparation of steel surfaces

This sub-clause adopts and modifies content from Clause 10 of ATS 5450.

11.3.1 General

The Quality Plan shall include details / procedures for undertaking the surface preparation, including:

- a) details of work to be carried out by shop treatment and the work to be carried out by field treatment
- b) details of the equipment, including:
 - i. abrasive blast cleaning plant
 - ii. waste collection equipment, and
 - iii. abrasive recycling equipment.
- c) details of solvent cleaning procedure and soluble salt removal procedures
- d) details and test results for the abrasive to be used for abrasive blast cleaning
- e) analysis certificate if non-metallic abrasives are used, and
- f) for new steelwork, a procedure in accordance with Clause 9.8 of AS/NZS 5131 for checking the condition of the steel after fabrication and surface cleaning, but before the application of the coating.

Prior to the application of the coating system, the surface shall be treated in accordance with the requirements of Clause 11.3.1 or Clause 11.3.2 and the requirements of the following clauses of AS/NZS 5131:

- Surface preparation: Clause 9.3.2
- Abrasive blasting: Clause 9.4, and
- Mechanical cleaning: Clause 9.5

The Contractor shall be responsible for ensuring the substrates are suitable for the application of the coating system. For any defective substrates which require repair, the Contractor shall notify the

Administrator of the defective substrate areas and the proposed corrective action to be undertaken. The corrective action shall be approved by the Administrator. **Hold Point 9**

The Contractor shall maintain daily records of the surface preparation work in accordance with Clause 11.9.

Note: The responsibility for surface treatment / finish (see Clause 9.8 of AS/NZS 5131) lies with the steelwork fabricator (refer to MRTS78 *Fabrication of Structural Steelwork*).

Where used, power tool cleaning and hand tool cleaning shall be carried out in accordance with ISO 8504-3 and AS 1627.7 respectively.

Elements not within the scope of works to be coated shall be protected during surface preparation and coating application.

11.3.2 Surface preparation and surface profile (plain steel substrate)

This clause applies when paint is applied as the primary protective coating.

Any localised deposits of mud, dirt, bird nests and droppings shall be removed by scraping, or cleaning by mechanical means or water. In the process of cleaning, contaminants shall not be spread over less contaminated areas. Prior to abrasive blast cleaning, any other surface preparation or painting, areas contaminated by oil, grease or bitumen shall be cleaned using alkaline or solvent solutions in accordance with AS 1627.1.

The air temperature, relative humidity and dew point and steel surface temperature and time of measurement shall be recorded just prior to commencing abrasive blast cleaning, every 2 hours afterwards and on completion.

The steel surfaces shall be cleaned by abrasive blasting to achieve a minimum of Sa 2½ surface finish in accordance with AS 1627.4, pictorially represented in ISO 8501-1. All cleaned surfaces shall be assessed for compliance.

The surface profile height shall be within the range of 40 µm to 75 µm when sampled and measured in accordance with AS 3894.5 Method A or C. One evaluation shall be performed for each 50m² of cleaned surface, with at least 3 evaluations made for each day's production.

The achievement of the surface preparation class and the measured surface profile height shall be recorded on the Contractor's daily inspection report.

Final blasting shall not be carried out unless the surface temperature is at least 3°C above the dew point.

11.3.3 Surface preparation and surface profile (galvanised steel substrate)

This clause applies when paint is applied over galvanised steel.

Galvanized surfaces shall be degreased by solvent cleaning or other approved method in accordance with AS 1627.1. The surface shall be dry abrasive sweep blasted in accordance with Appendix D of AS 1627.4 to achieve a surface profile of 10-30 µm. The blasted surface shall exhibit a dull grey finish and a surface profile suitable for the proper adhesion of the specified protective or decorative coating.

This clause does not appear in ATS 5450.

Sweep blasting is also known as brush or whip blasting.

11.3.4 Cleaning after blasting

Before applying the protective coating, all surfaces shall be cleaned free of any traces of blast product and debris by brushing with clean brushes and blowing down with clean dry compressed air or by vacuuming. Air used to blow down surfaces shall be free of oil and moisture. The effectiveness of the dust removal process shall be verified in accordance with Method C of AS 3894.6. A result equal or better than Rating 1 shall be achieved on all surfaces.

11.3.5 Surface cleanliness

All surfaces to be painted shall be tested for chloride contaminants by field analysis using reliable, reproducible test equipment. The procedures for extracting and analysing soluble salts shall be selected from Method A of AS 3894.6. The level of combined salt contaminants shall not exceed 7 µg/cm².

Oil or grease shall not remain on the blasted surface. Testing for the absence of these contaminants shall be as per Method B of AS 3894.6.

Testing for the level of surface contaminants shall be carried out at a rate of one test per 50m² of cleaned steel, or part thereof. The results of testing for surface contaminants shall be included in the Contractor's Daily Inspection Report.

If the level of contaminants exceeds the limits specified above, the affected area shall be cleaned, degreased and re-blasted as appropriate in accordance with this Technical Specification.

11.3.6 Records

Details of the surface preparation shall be recorded in accordance with AS 3894.10, AS 3894.14 or equivalent and submitted to the Administrator. At a minimum, the following shall be reported:

- a) name(s) of cleaning solution product(s) together with manufacturer(s) details
- b) designation of each member or area where the cleaning solution is used
- c) method(s) of surface preparation
- d) class of surface preparation
- e) profile of abrasive blast cleaned surfaces
- f) type and grade of abrasive
- g) soluble salt and lead content of non-metallic abrasives

- h) records of air temperature, relative humidity and dew point and steel surface temperature and times of measurement, and
- i) date(s) and time(s) of commencement and completion of abrasive blast cleaning.

11.4 Special areas

This sub-clause is significantly different to the equivalent Clause 11 of ATS 5450, to reflect the different assumption of responsibilities between the Designer and the Contractor.

Special areas, such as those with difficult access, shall be prepared and coated in accordance with the Drawings.

The faying surfaces (including the coating system) of friction-type bolted connections designed to AS/NZS 5100.6 shall be prepared and tested in accordance with Clause 8.4.2 of AS/NZS 5131. The calculated slip factor shall not be less than 0.35.

Shear studs shall be abrasive blast cleaned in accordance with AS 1627.4 Sa 2½ and then painted with the same coating as the base steel surface with total DFT of 50-150 µm.

11.5 Paint application

This sub-clause adopts and modifies content from Clause 12 of ATS 5450.

11.5.1 General

The Quality Plan shall include the following details application process and paint application conditions:

- a) procedures for the application of the coatings
- b) procedure for monitoring and managing the performance of personnel carrying out painting
- c) details of the equipment, including:
 - i. paint application equipment
 - ii. ventilation equipment
 - iii. waste collection equipment
 - iv. dehumidifying equipment
- d) Inspection and Test Plans
- e) details of the application process (including the manufacturer's recommendations) and paint application conditions
- f) the maximum and minimum ambient temperature
- g) the maximum and minimum temperature of surfaces to be painted
- h) maximum and minimum (if applicable) relative humidity
- i) minimum difference between temperature of surface to be painted and the dew point
- j) minimum and/or maximum time between application of successive coats

- k) procedure for the repair of any non-conforming work, and
- l) procedure for adjusting curing times to suit ambient conditions and adjusting curing time due to changes in thickness.

The coatings shall be applied in accordance with Clause 9.9 of AS/NZS 5131 and the additional requirements of this Clause 11.6.

Particular attention is drawn to Clause 9.9.10 of AS/NZS 5131 which deals with environmental conditions. That clause is quantitatively similar to Clause 9.10 of this Technical Specification

Each coat shall be applied before the maximum recoat time specified by the manufacturer but after the previous coat has sufficiently cured in accordance with the manufacturer's instructions.

The curing times shall be adjusted to account for the ambient conditions in accordance with the manufacturer's recommendations.

The Contractor shall take wet film thickness measurements during the application of all paint coatings in accordance with Appendix C of AS 3894.3 to verify that the specified film builds are being achieved. This requirement does not apply to inorganic zinc silicates or other fast drying coatings.

Details of the method of taking of wet film thickness measurements shall be included in the ITP.

11.5.2 Painting trials

This sub-clause replaces the equivalent clause in ATS 5450 with text based on ATS 5343 and moves it earlier in sequence.

A trial application of the coating system (including surface preparation) shall be conducted on a test area of the actual substrate of not less than 5 m² or a test panel (minimum size 0.5 m²) made from identical substrate. The test area or test panel shall be prepared, coated and tested in an identical manner to the full-scale coating system and demonstrate that the coating system will comply with this Technical Specification. If a test panel is used then coats shall be stepped to reveal all intermediate layers. Test panels shall include a field-welded joint where these form part of the Works.

The area selected as the sample should include representative features of the works including welds, bolts, and difficult to reach or obscured surfaces.

Actual coverage rates of the coating system shall be recorded in order that due allowance may be made in the full-scale application for rough, irregular or highly absorbent concrete substrate. Any additional requirements or observations shall be recorded and considered for the full-scale application.

If the trial application does not comply with the requirements of this Technical Specification, the deficiencies shall be rectified (which may include testing of any new materials / methods) and a further trial coating shall be prepared until the performance criteria of this Technical Specification are met.

Coating application shall not continue until approval of the sample panel or test area has been granted by the Administrator. **Hold Point 10**

11.5.3 Pre-painting inspection

Prior to painting, the area to be painted shall be inspected and tested in accordance with Section 13.8 of AS/NZS 5131, assuming Coating Quality Level PC2, for compliance with the surface preparation requirements. Any correction work shall be in accordance with this Technical Specification.

11.5.4 Application conditions

Except where field work is unavoidable, paint coatings for new steelwork shall be applied in enclosures that protect blast cleaned and freshly painted surfaces from damage from airborne dust and other environmental contaminants.

Heaters and dehumidifiers may be used to vary the temperature and relative humidity within the working area to comply with the paint manufacturer's recommendations. When such equipment is used, it shall be switched on for the whole time that the painting is being carried out, including for the recommended curing period.

If the manufacturer's recommendations are in conflict with those in AS 2312.1, the Contractor shall submit a proposal to the Administrator describing the recommended application conditions and the reasons for adopting those conditions.

11.5.5 Tools and equipment

All shop-applied paints and coatings shall be applied using airless or air-assisted airless spray equipment. However, conventional spray equipment may be used to apply zinc epoxy primer. Brushes and rollers may be used to apply stripe coats.

Site-applied coatings shall only be applied using spray if the Contractor can demonstrate that overspray and wind-borne paint will:

- a) be systematically monitored
- b) be prevented, as far as is practicable
- c) be mitigated by protecting surrounding and adjacent areas, and
- d) be rectified if drips, spills or damage eventuate.

This second paragraph is not in ATS 5450, which does not distinguish between shop- and field-applied coatings at this point.

11.5.6 Mixing paints

Paint shall be thoroughly mechanically mixed prior to use to ensure that it is homogeneous and shall be maintained to this condition during use.

Paints shall be mixed in accordance with the applicable Product Data Sheet (including thinner type and quantity, and any induction times) or as advised by the manufacturer.

Coatings or packs of coatings that do not exceed 5 litres in total may be hand mixed. Mechanical means shall be used to mix all kit sizes exceeding 5 litres.

For multi-pack coatings, each component shall be mixed thoroughly and separately before blending together. The entire content of containers of each component shall be mixed together. The contents of component containers shall not be split unless an accurate means of proportioning each component is used.

Where absolute colour consistency is required, pre-mix or box coating component containers that have been tinted to the required colour prior to the addition of the curing agent or converter.

For coatings containing heavy constituents (e.g. zinc metal filled coatings) the paint shall be strained using an appropriate mesh to collect agglomerations, and then continuously mechanically agitated in its container during application to prevent settling of the constituents.

11.5.7 Application of primer

Primers shall be applied to prepared surfaces before any deterioration, discolouration or contamination occurs. Unless humidity is controlled, the primer shall be applied on the same day that the surface is prepared.

If any deterioration of the prepared surface occurs by the time the primer is to be applied, the surface preparation shall be repeated until it complies with the specified requirements, at no cost to the Principal.

11.5.8 Stripe coats

For each new coat (other than the primer coat), a stripe coat shall be provided prior to the general spray application. A wet-on-wet stripe coat shall be applied in accordance with the paint manufacturer's recommendations.

Where specified, a stripe coat with a colour different to that of the underlying and subsequent coatings shall be applied. The stripe coat shall be fully cured before the application of the next coat.

Stripe coats shall be applied by roller or brush as appropriate, to the following areas:

- a) shadowed and difficult to spray areas such as nuts, bolts, washers, rivets, unsealed and filled lap joints, and crevices formed by plates and sections in contact
- b) areas prone to corrosion such as exposed edges, holes, welds, corners and pitted areas, and
- c) all concealed surfaces of hollow latticed members, lower and upper chords of trusses and base of lift span towers.

11.5.9 Crevices and gaps

The Contractor shall:

- a) ensure that as far as practicable, after painting, all crevices and surface imperfections are full of paint
- b) fill any unfilled crevices and gaps remaining after application of the primer and other coats excluding the topcoat with a two-pack, solventless epoxy putty compatible with the applied paints and recommended by the paint manufacturer for this purpose
- c) fill gaps between back-to-back angles or similar shapes only at upward facing locations with the potential to hold water and/or dirt (e.g. at intersections of battens in latticed members), and
- d) apply stripe coats to the filled crevices and gaps prior to the application of the topcoat.

11.5.10 Records

Details of the painting shall be recorded in accordance with AS 3894.10, AS 3894.14 or equivalent and submitted to the Administrator. At a minimum, the following shall be reported:

- a) name(s) of cleaning solution product(s) together with manufacturer(s) details
- b) designation of each member or area where the cleaning solution is used
- c) method(s) of surface preparation
- d) class of surface preparation
- e) profile of abrasive blast cleaned surfaces
- f) type and grade of abrasive
- g) soluble salt and lead content of non-metallic abrasives
- h) records of air temperature, relative humidity and dew point and steel surface temperature and times of measurement, and
- i) date(s) and time(s) of commencement and completion of abrasive blast cleaning.

11.6 Conformity

This sub-clause adopts and modifies content from Clause 13 of ATS 5450.

11.6.1 General

The Quality Plan shall include details of planned inspections and submission of inspection reports.

Inspections shall be carried and documented out at all stages of the Works in accordance with this Technical Specification. Inspections of final coatings shall be a **Witness Point 3**. The Administrator, or their representative, may undertake surveillance measurements in addition to those taken by the Contractor's designated inspector.

All measurements shall be taken using calibrated equipment.

School grade chalk, adhesive inspection labels or masking tape shall be used to mark defects. Crayon, paint or spirit-based ink pens shall not be used.

The Contractor shall monitor wet film thicknesses to ensure that the nominal DFT has been achieved and that the maximum wet film thickness recommended by the coating manufacturer is not exceeded. Wet film thickness gauges with worn 'feet' shall be discarded.

11.6.2 Definition of a lot

The work shall be subdivided into lots, which shall be one of the following, as appropriate to the work:

- a) a bridge girder span
- b) members forming an individual structure
- c) a surface with a length not more than 500 m, or
- d) a section or item defined by the approved Quality Plan.

11.6.3 Measurement of dry film thickness

A calibrated DFT gauge shall be on site at all times. Electromagnetic, magnetic induction and eddy current DFT gauges shall be calibrated and used in accordance with the relevant sections of AS 3894.3. In all cases, calibration and verification of calibration shall be over a smooth, polished test plate, using non-conductive and non-magnetic test shims or a reference standard as recommended by the gauge manufacturer. Calibration shall be in accordance with Method 108.1 of AS 1580.

The specified DFT values are based on the use of electromagnetic or magnetic induction DFT gauge using the appropriate magnetic base reading correction factor as described in AS 3894.3 for the depth of profile for all coating systems (or parts of systems) with specified minimum DFT of up to 3 times the profile height. When measuring DFT values, allowance shall be made for the thickness of the previous coating layer.

The Contractor shall measure and record the DFT of the area coated each day. The inspection plan for measurement of DFT for the area coated on each day shall not be less than that specified Clause 7.3 of AS 3894.3 for large surface areas or Clause 7.4 for areas less than 10 m². A single point reading is as defined in Clause 7.2 of AS 3894.3.

11.6.4 Dry film thickness requirements

The primer coat of the coating system shall be applied to achieve, at all point locations tested, the minimum DFT as nominated in the applicable coating system specification. For atmospheric exposure, the primer film thickness shall comply with the following requirements:

- a) the average of 5 single point readings for each 10 m² area of coating surface shall not be outside the specified coating DFT range, and
- b) all single point readings in any 10 m² area shall not be less than the specified minimum coating thickness.

When tested in accordance with AS 3894.3, the average DFT of the intermediate coats and top coat and the average total coating thickness shall not be less than the specified minimum.

In any 10 m² area, one single point reading may be less than the specified minimum coating thickness, but not less than 80% of the specified minimum coating thickness. However, all other point readings within that area shall not be less than the specified minimum.

The average of the point readings for each 10 m² area of coating inspected shall be within the range specified for the coating layer.

11.6.5 Adhesion

Adhesion tests shall be carried out where there are indications that coatings are unsound (e.g. bubbles, blisters, wrinkles, flaking or other visible defects).

The adhesion of cured coatings to metal and paint substrates shall exceed 2.0 MPa when measured in accordance with AS 3894.9.

11.6.6 Appearance

On completion, all painted surfaces shall have a uniform appearance and colour.

Repaired areas shall have the same appearance and colour as adjacent surfaces. Irregularly coated patches shall not be apparent.

Fishtails and other indications of poor paint application or equipment shall not be evident. Surfaces shall have a smooth, even finish free of runs, missed areas, voids, pinholes, sags, fat edges, blisters, stickiness, inclusions, overspray, overbuild or other paint film defects.

Rust stains, stains from hardwood, formwork or other stains on the painted surfaces shall not be apparent.

11.6.7 Disposition of nonconformity

Any coatings that do not comply with the specified requirements, including DFT, adhesion and other defects that would limit long-term performance shall be rectified. **Witness Point 4**

All areas of rust stains, stains from hardwood, formwork or other stains on painted surfaces shall be removed by solvent or detergent washing.

All repairs to coatings shall be satisfactorily repaired prior to the application of subsequent coatings.

Where bubbling and other visible defects occur on 10% or more of the surface, or when the tensile adhesion of cured coatings to metal and paint coating substrates is less than 2.0 MPa when measured in accordance with AS 3894.9, the Contractor shall abrasive blast clean all affected surfaces of contiguous members to bare metal and repaint.

Where the paint coating is less than the specified minimum DFT or greater than the specified maximum DFT, the Contractor shall submit a proposal to the Administrator which provides details of the proposed method to rectify the coating to achieve the requirements of this Technical Specification. The proposal shall also include the proposed corrective actions to prevent further failures.

If the completed paintwork on the outer face or soffit of an exterior girder, or a surface in general public view, is not uniform in appearance and colour as a result of coating repairs, the Contractor shall apply a further application of the topcoat paint having a minimum DFT of 40 µm for the full length of the girder or member.

11.7 Handling, storage, transport and erection

11.7.1 General

The Contractor shall use due care and effective measures at all times during all phases of construction to prevent damage to the protective treatment of steelwork.

11.7.2 Handling

Lifting lugs for lifting steelwork shall be used where provided. Where lifting lugs are not provided, chains or steel strand encased in a full-length nylon braid sheath shall be used.

Full-length nylon braid sheathing shall encapsulate chains or steel strand used to secure steelwork for transport to site. Bare chains or steel strand shall not bear directly on coated steel surfaces.

11.7.3 Storage

Painted girders shall be stored with soffits of girders a minimum distance of 600 mm above the ground.

11.7.4 Transport

For all steelwork, the Contractor shall allow a minimum curing period of 72 hours from the completion of painting before loading of steelwork for transport to site.

11.7.5 During construction

Steel filings, weld spatter and spatter from oxy and acetylene burning or similar shall not be deposited on painted or galvanized surfaces. Any such deposits shall be removed immediately to prevent rust staining.

The Contractor shall remove at once concrete and slurry deposits on painted steelwork resulting from construction works using a method that does not damage the protective coating.

11.7.6 Repair of damage during construction

Any damaged paint at supports for scaffolding shall be repaired in accordance with the specified paint coating system, modified as follows:

- a) Areas less than 100 cm² may be prepared using power tools, such as a 'bristle blaster'.
- b) Exposed steel surfaces at repair areas shall be rough with a surface profile, bright, and free of rust and other surface impurities just prior to painting.

To achieve uniform appearance and colour and to blend in with the previously applied paint, a light, feathered spray application of the final topcoat shall be applied from the same batch to areas adjoining repairs.

11.8 Records

Prior to removal of access and/or containment for the span or bay (for field work) or transportation of the members from the painting enclosure (for new work), the Contractor shall submit a report of the following to the Administrator. **Hold Point 11**

- a) surface preparation records in accordance with Clause 11.3.6
- b) paint application records in accordance with Clause 11.5.10
- c) DFT of each coat and the total coating thickness for each lot in accordance with Clause 11.6, and
- d) photographic records of the appearance of the finished surface.

Appendix A: Registration of coating systems

Coating systems shall be registered in accordance with this Appendix.

A1: Application

The manufacturer shall submit an application for consideration to the department (ET_Structures_ProductsAndSuppliers@tmr.qld.gov.au). The application shall include:

- a) an application form detailing company details and an overview of the coating system
- b) details of the proposed system, including:
 - i. coating purpose (see Clause 8.3)
 - ii. system designation (see Clause 8.2), and
 - iii. individual products, by name and designation (if applicable).
- c) technical data sheets for each product
- d) sample specification, highlighting:
 - i. coating thicknesses
 - ii. overcoat times, and
 - iii. special provisions / considerations.
- e) evidence of compliance to performance requirements, for products and/or overall system, as:
 - i. test reports, or
 - ii. certification of conformance (e.g. APAS).
- f) if applicable, a case history of system's use, including:
 - i. geographical location and climate conditions
 - ii. as-constructed inspection report, and
 - iii. subsequent inspection report.

A2: Scope of registration

Registration is valid for individual coating systems provided by a nominated manufacturer. Registration is valid for 5 years, or the life of this Technical Specification. Revisions to this document may require resubmissions to continue registration.

A3: Withdrawal of registration

Registration may be withdrawn following:

- a) poor product performance
- b) significant reformulation of the coating products, or
- c) failure to update the department with changes to contact details.

