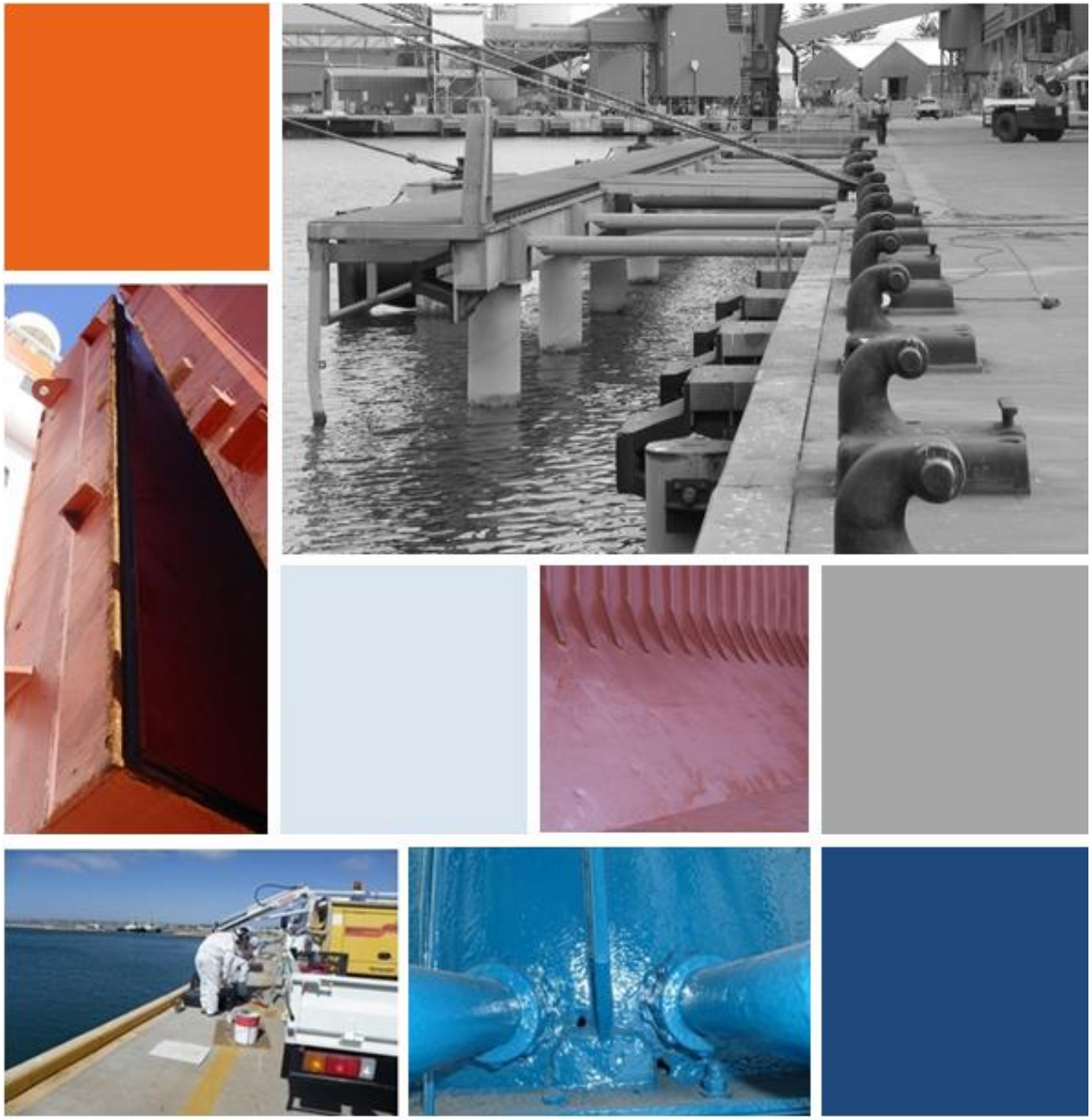
MID WEST PORTS

TECHNICAL GUIDELINE

MWPA401 – GUIDELINES FOR PROTECTIVE COATINGS



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APPENDICES

1 PREFACE

This document has been compiled for the Mid West Ports (MWPA) to provide developers, designers, contractors and inspectors with guidance on the corrosion protection by coatings of MWPA's steel and reinforced concrete assets. It does not replace bespoke project basis of design, design criteria or specifications, but it is intended to provide developers, designers, contractors and inspectors with a benchmark for the minimum technical requirements for new construction, refurbishment and repair corrosion protection projects.

The chapters of this guide include methods and guidance on the statutory requirements; MWPA health, safety, environment, quality and operational policies and procedures; site exposure classifications; port assets; protective coating materials, surface preparation, coating application and inspection and testing information to undertake a coating project at MWPA.

This document will be used as a basis for identifying any shortcomings in the technical content and ultimately accepting or rejecting proposed, underway or complete coating projects.

2 SCOPE

2.1 GENERAL

This document provides coating system selection, application and inspection guidelines for new construction and refurbishment projects at MWPA and forms part of the MWPA Technical Guidelines.

It includes the guidance on the technical requirements for design, surface preparation, application and testing of coatings for steel and reinforced concrete (RC) assets within the port area. The assets are exposed to a wide range of environments, from benign to very aggressive exposures. In addition, a range of atmospheric exposures occur inside and external to the various buildings, bulk handling facilities and structures on the site.

2.2 EXCLUSIONS

This guideline does not include concrete repair, cathodic protection, petrolatum tape and HDPE jacket wrapping systems, architectural finishes, fire proofing or insulation requirements. However, such finishes need to be compatible with the coating systems specified and not affect or reduce their life.

Except as otherwise specified in design documentation or technical specifications, the surfaces of the following are not generally coated:

- All stainless steel surfaces.
- Chromium plate, copper, brass, bronze, Ni-plate, rubber, power cable, wire rope, brick work and tile, mastics.
- Electrical/instrument panels with stainless steel materials.
- Galvanized surfaces of gratings, conduit pipes and fencing (which are more than 20 m from splash/spray).
- Motor shafts and other such moving parts.
- Machine finished surfaces except for rust inhibitors.
- Seals and gaskets.
- Surfaces in sliding or rubbing contact unless otherwise specified.
- Sealed parts and inaccessible interior surfaces, inside of piping, vessels and tanks, shall not be painted unless otherwise specified.

3 GLOSSARY

For the purposes of this Guideline the following particular definitions apply:

Table 1: Glossary of Terms

Term	Definition
Abrasive Blast	Surface preparation of substrate as described in AS 1627.4.
Acceptable	Shall mean acceptable to MWPA (the Owner) or the Owner's Engineer.
Applicator	Means the coating application Contractor or employee of the coating Contractor who prepares the surface for painting and applies the specified coatings.
Approved/ Approval	Approved by MWPA (the Owner) or Owner's Engineer in writing.
Brush Blast	Surface preparation of a substrate by abrasive blast method to conform to Appendix D of AS 1627.4 in order to uniformly impart sufficient anchor profile for coatings to adhere. Usually carried out using lower pressure and increased distance from the substrate than used for normal abrasive blasting. Also known as sweep, or whip blasting.
Bug holes	Refers to the air entrapment holes left at the surface of new concrete and made partially visible when formwork is removed.
Coat of Paint/Coatings	A continuous layer of dried paint film resulting from a single application of paint.
Coating System	A total number of types of paint coatings, or other protective or decorative materials, applied separately in a predetermined order to produce a laminated coating membrane.
Contract	The agreement between MWPA (the Owner) and the Contractor.
Design Life	Period of time the protective coating or lining must perform its intended function before first major maintenance. Coating Works must be specified and applied to minimise capital, operating and maintenance costs throughout the service life of the asset.
Diamond grind	Preparation of cured concrete with a slow speed rotational disc machine fitted with an industrial diamond cutting head. The machine removes old coatings, laitance and imperfections, leaving a new surface that is suitably prepared for coating.
Feather	A process whereby abrasion is carried out to the edges of intact, sound coatings at the site of localised damage to smooth out all leading edges around the damaged site. Can be carried out by spot blasting, hand sanding and mechanical sanding methods.

Term	Definition
Independent Coating Inspector	An appropriately qualified and experienced person or organization sub-contracted by the Principal to provide independent inspection, testing and reporting of the works.
Manufacturer	The supplier or manufacturer of the coating system or materials.
Multi-component	Coatings supplied in two or more separate packs that require mixing and combining together to complete the product prior to application.
Owner	Means the owner of the project or asset.
Owner's Engineer	A person or organisation deemed to have the authority of MWPA to make project related decisions, give direction, make inspections and request documentation for works determined under the Contract.
Pot life	The time that a coating material is usable after mixing.
Pre-blast	Preliminary blasting operations carried out to remove old, contaminated coatings and corrosion product. Usually carried out to remove surface contamination prior to profile blasting.
Reducer	See Thinner.
Service Life	Service life is defined as the period to first major maintenance. Major maintenance will be required once the protective coating or lining system has deteriorated beyond the condition stipulated in Clause 11.7.
Shall	Indicates a mandatory instruction.
Shelter	Partially enclosed, treated as an outdoor system.
Site	The work site as defined by the length of pipe to be installed, generally located between an inlet and outlet; however it may not always be the case.
Should	Indicates a suggested procedure or process.
Specification	Means the protective coating specification and the coating systems within the specification, including any annexures and schedules.
Stripe coat	Brush application of coatings to edges, sharp angles, corners slots, fixings etc. and any other part of the painted substrate where coatings applied by other methods may not be successful and where a reduced coating film could lead to early coating failure.
Substrate	Base material over which a coating is applied.
Tie Coat	A coat of paint applied to a previous coat to improve the adhesion of subsequent coats or to prevent other surface defects.

Term	Definition
Thinned, Thinner	Solvent (hydrocarbon or water based) supplied by the coating manufacturer for addition to a coating to reduce the viscosity to ease application by spray, brush or roller methods.
Two component	Coatings supplied in two separate packs that require mixing and combining together to complete the product prior to application.
Waterjetting	The use of a machine that pressurises water and dispenses the high-pressure water through a wand or nozzle to clean a surface. Waterjetting can be high pressure or ultra-high pressure.
Wet Abrasive Blast	Surface preparation methodology whereby a dry abrasive is drawn into a high pressure stream of water by means of a venturi nozzle.
Whip blast	See Brush Blast.
Works	The works performed under the Contract.

For the purposes of this Guideline the following particular abbreviations apply:

Table 2: Abbreviations

Abbreviation	Meaning
ACA	Australasian Corrosion Association
AINDT	Australian Institute for Non-Destructive Testing
ANSI	American National Standards Institute
AS	Australian Standard
AS/NZS	Australian-New Zealand Standard
BOD	Basis of Design
ASTM	American Standard of Testing and Materials
BS	British Standards
DFT	Dry Film Thickness
EMP	Environment Management Plan
EPA	Environment Protection Authority
MWPA	Mid West Ports Authority
HDG	Hot Dip Galvanising
HFO	Heavy Fuel Oil

Abbreviation	Meaning
HSEC	Health, Safety, Environment and Community
ISO	International Standards Organization
ITP	Inspection and Testing Plan
MD	Marine Diesel
MFO	Medium Fuel Oil
MS	Mild Steel
MSDS	Material Safety Data Sheet
µm	Micron (0.001 mm)
MRWA	Main Roads Western Australia
NACE	National Association of Corrosion Engineers
NATA	National Association of Testing Authorities
NDT	Non-Destructive Testing
O&M	Operations and Maintenance
PIANC	Permanent International Association of Navigational Congresses
ppm	Parts per million
PTDS	Product Technical Data Sheet
QA	Quality Assurance
QC	Quality Control
RC	Reinforced Concrete
RH	Relative Humidity
SAA	Standards Association of Australia
SWMS	Safe Work Method Statement
UNCTAD:MPM	United Nations Conference on Trade and Development: Monographs on Port Management
UV	Ultra Violet
WA	Western Australia

4 RELEVANT DOCUMENTATION

4.1 GUIDELINE SERIES

This guideline should be read in conjunction with other parts of the MWPA Technical Guideline series, where relevant, and these are listed below:

- MWPA 000 Series – Port Development Guidelines;
- MWPA 100 Series – Technical Guidelines - General;
- MWPA 200 Series – Drafting Guidelines and Surveying Guidelines;
- MWPA 300 Series – Mechanical Guidelines;
- MWPA 400 Series – Guidelines for Maritime Structures;
- MWPA 500 Series – Civil Engineering Guidelines;
- MWPA 600 Series – Buildings and Structures Guidelines;
- MWPA 700 Series – Electrical and Instrumentation Guidelines;
- MWPA 800 Series – Guidelines for Rail; and
- MWPA 900 Series – Additional Guidelines.

4.2 MID WEST PORTS POLICIES AND PROCEDURES

All parties developing, designing, specifying, preparing, applying and inspecting any aspect of a MWPA coating project should be aware and abide with MWPA policies and procedures. A full list of MWPA's policies and procedures can be found in **MWPA100** and obtained either from the MWPA website *www.midwestports.com.au* or requested from the MWPA Project Coordinator or Owner's Engineer.

4.3 LOCAL, STATE AND FEDERAL STATUTORY REQUIREMENTS

In addition to the requirements of this part of the MWPA Technical Guidelines, all protective coating works shall meet the requirements of Local, State and Federal statutory, health, safety and environmental requirements and regulations and include, but not be limited to the following:

- Western Australian Environmental Protection
- Western Australian Occupational Safety and Health Act (1984) and Regulations (1996)
- Western Australian Marine (Certificates of Competency and Safety Manning) Regulations (1983)
- Western Australian Mines Safety and Inspection Act (1994)
- Western Australian Mines Safety and Inspection Regulations (1995)
- Dangerous Goods Safety Act (2004)
- Port Authorities Act (1999)
- Maritime Transport and Offshore Facilities Security Act (MTOFSA) (2003)
- Environmental Protection Act and Regulations (1986)

4.4 AUSTRALIAN STANDARDS AND DESIGN CODES

The latest version of the following standards and documents shall be adopted for Works covered by this Guideline.

4.4.1 AUSTRALIAN STANDARDS AND DESIGN CODES

Table 3: Australian Standards and Codes

No.	Title
AS 1214	Hot-dip galvanized coatings on threaded fasteners (ISO metric coarse thread series)
AS 1318	Use of colour for the marking of physical hazards and the identification of certain equipment in industry (known also as the SAA Industrial Safety Colour Code) (incorporating Amdt 1)
AS 1345	Identification of the contents of pipes, conduits and ducts
AS 1397	Continuous hot-dip metallic coated steel sheet – Coatings of zinc and zinc alloyed with aluminium and magnesium
AS/NZS 1576	Scaffolding – General requirements
AS 1580	Paints and related materials – Methods of test – Introduction and list of methods
AS 1627	Metal finishing – Preparation and pre-treatment of surfaces – Method selection guide
AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction and installation
AS/NZS 1715	Selection, use and maintenance of respiratory protective equipment
AS/NZS 1716	Respiratory protective devices
AS/NZS 1891	Industrial fall-arrest systems and devices
AS/NZS 1892	Portable ladders
AS 1940	The storage and handling of flammable and combustible liquids
AS 2159	Piling - Design and installation
AS 2309	Durability of galvanized and electrogalvanized zinc coatings for the protection of steel in structural applications - Atmospheric
AS/NZS 2310	Glossary of paint and painting terms
AS/NZS 2311	Guide to painting of buildings

No.	Title
AS/NZS 2312.1	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings - Paint coatings (including Amendment 1: 2004)
AS/NZS 2312.2	Guide to the protection of structural steel against atmospheric corrosion by use of protective coatings - Hot dip galvanizing (Including Amendment 1: 2004)
AS 2331	Methods of test for metallic and related coatings
AS 2550.10	Cranes, hoists and winches – Safe use – Mobile elevating work platforms
AS 2700	Colour standards for general purposes
AS 3600	Concrete structures
AS 3750	Paints for steel structures
AS 3894 Parts 1-14	Site testing of protective coatings
AS/NZS 4020	Testing of products for use in contact with drinking water
AS 4036	Corrosion of metals – Dissimilar metals in contact in seawater
AS 4312	Atmospheric corrosivity zones in Australia
AS/NZS 4534	Zinc and zinc/aluminium-alloy coatings on steel wire
AS/NZS 4576	Guidelines for scaffolding
AS/NZS 4586	Slip resistance classification of new pedestrian surface materials
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 4758.1-2008	Personal flotation devices – General requirements
AS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process
AS/NZS 4801	Occupational health safety management systems – Specification with guidance for use
AS 5100.5	Bridge design - Concrete
AS/NZS ISO 9001	Quality management systems - Requirements
AS/NZS ISO 14001	Environmental management systems – Requirements with guidance for use
APAS	Australia Paint Approval Scheme Note: All coatings applied in Australia shall be APAS approved unless specifically otherwise approved by MWPA.
Code of Practice	Government of Western Australia - Prevention of falls in the workplace

4.5 INTERNATIONAL STANDARDS

In the absence of suitable Australian Standards and where items are to be coated overseas, the latest version of the following International Standards may be referenced.

4.5.1 INTERNATIONAL STANDARDS AND DESIGN CODES

Table 4: International Standards and Codes

No.	Title
ISO 1461	Hot dip galvanized coatings on fabricated iron and steel articles – Specification and test methods
ISO 2063	Thermal spraying - Metallic and other inorganic coatings - Zinc, aluminium and their alloys
ISO 8501-1 (AS 1627.9)	Metal finishing – Preparation and pre-treatment of surfaces - Pictorial surfaces preparation standards for painting of steel surfaces
ISO 8503	Preparation of steel substrates before application of paints and related products
ISO 9001	Quality management systems - Requirements
ISO 9223	Corrosion of metals and alloys - Corrosivity of atmospheres – Classification, determination and estimation
ISO 11127-6	Preparation of steel substrates before application of paints and related products - Test methods for non-metallic blast-cleaning abrasives - Part 6: Determination of water-soluble contaminants by conductivity measurement
ISO 12944	Paints and varnishes - Corrosion protection of steel structures by protective paint systems
ISO 14713	Zinc coatings – Guidelines and recommendations for the protection against corrosion of iron and steel in structures
ASTM D4285	Standard Test Method for Indicating Oil or Water in Compressed Air
ASTM D4263	Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
NACE SP 05 08	Methods of Validating Equivalence to ISO 8502-9 on Measurement of the Levels of Soluble Salts
NACE Report 6A192/ SSPC-TR 3	Dehumidification and Temperature Control During Surface Preparation, Application, and Curing for Coatings/Linings of Steel Tanks, Vessels, and Other Enclosed Spaces
SSPC-SP WJ-2/NACE WJ-2	Waterjet Cleaning of Metals—Very Thorough Cleaning (WJ-2)

No.	Title
SSPC VIS 4 /NACE VIS 7	Guide and Reference, Photographs for Steel Surfaces Prepared by Waterjetting
SSPC VIS 5 /NACE VIS 9	Guide and Reference Photographs for Steel Surfaces Prepared by Wet Abrasive Blast Blasting

4.6 ADDITIONAL REFERENCES

The following references have been used in the production of this guideline.

Table 5: Additional References

Item No.	References
1	*www.midwestports.com.au*
2	Contractor and Worker Requirements (Contractor Handbook) – A summary of the OSH, Environmental and Security Requirements at Geraldton Port (May 2013)

4.7 PRECEDENCE

As a general guide, where particular aspects are not covered in the MWPA Technical Guidelines or where conflict between documents exists, the following precedence for standards applies:

1. Statutory Regulations;
2. Design Codes and Standards;
3. Project Specific Specification;
4. MWPA Technical Guidelines; and
5. Other References (e.g. Recognised Industry Best Practice).

Regardless of the general order of precedence, if there is a conflict between documents the clause presenting the more conservative and pragmatic guidance will govern. If in doubt, or in all cases where noncompliance is anticipated, clarification shall be sought from the MWPA.

5 GENERAL

Before any surface preparation or coating application work occurs, developers, designers, contractors and inspectors are reminded to familiarise themselves with relevant MWPA marine operations, permit, access and HSEQ requirements. General guidance on these can be found in **MWPA100**, the MWPA Contractor Handbook and on the MWPA website, however specific requirements for coating works are outlined below.

5.1 PERMITS

Prior to undertaking any coating project works within the Port area, a permit to work must obtained from MWPA. A permit list, i.e. abrasive blasting, hotwork, confined space, work afloat, diving, etc. permit application procedure and contact information can be found in **MWPA100** and on the MWPA website *www.midwestports.com.au*

For routine work undertaken in the same manner on a regular basis, application can be made for a longer term permit.

5.2 ACCESS

Typical access required for coating works on port assets such as buildings, conveyor galleries, shiploaders, dust hoppers, transfer/take up towers or the berth substructure may include knuckle boom lifts, elevated work platforms, scaffold, vessels barges, ladders or rope.

Contractors shall provide all access equipment. It shall be appropriate for the work to be undertaken, operated to the manufacturer's specification, have inspection and certification documentation and be in accordance with MWPA's Working at Heights procedure and industry safe work procedures.

5.3 SHUTDOWNS

When relevant, works should be scheduled to coincide with quarterly planned shutdowns or otherwise planned so as not to hamper operations (as directed by the MWPA Project Coordinator or Owner's Engineer). The yearly schedule for planned maintenance shuts for the BHF rail and berth assets can be found on the MWPA website.

5.4 SAFETY

For all works at the port the contractor shall develop and submit a site specific safety plan to the MWPA Project Coordinator for approval prior to the commencement of any work. The safety plan should, wherever possible, incorporate the MWPA's existing HSEQ policies, procedures and alerts, and all risks and hazards associated with performing Abrasive Blasting and Industrial Painting work, including the planned treatment and response to injuries such as high pressure injection of abrasives, paints or cleaning water in the form of risk assessments, Safe Work Method Statements (SWMS) or Procedures (SWMP), Job Safety Environmental Analysis (JSEA). The safety plan should also record the name, contact details and location of the nearest Emergency Response Unit or Medical Practitioner.

5.5 PERSONAL PROTECTIVE EQUIPMENT

MWPA requirements for personal protective equipment (PPE) can be found in the MWPA Contractor Handbook, MWPA100 and the MWPA website.

5.5.1 ADDITIONAL REQUIREMENTS FOR BLASTING AND COATING APPLICATION

Blasters and coating applicators should be provided with all necessary protection equipment, clothing and respiratory apparatus to comply with the appropriate state statutory and occupational health and safety regulations.

Operators working with High Pressure and Ultra High Pressure Waterjetting equipment shall wear additional PPE to normal painting/protection issue PPE. PPE for waterjetting operations should be rated for the nozzle working pressure of the unit and shall afford adequate protection to hands, legs, feet, torso, ears, eyes and head.

5.5.2 RESPIRATORS

Suitable respirators shall be worn to protect operators from dust, fume and vapours in compliance with AS/NZS 1715 and AS/NZS 1716 and appropriate state statutory occupational health and safety regulations.

When personal breathing equipment is used, the operator's hood or headgear shall be ventilated by clean, cool, oil free air served through a regulator filter. Air supply to the operator must be free of hydrocarbon vapour, oil and dust particulate and be of breathing air quality.

5.6 ENVIRONMENT

For all works at MWPA, the contractor is required to submit a site specific environmental management plan (EMP) to the MWPA Project Coordinator or the Owner's Engineer for approval prior to commencement of any work. The EMP should include procedures to identify all hazardous materials, determine emission control requirements, assess compliance of removal of existing paint and abrasive blast material with MWPA's HSEQ requirements, limit or contain emissions and waste materials and ensure the safety of workers and the public.

Note that hazardous material emissions to soil, seawater or ground water are prohibited. Water or soil samples may be taken to determine background levels, and further sampling may be carried out if deemed necessary to demonstrate compliance, or to quantify the impact of any suspected or inadequate emissions. Visible inspection of the integrity of containment and monitoring of emissions should be carried out as the primary control.

5.7 INSPECTIONS AND AUDITS

The contractor shall allow the MWPA Project Coordinator or the Owner's Engineer access at any time to plant, equipment, personnel and records, when requested, to enable the MWPA Project Coordinator or Owner's Engineer to inspect or audit any aspect of the contractor's operations relevant to occupational safety, health and environment.

5.8 INDEPENDENT COATING INSPECTOR QUALIFICATIONS

A suitably qualified and independent coating inspector may be appointed by the MWPA Project Coordinator or the Owner's Engineer accordance with ISO 9000 Quality Management Systems.

The Independent Coating Inspector should, as a minimum, hold the following or equivalent current qualifications and have at least five years' experience after obtaining their inspection qualification:

- NACE Coating Inspector Program (CIP) Level 2;
- SSPC Protective Coatings inspector (PCI) Level 2; or
- FROSIO Paint Inspector Level III.

The Independent Coating Inspector should report to the MWPA Project Coordinator or the Owner's Engineer and conduct all aspects of their inspection work in accordance with the NACE code of professional conduct.

6 ASSETS

The key assets at the port are summarised below:

- Navigational aids
- Berth structures
- Jetty structures
- Pens
- Shiploaders
- Materials handling
- Train unloader
- Buildings
- Security
- Waste water treatment systems
- Signage and lighting
- Access

A more comprehensive list including parent assets/sub-assets/components, material type, nominated coating system and colour can be found in **Table 11** in Appendix A.

7 EXPOSURE ENVIRONMENT

7.1 GENERAL

Steel and reinforced concrete (RC) assets within the port area are exposed to a wide range of environments, from benign to very aggressive exposures. In addition, a range of atmospheric exposures occur inside and external to the various buildings, bulk handling facilities and structures on the site. A summary of environments and exposures encountered at the port is listed in **Table 6**. Note that as no Australian Standard classifies the exposure environment for all steel and RC port assets sufficiently well, **Table 6** is a composite of similar tables from several codes.

Table 6: Classification of Environmental Exposures at the Port

Environmental Exposure	Steel	Reinforced Concrete
Atmospheric	**AS/NZS 2312.1 & AS/NZS 2312.2**	**AS 3600**
External (All building and structures)	C5-M	B2
Internal (BHF Structures, Train Unloader, Truck Unloader, Dust Extraction Equipment, Chemical Stores)	C5-I	B1/B2
Internal (Shiploaders, Workshops)	C4	B1
Internal (Administration building, Operations and Control rooms)	C1	A
Tidal/Splash	**AS 2159**	**AS 3600**
Tidal - splash, immersion seawater (Wharf Substructure, Fenders, Dolphins, Navigational Aids, Slipway, Ramp)	Very severe	C
Submerged	**AS 2159**	**AS 3600 & AS 2159**
Fresh water, seawater, chemical (Pipes, Tanks, Wharf Substructure, Fenders, Dolphins, Navigational Aids, Slipway, Ramp)	Moderate - very severe	Mild-Severe/B2
Buried	**AS 2159**	**AS 3600 & AS 2159**
Fill, soil, industrial or mine waste (Piles, Pipes, Footings , Slabs)	Non-aggressive – very severe	Non aggressive – very severe

7.2 SELECTION OF PROTECTIVE COATINGS FOR THE EXPOSURE ENVIRONMENT

Protective coating systems shall be designed for continuous operation under the environmental, temperature and UV exposure conditions specified below:

- Atmospheric conditions within the port area shall be considered dusty and salt laden, and in bulk handling areas in combination with product, micro-climates are expected to exist on the steelwork. Coatings systems are required to be selected for the macro and microenvironments they will experience over the asset service life.
- The average yearly maximum ambient air temperature according to the Bureau of Meteorology (BoM) in Geraldton is 24.7°C, however this can be exceeded where components are located in direct sunlight due to solar gain and the thermal rating of any coating system should be taken as 50°C.
- External atmospheric corrosion at the port is classified as Severe Marine (AS/NZS 2312 Category C5-M) for all outdoor steel surfaces. For surfaces located inside workshops, shiploaders , bulk handling facility structures, train and truck unloaders, dust extraction equipment, control towers and buildings, the classification varies from low to high corrosivity, as noted in **Table 6**.
- Where structures are atmospheric (external) and exposed to UV light, and where chalking or degradation of the coating is not acceptable, they shall be top-coated with an indefinitely recoatable UV resistant coating such as an acrylic or polyurethane coating.
- Coatings for splash zones and immersed surfaces should be selected for the characteristics of the exposure liquid, the propensity for mechanical and impact damage and resistance to cathodic disbondement if a cathodic protection system is used as a secondary corrosion protection system to the submerged elements of the asset.
- Where structures or civil works are to be located below ground, soil and groundwater aggressivity should be tested to minimize the risk of materials failure.

8 COATING SELECTION

8.1 GENERAL

Two main groups of coatings, barrier and galvanic coatings, are used on MWPA's assets. Barrier or non-metallic coatings degrade by reaction with the environment, i.e. exposure to aggressive chemicals, weathering and UV light; and galvanic coatings are sacrificial in nature and are consumed during exposure. Typically, galvanic coatings are used as a primer on steel as they work when in contact with the substrate, they are not applied to concrete. The particular coating is selected to meet several requirements, including design life requirement, exposure environment, substrate and substrate conditions, and cost.

8.2 COATINGS ON STEEL

AS/NZS 2312.1 provides guidance on different painting systems for steel and Tables 6.3 and C1 in AS/NZS 2312.1 specify for the relevant exposure environments, the number of years for each coating system to first major maintenance (total recoat).

Recommendations for paint coating systems for steelwork are project specific, however they should generally be specified to be in accordance with AS/NZS 2312.1. Examples of acceptable coating systems for MWPA's port assets are listed in **Table 11** in Appendix A.

In the assessment of coating systems for the protection of steelwork the following points should be considered:

1. Are the coating systems suitable for the specified application in the Project?
2. Will the coating systems require significantly more maintenance over the specified design life than a galvanized treatment?
3. Are there are other coating systems which would provide reduced maintenance over the asset/sub asset design life?

The coating systems nominated in a project coating specification should be the best available in their individual categories, however performance of the coatings will depend on steelwork surface preparation, coating application and specified coating thickness.

Externally located epoxy coated steelwork exposed to UV light will require a top coat where chalking and coating colour degradation is unacceptable, typically an indefinitely recoatable acrylic or polyurethane coating should be specified.

Adherence to inspection and testing protocols (ITPs), quality control (QC) and observation of HOLD POINTS as set out in the project specification is mandatory.

Inspection of the coating is required to be carried out by an Australasian Corrosion Association (ACA) or NACE Certified Coating Inspector with current certification.

8.3 BARRIER COATINGS

Barrier coatings or non-metallic coatings are film forming paints that protect the underlying metallic substrate by forming a continuous film around the surface to act as a barrier to oxygen and electrolyte (usually water); the two principal components required for corrosion initiation.

Barrier coatings are applied to:

- Concrete,
- Steel,
- As a Topcoat Over Galvanic Primers, and
- As a Topcoat Over Hot Dip Galvanised Steel, Known as Duplex Systems.

8.4 ZINC BASED GALVANIC COATINGS

Zinc based galvanic coatings are used to protect steel.

Galvanic coatings are predominantly 100% zinc metal such as hot dip galvanised steel (HDG) or coatings that contain high levels of zinc metal pigment held in a binder to keep the coating attached to the steel and allow intimate contact between the zinc metal particles in the coating film and the substrate steel.

Zinc based coatings are effective as primers to protect steel and are often top-coated.

9 COATING MATERIALS

A guideline of suitable coating materials/systems for MWPA's assets, sub-assets and components and the general manner in which their thickness, mass or service life should be specified for long term corrosion protection are provided in **Tables 9** to **11**.

9.1 COLOUR REQUIREMENTS OF SUCCESSIVE LAYERS

Each coating material in the system should have a contrasting colour to the prepared substrate, previous coating/material or successive coating/material in the system.

Finish colours for MWPA's assets, sub-asset and components are provided in **Table 11**.

9.2 COATING SYSTEMS FOR USE WITH POTABLE WATER

Coating or lining systems for use with potable water systems shall be approved for use in accordance with AS/NZS 4020. Approval under AS/NZS 4020 shall not only apply to the lining material but also for the entire coating system.

9.3 PRE-COATED PROPRIETARY EQUIPMENT

The proprietary coatings provided to mechanical plant casings are generally inadequate for use in severe exposures. A tie coat system shall be applied to all mechanical plant in the port area prior to top coating. Tie and topcoats for mechanical plant are provided in **Table 11**.

9.4 SLIP RESISTANCE OF PEDESTRIAN SURFACES

Where coatings are applied to surfaces subject to pedestrian traffic, they shall have a minimum slip resistance of R10 (Oil-Wet Ramp Test) in accordance with AS/NZS 4586 in both wet and dry conditions.

9.5 COATING MATERIAL ACCEPTANCE CRITERIA

Coating materials should comply with the following criteria:

Table 7: Coating Compliance Criteria

Coating Material Acceptance Criteria
Be standard products from a global coating manufacturer, from a product range available worldwide.
Be manufactured to standard coating formulation tolerances.
Be APAS approved and readily available in Australia unless otherwise approved by the MWPA.
All coating container labels shall bear the coating manufacturer's name, brand, batch number, date of manufacture, dangerous goods class and any special directions.
Coatings (and any pigments and fillers used in the manufacturing or tinting of bases) containing hazardous materials shall not be used at MWPA. This includes coatings applied outside of Australia.

Coating Material Acceptance Criteria
Materials specifically banned include: • Lead • Chromium • Coal tar epoxies • Asbestos or any other industrial classified pollutant • Bituminous coatings • Chlorinated rubber
Coatings shall be delivered in their original unopened containers and safely stored under cover in conditions (temperatures) that will not cause any deterioration of the coatings or create a safety hazard.
Coatings shall be factory-tinted only; the contractor shall not facilitate tinting of any coating materials.
Coatings shall be used within the coating manufacturer's recommended use by date requirements, paint products exceeding these dates shall not be used.
All coating materials shall have a certificate of suitability from the coating manufacturer for coatings if they are to be used with sacrificial or impressed current cathodic protection systems.

10 GUIDELINES TO DESIGNERS

10.1 SAFETY IN DESIGN

Designers should ensure that all designs and documentation are in accordance with current Safety in Design best practice and legislation, and that the relevant reviews and audits have been carried out during the design development phases. Designs should demonstrate and document how safety has been considered in the final product, during construction and ongoing maintenance of the assets.

10.2 DESIGN TO RECEIVE COATINGS

10.2.1 STEEL

Designers should ensure that steel detailing is appropriate for the coating to be applied. Wherever possible, the surface area to be coated should be minimized and simplified with respect to allowing access for coating. Steel should be free draining and care taken to prevent locations where moisture could pond.

Steel to receive a protective coating must have all edges filleted to a minimum radius of 1.5 mm, or more as per coating manufacturer's recommendations. Welds should preferentially be seal welds, and welds and spatter should be ground flush with the surrounding surface.

Steel to be hot dip galvanized does not require radiused edges, however it should be detailed with holes or sheared corners for filling, venting, or draining as per AS/NZS 4680.

10.2.2 CONCRETE

As concrete is permeable to water, any concrete that needs to be coated must not have a source of water on the other face. Coatings on concrete that has water permeating through from the other face will be lifted from the moisture pressure and fail. These situations should be designed out and may require tanking where cast against ground or exposed to water pressure.

10.3 DISSIMILAR METALS

When different metals or alloys are in contact in the presence of an electrolyte such as seawater, this **may** result in a galvanic couple. In this situation one of the couples will corrode preferentially to the other at an accelerated rate. A typical example is zinc coupled to mild steel, where the zinc will corrode preferentially – this property is exploited in galvanic coatings and cathodic protection systems. Another example is steel screws through aluminium roof sheeting, when there is ponded water or trapped condensation the aluminium will corrode, leading to a dangerous situation where the screws are no longer fastening the roof sheeting. This situation is typically undesirable and needs to be designed out, e.g. through substitution of materials, electrical isolation, or exclusion of the electrolyte.

The use of dissimilar metals that may result in galvanic corrosion is not permissible without the prior approval of the MWPA Project Coordinator or the Owner's Engineer.

Where the use of galvanic couples is unavoidable, design guidance in AS 4036-2006 should be used to mitigate the risks of corrosion.

10.4 COATING SPECIFICATION

The MWPA Project Coordinator or Owner's Engineer reserve the right to reject any proposed coating specification if the product or system suitability for the application cannot be sufficiently demonstrated by the contractor or coating manufacturer, or if the proposed coating specification does not conform to the generic systems outlined in **Table 11**.

Copies of all relevant Material Safety Data Sheets (MSDS) and Product Technical Data Sheets (PTDS) shall be supplied to MWPA or the Owner's Engineer with the coating manufacturer's endorsement for the coating specification submitted for approval.

Although not specifically coved in this guideline, designers should, where appropriate, also consider the use of alternate barriers to corrosion such as petrolatum tape/HDPE jackets.

10.5 SERVICE LIFE REQUIREMENTS

The objective of any protective coating system is to maximise the life of steel or reinforced concrete assets by preventing damage by surface corrosion for the service life.

This service life requirement shall be defined as the period to first major maintenance. Major maintenance will be required once the protective coating system has deteriorated beyond the condition stipulated in Clause 11.7.

All coating works must be designed to minimise capital, operating and maintenance costs throughout the service life of the asset.

11 GUIDELINES TO CONTRACTORS

11.1 PRE-CONTRACT MEETING

Prior to work commencing, the contractor may convene a pre-contract meeting to facilitate consultation between the MWPA Project Coordinator, the Owner's Engineer, the contractor and the coating manufacturer, as well as the independent coating inspector, to confirm that selected coating systems are suitable for the nominated duty.

The meeting shall have an open agenda to resolve any matter likely to affect the quality or performance of the protective coating work. If applicable, the following topics may be reviewed and agreed:

- Site HSEQ, SWMS, JSEA and permits to work (if applicable).
- Site transport regulations, security issues, MWPA policies and procedures.
- Required site inductions and certification such as Construction Cards, MSIC, PCCP, etc.
- Emergency evacuation, assembly points, first aid location and procedures.
- The Coating Specification and ITPs.
- Lines of communication: MWPA Project Coordinator, Owner's Engineer, Contractor, Inspector, etc.
- Substrate Preparation, i.e. confirmation of party responsible for detailing fabricated items such as removal of weld spatter and radius of edges if required.
- ITP hold and witness points.
- Contractor's inspection documentation and the intended recipient.
- Coating sample plates, number and intended locations, if required.
- Work lots.
- Inspection methods, equipment to be used and certification.
- Coating repair and site repair methods.
- Coating application equipment and required test certification.
- Transportation, i.e. methods, handling and storage of coated structures brought into the work site.
- Responsibility for coatings once they leave the painting yard or site where applicable. Coating warranty terms and conditions, if required.

11.2 EQUIPMENT - ELECTRICAL SAFETY

Spray and blast cleaning equipment shall be earthed to eliminate any electrostatic discharge.

All power tools brought to site shall have a current safety certificate attached to the electrical cable or unit.

11.3 CATHODIC PROTECTION SYSTEM

Surfaces to be treated shall have any applied Impressed Current Cathodic Protection (ICCP) system switched off seven (7) days prior to commencement of surface preparation.

Although it is the responsibility of the MWPA Project Coordinator to switch off any ICCP systems, the contractor shall verify that the system has indeed been turned off and satisfy themselves that the ICCP system will not negatively influence the quality of surface preparation, coating application and cure.

The MWPA Project Coordinator shall ensure that the ICCP system is switched on no sooner than seven (7) days after application of the last coat to surfaces that are normally protected by the ICCP system

11.4 SURFACE PREPARATION

Depending on the scope of work, the contractor may select one of the surface preparation methods in **Table 8** to suit the type of work, environmental controls and level of access. Prepared surfaces shall meet the criteria outlined at each preparation method below.

Prior to commencement of surface preparation, the contractor shall uniquely number each individual section of the structure that is treated separately as one work lot. Surface preparation requirements below apply to each selected work lot. A work lot shall be defined as each section of the structure that can be prepared, dried and coated with the first coat in one continuous operation.

If the surface preparation process exposes surface defects such as rough, undercut and porous welds, sharp edges, weld spatter, fins, rolled-in slivers, laminations, pits and craters that may be detrimental to the performance of the protective coating system, they shall be brought to the attention of the MWPA Project Coordinator or the Owner's Engineer immediately. The MWPA Project Coordinator or the Owner's Engineer shall discuss with the contractor how the defects shall be dealt with. Any exposed defects that are repaired by grinding or welding shall comply with the specified surface cleanliness and surface profile standards. Any such repairs shall therefore be conducted prior to final cleaning.

11.4.1 CLIMATIC CONDITIONS

Surface preparation or coating application should not take place if the relative humidity exceeds 85% and/or the temperature of the steel is less than 3°C above the dew point.

Climatic conditions shall be measured with appropriately calibrated conventional or electronic gauges and recorded as per clause 11.6.2.

11.4.2 CONCRETE SURFACES

Concrete surfaces to be coated shall be:

- Cured to minimum 80% of final strength, or allowed to cure for a minimum of 28 days at temperatures above 21°C.
- Have moisture content within the range of three to eight percent, as measured by hygrometer or electrical resistance, unless approved in writing by the coating manufacturer.
- Free of chemical additives or hardening agents that could interfere with the adhesion of the coating to the concrete, and concrete should not have been treated with sealing agents or dust suppressing agents that contain silanes, silicones or silicates. Otherwise resultant surface residues shall be fully removed as part of the surface preparation procedures prior to coating.

- Free of contamination by hydrocarbons such as oil, grease, form oils etc. If required, shall be cleaned with a biodegradable oil-emulsifying degreasing solution. Cleaning solutions shall be fully removed as part of the surface preparation procedures prior to coating.
- Dry surface preparation methods that leave the surface roughened and with a profile are preferred:
  - The preferred method of surface preparation for concrete elements is by fully enclosed "Blast Track" cleaning.
  - Where a Blast Track unit can't be used, a Rotational Head Diamond Grinding unit can be employed.
  - Dry abrasive blasting or "brush blasting" is generally used to prepare concrete surfaces when Blast Track or Diamond Grinding methods cannot be used. It is suitable for both external concrete surfaces, i.e. chemical bund areas, and also for indoor floor or wall surface preparation provided the spent abrasive is captured and contained and produced abrasive and concrete dusts are extracted outside the work area.
  - Edges, corners and areas not easily accessible should be prepared by hand scabbling, machine grinding or by any other surface preparation method approved by the coating manufacturer.
- All "laitance", dust, contamination and any part of the concrete surface that is weak or friable shall be removed.

As it is low in dust, the Blast Track unit uses steel shot or steel grit as the abrasive media and vacuum recovery to collect the abrasive to achieve a suitable level of surface preparation for coating adhesion.

Surfaces to be coated should be dry abrasive blast cleaned to remove surface laitance and impart a surface profile as per the coating manufacturer's minimum requirements for the specified coating system.

High pressure water cleaning (34 to 70 MPa) is suitable for the preparation of concrete surfaces where the coating system will tolerate a lower surface profile and where the surface preparation is only concerned with removal of unbound cement fines, laitance and when it is used to open up 'bug holes' in the surface of off-form concrete. High pressure waterjetting (70 to 170MPa) and ultra-high pressure waterjetting (>170MPa) can remove old coatings, all contamination and expose concrete aggregates.

If "wet" methods such as water cleaning and jetting are used, the surface must be allowed to dry so that the moisture content is in the range from three to eight percent before the primer or coating system is applied.

Areas of the concrete surface that cannot be accessed by the blasting nozzle should be prepared by hand scabbling, machine grinding or any other surface preparation method approved by the coating manufacturer, to achieve a suitable level of surface preparation for coating adhesion.-

11.4.3 STEEL SURFACES

The preparation of steel surfaces shall be in accordance with the criteria provided in **Table 8**. Preference is given to dry abrasive blast cleaning, where other surface preparation methods are to be used they should not compromise the durability and adhesion of the coating, and shall be approved by the coating manufacturer.

11.4.4 FEATHERING OF EDGES OF INTACT COATINGS

Regardless of the selected surface preparation method, edges of the sound coating adjacent to the newly prepared surfaces shall be feathered back to a sound surface and roughened over a distance of 15 mm. This is best achieved simultaneously with the surface preparation process, but may be also be carried out with a disc grinder, flapper wheel, flexible sanding disc. Care shall be taken that any exposed bare metal is not burnished or polished if power tools are used to feather edges. All residual dust and debris shall be removed with clean and dry compressed air or by wiping with a solvent soaked rag. The solvent to be used shall be the same as the thinning solvent for the first coat that is to be applied.

11.4.5 ROUGHENING OF EXISTING COATING (INCLUDING HOT DIP GALVANISED SURFACES)

Intact coatings (including HDG surfaces) that are nominated for top coating or repair shall be high pressure cleaned and abrasive whip blasted with a fine inert non-metallic abrasive and at a reduced nozzle pressure in accordance with Appendix D of AS 1627.4 or by wet abrasive whip blasting prior to coating application. Whip blasting shall produce a uniform and evenly distributed roughness pattern and not penetrate or destroy the existing coating layer.

11.4.6 EXPOSURE OF THE PREPARED SURFACE

Extended exposure of the blast-cleaned surfaces shall not be permitted unless appropriate dehumidification equipment is operational or unless 100% of the surface to be coated is thoroughly re-cleaned to the specified cleanliness standard and made dust free immediately prior to application of the first coat. The prepared surfaces shall meet the criteria of the specified surface cleanliness immediate prior to application.

Table 8: Surface Preparation Acceptance Criteria

Surface Preparation	General Notes	Surface Preparation Acceptance Criteria			
		Dry Abrasive Blasting Cleaning	**Wet Abrasive Blast Cleaning**	**Ultra-High Pressure Waterjetting (UHPWJ)**	**Power Tool Cleaning**
General		Coated surfaces may be cleaned by removal of the coating by other means than abrasive blast cleaning, however the final preparation method shall be by dry abrasive blasting in accordance with AS1627.4. Where dry abrasive blasting is selected for spot repair of corrosion affected areas, blasting shall only be carried out in a stop-start manner in order to prevent penetration and damage to intact coatings that do not require treatment.	Wet abrasive blast cleaning is defined as the surface preparation methodology whereby a dry abrasive is drawn into a high pressure stream of water by means of a venturi nozzle. Water pressure has a minimum of 50 MPa (7000 psi) at the nozzle and water delivery is approximately 20 L/min.	Ultra High Pressure Waterjetting is defined as the surface preparation methodology whereby a water stream pressurised to a minimum of 125 MPa (18,000 psi) is directed onto a surface in order to remove all existing coatings, corrosion product and contamination without the use of abrasives prior to application of protective coatings.	If the contractor opts for power tool cleaning for the final cleaning of corrosion affected areas, cleaning shall be conducted only with a pneumatic Monti MBX Bristle Blaster™. No other method of power tool cleaning shall be accepted.
Compressed Air Quality		Check oil and water traps are empty and test the air from the blast nozzle as per ASTM D4285. Maintenance and air quality testing to be conducted at regular intervals and at least once per day.	-	-	-
Blast Abrasives		Abrasive media shall not contain free silica or traces of lead or hazardous substances. Abrasive media shall be accompanied by a certificate from the coating contractor stating that the water soluble residual contamination levels result in a conductivity of less than 25 mS/m, tested to ISO 11127-6. Abrasives causing discoloration when washed in potable water shall be rejected. Spent abrasive shall not be re-used for final blasting preparation.	-	-
Surface Cleanliness		Prior to application of the coating system, 100% of the prepared substrate in each work lot shall visually resemble Sa2½ on a rust grade A, B or C substrate as depicted in AS 1627.9. Remnants of tightly adherent inorganic zinc primer are permissible provided that they are visibly free from zinc salts and poorly coherent material.	Surfaces shall have cleanliness to NACE-SSPC WJ-2. Remnants of tightly adherent inorganic zinc primer are permissible provided that they are visibly free from zinc salts and poorly coherent material.	Surfaces shall visually resemble AS 1627.4 St 2½. Remnants of tightly adherent inorganic zinc primer are permissible provided that they are visibly free from zinc salts and poorly coherent material.

Surface Preparation	General Notes	Surface Preparation Acceptance Criteria			
		Dry Abrasive Blasting Cleaning	Wet Abrasive Blast Cleaning	Ultra-High Pressure Waterjetting (UHPWJ)	Power Tool Cleaning
Surface Profile	Surface Profile (AS 3894.5 method A (Testex replica tape) or C (Stylus needle type digital instrument)	40-70 µm Rz (≤ 300µm DFT) 80-100 µm (> 300µm DFT) 2 tests per work lot (Testex replica tape) 20 tests per work lot (Stylus needle digital instrument)		40-70 µm Rz (≤ 300µm DFT) 80-100 µm (> 300µm DFT) 2 tests per work lot (Testex replica tape) 20 tests per work lot (Stylus needle digital instrument) If UHPWJ cleaned surfaces do not have the required surface profile, the surface profile shall be achieved by wet or dry abrasive blasting or the use of an MBX Bristle blaster.	40 and 70µm Rz. 2 tests per work lot (Testex replica tape) 20 tests per work lot (Stylus needle digital instrument)
Residual Soluble Salts	Residual Soluble Salts (Chlorides) (AS 3894.6 method A, alternate 1 or 2)	< 50mg/m^2 (prior to first coat) 2 tests per work lot If soluble salt contamination exceeds the specified maximum, cleaning to the specified cleanliness standard shall be repeated. This is likely to require fresh water rinsing or high pressure cleaning.	< 50mg/m^2 (prior to first coat) 1 test per work lot If soluble salt contamination exceeds the specified maximum, cleaning to the specified cleanliness standard shall be repeated. This is likely to require fresh water rinsing or high pressure cleaning.		
Residual Dust	Residual dust (AS 3894.6 method C)	Upon completion of abrasive blast cleaning and removal of the bulk of spent abrasive, all surfaces that are to be coated shall be cleaned by means of blowing down with clean compressed air followed by final vacuum cleaning in order to remove all residual dust and spent abrasive. The location of the test is to the discretion of the Superintendent. The tests shall return a Rating 1 or better for dust sizes 3, 4, 5. 2 tests per work lot	-	-	-
Flash Rusting	NACE/SSPC Joint Surface Preparation Standard “Waterjet Cleaning of Metals—Very Thorough Cleaning (WJ-2)”	-	Immediately prior to application of the first coat in the specified system, the degree of flash rusting shall not exceed Light (L) flash rusting as described in NACE-SSPC WJ-2. The degree of flash rusting shall be assessed as per Appendix B of the same standard.		-

Surface Preparation	General Notes	Surface Preparation Acceptance Criteria			
		Dry Abrasive Blasting Cleaning	Wet Abrasive Blast Cleaning	Ultra-High Pressure Waterjetting (UHPWJ)	Power Tool Cleaning
Concrete Surfaces	Concrete surfaces that show contamination by hydrocarbons such as oil, grease, form oils etc. should be prepared by cleaning with a biodegradable oil-emulsifying degreasing solution. Cleaning solutions shall be fully removed as part of the surface preparation procedures prior to coating. Dry surface preparation methods that leave the surface roughened and with a profile are preferred to methods that only clean the surface and float finished concrete must have the surface roughened before coating. All “laitance”, dust, contamination and any part of the concrete surface that is weak or friable should be removed.at cannot support or adhere to the coating system.	As it is low in dust, the preferred method of surface preparation for concrete elements is by fully enclosed "Blast Track" cleaning. The Blast Track unit uses steel shot or steel grit as the abrasive media and vacuum recovery to collect the abrasive. Edges, corners and areas not accessible to the blast track unit should be prepared by hand scabbling, machine grinding or by any other surface preparation method approved by the coating manufacturer to achieve a suitable level of surface preparation for coating adhesion. Where a Blast Track unit can’t be used, a Rotational Head Diamond Grinding unit can be employed. Dry abrasive blasting or “brush blasting” is generally used to prepare concrete surfaces when Blast Track or Diamond Grinding methods cannot be used. It is suitable for both external concrete surfaces, i.e. chemical bund areas, and also for indoor floor or wall surface preparation provided the spent abrasive is captured and contained and produced abrasive and concrete dusts are extracted outside the work area. Surfaces to be coated should be dry abrasive blast cleaned to remove surface laitance and impart a surface profile as per the coating manufacturer’s minimum requirements for the specified coating system.	High pressure water cleaning (34–70 MPa) is suitable for the preparation of concrete surfaces where the coating system will tolerate a lower surface profile and where the surface preparation is only concerned with removal of unbound cement fines, laitance and when it is used to open up ‘bug holes’ in the surface of off-form concrete. High pressure waterjetting (70–170MPa) and ultra-high pressure waterjetting (>170MPa) can remove old coatings, all contamination and expose concrete aggregates. If “wet” methods such as water cleaning and jetting are used, the surface must be allowed to dry so that the moisture content is in the range from 3% to 8% before the primer or coating system is applied.		Areas of the concrete surface that cannot be accessed by the blasting nozzle should be prepared by hand scabbling, machine grinding or any other surface preparation method approved by the coating manufacturer, to achieve a suitable level of surface preparation for coating adhesion.-
Sharpening of Bristles	-	-	-	-	Assess surface profile visually and with a profile comparator every 10 minutes. Sharpen regularly or replace the bristle belt to maintain the level of cleanliness and surface profile.

11.4.7 APPLICATION PROCEDURE

SKILL OF LABOUR

All aspects of the coating application work shall be conducted by qualified, experienced and adequately supervised applicators. The operator(s) in charge of surface preparation and coating application shall have formal inspection or supervision qualifications.

AVAILABILITY OF RELEVANT DOCUMENTATION

The coating contractor shall ensure that copies of all relevant PTDS, application guidelines, MSDS's and a copy of this specification are immediately available to the operator(s) responsible for surface preparation and application of the specified coating system.

MIXING, THINNING, CURING AND RECOATING

Before use of any coating material, reference shall be made to the PTDS for details regarding mixing, thinning, induction times, application, curing and re-coating. The instructions outlined in the datasheets shall be adhered to.

Note: Varying substrate temperature and/or relative humidity will affect the minimum and maximum recoat times (refer to the PTDS).

Deviation from guidelines and parameters outlined in the PTDS is not permissible without prior written approval from the coating manufacturer.

VENTILATION

The contractor shall ensure that clean dry air is continuously flowing in the work area during surface preparation, cleaning, application and curing of the coating system. This may require the installation of forced ventilation equipment. Sufficient air flow within the work area shall be maintained from completion of surface preparation to a minimum of two days after application of the last coat in the system. Natural airflow or the capacity of the ventilation equipment shall be such that a maximum of 10% of LEL is not exceeded within the work area.

CONTRASTING COLOURS

All applied full coats and stripe coats shall be in contrast with each other.

Each coat in the coating system shall be of a significantly different colour than the previously applied coat in order to enable the applicator to establish whether the coated surface has been adequately and evenly covered.

Each successive application of the same material shall also be carried out with contrasting colours in cases where the dry film thickness of a coat in the specified system is to be achieved in multiple applications (e.g. when materials are is applied by brush and roller rather than by spray).

The colour of the first coat shall be in a colour that is in contrast with the cleaned substrate.

STRIPE COATING

Either before or after application of each full coat, all welds, edges, voids, joints, pits and corners shall be stripe coated by brush. The material used for stripe coating shall be the same as the material used for the preceding coat (stripe coating after full coat) or successive full coat (stripe coating prior to full coat). The contractor must ensure that the stripe coat fully covers the critical areas, particularly the depressions in welds, pits and corners. In order to verify this and for ease of inspection, the material for the stripe coat shall be contrasting to the colour of the full coat.

Minimum and maximum recoat times shall be observed between all coats.

SEALING OF CREVICES

A minimum of 12 hours and a maximum of 48 hours after application of the last coat in the specified system, all crevices between mating surfaces of bolted connections shall be sealed with a continuous bead of a recoatable polyurethane sealant such as Sikaflex 11FC or approved equivalent. Once the sealant has cured, a single coat of the specified topcoat shall be applied to fully cover the sealant.

PROCESS CONTROL

The Dry Film Thickness (DFT) of each coat shall be measured as per AS 3894.3 Method B and all areas where measurements have been obtained outside acceptable thickness parameters be marked for repair.

When inspecting their own work for compliance, the contractor shall take a sufficient number of DFT readings to ensure that all areas comply with the DFT requirements of the Specification.

Surfaces where the film thickness exceeds the maximum permissible DFT after a single application shall be sanded back.

Areas where the DFT is insufficient and other areas marked for repair (insufficient coverage, poor film formation, sanded areas, porosity or other discontinuities) shall receive an additional application of the material that was used for the preceding full coat in order to rectify the imperfections.

Any contamination, including dry spray, dust and inclusions, which occurs on the substrate prior to coating application, shall be removed. The contractor shall prevent contamination from boots, clothing, hoses or other equipment from entering the designated work lot area.

FINAL DRY FILM THICKNESS ACCEPTANCE CRITERIA

Dry Film Thickness (DFT) shall be measured in accordance with the following guidelines after application and cure of the last coat of epoxy in the specified system. In order for the contractor to ensure that the acceptance criteria are met, it is anticipated that the contractor will require considerably more rigorous checks in order to find non-conforming areas and have them repaired prior to invitation of other parties for acceptance of the work. Measurement and acceptance criteria for the structural steel components shall conform to the 80/20 rule as outlined below:

- Three gauge readings per square metre (m^2) of flat surface areas;
- Five gauge readings per square metre (m^2) but not less than three gauge readings taken at complex areas (i.e. flanges, pipe stubs, brackets, stiffeners and cleats);
- Additional spot checks are to be taken to verify coating thickness for any area considered necessary by the person inspecting the work;

- After application of the final coat, at least 80% of all thickness measurements shall by greater than, or equal to the specified DFT and none of the remaining 20% shall be below 0.8 x the specified DFT;
- Each single gauge reading shall be within a lower threshold of 80% of the specified total DFT whilst the upper threshold of the total DFT is as outlined by the coating manufacturer;
- For those readings outside the specified tolerances, corrective action will be necessary;
- Dry film thickness gauges shall be calibrated in accordance with the instrument manufacturer's recommendation using pre-calibrated shims or thickness standards prior to any batch readings;
- Any single gauge or triangular reading exceeding the maximum specified film thickness shall be reviewed by the contractor and the Owner's Engineer to determine the cause of the over thickness (i.e. rework area, stripe coating, multiple coats etc.). If the contractor and the Owner's Engineer disagree on the acceptance of the excessive thickness, the coating manufacturer must be contacted for further guidance;
- In order to correctly verify the value of potentially contestable individual thickness readings, each such reading must return a repeatable value. If a reading outside the above mentioned minimum and maximum tolerances cannot be repeated, it shall be discarded from the measurement records or noted as such in the quality records in accordance with Clause 11.6; and
- The average of all DFT readings shall exceed the specified nominal dry film thickness.

SURFACE FINISH

The aesthetic finish of the coated surfaces shall be free from excessive runs, sags, bubbling and other obvious imperfections. The finish shall furthermore be free from any inclusions (such as grit, dirt, dust and insects) as well as pinholes and blisters. Any such imperfections shall be repaired as per coating manufacturer's directions and to the satisfaction of the Owner's Engineer. A small degree of orange peeling, shallow brush marks, small localised runs, a slight rippling texture and a minimum of dry spray may be tolerated in the finish in complex areas only.

PREVENTION OF DAMAGE TO FINISHED PRODUCT

Special care shall be taken to avoid damage to coating systems during movements of access equipment/containment structures.

Any damage to the coating system shall be repaired as outlined in Clause 11.5.

11.5 REPAIRS

The purpose of a repair procedure is to ensure that any damage that has occurred to the coating is repaired in an appropriate, correct and systematic way, this is to ensure that:

- The integrity of the coating system is assured.
- The specified film thickness is achieved in all areas, including repaired areas.
- The performance of the coating system as a whole is not compromised.
- The repairs are endorsed by the coating manufacturer of the applied system subject to repairs.

The following repair procedure should be applied at all locations where damage has occurred:

1. The area of steel that requires coating repairs shall be dry and free from dirt, dust, oil and grease and loose and flaking paint or any other contamination that may compromise the performance of the coating system. If any such contaminants are present, they should be removed in the same manner as outlined for newly prepared surfaces.

2. Where the damage has penetrated to the substrate, the area immediately surrounding the penetration and exposed steel shall be power-tool cleaned to visually resemble AS 1627.9 Sa2½. This can be achieved with the use of a "Monti MBX Bristle Blaster".

3. Only if the total damaged area exceeds 0.5% of the total surface area of the work lot shall the damaged surfaces be wet or dry abrasive blast cleaned to AS 1627.9 Sa2½ with a surface profile as per the original specification. Abrasive blast cleaning of damaged areas shall only be conducted in a stop-start manner to ensure no over-blast damage is done to the intact coating. Masking of intact coating to prevent over-blast damage may be necessary.

4. Edges of the sound coating adjacent to the bare metal, cleaned surfaces shall be feathered back to a sound surface and roughened over a distance of 15mm from the edge of the bare metal. This may be achieved with a disc grinder, flapper wheel, flexible sanding disc, an MBX Bristle Blaster or abrasive spot blasting. No loose or flaking paint shall remain around the damaged area. Care shall be taken that any exposed bare metal is not burnished or polished. All bare metal and surrounding feathered edges shall have a visibly profiled surface. All residual dust and debris shall be removed with clean and dry compressed air or by wiping with a solvent soaked rag. The solvent to be used shall be the same as the thinning solvent for the first coat that is to be applied.

5. Localised touch-up repairs shall generally be conducted by brush, roller or spray, depending on the size and extent of repairs that are required and the location of the structure requiring repair are situated. The coating repair normally aims to reinstate the originally applied system and the original specification is therefore applicable to repairs as well. The first spot coat shall be applied by brush and completely cover the exposed metal substrate whilst overlapping onto the surrounding feathered edge of the existing coating by at least 25mm.

6. The total DFT of repaired areas shall comply with the specified film thickness. Depending on the required DFT and the application method, it may be necessary to apply multiple coats to achieve the total required film build. Each coat shall be allowed to cure in accordance with the minimum recoat times outlined in the coating manufacturer's datasheet.

7. All repairs shall be documented in the contractor's quality documentation and attached to the original inspection reports applicable to the work lot in which the damage has occurred.

11.6 QUALITY CONTROL AND QUALITY ASSURANCE

11.6.1 GENERAL REQUIREMENTS

All aspects of the protective coating work under the contract shall be adequately inspected and documented. This responsibility lies primarily with the contractor, and the contractor is therefore required to critically inspect and test their own work for compliance with the specification.

Only (independently) verified documentation of as-constructed details, relevant correspondence, test reports and inspection details can provide evidence that the works comply with the specification and the MWPA Project Coordinator or the Owner's Engineer reserve the right to witness, audit or duplicate any inspection or testing that is carried out by the contractor.

The absence of the MWPA Project Coordinator or the Owner's Engineer does not absolve the contractor from carrying out the tasks and the required quality inspection and documentation in accordance with the specification.

All coating contractors should be accredited to the Painting Contractor Certification Program (PCCP).

11.6.2 INSPECTION AND TESTING PLAN

The contractor shall prepare an Inspection and Testing Plan (ITP) that reflects how each individual task is to be inspected and tested and how the results are to be documented. The ITP shall include:

- Each aspect of the work that shall be inspected and tested as per the requirements of the specification;
- Party responsible for inspection or test;
- Method of test and relevant test standard;
- Timing of test and test frequency;
- Acceptance criteria for inspection or test;
- Nomination of the document in which the test result is to be recorded; and
- Name of person conducting inspection or test.

The ITP shall nominate the following minimum hold and witness points:

- Upon receipt of fabricated steel work to check for all surface defects, including cracks, laminations, deep pitting, weld spatter, slag, burrs, fins, sharp edges, coarse welds, porosity, undercuts, weld roughness and other defects. These shall be removed prior to the preparation of the surface to be coated;
- Carry out a visual surface check for oil and other contamination and degreasing as necessary prior to surface preparation;
- Confirm residual soluble salt concentration prior to first coat, i.e. less than 50mg/m^2;
- Confirm climatic conditions are acceptable, i.e. less than 85% relative humidity and dew point great 3^oC;
- Continuity (Pin Hole) testing for immersed surfaces without cathodic protection;
- After surface preparation as required in the specification;
- After the application of each coat of paint to determine thickness, quality and any repairs needed;
- Prior to handover of the coated items to record the visual condition of coatings at handover.

The ITP shall be submitted to the Owner's Engineer for approval prior to commencement of the works.

11.6.3 IDENTIFICATION AND TRACEABILITY

All protective coating work shall be subdivided into distinct work lots. Each work lot and item to be treated shall be assigned a unique identification number, and the contractor shall maintain a register of all allocated work lot numbers and the item numbers that are contained in each work lot.

The contractor shall follow the approved ITP's for each work lot based on the various tasks to be conducted.

The contractor shall ensure that traceability is maintained throughout all documented records under this contract. All test results where applicable under this contract shall be positively identified with their respective work lot number.

11.6.4 COMPLIANCE INSPECTIONS AND TESTING

All work under this contract shall be inspected and documented by the contractor to ensure compliance with the specification. For this purpose, the coating contractor shall subdivide all areas to be treated into distinct work lots or work items (refer clause 11.4, paragraph 2).

All compliance inspections and tests shall be based on work lots. The costs for all such inspections, tests and documentation shall be borne by the contractor and shall be allowed for in any submitted tender. The contractor shall document all equipment used in the project and all inspection and testing results in a Coating Inspection Report. The documentation may be the contractor's own standard QA documentation design but shall satisfy the requirements of AS 3894 Parts 10 to 14, as a minimum, and accommodate the documentation of all items listed in the approved ITP.

The contractor shall nominate a QA/QC representative. The QA/QC representative shall have current qualifications recognized by ACA, NACE, FROSIO or SSPC. The QA/QC representative's qualifications and experience shall meet the requirements of IMO PSPC.

The contractor shall conduct sufficient inspection and testing work (and subsequent repair work where necessary) in order to satisfy that each work lot complies with the specification. The contractor shall ensure that all aspects of the specification have been met prior to notifying the Owner's Engineer or any other QA/QC auditors to test and verify that the work conforms to the specification.

The contractor shall supply a complete set of QA records during handover of the works.

The QA record shall contain, as a minimum:

- All completed Coating Inspection Reports (refer to AS 3894 Part 10 to 14);
- All non-compliance reports;
- All records of corrective action (may be recorded in "Coating Inspection Report" or on "Non-Compliance Report" as appropriate);
- Any correspondence related to the works conducted in each individual work lot.

11.6.5 THIRD PARTY (INDEPENDENT) INSPECTION

The contractor shall advise the inspector in sufficient time to enable attendance at the work site without causing unnecessary delay or hindrance to the progress of work.

11.7 PREMATURE DETERIORATION

Warranty claims may be lodged with the contractor if an assessment of the coating condition shows that any of the following breakdown mechanisms has occurred prior to expiration of the warranty period.

- More than one to two percent of the total coated surface shows corrosion greater than Ri 2 as outlined in ISO 4628-3;
- Checking exceeds size 3 and density 2 as per AS 1580.481.1.7;
- Cracking exceeds size 3 and density 2 as per AS 1580.481.1.8;
- Blistering exceeds size 4 and density 2 as per AS 1580.481.1.9; and
- Faking and peeling exceeds Rating 2 as per AS 1580.481.1.10.

11.8 MAINTENANCE COATING SPECIFICATION

The contractor shall provide a detailed maintenance regime (including maintenance specification) for all coating maintenance work likely to be required over the asset service life.

The maintenance specification shall include the materials for all systems supplied to the contractor. The maintenance specification shall accompany the coating manufacturer's endorsement (refer the Fit for Purpose Statement as per clause 11.9).

The contractor shall make two (2) hard copies and one (1) electronic copy of the coating manufacturer's Fit for Purpose Statement and the maintenance specification available to the Owner's Engineer.

11.9 FIT FOR PURPOSE

The contractor shall obtain from the coating manufacturer written confirmation that the coating systems they nominate are fit for the intended purpose (to offer corrosion protection for the agreed period of years in operating conditions that prevail as listed in Chapter 7.0).

If the coating manufacturer is of the opinion that the specification is incorrect, incomplete or unsuitable for its intended purpose, or that additional work procedures are required, or that procedures or practices as outlined in the Specification are not complete, correct or appropriate, the coating manufacturer shall confirm this in his statement and include the required variations and corrections deemed necessary.

12 GUIDELINE TO INSPECTORS

The required acceptance inspection and testing remains essentially the same for factory (shop and yard) and site applied coatings.

12.1 AUTHORITY OF THE INSPECTOR

The Inspector shall conduct all aspects of their work in accordance with the NACE code of professional conduct.

The Inspector shall be the sole judge of whether compliance with the specification, relevant International Standards or good painting practices in general is being adhered to. Issues of non-compliance shall be addressed with the contractor upon detection. The coating contractor shall be given an opportunity to conduct rework within twenty four (24) hours in order to meet the specified criteria.

The Inspector shall immediately notify the MWPA Project Coordinator or the Owner's Engineer of any non-conformance issues and keep the MWPA Project Coordinator or the Owner's Engineer informed of the progress of rectification work. If rectification of the detected non-compliance is not carried out to the satisfaction of the Inspector, MWPA Project Coordinator or the Owner's Engineer, the Inspector shall submit a written non-conformance report to the MWPA Project Coordinator or the Owner's Engineer and the contractor.

In case of doubt about any aspects of the contractor's work, or in the absence of relevant guidance in the Specification, the Inspector shall nominate a suitable International Standard in consultation with the MWPA Project Coordinator or the Owner's Engineer, the coating manufacturer and the contractor in order to create clarity on any such matters.

The contractor shall provide the MWPA Project Coordinator or the Owner's Engineer and the Inspector with safe access to all treated areas and all QA/QC documentation at any time for the duration of the project.

No party conducting inspections or audits shall produce non-conformance reports without notifying the contractor that a non-conformance has been detected.

12.1.1 EXCLUSIONS

The Inspector shall not undertake the following roles or activities:

- Make changes to the scope of work or specification without written consent of the MWPA Project Coordinator or the Owner's Engineer and the coating manufacturer.
- Give instructions to the applicator to perform works outside of the Specification or the scope of work.
- Tell the applicator how to do their job. The Inspector's role is to point out requirements the applicator achieve in order to meet the Specification.
- Report non-conformances to the MWPA Project Coordinator or the Owner's Engineer or the coating manufacturer without notifying the applicator that a non-conformance has been detected.

12.2 INSPECTION OF SUBSTRATE AND COATINGS

Inspection of the substrate, coated areas and items shall include but not be limited to the following:

- Standard of surface preparation achieved to AS 1627.9;
- Surface profile tests to AS/NZS 3894.5 Method A;
- Surface contaminant tests to AS/NZS 3894.6 Method C;
- Coating thickness tests (DFT) to AS 3894.3;
- Tests for cure of coatings to AS 3894.4; and,
- 100% surface area testing of intermittently, or permanently immersed, coated surface not protected by CP, by continuity testing to AS 3894.2 or the Coating Manufacturer's written recommendation for test voltage.

The results of all paint coating tests shall be recorded on an approved Coating Inspection Report. This documentation may be the coating contractor's own standard QA documentation template but shall satisfy the requirements of AS 3894 Part 10 to 14, (and be modified to suit treatment of concrete substrates or other specific project requirements) as a minimum and accommodate the documentation of all items listed in the approved ITP.

All equipment to be used for inspection purposes shall be calibrated in accordance with equipment manufacturer's instruction and the relevant Australian or International Standards.

12.3 CONTRACTOR'S ITP

The contractor shall prepare and submit an ITP for the coating systems specified as per clause 11.6.2. The MWPA Project Coordinator or the Owner's Engineer shall approve the ITP before any work is commenced.

12.4 MAINTENANCE OF INSPECTION RECORDS

The contractor shall maintain proper records as required by the Specification in accordance with Australian Standard AS 3894 Parts 10, 11, 12, 13 and 14 and any additional records as required by the MWPA Project Coordinator or the Owner's Engineer. Such records shall be available for inspection at any time by the MWPA Project Coordinator or the Owner's Engineer and become the property of the MWPA Project Coordinator upon completion of the contractor's contract.

13 DOCUMENTS TO BE SUBMITTED

13.1 GENERAL

The contractor shall submit all coating information to the MWPA Project Coordinator or the Owner's Engineer for approval prior to the commencement of work.

Examples of typically required tender and project documentation are listed below and shall include as a minimum: a description of the proposed paint system and materials, manufacturer's data, application, drying, over-coating times and any other information necessary for the MWPA Project Coordinator or the Owner's Engineer to properly assess the proposed coating system. Documentation covering the work procedures, inspection, tests, methods of surface preparation, coating materials and their application on the project shall also be provided.

13.1.1 TENDER DOCUMENTS

- Scope of work
- Nominated Surface Preparation Method
- Nominate selected approved coating supplier and materials
- Product Technical Data Sheets (PTDS) for proposed coating materials
- Cathodic Protection confirmation re coating materials – if applicable
- MSDS for approved coating materials
- PCCP Certification Certificate
- Insurance (where applicable)
- Environmental Operating Licence, if applicable
- Approved Coating Inspector
- Evidence of Quality Assurance System conforming to ISO 9000

13.1.2 PROJECT DOCUMENTS

- Updated scope of work
- Safe Work Method Statement (SWMS) details of Work Method, Containment Process and Environmental Controls
- Site Health and Safety Plan
- Coating Inspection Report Form
- ITP (Inspection and Test Plan) for review
- Work lot identification
- Copy Daily Work Report
- List of inspection instruments and equipment
- Guarantee Format for evaluation

Note: The above list is a guide only and not necessarily complete.

13.2 SAFE WORK METHOD STATEMENT (SWMS)

The following is an example of the content that may be included in a project SWMS:

1.0 Introduction

2.0 Scope of QA/QC

3.0 Site Organization Structure

4.0 Tender and Contract Review

5.0 Production Procedures

5.1 Project planning meeting

5.2 Mobilization

5.3 Operation and surface preparation equipment

5.4 Operation of spray equipment

5.5 Weather conditions

5.6 Workmanship

5.7 Scope of work

5.8 Surface preparation

5.9 Coating materials (thickness control)

5.10 Handling, storage and transportation

6.0 Site Q/C procedures

6.1 General

6.2 Site preparation

6.3 Raw materials incoming inspection

7.0 General disputes procedures

8.0 OH & S

9.0 Environmental consideration

Appendix

Daily Work Report

Non-Conformance Report (NCR)

Inspection and Test Plan (ITP)

13.3 GUARANTEE

A guarantee shall be provided by the contractor for the protective coating works and shall be endorsed by the coating manufacturer for an agreed period. The coating manufacturer shall be given every opportunity by the contractor to inspect the work so that the guarantee is unconditional. The contractor in turn shall provide the coating manufacturer, confirmation that the application was in conformance to the specification and the manufacturers written instructions.

13.4 PERFORMANCE WARRANTY

The contractor shall warrant that the coating work and applied coating systems meet the requirements of the specification and the applicable standards, codes and regulations.

The coating system shall fully protect the nominated assets from corrosion for an agreed period from the handover date.

The contractor shall remain responsible for the rectification of any part of the work, which does not achieve the agreed service life.

The coating manufacturer and the contractor shall guarantee that, at the end of the above mentioned period, the corrosion protection system shall not have deteriorated beyond the condition outlined in Clause 11.7.

13.5 OPERATIONS AND MAINTENANCE MANUAL

The contractor must prepare a detailed manual of all operational and maintenance procedures relating the works.

The manual must include, but not be limited to, the following where appropriate:

- Procedures for periodic inspection of the coated work;
- Testing procedures and acceptance criteria;
- Detailed operations and maintenance instructions and/or procedures;
- Test certificates, materials and performance documentation;
- Instructions for access, dismantling and reassembly of all items;
- Preventative maintenance procedures;
- Repair procedures; and
- Inclusion of relevant coating details that may be entered into MWPA's asset register and asset database.

The manuals shall include coating manufacturer's instructions, MSDS, PTDS, painting procedures and certificates for all coatings applied as part of the works. In addition, drawings and specifications prepared in the course of the Contract shall be included.

APPENDIX A

COATING SYSTEMS GUIDE

ITEM A1 - INTRODUCTION

Due to the inadequacies of AS 2312 with respect to a number of exposure conditions and to ensure a uniform and consistent approach to coating system selection, this guideline contains generic coating system descriptions for each area of application.

For wet applied protective coating systems, the generic coating system description consists of a material designation and a dry film thickness indication.

The contractor shall submit a coating system produced by their preferred manufacturer for approval. Regardless of the selected manufacturer, the submitted system shall comply with the generic description including the required material properties as outlined in **Table 9** and the film thickness criteria outlined in **Table 11**.

ITEM A2 - MATERIAL DESIGNATION

The generic description of the typical coating materials used in industrial coating systems are based on the abbreviations in **Table 9**.

Table 9: Guideline for Selection and Specification of Coating Materials for Marine and Industrial Exposure

Material Designation	Description	Required Properties	Compliant Product Examples[1]
HDG	Hot Dip Galvanising	To AS 4860 at > 600g/m^2.	N/A
IOZ	Inorganic Zinc Silicate	Solvent or waterborne approved for slip coefficient for application to High Strength Friction Grip Connections.	International PC Interzinc 2277 Jotun Resist 78
LVEP	Low Viscosity Epoxy Primer	100% volume solids low viscosity penetrating epoxy primer, predominantly formulated as a primer for concrete surfaces.	International PC Ceilcote 680 Primer Altex Carboline Carboguard 1340 Epigen 0402
TEPM	Trowelable Epoxy Mortar	100% volume solids epoxy resin mixed (in factory or on site) with a mineral aggregate to form a mortar that can be applied by trowel.	BASF MasterProtect 105CR
EPGF	Glass Flake Reinforced Epoxy	Minimum volume solids (VS) of 85%, minimum Glass content of 10%. Resistant to cathodic disbonding as per ISO 15711.	International PC Interzone 1000 Jotun Marathon Dulux Duremax GFX

Material Designation	Description	Required Properties	Compliant Product Examples[1]
EPMIO	Micaceous Iron Oxide pigmented epoxy	Minimum volume solids (VS) of 75%, minimum sum Micaceous Iron Oxide (MIO) content of 40%, minimum Aluminium content of 5% (may vary with colour). Also suitable for direct to metal application and to suitably roughened galvanised surfaces. Suitable for immersion when applied to carbon steel.	International PC Interplus 1180 MIO Jotun Jotacote 605 MIO Dulux Duremax GPE MIO
EPZ	Zinc Epoxy	Zinc dust pigment compliant with ISO 3549, minimum content of 85% determined as per ASTM 2371-85.	International PC Interzinc 315 Jotun Barrier Dulux Zincanode 202
SFPE	Phenolic Epoxy	Solvent Free Phenolic Epoxy (Novolac) resistant to crude oil, HFO and MFO up to 80°C as well as marine diesel at ambient temperatures. Product shall have NORSOK M-501 REV 6, SYSTEM 7 A, B, C approval.	International PC Enviroline 290 PPG Sigma Novaguard 890
ACR/PU	2 pack acrylic or polyurethane	Indefinitely recoatable*, lead free pigments.	International PC Interfine 629/Interthane 990 Jotun Hardtop Ultra Dulux Acrathane IF/Luxathane R
EPSt	Surface tolerant epoxy	Minimum leafing aluminium content of 8%, also suitable for application to suitably roughened galvanised surfaces.	International PC Interplus 356 Jotun Jotamastic 90 AL Dulux Durebild STE
FR	Silicone based fouling release coating	Biocide-free fouling release coating based on silicon resin incorporating a hydrogel.	International PC Intersleek 757 Jotun SeaGuardian
TIE	Tie coat	Intermediate coat facilitating adequate adhesion between epoxy anti-corrosive system and silicon based fouling release coating.	International PC Intersleek 731 Jotun Safeguard Universal ES

Material Designation	Description	Required Properties	Compliant Product Examples[1]
EP PWC	Potable Water Certified Epoxy	Solvent free, certified to AS 4020, ANSI/NSF 61.	International PC Interline 975 Jotun Tankguard 412
ALU	Aluminium	Marine grade structural aluminium alloy.	N/A
GRP	Glass Fibre Reinforced Polymer	UV stabilised. Provide minimum service life of 40 years to first maintenance.	N/A
OEM	Original Equipment Manufacturer's corrosion protection system	Provide minimum service life of 15 years to first maintenance.	N/A

Note: Other products will be considered by MWPA subject to the supplier/applicator proving compliance.

ITEM A3 - DRY FILM THICKNESS, MASS OR SERVICE LIFE INDICATION

Depending on the type of coating material or system, each material will be applied at a specified thickness, or nominated service life, for the prevailing exposure conditions.

Wet applied coating materials are specified at the required dry film thickness (DFT) in microns (µm), Hot Dip Galvanising (HDG) is specified at a mass deposition rate in grams per square metre (g/m^2), and corrosion protection systems applied by the Original Equipment Manufacturer (OEM) are specified at the required service life to first major maintenance in years.

Table 10 shows typical examples of how coating materials and dry film thickness are combined to show the required coating system to be applied, and nominated coating thickness values are based on the assumption that each coat is applied by spray. If the nominated dry film thickness for each coat is not achieved in a single application, additional applications should be applied to ensure that the specified film thickness for each coat is achieved. Note however that the dry film thickness may vary depending on the system and its application.

A guideline for the recommended coating systems and final topcoat colour for MWPA assets is given in **Table 11**.

Table 10: Explanation of Coating System Designation

Coating Designation	Description	Minimum Dry Film Thickness (DFT)
HDG 600	Hot dip galvanising to 600 g/m^2 (600g/m^2 ≈ 85 µm).	600 g/m^2 ≈ 85 µm
IOZ 60 + EPMIO 200	One full coat of inorganic zinc silicate at 60 µm DFT plus one full coat of MIO pigmented epoxy at 200 µm DFT.	260 µm
EPGF400 + TIE 50 + FR 100	One full coat of glass flake reinforced Epoxy at 400 µm DFT plus one full coat of tie coat at 50 µm DFT plus one full coat of silicon based fouling release coating at 100 µm DFT.	550 µm
LVEP 25 + TEPM 2000 + EP PWC 400	One full coat of low viscosity penetrating epoxy primer plus one full coat of trowelable epoxy mortar at 2000µm DFT plus one full coat of potable water certified epoxy at 400µm DFT.	2400 µm

Table 11: Guideline for Protective Coating Systems for MWPA's Steel and Reinforced Concrete Assets

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour Note 2	Coating System Designation
BERTH STRUCTURES			
Berth Structures	**Above Deck**		
Deck	Reinforced concrete	-	-
Kerb	Reinforced concrete	Y14 Golden Yellow	ACR/PU 75
Fenders	Steel/Rubber/Proprietary Fender Systems	N35 Light Grey	EPGF 500 + EPGF 500
Bollards	Steel	N35 Light Grey	EPGF 500 + ACR/PU 75
Capstans	Steel	N35 Light Grey	EPGF 500 + ACR/PU 75
Access ladders	Steel	Y14 Golden Yellow	EPGF 500 + ACR/PU 75
Berth Structures	**Below Deck**		
Headstocks	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Piles[1]	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Sub-structure	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Mooring piles	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Dolphins	Steel	N35 Light Grey	EPGF 500 + EPGF 500

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
TUG BOAT JETTY			
Tug Boat Jetty	**Above Deck**		
Walkway	HDG steel gridmesh	-	HDG 600
Handrails / kickplates	HDG steel	Y14 Golden Yellow	HDG 600 + EPSt 125 + ACR/PU 75
Deck	HDG steel gridmesh	-	HDG 600
Fenders	Steel/Timber/Rubber Proprietary Fender System	N35 Light Grey	EPGF 500 + EPGF 500
Bollards	Steel	N35 Light Grey	EPGF 500 + ACR/PU 75
Access ladders	Steel/GRP/Marine grade stainless steel	Y14 Golden Yellow	EPGF 500 + ACR/PU 75
Tug Boat Jetty	**Below Deck**		
Substructure	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Piles1	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Mooring Piles	Steel	N35 Light Grey	EPGF 500 + EPGF 500
PILOT BOAT JETTY			
Pilot Boat Jetty	**Above Deck**		
Deck	Timber	-	-
Pilot Boat Jetty	**Below Deck**		
Substructure	Timber	-	-
Piles	Timber/Concrete jackets	-	-
ACCESS STRUCTURES			
Access Structures	**Atmospheric**		
Gangways/ Brows	Aluminium/proprietary access equipment	-	-
Pedestrian overpass	HDG steel gridmesh	-	HDG 600
Walkways	HDG steel gridmesh	-	HDG 600
Handrails/kickplates	HDG steel	Y14 Golden Yellow	HDG 600 + EPSt 125 + ACR/PU 75

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
Stairs/Landings	HDG steel gridmesh/GRP gridmesh	-	HDG 600
Ladders	HDG Steel/GRP	Y14 Golden Yellow	HDG 600 + EPSt 125 + ACR/PU 75
Access Structures	**Immersed**		
Ladders	Steel/GRP/Marine grade stainless steel	Y14 Golden Yellow	EPGF 400 + ACR/PU 100
NAVIGATION AIDS			
Navigation Aids	**Above waterline**		
Beacons/Buoys	Steel	Signal Red (Port) Emerald Green (Starboard) Leads (N14 White)	EPGF 400 + ACR/PU 100
Navigation Aids	**Below waterline**		
Beacons/Buoys	Steel	-	EPGF400 + TIE 50 + FR 100
BUILDING STRUCTURES			
Building Structures	**Internal**		
Structural elements	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Building Structures	**External**		
Structural elements	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + ACR/PU 75
Cladding (roof and wall)	Bluescope proprietary coating system: steel/ zincalume with thin film coating (25 µm) i.e. Colorbond®/Colorbond Ultra® (0.48 BMT)	Wilderness®	Major Maintenance: EPSt 125 + ACR/PU 75

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
MATERIALS HANDLING GENERAL			
Materials Handling General	**Atmospheric with potential for microclimates where product deposition**		
Ancillary Equipment	Steel	N35 Light Grey/X15 Orange	OEM Major Maintenance: EPZ 75 + EPMIO 200 + EPMIO 200
Conveyor Structure	Steel	N35 Light Grey	OEM Major Maintenance: EPZ 75 + EPMIO 200 + EPMIO 200
Conveyor Guard (protection etc.)	Steel	Y14 Golden Yellow	OEM Major Maintenance: EPZ 75 + EPMIO 200 + ACR/PU 75
Feeder general assembly	Steel	N35 Light Grey/X15 Orange	OEM Major Maintenance: EPZ 75 + EPMIO 200 + EPMIO 200
Hoppers	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Cable Trays	HDG Steel/Aluminium	X15 Orange	OEM Major Maintenance: replace or EPSt 125 + ACR/PU 75
Materials Handling General	**External**		
Dust Extraction Equipment	Steel	B15 Mid Blue	EPZ 75 + EPMIO 200 + ACR/PU 75
Materials Handling General	**Internal**		
Dust Extraction Equipment	Steel	-	EPGF 400

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
TRAIN UNLOADER			
Train Unloader	**Atmospheric**		
Building cladding	Bluescope proprietary coating system: steel/zincalume with thin film coating (25 µm) i.e. Colorbond®/Colorbond Ultra® (0.48 BMT)	Wilderness®	Major Maintenance: EPSt 125 + ACR/PU 75
Building superstructure	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Train Unloader	**Below ground atmospheric with microclimate (product deposition)**		
Tunnel	Reinforced concrete	-	-
Conveyor Structure	Steel	N35 Light Grey	OEM Major Maintenance: EPZ 75 + EPMIO 200 + EPMIO 200
Conveyor Guard (protection etc.)	Steel	Y14 Golden Yellow	OEM Major Maintenance: EPZ 75 + EPMIO 200 + ACR/PU 75
Unloader vault structure	Reinforced concrete	-	-
Unloading/feeding equipment/motors	Steel	N35 Light Grey/X15 Orange	OEM Major Maintenance: EPZ 75 + EPMIO 200 + EPMIO 200
TOWERS - TAKE-UP AND TRANSFER			
Towers - Take-up and Transfer	**Atmospheric with microclimate (product deposition)**		
Cladding enclosure Structure - General	Bluescope proprietary coating system: steel/zincalume with thin film coating (25 µm) i.e. Colorbond®/Colorbond Ultra® (0.48 BMT)	Wilderness®	Major Maintenance: EPSt 125 + ACR/PU 75

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
Structural framework (primary and secondary)	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Motors	Steel	X15 Orange	OEM Major Maintenance: EPSt 125 + ACR/PU 75
CONVEYORS			
Conveyors	**Atmospheric with microclimate (product deposition)**		
Cladding (roof and wall)	Bluescope proprietary coating system: steel/zincalume with thin film coating (25 µm) i.e. Colorbond®/Colorbond Ultra® (0.48 BMT)	Wilderness®	Major Maintenance: EPSt 125 + ACR/PU 75
Superstructure framework	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Substructure (primary and secondary)	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
SHIPLOADERS			
Shiploaders	**Atmospheric with microclimate (product deposition)**		
Structural steelwork (primary and secondary)	Steel	N35 Light grey	EPZ 75 + EPMIO 250 + ACR/PU 75
Dust Extractor Assemblies	Steel	B15 Mid Blue	EPZ 75 + EPMIO 200 + ACR/PU 75
Bogie Drives	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Boom Assemblies	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Cable Reel Assemblies	Steel	X15 Orange	EPZ 75 + EPMIO 200 + ACR/PU 75

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
Gantry Travels	Steel	N35 Light Grey	EPZ 75 + EPMIO 200 + EPMIO 200
Hydraulics	Steel	N35 Light grey /X15 Orange/Y14 Golden Yellow	OEM Major Maintenance EPZ 75 + EPMIO 250 + ACR/PU 75
Jet Slingers	Steel	N35 Light Grey	EPZ 75 + EPMIO 250 + ACR/PU 75
Chutes (cascade, discharge, dust, tele)	Steel/Manufacturer's proprietary materials	N35 Light Grey	EPZ 75 + EPMIO 250 + ACR/PU 75
Chute Attachments	Steel	N35 Light grey	EPZ 75 + EPMIO 250 + ACR/PU 75
Luffing Winch Assemblies	Steel	N35 Light grey/Y14 Golden Yellow	EPZ 75 + EPMIO 200 + ACR/PU 75
Shuttle Winch Assemblies	Steel	N35 Light grey/Y14 Golden Yellow	EPZ 75 + EPMIO 200 + ACR/PU 75
Operator/Mech & Elec area enclosure cladding	Bluescope proprietary coating system: steel/zincalume with thin film coating (25 µm) i.e. Colorbond®/Colorbond Ultra® (0.48 BMT)	Wilderness®	Major Maintenance: EPSt 125 + ACR/PU 75
Travel beams	Steel	N35 Light grey	EPZ 75 + EPMIO 250 + ACR/PU 75
PIPING GENERAL			
Piping General	**Atmospheric**		
Fire hydrants and pipwork	Steel	R13 Signal Red (R12 Scarlet, R14 Waratah acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75
Wash down/process water pipes	Steel	G21 Jade (G13 Emerald, G23 Shamrock acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
Water for drinking, heating and waster (not sewerage)	Steel	G21 Jade (G13 Emerald, G23 Shamrock acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75
Potable water	Steel	B24 Harbour Blue (B15 Mid Blue, B21 Ultramarine, B23 Bright Blue acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75
Oils	Steel	X53 Golden Tan (X51 Tan, X54 Brown, X55 Nut Brown acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75
Air	Steel	B25 Aqua (B41 Bluebell acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75
Other liquids (chemical waste, sewerage and organic waste)	Steel/Reinforced concrete/GRP/HDPE	N61 Black	EPZ 75 + EPMIO 200 + ACR/PU 75
WASTE WATER SYSTEMS			
Waste Water Systems	**External**		
Tanks and bunds	Steel/Reinforced concrete	N35 Light Grey	EPZ 75 + EPMIO 200 + ACR/PU 75
Waste Water Systems	**Internal**		
Tanks and bunds	Steel/Reinforced concrete	Manufacturers standard colour (typically N14 white/grey)	Steel: SFPE 300 + SFPE 300 RC: TEPM 2000 + SFPE 400
Waste Water Systems	**Atmospheric**		
Tank furniture	Steel/GRP/Stainless steel	N35 Light Grey	EPZ 75 + EPMIO 200 + ACR/PU 75

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
FUEL SYSTEMS			
Fuel Systems	**Atmospheric**		
Bunding	Concrete/Masonry	Manufacturers standard colour (typically N14 white/grey)	RC: TEPM 2000 + SFPE 400
Fuel Systems	**Atmospheric**		
Fuel Lines	Steel	X53 Golden Tan (X51 Tan, X54 Brown, X55 Nut Brown acceptable)	EPZ 75 + EPMIO 200 + ACR/PU 75
Fuel Systems	**Buried**		
Fuel Lines	Steel	NA	Denso Tape + CP
Fuel Systems	**Atmospheric**		
Pumps/Motors	Steel/Cast Iron	X15 Orange	OEM
Fuel Systems	**External**		
Storage Tanks	Steel	N14 White	EPZ 75 + EPMIO 200 + ACR/PU 75
Fuel Systems	**Internal**		
Storage Tanks	Steel	Manufacturers standard colour (typically N14 White/N35 Light Grey)	SFPE 300 + SFPE 300
SECURITY			
Security	**Atmospheric**		
Control Gates	HDG steel	-	HDG 600
Security Access Gates	HDG steel	-	HDG 600
Security Fences	HDG steel/HDG steel + PVC	-	HDG 20/HDG 20 + PVC 100
Gates general	HDG steel	-	HDG 600

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
Fences general	HDG steel/HDG steel + PVC	-	HDG 20/HDG 20 + PVC 100
Posts	HDG steel	-	HDG 600
SIGNAGE			
Signage	**Atmospheric**		
Signs	HDG steel/Aluminium	-	-
Posts	HDG steel/Aluminium	-	HDG 600
FBH AND FUEL WHARF			
FBH and Fuel Wharf	**Above Deck**		
Deck	Reinforced concrete/HDG gridmesh drain cover	-	HDG 600
Kerb	Timber	Y14 Golden Yellow	ACR /PU 75
Fenders	Steel/Timber	N35 Light Grey	EPGF 500 + EPGF 500
Bollards	Steel	N35 Light Grey	EPGF 500 + ACR/PU 75
FBH and Fuel Wharf	**Below Deck**		
Substructure	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Piles1	Steel	N35 Light Grey	EPGF 500 + EPGF 500
SERVICE JETTIES			
Service Jetties	**Above Deck**		
Deck	Reinforced concrete	-	-
Fenders	Steel/Rubber /Timber	N35 Light Grey	EPGF 500 + EPGF 500
Service Jetties	**Below Deck**		
Substructure	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Piles1	Steel	N35 Light Grey	EPGF 500 + EPGF 500

Asset/Sub Asset	Sub Asset - Material	Sub Asset – Colour [Note 2]	Coating System Designation
PENS			
Pens	**Above Deck**		
Deck	HDG Steel Gridmesh	N35 Light Grey	HDG 600
Fenders	Steel/Rubber/Timber	N35 Light Grey	EPGF 500 + EPGF 500
Pens	**Below Deck**		
Substructure	Steel	N35 Light Grey	EPGF 500 + EPGF 500
Piles1	Steel	N35 Light Grey	EPGF 500 + EPGF 500

Notes:

1. Although not specifically coved in this guideline, designers should where appropriate also consider the use of alternate barriers to corrosion such as petrolatum tape/HDPE jackets.
2. The colour requirements listed are standard MWPA requirements. Note these requirements are considered a baseline and similar approved systems that meet the project requirements can also be considered, e.g. International Interplus 1180 MIO in N33 Lightbox Grey.

APPENDIX B

INSPECTION AND TESTING PLAN (ITP) TEMPLATE

ITEM B1 - INTRODUCTION

The Inspection and Testing Plan (ITP) functions as a check list prior to the pre-start meeting and may also be used as a QA/QC audit checklist during inspection of the project.

An example ITP template listing the basic requirements for a steel protective coating project is presented in Table 12. All MWPA coating projects will require an ITP to be prepared prior to starting the work to ensure the basic requirements of the project are considered.

ITEM B2 - INSTRUCTIONS RELATED TO THE ITP

1. A pre-start meeting shall be held prior to commencement of the work.
2. The Coating Contractor must populate the ITP and enter applicable values in high-lighted areas prior to the pre-start meeting.
3. The Coating Contractor must obtain the required statements from the Coating Manufacturer prior to the pre-start meeting.

Table 12: Sample Protective Coating ITP

MID WEST PORTS

Sample Protective Coating ITP

Project Title		Date:	
MWP Project No.		Substrate:	
Principal:		Surpace Preparation Method:	
Contractor/Developer:		Coating System:	
Description of Works / Separable Portion of Works / Equipment:			

Task No.	Timing	Responsibility	Description	Test Method	Test Frequency	Acceptance Criterium	Document	Conforms (Yes / No - Name, Signature)
1			Prior to Project Start					
1.1	Planning stage	CC/SUP	Verification that all parties understand and agree on the scope of work with respect to areas to be treated and not to be treated	Verify and Discuss	1x At pre-start meeting	All parties agree	Signed contract / Minutes of Meeting	
1.2	Planning stage	CC / CM / SUP	Determine whether the proposed coating system complies with the system requirements of the Guideline.	Refer to Table A3 of Guideline	1x At pre-start meeting	Proposed system complies with generic description in Table A3	Manufacturer's Statement	
1.3	Planning stage	CC / CM / SUP	Verification that the specified coating system is fit for its intended purpose	Statement from manufacturer	1x At pre-start meeting	Material is fit for the intended purpose	Manufacturer's Statement	
1.4	Planning stage	CC / CM / SUP	Verification that the proposed work method is suitable, realistic and practically achievable	Verify and Discuss	1x At pre-start meeting	All agree that requirements can be met	Minutes of meeting/ correspondence	
1.5	Planning stage	CC / CM	Verification that all aspects of the specification are complete and accurate	Statement from manufacturer	1x At pre-start meeting	Spec meets all requirements to ensure coating performance	Manufacturer's Statement	
1.6	Planning stage	CC / CM	Verify whether selected coating materials are available in contrasting colours	Statement from manufacturer	1x At pre-start meeting	Spec meets all requirements to ensure coating performance	Manufacturer's Statement	
1.7	Planning stage	CC / SUP	Verify skill and experience of available labour	Obtain CV's, Verify and Discuss	1x At pre-start meeting	Suitably qualified and experienced	Copy of CV's	
1.8	Planning stage	CC / SUP	Verify qualifications and experience of Supervision / QA representative	Obtain CV, proof of qualification.	1x At pre-start meeting	Suitably experienced, qualified and certified	Copy of CV and Qualification Certificate	
1.9	Planning stage	CC / SUP	Verify that inspection report templates are suitable and compliant with the requirements of the specification	Refer AS 3894.	1x At pre-start meeting	Satisfy the requirements of AS 3894 Sections10, 11, 12, 13 and 14	Minutes of meeting	
2			Surface Preparation					
2.1	Prior to surface prep	CC / SUP	Ensure that a copy of the specification, MSDS's, Product Data Sheets and Application Instructions are available to all staff	Verify	Daily prior to start	Copy of all documents present on site	N/A	
2.2	Prior to surface prep	CC	Verify that all oil and grease is removed by solvent wiping or detergent washing	Visual, droplet test	1x per work lot	No oil or grease present	Coating Inspection Report *	
2.3	Prior to surface prep	CC	Verification if climate control equipment is operating satisfactory (if installed)	Measure climatic conditions	2x per day	Ta>10ºC, RH<50%	Coating Inspection + Clim. Cond. Report	
2.4	Prior to surface prep	CC	Verification of suitability of preparation and application equipment	Visual / refer datasheet	1x prior to start	Refer manufacturer's datasheets	Equipment Report	
2.5	Prior to surface prep	CC	Test cleanliness of compressed air supply	ASTM D4285-83	Daily prior to start	Air shall be clean and dry	Coating Inspection Report *	
2.6	After surface prep	CC	Determination of surface cleanliness	Visual (may use pictorial standard)	1x per work lot	Refer specification, depends on surface prep method.	Coating Inspection Report *	
2.7	After surface prep	CC	Determination of blast profile	AS 3894.5 Method A or C	Depending on method	Refer specification, depends on total coating system DFT.	Coating Inspection Report *	
2.8	After surface prep	CC	Determination of residual chloride contamination	AS 3894.6 Method A, alt. 2	1x per work lot	<50mg/m2	Coating Inspection Report *	
2.9	After surface prep	CC	Determination of degree of flash rusting (only applicable to UHPWJ and wet abrasive blasting)	AS 3894.6 Method A, alt. 2	1x per work lot	<50mg/m2	Coating Inspection Report *	
3			Coating Application					
3.1	Prior to each coat	CC	Ensure that a copy of the specification, MSDS's, Product Data Sheets and Application Instructions are available to all staff	Verify	Daily prior to start	Copy of all documents present on site		
3.2	Prior to each coat	CC	Determination of Relative Humidity	AS 3894.7	Hourly (data logger)	<50% (under dehumidification), <85% (atmospheric)	Coating Inspection + Clim. Cond. Report	
3.3	Prior to each coat	CC	Determination of Ambient Temperature	AS 3894.7	Hourly (data logger)	>10ºC	Coating Inspection + Clim. Cond. Report	
3.4	Prior to each coat	CC	Determination of Surface Temperature	AS 3894.7	Hourly (data logger)	>10ºC, >3ºC above Dew point temp	Coating Inspection + Clim. Cond. Report	
3.5	Prior to each coat	CC	Determination of Dewpoint	AS 3894.7	Hourly (data logger)	>3ºC below substrate Temp	Coating Inspection + Clim. Cond. Report	
3.6	Prior to each coat	CC	Record name and batch no's of A+B components of first coat used, verify if correct material and in date	Visual	1x prior to application	Record all batch numbers as printed on drum labels	Coating Inspection Report *	
3.7	Prior to each coat	CC	Verify equipment set-up (application method, pump pressure, tip sizes, filters removed etc.)	Visual	At every application	As per manufacturer's datasheet	Coating Inspection Report *	
3.8	Prior to each coat	CC	Confirm that materials are mixed in accordance with technical datasheet and good common painting practice	Visual	At every application	As per manufacturer's datasheet	Coating Inspection Report *	
3.9	Prior to each coat	CC	Confirm that the induction time is observed prior to start of application (if applicable)	Watch time between mixing and application	At every application	As per manufacturer's datasheet	Coating Inspection Report *	
3.10	Prior to each coat	CC	Verify correct wet film thickness is applied, wet film gauge is used by applicator	Visual, Calculate from VS% and DFT	Continuously	Sufficient to achieve specified DFT	Coating Inspection Report *	
3.11	After each coat	CC	Determination of dry film thickness, None complying areas marked	AS 3894.3 Method B and Visual	After every application	DFT to spec, all none compliant areas marked	Coating Inspection Report *	
3.12	After each coat	CC	Verification that all surfaces are adequately covered. Non-complying areas and surface flaws to be marked	Visual	After every application	All non compliant areas marked for repair	Coating Inspection Report *	
3.13	After each coat	CC	Verification if first stripe coat is applied (with same material as previous full coat but in a different colour where possible)	Visual	1x per work lot	Visual	Coating Inspection Report *	
3.14	After repair to each coat	CC	Verify if areas of low film build and marked areas are repaired	Visual	After every application	All areas compliant	Coating Inspection Report *	
3.15	After repair to each coat	CC	Confirmation that dry film thickness complies in all areas	AS 3894.3 Method B and Visual	After every application	80%-200% of spec	Coating Inspection Report *	
3.16	After repair to each coat	CC/SUP	Verification if areas of insufficient coverage, misses and bare spots have been repaired	Visual	After every application	Visual	Coating Inspection Report *	
3.17	After final repairs	CC	Confirmation that dry film thickness complies with the specification in all areas	AS 3894.3 Method B	1x per work lot	As per 80/20 rule	Coating Inspection Report *	
3.18	After final repairs	CC/SUP	Verify if the surface finish has been accepted and scaffolding/access equipment can be removed	Verify with SUP	1x per work lot	No unacceptable imperfections present (refer spec)	Coating Inspection Report *	
3.19	After completion	CC	Verify if scaffolding/staging is removed without damage	Visual	1x per work lot	All damage marked for repair	Coating Inspection Report *	
3.20	After repairs	CC	Verify if all damage is repaired in accordance with coating manufacturer's recommendation	Visual	1x per work lot	No remaining coating damage	Coating Inspection Report *	
4			Completion					
4.1	Prior to hand-over	CC/SUP	Confirmation of acceptance of the works by the Project Superintendent.	Discuss, obtain written confirmation	After final repairs	Completed to the satisfaction of the Project Superintendent	Coating Inspection Report *	
4.2	Prior to hand-over	CC & SUP	Verify all non conformances have been closed-out and all corrective action is documented	Visual, refer checklist	1x upon completion	Refer NCR register	All QA/QC documents	
4.3	Prior to hand-over	CC & SUP	Verify if coating inspection reports are up to date, complete and accurate	Visual, refer checklist	1x upon completion	All documents complete	All QA/QC documents	
4.4	Prior to hand-over	SUP	All signatures from all relevant parties placed on all relevant documents	Visual, refer checklist	1x upon completion	Verify, refer all relevant documents	All QA/QC documents	

* Coating Inspection Report Templates shall conform to the requirements of AS 3894 Part 10 to 14

CC= Coating Contractor, SUP = Project Superintendent, CM= Coating Manufacturer

= Items to be inspected at the following Hold Point

= Hold Point. Work shall not continue beyond this point until completed work has been inspected by the SUP

= To be populated and applicable values entered by the CC prior to the pre-start meeting