Steel Pipeline PUR-B Coating Specification

Pr9974

Unitywater

Pr9974 - Specification for Steel Pipeline PUR-B Coating

Documents Details

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Contents

1. Purpose

1.0.1 The purpose of this Specification is to set out the standard protective coating requirements to ensure a high quality level of workmanship and ensure a long-term protective coating performance is achieved. The document applies solely to the Polyurethane coating system (PUR-B) for Unitywater's exposed water or sewer mains. This document contains the required standards for performing a PUR-B coating system procedure on a Unitywater asset.

1.0.2 This Standard shall be used in conjunction with all technical documents provided by the Supplier of the coatings to be used. This Document also refers to, and shall be used in conjunction with, applicable legal and regulatory documents, codes of practice, relevant Australian Standards (AS), Australian/New Zealand Standards (AS/NZS), and other international standards. Together they form an integrated specification that must be adhered to by the Applicator. If there are any contradictory recommendations or requirements between the documents, then they shall be referred to the Principal (Unitywater Statutory Authority).

2. Scope

2.0.1 This Specification shall apply to works being constructed directly for Unitywater or other authority or for an owner who will hand over the ownership of the constructed works to a local government or who will retain ownership.

2.0.2 For construction works, the following applies:

- The Applicator is engaged to apply the specified protective coating in the design Specification and/or Drawings;
- The Applicator must follow the methodology specified in this document (Section 5) and use approved materials and products only (Section 4), and other sections referred by the Designer or Project Manager.

2.0.3 For testing works, the following applies:

- Coating inspector(s) working under Applicator or Project Manager should refer to s.5.5.

3. References

3.1 General

3.1.1 All work and/or testing carried out under this Specification shall comply in all aspects in accordance with:

- South East Queensland Water Supply and Sewerage Design and Construction Code (SEQ WS&S D&C Code) including:
  - SEQ WSA 03 – Water Supply Code of Australia;
  - SEQ WSA 04 – Sewage Pumping Station Code of Australia;
  - SEQ WSA 07 – Pressure Sewer Code of Australia;
  - SEQ IPAM List (SEQ approved Infrastructure Products and Materials List);

- SEQ Asset Information Specification;
- SEQ WSA03-2011-3.1 Appendix 'I' Disinfection of Water Mains, Water Quality Compliance Specification.

- Unitywater's Technical Specifications, including:
  - Pr9903 Specification for Building and Structural Works;
  - Pr9902 Specification for Civil and Earth Works;
  - Pr9904Specification for Pressure Pipe Construction;
  - Pr9875Specification for Non-Pressure Pipeline Construction;
  - Pr9032 Procedure for Determination of Acceptance of New Mains;
  - Pr9083 Dewatering – Construction, Commissioning, Reservoir Work Instruction;
  - Pr9817 – OPRP – Mains Commissioning.
- Standards included in the following sections.

3.1.2 Reference to specific clauses of the various codes is intended to highlight those points and shall not be taken to imply a lesser importance for all other applicable clauses.

3.1.3 All the works shall conform to the Rules and Regulations of the Statutory Authorities having jurisdiction over the Site.

3.1.4 If the requirements of this Specification do not articulate the minimum requirements of the statutory regulations and standards, the regulatory requirements are taken to apply. If the requirements of this Specification are more exacting than the minimum requirements of the statutory regulations and standards, the former shall apply.

3.1.5 All Materials, fittings, accessories and equipment supplied by the Contractor shall be new and the best obtainable of their kind and shall comply in all respects with the requirements of the relevant Standards Australia specifications.

3.2 Applicable Legislation and Regulation

3.2.1 At least the following legislation and related regulation shall apply:

a. *Work Health and Safety Act 2011* (Qld);

b. *Work Health and Safety Regulation 2011* (Qld);

c. *Water Supply (Safety and Reliability) Act 2008* (Qld);

d. *Environmental Protection Act 1994* (Qld);

e. *Queensland Building Services Authority Act 1991*.

3.3 Codes of Practice (ratified by Legislation)

6.2.1 At least the following Codes or Practice (ratified by Legislation) shall apply:

- **SEQ Water Supply and Sewerage Design and Construction Code**

The SEQ Water Supply and Sewerage Design and Construction Code (SEQ WS&S D&C Code) is available via the SEQCODE website: www.seqcode.com.au.

- Work Health and Safety Queensland Codes of Practice, including:
  - Abrasive blasting Code of Practice 2013;
  - Confined Spaces Code of Practice 2011;
  - Demolition Work Code of Practice 2013;
  - Excavation Work Code of Practice 2013;
  - First aid in the Workplace Code of Practice 2013;
  - Formwork Code of Practice 2006;
  - Hazardous Manual Tasks Code of Practice 2011;
  - How to Manage and Control Asbestos in the Workplace Code of Practice 2011;
  - How to Manage Work Health and Safety Risks Code of Practice 2011;
  - How to Safely Remove Asbestos Code of Practice 2011;
  - Labelling of Workplace Hazardous Chemicals Code of Practice 2011;
  - Managing Noise and Preventing Hearing Loss at Work 2011;
  - Managing Risks of Falls at Workplaces Code of Practice 2011;
  - Managing risks of Hazardous chemicals in the workplace code of Practice 2013;
  - Mobile Crane Code of Practice 2006;
  - Scaffolding Code of Practice 2009;
  - Spray Painting and Powder coating code of Practice 2013;
  - Traffic Management for Construction or Maintenance Work Code of Practice 2008;
  - Welding Processes Code of Practice 2013;
  - Work Health and Safety Consultation, Co-operation and Co-ordination Code of Practice 2011.

3.4 Quality and Standards

3.4.1 Unless otherwise specified, the work described in this Specification shall be undertaken and tested in accordance with the following, listed in order of precedence:

- The Project Contract documents;
- Requirements of the Statutory Authorities having jurisdiction over all or part of the manufacture, installation or operation of the plant;
- The SEQ WS&S D&C Code;

- All relevant Australian and governing Queensland standards where applicable;
- Water Services Australia (WSAA) national codes.

3.4.2 In the absence of relevant SEQ WS&S D&C Code, WSAA or Australian codes or standards, relevant industry, international (ISO), European or British standards shall be followed. International standards shall take precedence over European or British standards. The Contractor shall obtain approval from the Superintendent prior to using any non-Australian standards not nominated in the equipment specifications, schedules, datasheets or associated drawings.

3.4.3 Where local or international standards do not exist, the manufacture and installation of equipment shall be in full compliance with the manufacturer's own recognised standards. Manufacturer's standards, where used, shall be submitted to the Superintendent by the Contractor for review and acceptance shall be obtained by the Contractor from the Superintendent prior to commencement of manufacture.

3.4.4 All equipment shall comply with relevant Federal and State Acts, Regulations and Codes including, but not necessarily limited to, the following:

- *Work Health and Safety Act 2011* (Qld);
- *Work Health and Safety Regulation 2008* (Qld);
- Work Health and Safety Queensland Codes of Practice.

3.4.5 The version of any applicable standard or regulation shall be the revision in place at the date of invitation of contract packages.

3.4.6 The Contractor shall have in place a dedicated quality system that conforms to ISO 9001.

3.4.7 Quality control procedures for management, inspection, review and evaluation of all materials, manufacture, workmanship and testing of all products shall be planned and implemented by appropriately skilled and qualified persons to ensure that requirements of the quality procedures are met and that high quality is maintained.

3.4.8 The Contractor shall ensure that all equipment supplied/installed under this Specification is the product of a manufacturer who is fully experienced, reputable, qualified and regularly engaged for at least five years in the manufacture of the equipment to be supplied/installed.

3.5 International and Australian Standards

Standard	Title
AS/NZS 1345	Identification of the contents of piping
AS 1627.1	Surface Preparation - Degreasing
AS 1627.4	Surface Preparation - Abrasive Blast Cleaning
AS 1627.9	Pictorial surface preparation standards for painting steel surfaces
AS/NZS 1715	Selection, use and maintenance of respiratory protective equipment
AS/NZS 1716	Respiratory protective devices
AS/NZS 2310	Glossary of paint and painting terms
AS 2700	Australian Standard Colour Code

AS 3894.1	Site Testing of Protective Coating - Continuity Testing (High Voltage Brush Method)
AS 3894.3	Site Testing of Protective Coating - Determination of film thickness
AS 3894.4	Site Testing of Protective Coating - Degree of Cure
AS 3894.5	Site Testing of Protective Coating - Determination of surface profile
AS 3894.6	Site Testing of Protective Coating - Contamination
AS 3894.7	Site Testing of Protective Coating - Determination of surface temperature
AS 3894.9	Site Testing of Protective Coating - Determination of Adhesion
AS 3894.10	Site Testing of Protective Coating - Inspection report (Daily surface and ambient conditions)
AS 3894.11	Site Testing of Protective Coating - Inspection report (Equipment)
AS 3894.12	Site Testing of Protective Coating - Inspection report (Coating)
AS/NZS 4020	Testing of products for use in contact with drinking water
ASTM D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method

4. Definitions/Abbreviations

4.0.1 The glossary of paint and painting terms presented in AS/NZS 2310 may be used in this document.

4.0.2 The following definitions also apply for this Specification:

Term	Meaning
Steel or steelwork	Refers to all ferrous-based components including carbon steel, wrought-iron, cast iron and galvanized components.
Dry film thickness (DFT)	The dry film thickness of a coating remaining on the surface and above the peaks of the surface profile when the coating or system has hardened and cured.
Nominal dry film thickness (NDFT)	The dry film thickness specified for each coating layer or for the whole coating system.
Minimum dry film thickness	The minimum acceptable dry film thickness for each coating layer or for the whole coating system.
Maximum dry film thickness	The highest acceptable dry film thickness for each coating layer or for the whole coating system above which the performance of the coating layer or system could be impaired.
Gauge reading	A single DFT reading taken at one point.
Spot measurement	The arithmetic average of thee gauge readings made within a circle of approximately 40mm diameter.

5. General Requirements

5.1 Quality Assurance

5.1.1 The Applicator shall develop and implement a Quality Management System for the works. In all cases, this is to involve preparing ITPs (Inspection and Test Plans) for the specified coating system to be used and the provision of a suitable system of Quality Control (QC) records.

5.1.2 A written specification or coating schedule from the Supplier prior to the commencement of the work shall be submitted for the specified coating system. It must contain the requirements for the supply, storage, mixing, equipment, surface preparation, application, recoat times, curing, inspection, testing and repair of defects.

5.1.3 Surface preparation and coating application shall be undertaken by a pre-qualified painting contractor (Applicator).

5.1.4 The Applicator shall be accredited by the Painting Contractors Certification Program (PCCP) to the class relevant to the work to be undertaken. Where the work involves the removal of coatings that contain or may contain lead compounds or other toxic substances, such work shall only be undertaken by a pre-qualified Applicator holding a PCCP Class 5 certificate.

It should be noted that there are some products specified herein that may be applied by a non-PCCP accredited Applicator. These products are typically linings for concrete and masonry structures. They include polymer modified mortars and bitumen, aluminate cements, and geosynthetics. For this work, the Applicator shall demonstrate that its personnel have successful track records in applying the nominated product.

5.1.5 If the Supplier requires that the application of its products to be undertaken on by an applicator that has been approved by the Supplier, then the Applicator shall be a Supplier-approved one.

5.2 Materials

Protective Coatings

5.2.1 The specified protective coating system details can be found in Section 6. This coating system has been assessed to:

- Have a satisfactory long-term track record;
- Have relevant certification issued by Australian Paint Approval Scheme (APAS).

5.2.2 Where available, all products used within the specified coating system should originate from a single supplier. Importantly, they must be compatible with each other and applied strictly in accordance with this Standard and the Supplier's specification.

5.2.3 Unitywater reserves the right to make any changes to the content of the list without giving notice or explanation.

Thinners

5.2.4 For the coating product, only the specific thinner recommended by the Supplier shall be used for thinning of coating. Thinners shall not be decanted into previously used container and all drums and cans are to have their original and traceable batch number.

5.2.5 Solvents that are specified only for the cleaning of equipment shall not be used to thin any coating material. Prior to application coating, all cleaning solvents shall be removed and flushed from the equipment.

Transportation and Storage

5.2.6 All products brought to site must be in their original unopened containers, bearing the manufacturer's label, batch number, product code(s), coating colour, mix ration information and expiry data where applicable.

5.2.7 Products that have exceeded their expiry date or have deteriorated during storage shall not be used.

5.2.8 All products are to be stored under cover and in a manner that ensures protection from extremes of temperature, contact with moisture or other conditions that could lead to deterioration of the material.

5.2.9 Lids on solvent drums or cans must be kept closed when not in use to prevent contamination with water or other materials.

5.2.10 Coatings about to be used shall be within a temperature range that meets the Supplier's recommendations. If no recommendations are provided, the temperature of all components shall be between 15°C and 25°C at the time of mixing.

Cathodic Protection System Compatibility

5.2.11 Where the coating is nominated for structures that have cathodic protection (CP) system, a certificate of suitability from the Supplier shall be provided.

5.3 Surface Protection

General

5.3.1 The surface preparation method or combination of methods shall be selected taking into account the condition of the structure, the potential contaminants present, access to perform the work, and the required surface cleanliness and profile.

5.3.2 Prior to blast cleaning in order to achieve the required surface cleanliness and profile, any defects shall be repaired and all surfaces shall be pre-cleaned.

Mild Steel

5.3.3 All mild steel surfaces shall have an angular surface profile of 30 – 60 microns and a minimum Class 2½ (Sa 2½) finish in accordance with AS 1627.4, unless otherwise stated in Section 6.

Concrete and Masonry – Old Concrete

5.3.4 Any drummy or delaminated concrete sections or concrete deteriorated by corrosion or other means shall be broken out and removed so that sound substrate remains. Sound concrete shall have pH 10 or greater. This may be indicated using a phenolphthalein solution spray.

5.3.5 All oil, grease and chemical contaminants must be removed from the surface of concrete. Concrete surrounding any corroded reinforcement bars shall be broken out beyond the limits of corrosion until clean bar is evident and at least 20 mm behind the bar.

5.3.6 Where there is a potential for excessive removal of substrate material or the reinforcement bar has more than surface corrosion, a direction from the Principal shall be sought. Any exposed reinforcement shall be primed with zinc rich coating, and fully embedded without any air pockets being entrapped. The surface shall be steel trowelled and its profile shall be made to achieve optimum bond with the protective coating.

5.3.7 The broken out voids and lost concrete sections shall be restored to the original surface level using a suitable patch repair mortar.

5.3.8 Feathered edges shall be avoided by saw cutting to a minimum depth of 10 mm at the edges of the area to be patched.

5.3.9 Static cracks wider than 0.3 mm shall be repaired. The path along the crack shall be chased forming a wedge-shaped slot of 20 mm wide x 20 mm deep. The slot is then to be filled with polymer modified repair mortar. The surface shall be struck flush with the cleaned concrete adjacent to the crack. Any active crack shall be treated as a joint, and repaired using a waterproof joint sealant system. Any infiltration at the crack shall be stopped first prior to undertaking crack repair.

Rectification of Metal Defects

5.3.10 Prior to preparing the surface to the specified degree of cleanliness and surface profile required, the Applicator shall ensure the surface is free of all metal defects including but not restricted to:

- Cracks
- Burrs
- Sharp edges
- Coarse welds
- Porosity
- Weld splatter
- Fins
- Laminations
- Deep pitting
- Undercuts
- Slag
- Weld roughness

5.3.11 Sharp edges, bolt holes and corners, including sharp edges resulting from loss of section shall be ground to a minimum radius of 2mm to meet the requirements of Preparation Grade P2 as defined in ISO 8501.3. Welds shall be ground to a smooth surface free of peaks and sharp edges to a degree where they are paintable.

Pre-Cleaning

5.3.12 All pre-cleaning processes shall be carried out in accordance with AS 1627.1 and appropriate environmental standards to remove oil, grease, dirt, bird droppings, algae, moss, etc.

5.3.13 For heavy deposits of contaminants, it may be necessary to repeat pre-cleaning processes to achieve the required level of cleanliness or use a combination of processes.

Abrasive Blast Cleaning

5.3.14 The abrasive blast cleaning process shall be performed in accordance with AS1627.4 and appropriate environmental standards.

5.3.15 For all on-site work, use either almandine garnet or staurolite abrasive for the final blast, regardless of whether the work is carried out in a weatherproof containment or not.

5.3.16 Do not use copper slag and other mineral slag abrasives that may contain various forms of heavy metals. Slag abrasives that are demonstrated to be free from heavy metals (less than 100 ppm lead) may be used as an abrasive for initial blasting of heavy coating films, but in all cases, the final blast cleaning shall be performed using new (not recycled) garnet or staurolite.

5.3.17 Remove all inspirable dust, contaminants, surface preparation debris and toxic contaminants from abrasives used as a blasting medium prior to their re-use in the blasting process. The Principal's approval must be sought before the re-use of any non-metallic abrasive.

5.3.18 Abrasives are to be analysed before first use or re-use and must comply with the following:

- Moisture content: Maximum 0.2% as determined in accordance with ANZECC Method 102;
- Soluble salt: Maximum conductivity of aqueous extract, 250µS/cm tested as per ISO 11127-6;
- Water soluble chlorides: Maximum of 50 ppm tested as per ISO 11127-7;
- Total lead (Pb) content: Maximum of 100 mg/kg (ppm) tested as per US EPA Method 6010B;
- Free crystalline silica: Maximum of 1% as determined by infrared spectroscopy or XRD analysis;
- Free clay or fine silt: Maximum of 1% when tested to AS 1141.33.

5.3.19 Blasting abrasive shall be non-metallic, dry, clean, sharp and angular, free from contaminants, and of a type and size adequate to give the relevant surface profile amplitude and an angular profile shape. Recycling of abrasives contaminated with bitumen, coal tars, oil or grease is not permitted.

5.3.20 A suitable containment must be used to prevent the spread of emissions. A vacuum blasting system may be used as an alternative to prevent the spread of emissions.

5.3.21 Dust and spoil shall be removed from the surface immediately prior to coating or recoating by blowing with clean, dry air followed by either vacuum cleaning or careful brushing.

5.3.22 Where nominated in the Specification or the ITP, tests for the presence of dust on the prepared steel surface shall be conducted in accordance with AS 3894.6, Method C,

Determination of surface dust. A rating of 2 or better is required for atmospheric service, and a Rating 1 or better for immersion service.

5.3.23 The prepared surface must be coated before any contamination or corrosion occurs. Flash rusting typically occurs within four hours of blasting, unless dehumidification is provided. In all cases, the specified standard of surface cleanliness and surface profile height and shape, must exist at the time the primer is applied to any surface area.

Brush Blasting

5.3.24 Abrasive brush blasting (sweep blasting) shall be carried out in accordance with AS 1627.4 – Appendix D, as well as all of the requirements for abrasive blast cleaning listed above.

Hand or Power Tool Cleaning

5.3.25 In the event that abrasive blast cleaning is impractical and at the sole discretion of the Principal, surfaces may be mechanically cleaned using hand or power tools such as needle guns. All hand or power tool cleaning shall be carried out in accordance with AS 1627.2.

5.3.26 A suitable containment must be used to prevent the spread of emissions, such as drop sheets and/or side tarps. Dust and spoil shall be removed from the surface immediately prior to recoating by blowing with clean, dry air followed by either vacuum cleaning or careful brushing.

5.3.27 The prepared surface shall be coated with primer before any contamination or corrosion occurs.

5.4 Coating Application

5.4.1 Coating application shall be performed by competent and experienced personnel under close supervision to ensure that coatings are not applied until the specified standard of surface preparation has been achieved, weather conditions are suitable for coating application and curing and the coating application and film thickness requirements are strictly followed.

5.4.2 The applied coating shall be uniform in thickness and appearance and shall be free of defects such as runs, blisters, pinholes, holidays, overspray, inclusions, etc. by using:

- application equipment (or a combination of equipment), and
- a sequence of coating various surfaces and techniques,

that produce the required coverage, DFT, standard of finish and film integrity implied by this Specification and the product data sheets for the coating products employed.

5.4.3 All overspray shall be removed by sanding from the surface of primer or intermediate coats before over coating commences.

5.4.4 The Contractor shall record all details of surface preparation, paint application, ambient weather conditions, and film thickness measurements on Daily Inspection Reports. As a guide, suitable forms are available in AS 3894.10 to 14. Airborne dust, insects and other foreign matter that settles onto and is protruding from the primer or

intermediate coat surface shall be removed by sanding once the coating has sufficiently hardened.

5.4.5 Where more than one coating layer is to be applied, the colour of successive coats (including stripe coats) shall be different to aid application and inspection.

Application Constraints

5.4.6 Unless overruled by the coating manufacturer's product data sheet(s) or written instructions, the following limits of application and curing conditions are to apply:

5.4.7 Final surface preparation, coating application or initial coating curing (at least 12 hours) shall not take place when:

- The relative humidity is above 85%; or
- The substrate temperature is less than 3°C above the dewpoint; or
- The ambient air temperature is below 10°C or above 30°C; or
- The substrate temperature is below 10°C or above 35°C; or
- The surface to be coated is wet or damp; or
- Where the full prime coat application cannot be carried out before the specified cleanliness of the surface deteriorates.

5.4.8 Proper and effective control of the environment and conditions during the curing stage of all coating layers are to be maintained.

Additional Constraints for Application of Concrete Surface

5.4.9 Application in direct sunlight and/or with rising surface temperatures is strongly not recommended, as this may result in blistering of the materials due to expansion of entrapped air or moisture (out-gassing) in the concrete. In such cases, it will be necessary to postpone the application until later in the day when the temperature of the substrate is falling.

Mixing

5.4.10 Two-pack coatings shall be thoroughly mixed using the whole contents of each container to ensure the correct proportioning ratio has been maintained. Split or part packs shall not be used unless a reliable and repeatable method of proportioning the components is used.

5.4.11 Coating materials containing heavy or metallic pigments that have a tendency to settle shall be kept in suspension in the fluid pot by a power driven mechanical agitator. Other coating materials shall be agitated as frequently as workability requires.

5.4.12 If the coating material requires the addition of a catalyst, the pot life for the prevailing conditions must not be exceeded. When the pot life limit is reached, the materials must be discarded and all equipment cleaned.

Film Thickness

5.4.13 The Supplier should be consulted to determine if the dry film thickness (DFT) for a single coat called for by this specification is achievable. If the dry film thickness cannot be achieved in a single coat, then multiple coats may be used, so long as the specified dry film thickness for that coating system is achieved. In all cases, the DFT specified is to prevail, not the number of coats.

5.4.14 Where multi-coat systems are specified in this document, the condition of the coated surface shall be in accordance with this Specification and the Supplier's requirements prior to application of subsequent coats. The specified time between coats shall be calculated from the product data sheets at the prevailing temperatures, and strictly adhered to.

5.4.15 Application shall be carried out such that a smooth, uniformly coat within the correct film thickness range is obtained. There shall be no deep or detrimental brush marks or adverse spray patterns that could compromise the performance of the coating. Paint shall be worked into all crevices and corners without causing overbuild.

5.4.16 The cured coatings shall be free of pinholes, voids, inclusions, bubbles, runs and sags.

Edge Coating and Stripe Coats

5.4.17 All areas such as external corners and edges, welds, bolts, nuts and interstices shall receive a stripe coat prior to application of the specified film thickness and to ensure continuity of the coating, except for the primer which shall be stripe coated after the full coat has been applied. The stripe coat shall be allowed to touch dry prior to the next coating application.

5.4.18 Where specified, a separate additional stripe coat, having a colour distinctly different to the underlying and subsequent coatings, is to be applied.

5.4.19 The purpose of the stripe coat is to ensure that the final DFT achieved on difficult-to-spray areas will be between the minimum and maximum limits, but having excessive film build that could in itself be detrimental.

5.4.20 Where stripe coats are specified, they shall be applied to all shadowed and other difficult-to-spray areas such as:

- Edges
- Unsealed/filled lap joints
- Welds
- Washers
- Bolt heads
- Exposed edges
- Nuts
- Holes
- Crevices formed by plates
- Heavily pitted areas
- rivets

5.4.21 Before the application of each full coat, except for primers, where the stripe coat is to be applied after the full coat is sprayed. Inorganic zinc silicate primers are generally not to be brush-applied as stripe coats. Stripe coats shall be applied by brush, roller, spray or other application method as applicable to the nature of the surface or structure.

5.4.22 If the combination of a prior-applied stripe coat and then a spray-applied full coat does not achieve the correct coverage and film build in all areas, additional touch-up effort will be required to complete each layer to achieve the specified acceptance criteria before any subsequent coating layers commence.

Crevices and Gaps

5.4.23 Unless specified otherwise, fill any crevices and gaps that are not filled following application of the primer and intermediate coats. The filler material shall be compatible two-pack, marine-grade solvent-less epoxy filler, approved by the Supplier.

5.4.24 As there is minimal corrosion protection afforded by the epoxy filler, it is not to be applied to bare or primed steel. The epoxy filler is to be applied after the first coat of epoxy high build and is then to be sealed with a stripe coat of epoxy high build prior to the application of the balance of the coating system.

5.4.25 Fill gaps between back to back angles or other sections with an epoxy filler only at upward facing locations that have the potential to hold water and/or dirt such as at points of intersection of slats in latticed members. Apply a stripe coat of the epoxy build coat paint and other paints in the coating system to filled crevices and gaps prior to the application of the topcoat.

5.4.26 Unsealed joints without any principal gap in atmospheric service only, such as on crossed lattice slats, shall be filled using compatible caulking gun-grade polyurethane. This filler shall be applied after the first coat of epoxy high build, be stripe coated and then top-coated.

Repair of Defects in New Coatings

5.4.1 Areas where inadequate coating thickness or pinholes have been detected, shall be repaired with the following methodology:

a. Remove all loose and flaking coatings until a sound, tightly adhering edge is achieved;

b. Pre-clean the surface to ensure the surface is clean and free of oil, grease, dirt and all contaminants;

c. Grind out or sand pinholes or minor faults sufficiently to ensure the repair coating will penetrate and eliminate the defect;

d. Feather, taper or smooth-off all sharp edges of the remaining sound coating to an appropriate degree;

e. Lightly abrade the damaged surface with a hand or power tool, or sweep blast to remove visible gloss;

f. Remove all dust using a slightly solvent-wet rag; and

g. Reinstate the surface by re-applying the coating system over the affected area.

5.5 Inspection and Testing

Inspection and Test Plan (ITP)

5.5.1 Prior to commencement of the work, an ITP similar to the informative example in Section 5.3 shall be prepared for each coating system and submitted for approval. The ITP must also show the type, sequence and number of tests to be taken in a given area and how the pass or reject criteria are determined.

Coating Inspector

5.5.2 A coatings inspector shall be nominated by the Applicator as their quality control officer to carry out inspections, to undertake the required testing and to make the appropriate records for all work performed in accordance with this document.

5.5.3 The Applicator's Coating Inspector shall be certified by either:

- Australasian Corrosion Association (ACA);
- Painting Contractors Certification Program (PCCP);
- NACE International; or
- Society of Protective Coatings (SSPC).

5.5.4 The Principal may instruct a representative or an independent coatings inspector to carry out quality audits on the work from time-to-time on behalf of Principal. Access to the site for this purpose shall be provided at no cost to the Principal.

Quality Control Records

5.5.5 Quality Control (QC) records, in a format similar to AS 3894 – Parts 10, 11 and 12 or equal, shall be prepared and submitted for approval on a daily basis during the work. They shall consist of:

a. *Inspection Report – Daily Surface and Ambient Conditions Report* (Refer to AS 3894.10):

- Details of prevailing weather conditions and other matters potentially influencing the durability of the applied coatings shall be recorded at regular intervals during the application process. These shall include, but not be restricted to: surface temperature (measured in accordance with AS/NZS 3894.7), air temperature, dew point, relative humidity, the difference between the surface temperature and the dewpoint and general weather observations.
- Details of the final standard of surface preparation. Any defects in the surface to be painted shall also be recorded.

b. *Equipment Report* (Refer to AS 3894.11):

- Details of all production and test equipment used during application and inspection shall be recorded at the commencement of the work. Records shall be updated whenever calibration, standardisation, or replacement of equipment occurs.

c. *Inspection Report – Coating* (Refer to AS 3894.12):

- Details of all paints, coatings and their component parts – including solvents and thinners used – shall be recorded;
- The results of QC testing shall be recorded for each stage of the work. All defects shall be recorded and subsequently repaired. These records shall be made available for inspection upon request at any time during the work and a copy provided daily to the Principal;
- Upon completion of the work, a full copy of all records shall be submitted to the Principal, even if these have been previously supplied.

Quality Control Testing

5.5.6 The following tests shall be carried out for the protective coating of all items and the results shall be recorded in accordance with the requirements detailed above:

a. *Inspection of Defects -*

- All surfaces, including previously and newly coated surfaces, shall be visually inspected for defects. The coating shall be free of lumps, bubbles, inclusions, ripples, sags, runs, air holes and other film faults.

b. *Adhesion of Existing Coating -*

- Prior to the commencement of any surface preparation or coating application, areas of existing coating that have not experienced visible symptoms of deterioration shall be tested for the level of adhesion to the substrate;
- For substrates other than concrete, adhesion shall be determined in accordance with the requirements of AS 3894.9 – Method A (Knife test);
- For concrete substrates, tests shall be in accordance with AS 3894.9 – Method C (Pull-off test) using 50 mm diameter test stubs;
- The tests shall be carried out at the same frequency as that described in the standard.
- Where the test result indicates an adhesion rating of greater than 2 for the Knife test or bond strength of less than 1 MPa for the Pull-off test, the area of existing coating represented by the test shall be completely removed to bare substrate and the surface shall be prepared for the application of new coating in accordance with the requirements detailed in this document.

c. *Surface Cleanliness -*

- Following pre-cleaning, the presence of residual amounts of soluble materials, oil and water, residual dust, mill scale and other undesirable materials shall be determined in accordance with the requirements of AS 3894.6;
- Items that are highly unlikely to be contaminated by certain materials do not require testing for those substances, e.g. new steel items in the factory do not require testing for chloride.
- Unless otherwise instructed, inspection or testing for the level of surface contamination shall be at a rate equal to one test per each 50 m^2 of cleaned

steel up to 200 m^2, then one test per each subsequent 200 m^2 up to the first 1,000 m^2 and one test per each 500 m^2 thereafter; all per structure. Sites for surface contaminants inspection or testing are to be selected by, or agreed with, the Principal.

- Any dirt or soluble materials are to be removed by jet washing using fresh, potable water and test as per AS 3894.6, Method A;
- The maximum level of chloride shall be 7 µg/cm^2 (micrograms per square centimetre);
- Proprietary chloride extraction agents are not to be used;
- Where the surface was blast cleaned, re-blast after salt testing.

d. *Surface Appearance* -

- After surface preparation is complete, the surface shall be visually inspected using AS 1627.4 and AS 1627.9;
- Abrasive blast cleaned surfaces are to be inspected to ascertain the degree of surface cleanliness that has been achieved. 100% of all surfaces are to be inspected and the specified class is to exist in each square decimetre (100 mm by 100 mm), not as an average of all areas;
- The class of blast cleaning surface preparation grade specified is nominated in the relevant coating system in Section 6;
- Determinations of the class of blast that has been achieved are to be made under natural light (where possible), by viewing the surface at right angles to the substrate and without magnification.
- The written descriptions of the various classes of blast cleaning contained in Appendix B of AS 1627.4 are to prevail;
- The written descriptions can be augmented with the pictorial representation contained in AS 1627.9;
- The specified surface preparation standard – in cleanliness, profile height and shape – is to exist in all respects at the time the primer is being applied;
- For metallic substrates, two sets of coupons of the same material as the substrate shall be prepared at the commencement of works to show the minimum standard of surface preparation to be achieved. Following approval, they may be used as on-site QC Secondary Standards for both profile and the degree of surface cleanliness. One set of coupons would be retained by the Applicator, and one set by the Principal.

e. *Surface Profile* -

- Following abrasive blasting of metallic substrates, the surface profile amplitude shall be determined using Methods A or B of AS 3894.5;
- The profile shape or nature is to be angular and sharp, not peened or rounded and free from raised or folded hackles. The profile shape is generally more important to coating performance than amplitude. The nature of the

profile is to be ascertained in representative areas by inspecting with an illuminated microscope or magnifier;

- The amplitude of the surface profile (the average peak to valley depth) is to be assessed in accordance with Method A or Method B of AS 3894.5 and reported as per the designations provided in Table 1 of AS 3894.5;
- The achievement of the surface profile shape and amplitude is to be recorded on the Daily Inspection Report.

f. *Temperature and Relative Humidity -*

- Prior to coating application, the surface temperature, dew point, ambient temperature, and relative humidity shall be measured and recorded once every four hours of each shift. A calibrated psychrometer or electronic climatic measuring gauge shall be used to determine these readings;
- The application of coatings shall not proceed when conditions are contrary to the Supplier's technical literature.

g. *Wet Film Thickness*

- A gauge for measuring wet film thickness shall be used during the application to minimise the possibility of low dry film thickness;
- The gauge shall be used and readings recorded in accordance with Australian Standard AS 3894.3 – Appendix C: Determination of wet film thickness by comb gauge.

h. *Dry Film Thickness*

- After the application of coating layer or system for any given area, the dry film thickness of the applied coating shall be determined in accordance with the requirements of AS 3894.3, except as modified herein. DFT gauges shall be calibrated and verified in accordance with the procedure established in Appendix D of AS 3894.3 or as instructed by the equipment manufacturer. In all cases, only the coating thickness above the peaks of the surface profile will count as achieved DFT;
- A DFT Inspection Plan shall be prepared for each contiguous area, establishing the number, frequency and distribution of DFT readings to be taken according to the guidance provided in AS 3894.3. Usually, the surfaces to be measured are to be divided into zones of about 10 m^2 each;
- Thickness determinations shall be taken at representative locations in accordance with the Inspection Plan using spot measurements (as defined above) for each determination. For most coating systems, a minimum DFT and a maximum DFT will be specified for each coating layer and for the complete coating system. If they are not stated, the specified thickness shall be the minimum;
- The average DFT of spot measurements for each 10 m^2 shall be between the minimum and maximum DFT. No single spot measurement shall be less than 80% of the minimum DFT and more than 120% of the maximum DFT. Non-conforming area shall be investigated, reported, and repaired according to clause 2.3.7;

i. *Adhesion of New Coatings*

- At the completion of coating for any given area, the level of adhesion of the coating to the substrate shall be determined as described in clause 2.4.4.2 above;
- The number of tests shall be minimised so as to limit damage to the coating;
- All test locations shall be repaired after the test, as described in clause 2.3.2, such that they blend in with the surrounding areas;
- Subject to the Principal's consent, test coupons made from the same or similar substrate and sprayed at the same time and in the same manner as the work piece, can be used for destructive evaluations of adhesion;

j. *Film Continuity -*

- Continuity testing to determine the presence of holidays, pinholes, cracks and other discontinuities shall only be undertaken on new lining or coating systems that are cured, are intended for immersion or underground service and have not been exposed to water or high relative humidity since being applied;
- Coating systems for normal atmospheric exposure should not be continuity tested. Coating systems containing potentially conductive pigments, e.g. metallic zinc or aluminium shall not be continuity tested.
- All continuity testing shall be conducted in accordance with AS 3894.1; however, for high build systems and/or where high volume solids coating materials are used, the Supplier shall be consulted to verify that the voltage suggested by the formulae in AS 3894.1 is appropriate for that coating. If the suggested test voltage is above the Supplier's recommendation, the lower voltage is to be used;
- If the number of defects is greater than five and are spread randomly over an area of not less than 10 m², the Applicator shall repair in accordance with clause 2.3.7;
- Where several defects fall within a circle of 100 mm radius, they shall collectively be deemed to be a single defect. The entire area within the circumference shall then be repaired in accordance with the requirements in clause 2.3.2.
- Film continuity testing may be carried out on the repaired area if requested by the Principal.

k. *Degree of Cure -*

- The degree of cure of a coating shall be determined using AS 3894.4 – Method C. Full cure shall be achieved before the coating is placed in service, subjected to continuity testing or adhesion testing;
- Defective work shall be marked with school grade chalk, self-adhesive inspection labels, or masking tape. Wax crayons or other grease-based markers shall not be used.

5.6 Health and Safety

5.6.1 The Applicator shall implement a Safety Management System specifically for industrial coating application which addresses the requirements of the following clauses:

a. *Handling of Chemicals -*

- Material safety data sheets (MSDSs) of all products shall always be available for review during transport and at all times when the product is in use;
- Attention shall be paid to all warning labels attached to the coating and/or related product containers, the MSDSs and the Supplier's relevant technical literature;
- Copies of MSDSs shall be made available on-site and procedures shall be made to comply with all MSDS directions;
- The Supplier's instructions for the safe handling of products shall be followed to minimise the risk of injury or creation of health hazards to personnel;
- Handling of coatings, solvents and chemicals shall be carried out with due care and diligence. Personnel not directly concerned with coating operations shall be protected against the effects of products used during surface preparation and coating application;
- The correct use of personal protective equipment (PPE) shall be employed during the surface preparation, coating material preparation and application and site clean-up;
- Disposal of chemicals must be treated with due regard to environmental protection, and shall be in accordance with manufacturer's guidelines and statutory requirements.
- No Smoking and Flammable Liquid signs shall be displayed, and suitable fire fighting equipment shall be readily available at the work site.

b. *Pressure Equipment*

- Details on how to operate all pressure equipment in a safe manner shall be made available to relevant personnel;
- The details must include the inspection method and frequency of inspection of such equipment;
- A mechanical restraint is to be used on all hose-to-hose and all hose-to-equipment connections to prevent injurious disengagement;
- All blast hose connections are to be pinned with a safety clip. All associated connections to pressure equipment shall be regularly inspected and well maintained.

c. *Earthing -*

- All coating application equipment, particularly spray and blast cleaning equipment, shall be earthed to eliminate any electrostatic charge;

d. *PPE and Ventilation -*

- Health and safety instructions on the use of coatings and sealants printed on the MSDS and warning labels shall be fully understood before any work is undertaken;
- All necessary protective equipment and clothing shall be provided for all personnel.
- Appropriate air-fed masks shall be used during abrasive blasting and coating operations;
- Compressed air for breathing shall be supplied from an oil- and water-free source and be fitted with a comprehensive monitoring and alarm system for the key air quality parameters;
- All air lines conveying air for breathing shall be diver-grade, be used only for that purpose and have connection fittings that are not compatible with air lines for other duties;
- Other personnel in the vicinity shall wear suitable protective masks or respirators when necessary. Suitable respirators shall be worn to protect operators from dust, fumes, and vapours, in compliance with AS/NZS 1715 and AS/NZS 1716;
- First aid equipment, including eye wash bottles, shall be available at the work site. Eye wash bottles shall be located at or near the material pump, mixing area, and paint storage point;

e. *Access -*

- Scaffolding, platforms, lifts or floating stages must only be erected and operated by licensed or qualified personnel;
- The appropriate tagging system, as stipulated by the relevant authorities, shall be employed and clearly displayed;
- Adequate warning notices shall be posted where overhead work is in progress. Geo textile materials may be used to stabilise marsh/swamp ground to ensure a safe and level working surface.

5.7 Environmental Protection

General

5.7.1 All works shall comply with relevant national, state and local legislation concerning the preparation and coating of surfaces.

5.7.2 The Applicator shall refer to WorkCover Queensland Health and Safety Guide: Spray Painting for guidance concerning the control of paint emissions, waste management and public safety for both new and previously painted structures.

Lead Paint

5.7.3 Where lead paint is present, all work shall be performed in accordance with AS 4361.1.

5.7.4 A dedicated Work Plan (specification) shall be prepared. It shall include surface preparation, ventilation, encapsulation, waste disposal and any other health and environmental protection measures.

5.7.5 The work shall be undertaken by a pre-qualified Applicator holding a PCCP Class 5 certificate.

Containment

5.7.1 Where the works are to be performed on-site, the Applicator is responsible for the design and erection of a suitable containment structure intended to prevent the escape of emissions into the environment, soils, waterways, and for the protection of the public. Emissions include, but are not limited to:

- paint overspray;
- spills;
- wastewater; sludge; or
- dust from abrasive blasting; and
- any other site discharges associated with the work.

5.7.2 It is the Applicator's responsibility to ensure the design of the containment system complies with all national, state and local legislation and that no visible emissions escape to the environment from the contained work area.

5.7.3 A containment system may include, but is not restricted to:

- cover panels;
- screens;
- tarpaulins;
- hoardings and shrouds;

supported by scaffolding or other structures which, when used separately or in combination, will enclose the entire working area.

5.7.4 All necessary measures to recover any removed coating, spent abrasive, and associated debris shall be undertaken. All collected residues and waste materials shall be disposed of properly in accordance with the appropriate statutory requirements.

5.7.5 Prior to the commencement of the works, the details of the proposed containment system to be installed for the control of emissions shall be submitted to the Principal. It should be noted however that the submission of the proposed containment details would not in any way constitute the approval or acceptance of responsibility for the containment by the Principal.

External Surfaces

5.7.6 Where vacuum shrouded power tools and vacuum blast cleaning are used in conjunction with brush or roller application of the coatings, a fully sealed structure for the containment of emissions may not be required.

5.7.7 Where open power tools or vacuum shrouded power tools and/or spot abrasive blast cleaning are used in conjunction with the spray application of the coatings, a sealed containment system is required.

Assessing Emissions

5.7.8 Surface preparation, paint removal operations, and the application of paint may each produce emissions. The potential of various activities to generate emissions is categorised in AS 4361.1.

5.7.9 The Applicator shall estimate the potential level of emissions, and install an appropriate containment to protect the environment, the public and other nearby personnel from any hazard.

5.7.10 Visible emissions may be permitted providing the duration of the discharge does not exceed the cumulative level listed in Table below or extend beyond the controlled area delineated by a boundary line or barrier.

Table 1: Guide to Estimating Emissions

Emission Level	Description
0	No visible emission. (This level may not be achievable during abrasive blasting)
1	Random emissions having a cumulative duration of no more than 1% of the work day (e.g. five minutes in an eight hour work day).
2	Random emissions having a cumulative duration of no more than 5% of the work day (e.g. 24 minutes in an eight hour work day).
3	Random emissions having a cumulative duration of no more than 10% of the work day (e.g. 48 minutes in an eight hour work day).
4	Emissions are unrestricted and may occur at any time.

Notes:

1. Workday activities for timing emissions encompass surface preparation and clean up only.
2. The maximum emission level for external abrasive blast cleaning shall be Level 2 or as required by the relevant statutory organisation, whichever is the most restrictive.

6. Recommended Coating System

6.1 PUR-B (Polyurethane, Moderate Performance)

Table 2: Coating Specifications of PUR-B

Item	Description	Nominal DFT	Minimum DFT	Maximum DFT
Preliminary Cleaning	**New**: Wash and dust off **Existing**: Remove mud, dirt, chalk, algae, bird droppings and other loose contamination. Wash using high pressure water jetting or spot clean using buckets, brushes and water			

Item	Description		Nominal DFT	Minimum DFT	Maximum DFT
Oil & Grease Removal	Remove oil and grease in accordance with AS 1627.1				
Substrate	**Steel**	**Previous Coating**			
Surface Preparation	Sa 2½ blast	Sand if glossy			
Primer	Zinc-rich epoxy primer [P1]	Surface tolerant epoxy [C1]	**75 µm**	50 µm	125 µm
Stripe Coat	High build epoxy [C2] or surface tolerant epoxy [C1]. Applied to all nominated surfaces. Colour: N-35 Light Grey or as nominated		**(60 µm)**	(50 µm)	(100 µm)
Topcoat	High build acrylic polyurethane [T1]. Gloss or semi-gloss. Colour: as nominated (including MIO)		**75 µm**	50 µm	125 µm
Total Dry Film Thickness	Excluding stripe coats		**150 µm**	100 µm	250 µm

Notes:

1. For steelwork in moderate environments, use a surface tolerant epoxy primer at 125 µm NDFT instead of the zinc-rich epoxy primer.
2. The zinc-rich epoxy (ZRE) will have a lower tolerance of maximum DFT (approx. 90 µm) than the surface tolerant epoxy.
3. Spot surface preparation and spot priming may be needed for paint systems with minor breakdown.

6.2 Default Colour

6.2.1 The following table provides the default colour for the asset's topcoat.

Table 3: Default coating colour

Item	Colour code	Description
Pipes [above ground]	G54	Mist Green

7. Approved Coating Products

7.0.1 A list of approved protective coating products can be found in this section. These coatings have been assessed to:

- Have satisfactory long-term track records;
- Originated from quality assured manufacturers and/or suppliers;
- Be part of a global product rang; and
- Have relevant certifications issued by Australian Paint Scheme (APAS).

7.0.2 APAS approved coating products are preferred by Unitywater and therefore their uses shall be considered first. If the listed APAS approved products are not available. Then the listed non-APAS approved products may be used.

7.0.3 Unitywater reserves the right to request a documented evidence of the unavailable of a listed product.

7.0.4 In the case of all listed products not being available, other products that can be demonstrated to have at least equal performance to the specified products in the list may be used, subject to prior approval from Unitywater.

7.0.5 Where available, all products used within a selected coating system should originate from a single supplier. These products must be compatible with each other and applied strictly in accordance with this Specification and the Supplier's specification.

7.0.6 Unitywater reserves the right to make any changes to the content of the list without giving notice or explanation.

Table 4: List of Approved Protective Coating Products

Code	Description	References	International	Jotun	PPG	Dulux
P1	Zinc rich epoxy primer	APAS 2916/1 AS/NZS 3750.9 T.2	Interzinc 72 Interzinc 315	Barrier	Amercoat 68K Amercoat 471	Zincanode 402 Zincanode 202
C1	Surface tolerant epoxy	APAS 0156/2977 AS/NZS 3750.1	Interplus 356 Interplus 1180	Jotamastic 87	Amerlock 400 Amerlock 2K	Durebild STE
C2	High build epoxy	APAS 2973 AS/NZS 3750.14	Intercure 420	Jotacote 605	Amerlock 400 Amerlock 2K	
	High build epoxy (potable water use)	APAS 2973P AS/NZS 3750.14 AS/NZS 4020	Interline 850		Amerlock 400	Duremax GPE
T1	Gloss 2-pack acrylic polyurethane	APAS 2911 AS/NZS 3750.6	Interthane 990 Interthane 870 (MIO)	Hardtop AS	Sigmadur 550	Weatherma x HBR

Note: Grey/light coloured text represent not-APAS approved products and black coloured text represent APAS approved products.

8. Example of Inspection and Testing Plan

No	Work Phase	Inspection and testing activities	Pass criteria	Applicator	Inspector	Unitywater
1	Prior to work commencement	Submission of design specification, inspection and testing plan, and product information	Unitywater acceptance	X	X	H
		Coatings Inspect containers and labels Verify products are certified under appropriate standard Inspect storage conditions	Specified in Section 5.2	X	W	W
		Solvents and cleaners Inspect container and labels Verify solvents and cleaners are suitable with the coatings Inspect storage conditions	Specified in Section 5.2	X	W	W
		Abrasive blast equipment and media Verify equipment is in good condition and meets Safe Work Australia Model Code of Practice for Abrasive Blasting requirements (e.g. safety relief valve, earthing dead man control, pressure rating) Verify media meets specification and is suitable to produce the require surface profile Verify suitable environmental controls for dust and noise are in placed	Specified in Section 5.3	X	W	W
		Spraying equipment Verify equipment is suitable for applying the product (type and size)	As per coating supplier's recommendation	X	W	W
		Monitoring and testing instruments Inspect climate monitoring equipment (psychrometer and thermometer) Ensure pictorial standard for blast cleaning class	Equipment and instruments are on site, calibrated and operating	X	W	W

No	Work Phase	Inspection and testing activities	Pass criteria	Applicator	Inspector	Unitywater
		Ensure surface profile testing equipment as per AS 3894.5:2002 (Method A or B) is on site Ensure wet film thickness comb gauge is calibrated Verify high voltage holiday tester is calibrated				
		<u>Coatings</u> Inspect containers and labels Verify products are certified under appropriate standard Inspect storage conditions	Specified in Section 5.2	X	W	W
3	Surface preparation	<u>Prior to abrasive blast cleaning</u> Visual inspection for existing defects, including shape edges, welds, and irregular surfaces Oil droplet (Method B of AS 3894.6:2002)	Test as required No metal defects and sharp edges No presence of oil droplet	X	W	W
		<u>Following abrasive blast cleaning</u> Chloride content level (Method A of AS 3894.6:2002) Oil or water droplet (Method B of AS 3894.6:2002) Surface dust (Method C of AS 3894.6:2002) Ferrous salt (Method D of AS 3894.6:2002) Mill scale (Method E of AS 3894.6:2002) Blast class (AS 1627.4 and AS 1627.9) Surface profile (AS 3894.5:2002, Method A or B)	Specified in Section 5.3 Chloride content level ≤ 7 µg/cm2 No presence of oil or water droplet Rating 1 or cleaner for surface dust No presence of ferrous salt No presence of mill scale Blast class Sa 2.5 40-60 µm, sharp and angular	X	X	W
		<u>Safe operation of abrasive blast cleaning</u> Visual observation	Meets requirements of Safe Work Australia	X	W	W

No	Work Phase	Inspection and testing activities	Pass criteria	Applicator	Inspector	Unitywater
			Model Code of practice for Abrasive Blasting			
		Monitor environmental conditions Relative humidity Ambient air temperature Substrate temperature	Test at least ever four hr RH ≤ 85% 10 ≥ T°C ≥ 30 Substrate temperature ≥ 3°C above dew point, and 10 ≥ T°C ≥ 35	X	W	W
4	Coating Application	Mixing of coatings Visual observation	As per CLAUSE and coating supplier's instructions	X	W	W
		Monitor environmental conditions Relative humidity Ambient air temperature Substrate temperature	Test every four hours or more RH ≤ 85% 10 ≥ T°C ≥ 30 Substrate temperature ≥ 3°C above dew point, and 10 ≥ T°C ≥ 35	X	W	W
		Primer coat During application Wet film thickness (WFT) testing Visual inspection for holidays and discontinuities during application After application Allow sufficient curing time	Test as required During application WFT = DFT / % of solid (Note: DFT = 40-75 µm) Apply stripe coat wet-on-wet on defects After application Within the minimum and maximum curing time	X	W	W
		Stripe coat During application Wet film thickness (WFT) testing	Test as required During application WFT = DFT / % of solid (Note: DFT = 50-100	X	W	W

No	Work Phase	Inspection and testing activities	Pass criteria	Applicator	Inspector	Unitywater
		After application Allow sufficient curing time	µm) After application Within the minimum and maximum curing time			
		<u>Top coat</u> During application Wet film thickness (WFT) testing After application Allow sufficient curing time Rub test for testing degree of cure (Method C of AS 3894.4:2002) Dry film thickness (DFT) testing after curing in accordance with AS 3894.3 Holiday test in accordance with AS 3894.1 Visual inspection of defects	Test as required During application WFT = DFT (Note: DFT = 400-700 µm) After application Within the minimum and maximum curing time Full cure Total DFT = 440-775 µm (with primer coat) No holidays No lumps, bubbles, ripples, sags, etc.	X	X	W
		<u>Safe operation of paint spraying</u> Visual observation	Meets requirements of Safe Work Australia Model Code of Practice for Spray Painting and Powder Coating	X	W	W
5	Completion of protective coating application	Submission of work completion report including testing an any warranty certificates		X	X	H

X = Responsible H = Hold point W = Witness (option is given to inspect)

9. Additional Information (Explanatory)

3.1 Chemical Corrosivity

9.1.1 The following table provides guideline for determining the level of corrosivity of common chemicals used in Unitywater.

Table 5: Corrosivity levels of common chemicals used in Unitywater

Chemicals	Typical Concentration	Corrosivity Level
Acetic Acid	Variable	>70% is highly corrosive, otherwise moderately corrosive.
Aluminium Sulphate	45-50% (pH 2-3)	Moderately corrosive
Ammonia (ammonium hydroxide)	25% (as NH_3)	Not corrosive.
Calcium Nitrate	30-60%	Moderately corrosive.
Citric Acid/Sodium Citrate	Variable	Moderately corrosive.
Ethanol	>96%	Not corrosive, but acrylic coatings must not be used.
Ferric Chloride	43% (pH 3)	Highly corrosive to carbon steel and stainless steel (304 & 316).
Hydrofluosilicic Acid	19-21%	Highly corrosive to aluminium, carbon steel, stainless steel (304 & 316) and concrete, only use vinyl ester or epoxy novolac.
Lime (Hydrated)	Delivered as powder, made up on site as slurry	Not corrosive, but galvanised items should be coated with epoxy or polyurethane.
Magnesium Hydroxide	55%	Not corrosive, but galvanised items should be coated with epoxy or polyurethane.
Methanol	>98%	Not corrosive, but acrylic coatings must not be used.
Potassium Permanganate	Delivered as crystals, dissolved on site. Potential for exposure to saturated solutions (6.4% at 20degC)	Moderately corrosive to steel, concrete should be seal coated.
Sodium Bisulphite	Approx. 34% (pH 4.7)	Moderately corrosive to steel, reinforced concrete should be seal coated.
Sodium Hydroxide	45-50%	Moderately corrosive.

Chemicals	Typical Concentration	Corrosivity Level
Sodium Hypochlorite	Approx. 14%	Highly corrosive to carbon steel and moderately corrosive to stainless steel 304. Reinforced concrete should be coated, use vinyl ester, epoxy novolac, or chlorinated rubber only.
Sulphuric Acid	70%	Highly corrosive to aluminium, carbon steel, stainless steel (304 & 316) and concrete, only use vinyl ester or epoxy novolac.