

# Supplementary Specification to Norsok M-501 for Coating and Painting for Offshore, Marine, Coastal and Subsea Environment

Public Review Draft

## Revision history

VERSION	DATE	PURPOSE
0.1	January 2020	Issued for Public Review

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## Acknowledgements

This IOGP Specification was prepared by a Joint Industry Project 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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## Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2014).

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## Introduction

The purpose of this specification is to define a minimum common set of supplement requirements for the procurement of coating and painting for offshore, marine coastal and subsea environment in accordance with Norsok M-501 Edition 6, 2012, Surface Preparation and Protective Coating, for application in the petroleum and natural gas industries.

This JIP33 standardized procurement specification follows a common document structure comprising the four documents as shown below, which together with the purchase order define the overall technical specification for procurement.



**JIP33 Specification for Procurement Documents  
Supplementary Technical Specification**

It is required to use all of these documents in conjunction with each other when applying this specification, as follows.

**IOGP S-715: Supplementary specification to Norsok M-501 for Coating and Painting Specification for Offshore, Marine Coastal and Subsea Environments**

This specification is written as an overlay to Norsok M-501 Edition 6, 2012, Surface Preparation and Protective Coating, following the section structure of the parent standard, to assist in cross-referencing the requirements. The terminology used within this specification follows that of the parent standard and is otherwise in accordance with ISO/IEC Directives, Part 2.

Modifications to the parent standard defined in this specification are identified as Add (add to section or add new section), Replace (part of or entire section) or Delete.

**IOGP S-715D: Datasheet for Coating and Painting for Offshore, Marine Coastal and Subsea Environment**

This document provides project specific requirements where this specification requires the purchaser to define an application specific requirement. It also includes information required by the purchaser for technical evaluation. Additional purchaser supplied documents are also listed in the datasheet, to define scope and technical requirements for enquiry and purchase of the equipment.

**IOGP S-715L: Information requirements for Coating and Painting for Offshore, Marine Coastal and Subsea Environment**

This document defines the information requirements, including format, timing and purpose, for information to be provided by the vendor. It also defines the specific conditions which must be met for conditional information requirements to become mandatory. The information requirements listed in the IRS have references to the source of the requirement.

**IOGP S-715Q: Quality requirements for Coating and Painting for Offshore, Marine Coastal and Subsea Environment**

This document includes a conformity assessment system (CAS) which specifies standardized user interventions against quality management activities at four different levels. The applicable CAS level is specified by the purchaser in the data sheet.

The data sheet and IRS are published as editable documents for the purchaser to specify application specific requirements. The supplementary specification and QRS are fixed documents.

Unless defined otherwise in the purchase order, the order of precedence (highest authority listed first) of the documents shall be:

- a) regulatory requirements;
- b) contract documentation (e.g. purchase order);
- c) purchaser defined requirements (data sheet, IRS, QRS);
- d) this specification.



## 1 Scope

### Replace clause with

The scope of this specification includes the following aspects:

- selection of coating and paint systems,
- design for coating systems application,
- surface preparation and cleanliness,
- description of the coating systems,
- qualification of coating systems,
- application procedures,
- qualification of coating manufacturers, applicators, inspectors,
- inspection and testing requirements,
- quality management,
- repairs of the newly applied coating and paint systems.

This specification applies to shop and field applied coatings for new construction including structures, piping and equipment items.

This specification is applicable to the following environments:

- offshore, marine coastal and subsea,
- buried and submerged,
- internal coating of tanks and process vessels,
- painting and coating under insulation,
- subsea production systems (subsea hardware) and valves,
- underground piping (excluding pipeline), underground storage facilities,
- operating temperature range from -196 °C (-320 °F) to 600 °C (1112 °F).

This specification is not applicable to the following items and applications:

- coatings for onshore facilities,
- hull coatings,
- painting and coating systems of non-metallic components,
- pipeline and flowline coatings,
- riser coatings and splash zone sheathings,
- concrete coatings,
- passive fire protection coatings,
- anti-fouling or fouling release coatings,
- building coatings,
- maintenance painting and coating systems,
- fasteners coatings,
- thermoplastic and thermosetting liners,
- elastomeric coatings,
- metallic linings,
- internal coatings for downhole tubing or drill pipes,

- anti-galling coatings,
- thin film coatings not intended for corrosion protection (e.g. PTFE, and other coatings whose main purpose is to reduce friction, temporary storage, etc.),
- functional coatings for erosion or abrasion protection (e.g. ENP coating, hard facing coatings),
- insulation coatings (but the corrosion protection coating under insulation is in scope),
- colour coding,
- temporary coatings for preservation, transportation and storage,
- coatings for temporary equipment or for equipment with a design life shorter than 15 years.

## 2 Normative References

### Add to clause

API Specification Q1	Specification for quality management system requirements for manufacturing organizations for the petroleum and natural gas industry
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A780	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM D1475	Standard Test Method For Density of Liquid Coatings, Inks, and Related Products
ASTM D2369	Standard Test Method for Volatile Content of Coatings
ASTM D2485	Standard Test Methods for Evaluating Coatings for High Temperature Service
ASTM D4285	Standard test method for indicating oil or water in compressed air
ASTM D4414	Standard Practice for Measurement of Wet Film Thickness by Notch Gages
ASTM D4417	Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4541	Standard test method for pull-off strength of coatings using portable adhesion testers
ASTM D4940	Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blast Cleaning Abrasives
AWS C2.23M/C2.23, NACE NO.12, SSPC CS-23	Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel
CSA Z245.20	Plant-applied external coatings for steel pipe
CSA Z245.30	Field-applied external coatings for steel pipeline systems
IEC 60529	Degrees of Protection Provided by Enclosures (IP Code)
ISO 2063-1	Thermal spraying - Zinc, aluminium and their alloys - Part 1: Design considerations and quality requirements for corrosion protection systems
ISO 2063-2	Thermal spraying - Zinc, aluminium and their alloys - Part 2: Execution of corrosion protection systems
ISO 2808	Paints and varnishes - Determination of film thickness
ISO 2811-1	Paints and varnishes - Determination of density - Part 1: Pycnometer method
ISO 3251	Paints, varnishes and plastics — Determination of non-volatile-matter content

ISO 8501-2	Preparation of steel substrates before application of paints and related products - Visual assessment of surface cleanliness - Part 2: preparation grades of previously coated steel substrates after localized removal of previous coatings
ISO 8502-4	Preparation of steel substrates before application of paints and related products - Tests for the assessment of surface cleanliness - Part 4: Guidance on the estimation of the probability of condensation prior to paint application
ISO 8503-1	Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces
ISO 8503-2	Preparation of steel substrates before application of paints and related products - Surface roughness characteristics of blast-cleaned steel substrates - Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel - Comparator procedure
ISO 8503-5	Preparation of steel substrates before application of paints and related products Surface roughness characteristics of blast-cleaned steel substrates - Part 5: Replica tape method for the determination of the surface profile
ISO 9001	Quality management systems - Requirements
ISO 11124-2	Preparation of steel substrates before application of paints and related products - Specifications for metallic blast-cleaning abrasives - Part 2: Chilled-iron grit
ISO 11124-3	Preparation of steel substrates before application of paints and related products - Specifications for metallic blast-cleaning abrasives - Part 3: High-carbon cast steel shot and grit
ISO 11126-4	Preparation of steel substrates before application of paints and related products - Specifications for non-metallic blast-cleaning abrasives - Part 4: Coal furnace slag
ISO 11126-7	Preparation of steel substrates before application of paints and related products - Specifications for non-metallic blast-cleaning abrasives - Part 7: Fused aluminium oxide
ISO 11126-9	Preparation of Steel Substrates Before Application of Paints and Related Products - Specifications for Non-Metallic Blast-Cleaning Abrasives - Part 9: Staurolite
ISO 11126-10	Preparation of steel substrates before application of paints and related products - Specifications for non-metallic blast-cleaning abrasives - Part 10: Almandite garnet
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 12690	Metallic and other inorganic coatings — Thermal spray coordination — Tasks and responsibilities
ISO 12944-1	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction
ISO 12944-2	Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 2: Classification of environments
ISO 12944-3	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 3: Design considerations
ISO 12944-7	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 7: Execution and supervision of paint work
ISO 12944-8	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 8: Development of specifications for new work and maintenance

ISO 12944-9	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 9: Protective paint systems and laboratory performance test methods for offshore and related structures
ISO 14918	Thermal spraying — Qualification testing of thermal sprayers
ISO/TR 15608	Welding - Guidelines for a metallic materials grouping system
ISO 16276-1	Corrosion protection of steel structures by protective paint systems — Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating — Part 1: Pull-off testing
ISO 18796-1	ISO 18796-1 Petroleum, petrochemicals and natural gas industries - Internal coating and lining of carbon steel process vessels - Part 1: Technical requirements
ISO 19277	ISO 19277 Petroleum, petrochemical and natural gas industries - Qualification testing and acceptance criteria for protective coating systems under insulation
ISO 21457	Petroleum, petrochemical and natural gas industries — Materials selection and corrosion control for oil and gas production systems
ISO 21809 (all parts)	Petroleum and natural gas industries — External coatings for buried or submerged pipelines used in pipeline transportation systems (All Parts)
ISO/TS 29001	Petroleum, petrochemical and natural gas industries — Sector-specific quality management systems — Requirements for product and service supply organizations
NACE 6G198 / SSPC-TR 2	Wet abrasive blast cleaning
NACE No. 1 / SSPC-SP 5	White metal blast cleaning
NACE No. 2 / SSPC-SP 10	Near-white metal blast cleaning
NACE No. 3 / SSPC-SP 6	Commercial Blast Cleaning
NACE No. 4 / SSPC-SP 7	Brush-off blast cleaning
NACE No. 5 / SSPC-SP 12	Surface preparation and cleaning of metals by water jetting prior to recoating
NACE No. 13 / SSPC-ACS-1	Industrial Coating and Lining Application Specialist Qualification and Certification
NACE SP0178	Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service
NACE SP0188	Discontinuity (holiday) testing of new protective coatings on conductive substrates
NACE SP0287	Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
NORSOK M-501, Ed. 6, Feb 2012	Surface preparation and protective coating
SSPC AB 1	Mineral and Slag Abrasive
SSPC AB 3	Ferrous Metallic Abrasive
SSPC-PA 1	Shop, field, and maintenance coating of metal
SSPC-PA 2	Procedure for determining conformance to dry coating thickness requirements
SSPC PA GUIDE 10	Guide to Safety and Health Requirements for Industrial Painting Projects
SSPC Painting Manual Volume 1	Good painting practice
SSPC QP-3	Certification Standard for Shop Application of Complex Protective Coating Systems
SSPC-SP 1	Solvent cleaning
SSPC-SP 2	Hand tool cleaning
SSPC-SP 3	Power tool cleaning

SSPC-SP 11	Power tool cleaning to bare metal
SSPC-SP 16	Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals

Delete from clause

ISO 20340	Paints and varnishes - Performance requirements for protective paint systems for offshore and related structures
NORSOK M-001	Materials selection
NORSOK R-004	Piping and equipment insulation
NORSOK S-002	Working environment
SFS 8145	Anticorrosive painting, surface preparation methods of blast cleaned and shop primer coated steel substrates and preparation grades for respective treatments
ISO 2814	Paints and varnishes – Comparison of contrast ratio (hiding power) of paint of the same type and colour
ISO 8503	Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast cleaned substrates

### 3 Terms, definitions and abbreviations

The following terms and definitions shall apply. Other painting, coating and surface treatment terms and definitions shall be according to ISO 4618, ISO 12944, IOGP Report 589.

#### 3.1 Terms and definitions

Delete term

##### 3.1.2 coat-back

##### 3.1.7 may

Replace definition with

Verbal form used to indicate a course of action permissible within the limits of this specification.

##### 3.1.9 shall

Replace definition with

Verbal form used to indicate requirements strictly to be followed in order to conform to this specification and from which no deviation is permitted, unless accepted by the end (equipment) user.

##### 3.1.10 shop primer

Replace definition with

Paint typically applied below 50 µm to prepared steel, to provide temporary protection during storage and transportation.

NOTE 1 to entry See also pre-fabrication primer (3.1.15) and holding primer (3.1.21)

##### 3.1.11 should

Replace definition with

Verbal form used to indicate a recommendation.

Add new term

##### 3.1.13 end user

Company or organization (normally an oil company) that is responsible for the operation of an installation or facility and its components (e.g. piping, valve, etc.).

*Add new term*

**3.1.14 purchaser**

Party which purchases a product from a manufacturer. In the context of this specification, an oil company, the contractor or the buyer are purchasers.

*Add new term*

**3.1.15 pre-fabrication primer**

Fast-drying primer that is applied to blast-cleaned steel to provide temporary protection during fabrication while still allowing welding and cutting.

[SOURCE: ISO 12944-5:2018, 3.8]

*Add new term*

**3.1.16 lining**

Internal coating.

[SOURCE: ISO 18796-1:2018, 3.1.13]

*Add new term*

**3.1.17 off-the-shelf item**

Item available for purchase and use that is not specially designed or custom made in accordance with applicable project specifications.

*Add new term*

**3.1.18 coating contractor**

Party, including subcontractors, which carries out coating work (e.g. surface preparation, coating application, etc.) that affects the properties of the finished coating.

*Add new term*

**3.1.19 coating material**

Product, in liquid, paste or powder form that, when applied to a substrate, forms a layer possessing protective, decorative and other specific properties.

[SOURCE: ISO 4618:2004, 2.51]

*Add new term*

**3.1.20 coating system**

Combination of all coats of coating materials which are to be applied or which have been applied to a substrate.

[SOURCE: ISO 4618:2014, 2.54]

*Add new term*

**3.1.21 holding primer**

Fast-drying primer that is applied to blast-cleaned carbon steel to protect it during fabrication of a structure, but does not allow the carbon steel to be welded.

NOTE 1 to entry Holding primers which do allow the carbon steel to be welded are called pre-fabrication primers.

[SOURCE: ISO 12944-9:2018, 3.7]

*Add new term*

**3.1.22 unexposed area**

Enclosed area with natural ventilation by louver panels.

NOTE 1 to entry As opposed to HVAC and dry indoor areas, enclosed areas may be exposed to high humidity and condensation. These conditions determine a reduced corrosivity category C5 (very high) to ISO 12944-2 compared with external exposed atmospheric areas with corrosivity category CX (extreme).

Add new term

**3.1.23 HVAC and dry indoor area**

Fully enclosed area with ventilation by a HVAC system, heated and dry indoor areas with clean atmosphere, areas inside an IP65 or higher rated enclosure.

NOTE 1 to entry These conditions determine a reduced corrosivity category C1 (very low) to ISO 12944-2 compared with external exposed offshore areas with corrosivity category CX (extreme) and unexposed areas with corrosion category C5 (very high).

Add new term

**3.1.24 nominal dry film thickness (NDFT)**

Minimum dry-film thickness specified for each coat and for the whole coating system to achieve the required performance.

NOTE 1 to entry A 80/10 practice according to ISO 19840 means that 80 % of all individual thickness measurements shall be greater than, or equal to, 80 % of the NDFT and none of the remaining 20 % of individual measurements shall be below 80 % of the NDFT. The arithmetic mean of all individual DFT measurements shall be equal or greater than the NDFT.

[SOURCE: ISO 19840:2012, 3.6, modified to add 'minimum' and replace 'paint system' with 'coating system'.]

Add new term

**3.1.25 mist coat**

A very thin coat of paint usually pre-applied as a part of existing coat to release air from a porous substrate and thereby reducing penetrating irregularities in the coating.

[SOURCE: IOGP Report 598, 2017]

Add new term

**3.1.26 durability**

Expected life of a protective coating system to the first major maintenance coating.

NOTE 1 to entry Durability is a technical consideration/planning parameter that can help the owner set up a maintenance programme, but it is not a guarantee time. The guarantee time is usually shorter than the durability range.

[SOURCE: ISO 12944-1:2017, 3.5, modified to replace "paint" with "coating" and to add more details to the explanatory NOTE 1]

Add new term

**3.1.27 IP rating**

A coding system to indicate the degrees of protection provided by an enclosure against access to hazardous parts, ingress of solid foreign objects, ingress of water and to give additional information in connection with such protection.

[SOURCE: IEC 60529 Edition 2.2, 2013, 3.4]

Add new term

**3.1.28 atmospheric zone**

Zone located above the splash zone or tidal zone.

Add new term

**3.1.29 splash zone and tidal zone**

Areas that are alternately wet and dry because of the influence of tides, winds and/or waves or ballasting/loading.

[SOURCE: ISO 12944-9:2018, 3.6]

## 3.2 Abbreviations

ACQPA	Association for Certification and Qualification of Anticorrosion Paintwork
APS	application procedure specification (same as CPS)
ATEX	equipment for potentially explosive atmospheres
CPS	coating procedure specification (same as APS)
CPT	coating procedure test (same as PQT)
CSDS	coating system data sheet
FROSIO	The Norwegian Professional Council for Education and certification of Inspectors for Surface Treatment
HSSE	Health, safety, security and environment
HVAC	heating ventilation air conditioning
IP	ingress protection (rating code)
MSDS	material safety data sheet
NDFT	nominal dry film thickness.
PDS	product data sheet (same as product TDS)
PPT	pre-production trial
PQT	procedure qualification trial (same as CPT)
PTFE	polytetrafluoroethylene
TDS	technical data sheet (same as PDS).
TSA	thermally sprayed aluminium
TSZ	thermally sprayed zinc

## 4 General Requirements

### 4.1 General

Replace first paragraph with

Selection of coating systems and application procedures shall be made in cooperation with the coating manufacturer based on HSSE requirements, technical requirements of this specification, laboratory test results and proven track record of the coating system.

Add after first paragraph

The environmental and process conditions during manufacturing, fabrication, installation and service of the equipment item and facility shall be considered.

Replace second paragraph with

Qualification of coating systems, personnel and coating contractors shall be according to clause 10.

Add to clause

Coating material and coating systems shall be selected from clause 14 and Annex A.



Add to clause

Paint and coating systems shall meet the performance requirements of this specification.

Add to clause

The corrosivity category shall be as specified below according to ISO 12944-2:

Add to clause

The atmospheric zone corrosivity category for offshore and coastal facilities shall be CX.

Add to clause

The environmental corrosivity of offshore and coastal facilities permanently immersed in seawater shall be Im4.

Add to clause

Offshore and coastal facilities exposed to the splash zone or the tidal zone and sea water filled compartments shall meet the performance requirement of both corrosivity categories CX and Im4.

Add to clause

The environment corrosivity for underground piping (excluding pipeline) and underground storage facilities shall be Im3.

Add to clause

Carbon steel in HVAC environment or exposed to dry, indoor conditions during fabrication, storage, installation and operation, or items located inside IP65 or higher rated enclosures to IEC 60529 may be coated with CSDS No. 8 (Annex A) or manufacturer's standard coating system, except where a different coating system is specified in clause 14.

Replace clause heading with

## **4.2 Design and planning**

Replace first paragraph with

All coating activities shall be detailed in a project specific quality plan in accordance with clause 13.

Add to clause

Field painting shall be limited to touch-up and repair of coating damaged during transport, site storage or installation and complete painting of field weld areas.

Add to clause

Equipment and structures to be coated shall comply with the design recommendation of ISO 12944-3 or NACE SP0178.

Add to clause

Maximum and minimum operating parameters shall be used for coating selection.

Add to clause

Environmental and short-term conditions such as steam cleaning (steam out) affecting the coating performance shall be considered.

Add to clause

Scaffolding and staging shall provide easy and safe access for the coating application and inspection of coated surfaces.

Add to clause

All staging should be erected to leave a clear area of at least 30 cm (1 ft) from surfaces to be coated.

Add to clause

Clearance between each level shall be in accordance with local HSSE requirements.

Add to clause

Tubular scaffolding and planks layout shall not mask surfaces to be coated or prevent the correct execution of the paint works.

Add to clause

All open ends of tubular scaffolding shall be plugged to prevent access of abrasive material, powder and dirt.

Add to clause

The staging shall not be removed before all tests and final inspection have been performed.

#### **4.4 Ambient conditions**

Add to first sentence of first paragraph after "3 °C"

(5 °F)

Add to clause after first sentence of first paragraph

Humidity measurement and dew point determination shall be done in accordance with ISO 8502-4.

Add to second sentence of first paragraph after "0 °C"

(32 °F).

Add after second sentence of first paragraph

The maximum surface temperature during coating application shall not exceed 50 °C (122 °F), unless a higher temperature is specified in the product data sheet.

Add to clause

Coating shall be applied and cured at temperatures and relative humidity within the limits specified in the coating manufacturer product data sheet.

Add to clause

Final blast cleaning or coating shall not be done under adverse weather conditions, unless the conditions can be controlled to the requirement of this specification.

Add to clause

Surfaces shall be re-blasted and re-coated if adverse weather conditions happen before the paint has cured.

## 4.5 Coating materials

Add to clause after first paragraph and list

The purchaser shall provide all the relevant information regarding the intended use of the coating to the coating contractor.

Replace third paragraph with

The container shall bear the information required in ISO 12944-9 Clause 6.3.

Add to clause after third paragraph

The product technical data sheets (TDSs) delivered with the coating material shall contain the information required in ISO 12944-9 Clause 6.4.

Delete fifth paragraph

Delete sixth paragraph

Replace seventh paragraph with

The minimum number of coats and the minimum coating film thicknesses given in Annex A shall apply for coating systems subject to performance testing.

Add to clause

Piping and equipment media identification and flow direction, if required on piping systems shall be in accordance with the end-user requirements and local regulations.

Add to clause

Damaged containers with breaching containment or materials that have exceeded the shelf life shall not be used.

Add to clause

Materials that have deteriorated (changes in viscosity, colour, visual appearance, etc.) during storage shall not be used.

Add to clause

Mixing of coating materials shall be performed by mechanical mixing and in accordance with the manufacturer's instructions.

Add to clause

Addition of thinners shall be employed at the concentration allowed in the product technical data sheet.

Add to clause

Only the coating manufacturer's thinners specified in the product technical data sheets shall be used.

Add to clause

Multi-coat systems shall use coating materials, including thinners, additives and equipment cleaners, from the same coating manufacturer for each coat.

Add to clause

There shall be no mixing of different paint systems or different brands of paint for individual systems.

Add to clause

Lining material for process vessels and tanks handling produced fluids shall comply with ISO 18796-1 and the additional requirements in this specification.

Add to clause

Qualification testing for protective coating system under insulation shall be in accordance with ISO 19277.

Add to clause

Tests and acceptance criteria for operating temperature outside the limit specified in ISO 19277 shall be defined by coating manufacturer and purchaser.

Add to clause

All coating materials shall comply with the applicable HSSE law and regulations as detailed in Clause 5.

#### **4.6 Steel materials**

Replace second sentence with

Shop primer, holding primer and pre-fabrication primer shall be completely removed prior to the application of the coating systems.

#### **4.8 Unpainted surfaces**

Delete "unless otherwise specified" in first paragraph

Delete first bullet point

Add to list

- PTFE-coated, electroplated, hard faced or other specially coated items;
- Machined surfaces;
- Sealing area of flange and hub;
- Ring joints and gasket contact surfaces;
- On compact flanges, flange facing area including wedge shall not be coated;
- Internal surfaces of piping and equipment item, unless internal coating is applied;

- Cables and cable trays;
- Weld bevels after final machining;
- Signs, tags, notices, nameplates, lettering;
- Sight glasses, light fittings;
- Valve stems;
- Cylinder rods;
- Active surface of cathodic protection anodes;
- Electrical contact points;
- Bursting discs;
- Items not permitted to be coated due to equipment certification (e.g. ATEX certification);

Add to end of second sentence of second paragraph

and low melting point metals such as Sn and Pb.

Add to clause

Unpainted surfaces shall be protected from damage during surface preparation and coating of adjacent areas.

Add to clause

On completion of the work, all masking materials shall be removed.

#### **4.10 Qualification of products, personnel and procedures**

Replace with

Qualification in accordance with clause 10 shall be completed prior to commencement of work.

#### **4.11 Metal coating**

Add to end of first paragraph, first sentence

or ASTM A123/A123M.

Replace first paragraph, second sentence with

Minimum average coating thickness for structural items and outfitting steel shall be 100  $\mu\text{m}$  (3.9 mils) or 705  $\text{g/m}^2$  (2.3  $\text{oz/ft}^2$ ).

Replace first paragraph, third sentence with

If required to remove surface contamination, structural items shall be blast cleaned before chemical cleaning and hot-dip galvanising.

Replace "6" in first paragraph, fourth sentence with

6B

Replace second paragraph with

Metal spraying shall be in accordance with clause 8.

Add to clause

Thermally sprayed aluminium (TSA) coating shall not be overlapped with paint, except with Zn rich primer.

#### **4.12 Records and reports**

Replace first sentence of first paragraph with

All measurements and inspection results required by this specification shall be recorded.

Add to third paragraph after "Defective work"

and repairs

Add to clause

The coating manufacturer's product technical data sheets, fingerprinting and batch testing certificates, coating manufacturer CSDS, application instructions, and material safety data sheets (MSDSs) shall be supplied with the coating report.

Add to clause

CPS (APS) and CPT (PQT) prepared in accordance with clause 10 shall be submitted before commencement of the coating work.

Add to clause

On completion of the coating work, the coating contractor shall submit the paint report to the purchaser.

Add to clause

Approval certificate and test certificates for coating in contact with potable water and jet fuel shall be submitted with the paint report.

Add to clause

Guarantee certificates, if required by the purchaser, shall be submitted with the paint report.

Replace clause heading with

#### **4.13 Additional requirements for equipment, piping and materials**

Add new clause

##### **4.13.1 General**

Delete first bullet of first paragraph

Replace third paragraph with

Intermittent welds and spot welds shall be permitted only in HVAC environment or areas exposed to dry, indoor conditions.

Replace fourth paragraph with

Gaps and voids that cannot be blast cleaned and painted shall be sealed or closed in accordance with the guidelines in ISO 12944-3, Clause 5.3.

Add after fifth paragraph

The requirement in 4.8 shall apply to prevent damage to sealing areas.

Add to clause

The design guidelines in ISO 2063-1 shall be followed.

Add new clause

#### **4.13.2 Stainless steels**

##### **4.13.2.1**

The guidance in ISO 21457 shall apply for restrictions on the use of un-coated stainless steels in offshore and coastal environments.

##### **4.13.2.2**

Stainless steels shall be painted using the coating systems in Annex A

##### **4.13.2.3**

Stainless steels under insulation shall always be painted regardless of the temperature, except for HVAC ducting (see 4.8).

Add new clause

#### **4.13.3 Nickel steel**

9 % nickel steel shall not be coated with metallic zinc based coatings.

Add new clause

#### **4.13.4 Painting under personnel protection guards**

Coating system shall be selected as for un-insulated surfaces when perforated guards or sheets are used for personnel protection.

Add new clause

#### **4.13.5 Supports and pipe penetration**

##### **4.13.5.1**

The part of the pipe that penetrates a sealed or closed pipe penetration shall be coated according to the coating requirements for insulated pipes.

#### 4.13.5.2

The pipe penetration area and 50 cm (20 in) on both sides of the penetration shall be coated.

#### 4.13.5.3

Pipe penetration sleeves shall be painted prior to running the pipe.

#### 4.13.5.4

Saddles, support plates, wear pads and belts and supports shall be painted before installation.

*Add new clause*

#### 4.13.6 Dissimilar materials

##### 4.13.6.1

All stainless steel pipe shall be painted on areas in contact with carbon steel piping supports.

##### 4.13.6.2

Where aluminium structural items, hot dip galvanised or composite grating are resting on painted steel surfaces, the painted landing area shall be protected from damage using non-metallic pads.

*Add new clause*

#### 4.13.7 Isolation joints

Paints containing conductive components, e.g., zinc or aluminium shall not be used on isolation joints.

*Add new clause*

#### 4.13.8 Manufacturer standard, off-the-shelf items

##### 4.13.8.1

The purchaser may accept alternative coating material and coating systems for manufacturer's standard equipment and off-the-shelf items not listed in clause 14.

##### 4.13.8.2

The equipment manufacturer's coating system shall comply with the performance requirements of ISO 12944-9.

## 5 Health, safety and environment

*Replace clause with*

### 5.1

Protective coatings shall comply with the applicable Law and Regulations on surface preparation, coating application, storage, handling, safety, and environmental requirements.



## 5.2

The HSSE recommendations of ISO 12944-1 or SSPC-PA Guide 10 shall be followed as a minimum.

## 5.3

Plant and equipment used for surface preparation and coating application shall conform to the applicable HSSE requirements.

## 5.4

Product data sheets and materials safety data sheets shall be supplied for all materials before the commencement of the work.

## 5.5

Purchaser and painting contractor shall review PDS and MSDS to check for the presence of hazardous components.

## 5.6

Data sheets shall be provided in English and the language(s) of the country where the work is being performed.

## 5.7

Personal protective equipment detailed in the materials safety data sheets shall be used.

## 5.8

Coating contractor's personnel shall receive training in safety procedures to applicable HSSE regulations before commencing work.

## 5.9

ISO 18796-1 HSSE requirements shall be followed during equipment lining work.

## 5.10

Personnel performing internal surface preparation and coating of vessels, equipment items or tanks shall undergo a confined space awareness training program from a certified training body.

## 6 Surface preparation

### 6.1 Pre-blasting preparations

*Add before first paragraph*

Surface preparation shall comply with ISO 12944-4 or SSPC Painting Manual Volume 1 and the requirements of this specification.

*Add after third paragraph*

After cleaning, surfaces shall be dry before proceeding with further preparation and coating.

Replace fifth paragraph with

Any oil and grease contamination shall be removed in accordance with ISO 12944-4 or SSPC SP 1, prior to blasting operations.

In second sentence of seventh paragraph, replace "etc." with

, weld spatter, rough capping, undercut and slag

## 6.2 Blast cleaning

Replace "ISO 8503" with

ISO 8503-1

Replace fourth sentence of second paragraph with

The grit used on stainless steel substrates and non-ferrous materials shall be non-metallic.

Add to clause

Abrasives for use in blast cleaning shall be in accordance with ISO 8504-2 or SSPC AB1/AB3 and Table 4.

Add new table

**Table 4 - Abrasives requirements**

Type of abrasive	Generic Name	Characteristics	Standard
Metallic	Iron grit	> 1.7 % carbon	ISO 11124-2
	Steel grit	0,8 % to 1,2 % carbon	ISO 11124-3
Natural mineral <sup>a</sup>	Staurolite	Iron/aluminium silicate	ISO 11126-9
	Garnet	Calcium iron silicate	ISO 11126-10
Synthetic mineral <sup>a</sup>	Coal slag	Aluminium silicate	ISO 11126-4
	Aluminium oxide	Crystalline corundum	ISO 11126-7

<sup>a</sup> Abrasive shall contain no more than 1.0% by weight of crystalline silica.

Add to clause

Abrasives shall be supplied in sealed and watertight packaging.

Add to clause

Each batch of abrasive shall be certified.

Abrasive shall be stored following manufacturers recommendation away from possible contamination.

Add to clause

Abrasive product delivered in defective packaging shall be rejected.

Add to clause

Non-metallic abrasive shall be free from dust.

Add to clause

The conductivity measured according to ISO 11127-6 or ASTM D4940 shall not exceed 150 µS/cm.

Add to clause

The soluble chloride salts content shall not exceed 25 mg/kg (25 ppmw).

Add to clause

Reclaimed abrasives shall comply with all the requirements of this clause.

Adjacent finished coated surfaces shall be preserved to prevent any over-blast damage.

Add to clause

Blasting dust and abrasive shall not contaminate coated surfaces which are not yet dry.

Add to clause

The air supply for air blast cleaning equipment shall be free of oil and water.

Add to clause

Contamination shall be checked in accordance with ASTM D4285 at least once per shift and following every compressor re-start.

### 6.3 Final surface condition

Add after first paragraph

Surface irregularities appearing after surface preparation shall be removed.

Add after first paragraph

The affected area shall be re-blasted.

In second paragraph, replace "rating 2 of" with

quantity rating 2, size class 2 according to

Add to clause

Surface profile shall be measured with a replica technique in conformance to ISO 8503-5 or ASTM D4417 Method C or NACE SP0287.

Add to clause

The purchaser may permit the use of alternative methods for surface profile measurement in conformance with these standards.

Add to clause

Frequency of inspection of the final surface condition shall be according to Table 3.

Add to clause

Table 5 specifies equivalent surface preparation grades according to ISO, SSPC and NACE.

Add new table

**Table 5 - Equivalent surface preparation standards**

Cleaning method	ISO 8501-1	SSPC	NACE
Solvent cleaning	-	SP 1	-
Hand tool cleaning	St 2	SP 2	-
Power tool cleaning	St 3	SP 3	-
Power tool cleaning to bare metal	-	SP 11	-
Cleaning of metals by water jetting	-	SP 12	No. 5
White metal abrasive blast cleaning	Sa 3	SP 5	No. 1
Commercial blast cleaning	Sa 2	SP 6	No. 3
Brush Off (sweep) blast cleaning	Sa 1	SP 7 / SP 16	No. 4
Near White abrasive blast cleaning	Sa 2.5	SP 10	No. 2
Wet abrasive blast-cleaning	-	TR 2	6G198

Add to clause

Internal surfaces of process vessels and process storage tanks requiring internal coating shall be prepared to 8501-1 Sa 3 in accordance with ISO 18796-1.

Add to clause

Precautions shall be taken to preserve prepared surfaces from damage and contamination until the first coat is applied.

Add new clause

**6.4 Stainless steels and non-ferrous metals**

**6.4.1**

Stainless steel and non-ferrous materials shall be segregated from carbon steel during all coating operations to prevent contamination.

**6.4.2**

If segregation is not possible, the coating contractor shall implement alternative measures to prevent contamination (e.g. protective varnish, coverings, etc.).

**6.4.3**

Stainless steel, nickel, and copper-based alloys shall be cleaned with dedicated abrasive equipment.

#### 6.4.4

Chloride free detergents and clean potable water shall be used for pre-cleaning and rinsing of stainless steels and non-ferrous materials.

#### 6.4.5

Galvanized surfaces requiring painting shall be de-greased using an alkaline, emulsifying detergent followed by rinsing with clean potable water and sweep blasting using non-ferrous abrasive or in conformance to SSPC SP 16.

#### 6.4.6

No defects, break through or crisping of the zinc layer shall be permitted.

#### 6.4.7

Aluminium surfaces requiring painting shall be de-greased using an alkaline, emulsifying detergent followed by rinsing with clean potable water and sweep blasting using non-ferrous abrasive in conformance to SSPC SP 16.

#### 6.4.8

Emulsions and alkaline solutions for cleaning aluminium alloys shall have a pH not exceeding pH 9.

Add new clause

### 6.5 Alternative surface preparation methods

#### 6.5.1 Power tool cleaning

##### 6.5.1.1

If abrasive blast cleaning (any methods including wet abrasive blasting or vacuum blasting) is not feasible or is prohibited for HSSE reasons, the use of power tool cleaning may be permitted.

##### 6.5.1.3

Separate qualification shall be carried out as stated in 10.3.

##### 6.5.1.4

Power tool cleaning to bare metal in accordance with SSPC-SP 11 shall be used.

##### 6.5.1.5

Power tools used to clean carbon steel shall not be re-used on stainless steel, nickel and copper based alloys.

##### 6.5.1.6

Power tools used to clean stainless steel, nickel, and copper based alloys shall be made of corrosion resistant material, stainless steel as a minimum.

#### 6.5.2 Hand tools

The use of hand tools shall be limited to spot repair of less than 1 cm<sup>2</sup> (0.2 in<sup>2</sup>).

## 7 Paint application

### 7.1 General

Delete second paragraph

Add to fourth bullet

and effect of thinner, thickness and humidity.

In sixth bullet, replace "Table 1" with

Clause 12

Add new bullet

- Maximum and minimum environment and surface temperatures.

Add new bullet

- Method and equipment for coating application.

Add to clause

Painting and coating application shall follow the general requirements of ISO 12944-7 or SSPC-PA 1 and the additional requirements specified herein.

Add to clause

The paint systems for each particular item of equipment, operating environment, the required surface preparation standard, the coating thickness (maximum and minimum) of each coat within the system and the total coating system are detailed in Annex A.

### 7.3 Application

Add to clause

The surface shall be re-blasted if:

- application of the primer cannot be completed within 4 hours of preparing the surface or within the time recommended by the coating manufacturer, whichever is shorter,
- the requirement for surface preparation cleanliness is no longer satisfied at the time of coating application within the 4 hours window.

Add to clause

Successive coating shall be applied within the re-coating time specified in the manufacturer's PDS.

Add to clause

If the existing coating has exceeded the maximum re-coating time, the surface shall be re-blasted to bare metal or abraded according to the coating manufacturer's product data sheet, prior to application of the successive coat.

Add to clause

The painting systems shall be dried and cured for the time and temperature specified in the manufacturer's PDS.

Add to clause

The coating DFT requirements provided in the coating manufacturer's PDS and in Annex A shall be met for each individual coat and the coating system.

Add to clause

If the minimum DFT measured in accordance with 11.13 is not achieved and providing the PDS permits re-coating, an additional layer of the same coat (with the exception of zinc-rich primer) shall be applied in accordance with the coating manufacturer's recommendations.

Add to clause

Re-coating shall be within the coating maximum re-coating time recommended by the manufacturer.

Add to clause

If the existing coating has exceeded the maximum re-coating time, the coating shall be repaired (see clause 12).

Add to clause

The maximum DFT shall not exceed the value specified by the coating manufacturer or in Annex A, whichever is lower.

Add to clause

The area exceeding the maximum specified DFT shall be repaired in accordance with Clause 12.

Add to clause

No painting shall be applied within 50 mm (2 in) minimum of areas requiring subsequent welding and non-destructive examination.

Add to clause

Nut bearing area and bolt holes shall only be coated with primer coat prior to installation.

Add to clause

Remaining layers around the nut bearing areas shall be applied after installation.

Add to clause

Hub surfaces mating with clamp shall only be coated with primer coat, if coating is required.

Add to clause

Application of internal coating on process vessels shall comply with ISO 18796-1 and this specification.

Add to clause

Application shall be supervised by the coating manufacturer.

Add to clause

The applicator shall check the wet film thickness of individual coat during application against the product data sheet according to ISO 2808 Method 1A or ASTM D4414.

## 8 Thermally sprayed metallic coatings

### 8.1 General

In first sentence, replace "NORSOK standard" with

specification

Add to clause

Thermally sprayed coating shall consist of aluminium (TSA) or zinc (TSZ) sprayed coating in accordance with ISO 2063 (Part 1 and 2) or AWS C2.23/NACE No.12/SSPC CS 23.00 and the requirements of this specification.

Add to clause

In addition to the requirements in clause 6, surface preparation for thermal spray coating shall conform to ISO 2063-2.

Add to clause

The final surface preparation shall be ISO 8501-1, Sa 3 for TSA coating and ISO 8501-1, Sa 2 1/2 for TSZ coating, Grade Medium (G) according to ISO 8503-1 (ISO 8503-2).

NOTE Refer to Table 5 for corresponding SSPC and NACE surface preparation requirements.

Add to clause

Thermally sprayed coating containing zinc shall not be used on stainless steels, in sea water immersion service, splash or tidal zones.

### 8.2 Coating materials

Replace first list item with (and add 1.)

1. Al99,5 in accordance with ISO 14919, code number 3.2 or equivalent.

Replace second list item with (and add 2.)

2. AlMg5 in accordance with ISO 14919, code number 3.3 or equivalent.

Replace third list item with (and add 3.)

3. Zn99,99 in accordance with ISO 14919, code number 2.1 or equivalent.

Add to list

4. ZnAl15 in accordance with ISO 14919, code number 2.3 or equivalent.



Replace third paragraph with

Metal coating shall be sealed or overcoated as specified in coating system no. 2 in Annex A.

Add after third paragraph

Only sealers that are specifically formulated for sealing the inherent porosity of TSA shall be used.

Add after third paragraph

Sealer and thinners shall be from the same manufacturer.

### **8.3 Application of thermally sprayed coating**

Add after first paragraph

The coating systems shall be applied to the thicknesses specified in Annex A.

Add to clause

TSA coated surface shall be kept dry and free from contamination.

Add to clause

The sealers shall be applied within 4 hours.

Add to clause

The sealer overlay thickness shall be less than 20 µm (0.80 mil).

Add to clause

Drying of the sealer coat before handling shall conform to sealer manufacturer's instructions.

Add new paragraph

Topcoats shall not be applied to the sealed TSA surface.

### **8.4 Repair, field coating of pipes and coating of in-fill steel**

Add to clause

If the minimum thickness is not achieved, additional layer shall be applied within 4 hours of the initial coating while the surface is still clean and dry.

Add to clause

Areas of damaged metal sprayed coating exposing the steel substrate shall be re-blasted and re-coated in accordance with the original coating requirements.

Add to clause

Areas of visible damage to the coating not exposing the substrate surface shall have their remaining coating thickness checked.

Add to clause

If the coating thickness is less than the specified value, the affected area shall be re-coated, providing the maximum re-coating time (4 hours) have not been exceeded.

Add to clause

If the maximum re-coating time is exceeded the coating shall be re-blasted and the complete coating re-applied.

Add to clause

If the remaining thickness exceeds the minimum specified value, only the sealer coat shall be repaired.

Add to clause

Edges of damaged areas or with insufficient coating thickness shall be feathered to provide a minimum 50 mm (2 in) overlap with the newly applied thermally sprayed coating.

## **9 Sprayed on passive fire protection**

Delete clause

## **10 Qualification requirements**

Replace clause heading with

### **10.1 Performance testing of the coating system**

Replace first paragraph first sentence with

Performance (pre-qualification) testing shall be carried out by the coating manufacturer according to this specification, when pre-qualification is required in the CSDS (Annex A).

Delete first paragraph second sentence

In fourth sentence of first paragraph, replace "pre-qualification report" with

performance testing report

Add before second paragraph

The performance tests and acceptance criteria shall be in accordance with Table 1.

Replace second sentence of second paragraph with

Testing shall be carried out by an independent laboratory certified to ISO 17025 or equivalent standard accepted by the end user.

Replace third paragraph with

The purchaser may waive performance testing of existing coating systems qualified to a different standard provided the coating system fulfils the requirements of this specification.

Delete fifth paragraph

Delete sixth paragraph

Delete seventh paragraph

Delete eightieth paragraph

Delete ninth paragraph

Add to clause

Lining for services not covered in Annex A shall be qualified by the coating manufacturer in accordance with ISO 18796-1.

Add to clause

Lining material shall have a 5-year proven performance in the specific service fluid.

Add to clause

All performance qualification documentation shall be submitted with the CPS.

Add to clause

Each paint in a paint system shall be identified in accordance with 13.2.

Add to clause

Any of the following changes shall require re-qualification of the paint system:

- composition of individual paint in the paint system, as established through fingerprinting and batch testing (see 13.2);
- description of the paint system including:
  - name and address of the coating manufacturer;
  - environment, type of surface and material the painting system is designed for;
  - surface preparation requirements;
  - product designation for each paint in the paint system in the order of application, except for changes in the generic name of the paint;
  - colour;
  - recommended nominal DFT for each individual coat and for the paint system.

Replace Table 1 with

**Table 1 - Performance tests requirements and acceptance criteria for coatings**

Activity No.	Activity description	Environment corrosivity to ISO 12944-2	Verification method	Acceptance criteria	Remarks
10.1.1	Fingerprinting	All environment	ISO 12944-9 Annex C	ISO 12944-9 Annex C	
10.1.2	Cyclic ageing test	CX (Offshore and coastal atmospheric zone) and	ISO 12944-9 Clause 9	ISO 12944-9 Clause 9 Supplementary requirements:	

Activity No.	Activity description	Environment corrosivity to ISO 12944-2	Verification method	Acceptance criteria	Remarks
		CX + Im4 (splash zone and tidal zone), seawater filled compartments and Im3 (buried items)		Chalking to ISO 4628-6, maximum rating 2. Pull-off test to ISO 4624, minimum 5,0 MPa and maximum 50% reduction from value measured before ageing.	
10.1.3	Seawater immersion test	CX + Im4 (splash zone and tidal zone), seawater filled compartments and Im4 (submerged zone) and Im3 (buried items)	ISO 12944-9 Clause 9	ISO 12944-9 Clause 9	For seawater filled compartments, internal coating qualified to IMO MSC.215 (82) shall be acceptable, except that alternative systems to IMO MSC.215 (82) are not permitted.
10.1.4	Cathodic disbonding test	CX + Im4 (splash zone and tidal zone), seawater filled compartments with CP and Im4 (submerged zone) and Im3 (buried items)	ISO 12944-9 Clause 9	ISO 12944-9 Clause 9	For seawater filled compartments, internal coating qualified to IMO MSC.215 (82) shall be acceptable, except that alternative systems to IMO MSC.215 (82) are not permitted.
10.1.5	High temperature cathodic disbonding test	CX + Im4 (splash zone and tidal zone), seawater filled compartments with CP and Im4 (submerged zone) and Im3 (buried items)	Cathodic disbonding testing for operating temperature > 50°C shall conform to the following supplementary requirement to ISO 12944-9: The steel temperature shall be the maximum operating temperature anticipated during service; The electrolyte shall contain 3,5% NaCl; The electrolyte bulk temperature shall be maintained at 30°C; The cathodic protection potential shall be -1200 mV (SCE) The oxygen concentration of the test solution shall be maintained at its saturation value at the	ISO 12944-9 Clause 9	

Activity No.	Activity description	Environment corrosivity to ISO 12944-2	Verification method	Acceptance criteria	Remarks
			electrolyte bulk temperature. Duration 4 weeks. Cathodic disbonding tests for operating temperature above 100 °C shall be done under pressure to prevent boiling of the solution on the steel surface.		
10.1.6	ISO 21809 (all parts) or CSA Z245.20/30	Im3 (buried pipe)	ISO 21809 (all parts) or CSA Z245.20/30	ISO 21809 (all parts) or CSA Z245.20/30	Applicable to pipeline-type coating such as FBE coating and liquid epoxy coating when used for buried piping in coastal facilities.
10.1.7	ISO 18796-1 Clause 6.8	Internal surface of process equipment, vessels and tanks handling process fluids.	ISO 18796-1 Clause 6.8	ISO 18796-1 Clause 6.8 and CSDS (Annex A)	Qualification of linings shall sample all phases (e.g. oil, produced water and vapour phases) of multi-phase systems.
10.1.8	CUI testing	Coating under insulation	ISO 19277	ISO 19277	For cryogenic service, the testing requirements in ISO 19277 Clause 8.1 shall be mandatory.
<p>KEY</p> <p>CP = cathodic protection.</p> <p>NOTE For the purpose of this specification ISO 4624 is considered equivalent to ASTM D4541.</p>					

## 10.2 Qualification of companies and personnel

### 10.2.1 Companies

Replace clause with

Coating contractors shall be qualified in accordance with ISO 12944-7 or SSPC QP-3, or equivalent standard accepted by the purchaser.

Add to clause

Coating contractors shall have a quality management system in compliance with Clause 13.

### 10.2.2 Qualification of paint operators

Replace first sentence of first paragraph with

Personnel carrying out surface preparation and coating application shall be individually certified to NACE, SSPC, ACQPA, FROSIO, or equivalent certification programme accepted by the purchaser.

Replace second sentence of first paragraph with

Other personnel involved with coating work (e.g. mixer) shall have documented experience and training on health and safety hazard, use of protection equipment, coating materials, mixing and thinning of coatings, coating pot-life, surface preparation requirements and tools, coating application equipment.

Delete second paragraph

Add to clause

Operators may be qualified by demonstration of the PQT during PPT, when specified by the purchaser.

### 10.2.3 Qualification of metal spray operators

Replace first sentence of first paragraph with

Prior to commencement of work, thermal spray operators shall be qualified in accordance with ISO 14918 as amended by Table 2 of this specification.

Replace second sentence of first paragraph with

The qualification shall remain valid for a period of three years, providing the operator does not interrupt production spraying for a period of more than six months.

Add to clause

Test plate materials shall be of a grade comparable with the material to be used in production.

NOTE For the purpose of this specification, materials within the same material group according to ISO/TR 15608 are considered comparable.

Add to clause

The coating shall be applied in accordance with the proposed coating procedure specification.

Replace Table 2 with

**Table 2 - Qualification of metal spraying**

Activity No.	Activity description	Verification method	Acceptance criteria
10.2.3.1	Visual examination of coating	All test panels shall be examined without magnification and with 10X magnification.	See 8.3.
10.2.3.2	Film thickness and shape test	ISO 19840 Supplementary requirements: Specimens for shape test shall include:	TSA: Minimum 200 µm on all specimen surfaces  TSZ: Minimum 100 µm on all specimen surfaces

Activity No.	Activity description	Verification method	Acceptance criteria
		One 1500 mm long "T", "I" or "H" shaped profile approximately dimensions 750 mm high and 13 mm thick. Another specimen shall be cut from a 1500 mm long 50 mm diameter pipe.	
10.2.3.3	Adhesion test	ISO 4624 Supplementary requirements: Five test panels, each with room for six dollies shall be prepared according to the requirements of ISO 4624 using minimum 5 mm thick panels. Test equipment with an automatic centering pulling force shall be used. All test panels shall be tested. Examination of the test specimens shall be conducted after rupture to determine the cause of failure.	TSA: No single measurement less than 9,0 MPa. TSZ: No single measurement less than 5,0 MPa  Re-testing is required if the failure occurs at the adhesive/coating interface.

#### 10.2.4 Qualification of passive fire protection operators

Delete clause

#### 10.2.5 Qualification of supervisors, foremen and QC personnel

Replace first paragraph with

Personnel carrying out inspection or verification shall be qualified in accordance with FROSIO, Inspector level III or certified as NACE No. 13 coating inspector level III or ICorr inspector level III.

Replace second paragraph with

Inspectors according to FROSIO, NACE or ICorr Inspector level II shall carry out inspection work under the supervision of an inspector level III

Replace third paragraph with

Supervisors and foremen shall be qualified in accordance with FROSIO Inspector level II, or NACE level II, or shall be certified to an equivalent level by an organisation such as ACQPA, FROSIO specified by the purchaser.

Delete fourth paragraph

Add to clause

Qualification of personnel supervising and coordinating thermal spraying activities shall follow the principles of ISO 12690.

### 10.3 Qualification of procedures

#### 10.3.1 Coating procedure specification (CPS)

In first paragraph, replace "NORSOK standard" with

specification

In first paragraph, add bullet point

- performance (pre-qualification) test report.

Delete second paragraph

Add after third paragraph

The CPS documentation shall always be available to the personnel executing the work.

In fourth paragraph, replace first bullet with

- modifications, reformulations or substitution of approved individual coats and coating systems (see 10.1 and 13.2);

Replace second sentence of fifth paragraph with

Each coating specification shall be uniquely identified.

Add to clause

Typical content of the CPS should follow the requirements of ISO 12944-8. A sample thermal spray procedure specification form is given in ISO 14921 Annex C.

Add to clause

The CPS documentation shall be made available to the purchaser according to 4.12.

Replace clause heading with

#### 10.3.2 Coating procedure test (CPT) and pre-production trial (PPT)

Add to first paragraph after first sentence

A separate CPT shall be required for each applicator contractor executing coating work and for each coating system applied on different substrate materials.

Delete third paragraph

Delete sixth paragraph

CPT and CPS qualified according to this specification shall remain valid for a period of three years.

Add to clause

Pre-production trials (PPT) shall be carried out for internal coating work on process vessels in accordance with ISO 18796-1.



## 11 Inspection and testing

Replace Table 3 with

**Table 3 - Inspection and testing**

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
<b>Paint material identification</b>						
11.1	Routine batch testing of painting material	Coating manufacturer <sup>a</sup>	a) Density ISO 2811-1 or ASTM D1475 b) Non-volatile matter (solid content) ISO 3251 or ASTM D2369	Each batch of paint	a1) For density $\leq 2.0 \text{ g/cm}^3$ , $\pm 0,05 \text{ g/cm}^3$ from fingerprint of paint used for CPT. a2) For density $> 2.0 \text{ g/cm}^3$ , $\pm 0,10 \text{ g/cm}^3$ from fingerprint of paint used for CPT. b) $\pm 2 \%$ wt from fingerprint of paint used for CPT.	Unused painting material shall be quarantined. Fingerprinting check shall be carried out to verify material against CPT material. If the fingerprint does not match the material used for the CPT, the entire batch shall be rejected and the areas coated with the non-compliant material shall be re-blasted and re-coated with a coating that meets the specification.
11.2	Fingerprinting	Coating manufacturer <sup>b</sup>	ISO 12944-9 Annex C	CPT paint material only, unless required to verify a paint batch <sup>9</sup> .	ISO 12944-9 Annex C	Paint material to be rejected. Re-blast and re-coat with material compliant with CPT.
<b>Environmental conditions</b>						
11.3	Environmental conditions	Applicator contractor	Ambient and metal temperature, relative humidity, and dew point (see 4.4).	At the start of each shift and minimum of twice per shift.	In accordance with specified requirements in 4.4 and coating manufacturer's technical data sheet.	No blasting nor coating
<b>Surface preparation</b>						
11.4	Visual examination of surface	Applicator contractor	Visual inspection according to 6.1	100 % of all surfaces	No defects according to 6.1.	Defects to be removed or repaired
11.5	Salt testing of abrasives	Applicator contractor	ISO 11127-6 or ASTM D4940	At the start of each shift	150 $\mu\text{S/cm}$ 25 mg/kg of soluble chlorides	Change of blasting media. Re-washing and re-blasting of surfaces.
11.6	Compressed air quality	Applicator contractor	ASTM D4285	At the start of each shift and minimum twice per shift.	Free from any contamination	Clean and service air delivery system. Clean and re-blast contaminated components since last acceptable test.

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
11.7	Surface cleanliness	Applicator contractor	a) ISO 8501-1 b) ISO 8502-3	a) 100 % visual of all surfaces b) Minimum one test for each component or batch of components for bulk supplied items, at least once per 100 m <sup>2</sup> (1076 ft <sup>2</sup> ) of prepared surface with a minimum of three checks per day.	a) In accordance with specified requirements in CSDS b) Maximum quantity rating 2 and size rating 2	a) Re-blasting b) Re-cleaning and retesting of non-conforming area until acceptable
11.8	Salt test of surface	Applicator contractor	ISO 8502-6 and ISO 8502-9	Minimum one test for each component or batch of components for bulk supplied items, at least one test per 100 m <sup>2</sup> , with minimum three checks per day.	As per 6.3, maximum single 20 mg/m <sup>2</sup> (2µg/cm <sup>2</sup> )	Repeated washing of non-conforming area with potable water and retesting until acceptable followed by re-blasting
11.9	Surface profile	Applicator contractor	ISO 8503-5 or ASTM D4417 Method C or NACE SP0287 (see 6.3)	Minimum one test for each component or batch of components for bulk supplied items, at least one test per 10 m <sup>2</sup> , a minimum of 3 times per blasting operator per day.	As specified in the CSDS	Re-blasting non-conforming area with abrasive of suitable grade to achieve desired surface profile.
<b>Coating application</b>						
11.10	Curing test (for Zn silicate)	Applicator contractor	ASTM D4752 for Zn silicate	Each component or batch of components for bulk supplied items, at least once per 100 m <sup>2</sup>	Level 4 to 5	Allow to cure

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
11.11	Visual examination of coating	Applicator contractor	Visual examination to determine curing, contamination, solvent retention, pinholes/popping, sagging and surface defects.	100 % of surface after each coat	According to specified requirements in 7.3 and 8.3.	Repair of defects
11.12	Holiday detection	Applicator contractor	ISO 29601 or NACE SP0188	100 % of lined surfaces, splash and tidal zone coating, buried coating or as per CSDS. 100% of welds of submerged equipment items. Atmospheric and under insulation piping (if organic coating system is used): 10% of coated area which includes weld seams, corners and edges.	No holidays	Repair and retesting.
11.13	Dry film thickness (individual coat and complete system)	Applicator contractor	ISO 19840 or SSPC PA 2 Level 3	ISO 19840	ISO 19840 and Annex A, with NDFT to be the minimum DFT specified in the CSDS.	Repair, additional coats or re-coating as appropriate
11.14	Adhesion <sup>c</sup>	Applicator contractor	ISO 4624 (method A or B) or ASTM D4541, using equipment with an automatic centred pulling force, and carried out when coating system are fully cured.	Test panel before each first component or batch of components for bulk supplied items, at least once per 100 m <sup>2</sup> or once per week, whichever comes first.	TSA coating: 7,0 MPa (1015 psi), minimum single. Other coating systems and TSZ: maximum 50% average reduction from CPT, 5,0 MPa (725 psi) minimum single.	Test may be repeated once using two additional test samples taken from the original test panel. If any of the additional test fails, coating applied since last acceptable test shall be rejected. Re-blast and re-coat.
11.15	Adhesion - Internal coating of process vessels and tanks qualified	Applicator contractor	ISO 18796-1, 10.7 and ISO 16276-1 using test panels and automatically centred test equipment.	ISO 16276-1	ISO 16276-1, maximum 30% reduction from CPT value, minimum single 7,0 MPa (1015 psi).	Coating applied since last acceptable test to be rejected. Re-blast and re-coat.

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
	to ISO 18796-1					
<p><sup>a</sup> Additional batch testing may be carried out by the applicator or the purchaser on a random batch.</p> <p><sup>b</sup> Additional fingerprint check may be carried out by the applicator or the purchaser on a random paint batch to verify the fingerprint of the supplied material against the material used for CPT.</p> <p><sup>c</sup> Scored sample shall be used.</p>						

Add new clause

## 12 Repair of coating

### 12.1 General

#### 12.1.1

Defects shall be repaired before the application of further coats.

#### 12.1.2

Coating repair systems shall be qualified in accordance with Clause 10.

#### 12.1.3

After surface preparation, the specified coating system or the required layers of the specified coating shall be re-applied in accordance to the qualified CPS.

#### 12.1.4

Repair of galvanized items damaged during fabrication, transportation, erection or installation shall be carried out according to ISO 1461 or ASTM A123.

#### 12.1.5

Inspection of the repaired surface shall comply with clause 11.

#### 12.1.6

Repair of metal sprayed coating shall comply with 8.4.

### 12.2 Repair of low or high DFT

#### 12.2.1

If the minimum DFT is not achieved and the existing coating has exceeded the maximum re-coating time (see 7.3), the surface shall be either:

- re-blasted to bare metal and coated with the originally specified coating system, or;
- abraded according to the coating manufacturer's product data sheet, prior to application of the same coating material layer.

### **12.2.2**

Except for areas where a stripe coat is applied, where the DFT exceeds the specified maximum requirement, the coating shall be removed, the surface re-blasted to bare metal and re-coated with the specified coating system.

## **12.3 Repair of damaged coating**

### **12.3.1**

Coating repair procedures shall be developed based on coating manufacturer recommendation.

### **12.3.2**

The procedure shall cover the following repairs:

- repair of partial thickness damage;
- repair of full thickness damage.

### **12.3.3**

Abrasive blast cleaning shall be used where the coating needs to be removed completely, except when the use of alternative cleaning methods is permitted in 6.5.

### **12.3.4**

Surface preparation shall remove the entire damaged area and extend to the surrounding coating surface for minimum 200 mm (8 in) all around.

### **12.3.5**

Feathering of the edges shall be done by manual abrasion (e.g. sandpaper) over a width of at least 50 mm (2 in).

### **12.3.6**

The prepared areas shall be cleaned from contaminants in accordance with ISO 12944-4 or SSPC SP 1 before re-coating.

Add new clause

## **13 Quality management and performance assurance**

### **13.1 Quality management**

#### **13.1.1**

The coating manufacturers and contractors shall have a quality management system conforming to ISO 9001 or ISO/TS 29001 or API Specification Q1.

#### **13.1.2**

Thermal spray contractor shall have a quality management system that fulfils the requirements of ISO 2063-2.

### **13.1.3**

Coating work shall be supervised at all time by personnel qualified according to 10.2.

### **13.1.4**

All instruments and gauges shall be calibrated.

### **13.1.5**

Calibration certificates shall be available for review by purchaser.

### **13.1.6**

Thickness gauges shall be adjusted to compensate for the surface profile effect prior to application of any coating.

### **13.1.7**

The coating contractor shall submit a quality plan before commencement of the painting work.

### **13.1.8**

The quality plan shall cover the following elements:

- work plan and method statement(s) covering the various activities;
- detailed scope of the work including each item or area, the required surface preparation and proposed coating systems;
- details of the blasting, paint mixing and spray equipment, temperature, humidity and environmental control measures;
- details of the personnel involved in the work together with a clear definition of their responsibilities and reporting lines;
- details of any sub-contractor and sub-contracted activities;
- detailed procedures for inspection and testing, including the methods, equipment, frequency of their application and acceptance criteria;
- dew point determination according to ISO 8502-4;
- description of and calibration methods for the required inspection equipment;
- qualification of personnel in accordance with 10.2;
- reporting requirements;
- plan and schedule of operation for surface preparation and application of each coat of the coating system;
- details of storage areas, location and storage procedure for the paint and coating materials;
- inspection and test plan (ITP) listing all activities to be performed before, during and after coating application, including the activities listed in Table 3.

### **13.1.9**

Daily report and final coating report should be in accordance with Annex D or ISO 12944-8 Annex H and Annex I.

## 13.2 Paint product identification

### 13.2.1

Each paint in a paint system shall be identified (fingerprinting) as part of the CPT in accordance with Table 1.

### 13.2.2

Batch checks during execution of the work shall be in compliance with Table 3.

Add new clause

## 14 Coating system selection

### 14.1

Coating system selection shall be based on the following essential factors:

- Type of material;
- Type of application or item;
- Operating environment;
- Operating conditions;
- Project design requirements including design life, maintenance strategy and criticality of the item to be coated.

### 14.2

Coating systems for a specific material, application or item, and operating environment shall be selected from Table 6, Table 7 or Table 8.

### 14.3

The coating selection table shall be read in conjunction with the CSDS in Annex A for additional restrictions on operating conditions for the specific coating system.

### 14.4

The tables have one column for 'default' systems and one column for 'alternative' systems.

### 14.5

The default system is the coating system recommended for a 15 years durability.

### 14.6

Coating systems listed under 'alternative' may be specified by the purchaser for applications requiring extended design life or reduced maintenance or for high criticality areas or items.

### 14.7

Where multiple coating systems are listed in the coating selection tables they shall not be regarded as equivalent.

## 14.8

For applications or equipment items not covered in the coating selection table, the coating system selection shall be specified by the purchaser.

## 14.9

The coating systems are numbered in accordance with Norsok M-501 Edition 6 (2012) with the following additions and amendments.

1. System 1 is split into the following sub-systems:
  - a. System 1A with inorganic zinc-rich primer.
  - b. System 1B with zinc-rich epoxy primer.
  - c. System 1C for operating temperature from 80 °C (176 °F) up to 400 °C (752 °F).
  - d. System 1D for insulated condition and operating temperature up to 200°C (392 °F).
  - e. System 1E for insulated condition and operating temperature from 200°C (392°F) up to 400°C (752 °F).
  - f. System 1F for buried condition and operating temperature up to 80°C (176 °F).
2. System 4 is split into the following sub-systems:
  - a. a. System 4A for heavy duty and helideck.
  - a. b. System 4B for light and normal duty.
  - a. c. System 4C for light and normal duty dry indoor and HVAC areas.
3. System 10 for cold and cryogenic service (minimum operating temperature colder than -50°C (-58°F)).



**Table 6 - Coating selection table - structural items**

Substrate Material	Application or Item	Operating Environment	Coating System <sup>1,2</sup>		Remarks
			Default	Alternative	
Carbon steel	Structures and structural components (general)	Atmospheric zone	1A	2A, 2B, 1B	
		Unexposed area	1B	1A, 7A	
		HVAC and dry indoor areas	8	1A, 1B	Manufacturer's standard coating system may be used.
		Splash zone and tidal zone	7A		
		Submerged ≤ 50 °C	N/R	7B, 7A, 7C	Cathodic protection shall be applied.
		Submerged > 50 °C	7C		Cathodic protection shall be applied.
		Between splash zone and underside cellar deck	7A	2A, 2B	
		Underside of deck and atmospheric areas directly above sea	7A	2A, 2B	
		Buried steel structures, piles	1F		
	Bridges	Atmospheric zone	1A	7A, 2A, 2B	
	Exhaust stack, flare stack and boom	Atmospheric zone	1A	1C, 2A, 2B	
	Crane boom and A-frame	Atmospheric zone	1A	2B	
	Lifeboat stations/Rescue areas	Atmospheric zone	1A	2B	
	Escape routes and solid walkways, heavy duty deck areas	Atmospheric zone	4A		
	Lay down areas	Atmospheric zone	4A	4A	
	Deck (normal and light duty)	Atmospheric zone	4B	4A	
	Deck (normal and light duty)	Unexposed areas	4C	4A, 4B	
	Deck	HVAC and dry, indoor areas	4C		
	Permanent lifting beams and lugs	Atmospheric zone	1A	2A, 2B	
	Caisson	External surface, all zones	7A		
Caisson	Internal surface	7B	7A	7A shall be used for very high durability (> 25 years). In alternative, polymer liner subject to separate qualification and approval by the end-user may be considered.	

**Table 7 - Coating selection table - equipment items, piping and valves**

Substrate Material	Application or Item	Operating Environment	Coating System <sup>1,2</sup>		Remarks
			Default	Alternative	
Carbon steel, low-alloy steel	Pressure vessels, piping and valves, pumps	Atmospheric, non-insulated ≤ 80 °C	1A	2A, 2B	
		Atmospheric, non-insulated > 80 °C up to 400 °C	1C	2A	
		Atmospheric, non-insulated > 400 °C	1E	10	
		Atmospheric, insulated ≤ 200 °C	1D	2A, 10	Coating system shall be selected as for un-insulated surfaces when perforated guards or sheets are used for personnel protection (see 4.13.4).
		Atmospheric, insulated ≤ 400 °C	2A	1E, 10	
		Atmospheric, insulated > 400 °C	1E	10	
		Buried	1F		Alternative coating systems qualified according to 10.1.6 may be used.
		Splash zone and tidal zone	7A		
		Submerged ≤ 50 °C	N/R	7B, 7C, 7A	Cathodic protection shall be applied.
		Submerged > 50 °C	7C		Cathodic protection shall be applied.
		Cold and cryogenic service	6C	1E, 2A	Minimum operating temperature colder than -50 °C.

Carbon steel, low-alloy steel	Actuator, gear box	Atmospheric zone	1A	2A, 2B	
	Hand wheels	Atmospheric zone	6B		HDG wheel.
	Electric generators, motors, transformers	Atmospheric zone	1A	2B	System 2B shall be used for MV and HV motor
		Unexposed area	1B	1A, 2B	Manufacturer standard coating complying with ISO 12944-5 corrosivity category C5, durability high may be used.
	Miscellaneous mechanical equipment items	Atmospheric zone	1A	2B, 1C	
		Unexposed area	1B	1A, 1D	Manufacturer standard coating complying with ISO 12944-5 corrosivity category C5, durability high may be used.
	Frames, foundations, base plate	Atmospheric zone	1A	2A, 2B	
		Unexposed area	1B	1A	
	Enclosures	Atmospheric zone	1A	2B	
		Unexposed area	1B	1A	
	Turbines, compressors, diesel engines	Atmospheric zone	1A	1C, 1D	Manufacturer standard coating complying with ISO 12944-9 corrosivity category CX may be used.
		Unexposed area	see remarks		Manufacturer standard coating complying with ISO 12944-5 corrosivity category C5, durability high shall be used.
Stainless steel (grade 316 or higher)	Pressure vessels, piping and valves, pumps	Non-insulated, atmospheric zone	N/R	6A, 2A, 1E	
		Non-insulated, splash zone	7A		
		Submerged ≤ 50 °C	7B	7C, 7A	
		Submerged > 50 °C	7C		Cathodic protection shall be applied.
		Insulated, atmospheric zone	6C	2A	
		Insulated subsea	7B	7C, 7A	
		Cryogenic service	6C	10	
		Non-insulated HVAC and dry, indoor environment	N/R	6A	System 6A may be used when painting is required, e.g. for colour coding.
	Actuator, gear box	Non-insulated	N/R	6A	System 6A may be used when painting is required, e.g. for colour coding.
		Insulated	6C		
	Instruments and instrument tubing	Non-insulated	N/R	6A	System 6A or 6C may be used when painting is required, e.g. for colour coding.

Aluminium	Actuator and other equipment items	Atmospheric zone	N/R	6A	System 6A may be used when painting is required, e.g. for colour coding.
Carbon steel HDG	Miscellaneous equipment items, electrical equipment	Atmospheric zone	N/R	6B	System 6B may be used when painting is required, e.g. for safety.

KEY  
N/R = not required.

NOTE This table shall be read in conjunction with the CSDS in Annex A which includes additional restrictions on operating conditions for each coating systems.

<sup>1</sup> Coating system selection shall be appropriate for the actual process condition.  
<sup>2</sup> Where multiple coating systems are listed they shall not be regarded as equivalent.

**Table 8 - Coating selection table - internal coating of offshore storage tanks and process vessels**

Substrate Material	Application or Item	Operating Environment (internal)	Coating System <sup>1,2</sup>		Remarks
			Default	Alternative	
Carbon steel	Storage tank and process vessels	Potable water	3A		
		Service water	3A		
		Demineralised water	3D		
		Diesel, condensate, stabilised crude	3C		
		Seawater, firewater, raw water	3B		In combination with cathodic protection.
		Open drain	3B	3D	In combination with cathodic protection.
		Closed drain	3B	3D, 3E, 3F	
		Methanol, ethanol, MEG, TEG	3G		
		Sewage	3D	3E	
Fuel, Aviation fuel	3D	3E	Shall be certified for aviation fuel storage.		

KEY  
N/R = not required.

NOTE 1 This table shall be read in conjunction with the CSDS in Annex A which includes additional restrictions on operating conditions for each coating systems.

NOTE 2 External coating in accordance with the requirement for structures and structural components in Table 7.

<sup>1</sup> Coating system selection shall be appropriate for the actual process condition.  
<sup>2</sup> Where multiple coating systems are listed they shall not be regarded as equivalent.

## Annex A (Normative) Coating systems

### A.1 Coating system no. 1 (shall be pre-qualified)

*Replace table with*

**Table A.1.1 - CSDS No. 1A**

Coating System Data Sheet		CSDS No. 1A		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal. Non-insulated.			
Minimum/maximum operating temperature	-50 °C to +80 °C (-58 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc silicate <sup>1,2</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy	Intermediate and top coat DFT as per qualified coating system.		
3 (topcoat)	Non-isocyanate coat or polyurethane <sup>3</sup>			
Total minimum DFT		280		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12 and 11.15.			
Inspection	Table 3, all testing activities except 11.12 and 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				

Coating System Data Sheet		CSDS No. 1A		Rev. 01 Page 1 of 1
Type and level of preparation:			ISO 8501-2 P Sa 2 ½, SSPC-SP 10	
Surface profile			50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2	
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich primer <sup>1,2</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy	Intermediate and top coat DFT as per qualified coating system.		
3 (topcoat)	Non-isocyanate coat or polyurethane <sup>3</sup>			
Total minimum DFT		280		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1	Epoxy <sup>1</sup>	DFT of each coat as per qualified coating system.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Non-isocyanate coat or polyurethane <sup>3</sup>			
Total minimum DFT		280		
<p><b>KEY</b></p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p><b>NOTE</b> The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> If a tie-coat is applied according to the coating manufacturer's recommendations, it shall be performance tested as a part of the coating system.</p> <p><sup>2</sup> Zinc primer shall be in accordance with ISO 12944-5, 7.1.2. (minimum 85% by mass zinc content in dry film).</p> <p><sup>3</sup> HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

Add new table

**Table A.1.2 - CSDS No. 1B**

Coating System Data Sheet		CSDS No. 1B		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Unexposed areas, atmospheric zone offshore and coastal. Non-insulated.			
Minimum/maximum operating temperature	-50 °C to +80 °C (-58 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich primer <sup>1,2</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy	Intermediate and top coat		
3 (top coat)	Non-isocyanate coat or polyurethane <sup>3</sup>	DFT as per qualified coating system.		
Total minimum DFT		280		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12 and 11.15.			
Inspection	Table 3, all testing activities except 11.12 and 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich primer <sup>1,2</sup>	60	Maximum DFT for each coat and coating system shall	
2	Epoxy	Intermediate and top coat		
3 (top coat)	Non-isocyanate coat or polyurethane <sup>3</sup>	DFT as per qualified		

Coating System Data Sheet		CSDS No. 1B		Rev. 01 Page 1 of 1
		coating system.	be as qualified by the coating manufacturer.	
Total minimum DFT		280		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$		
		Min	Max	
1	Epoxy <sup>1</sup>	DFT of each coat as per qualified coating system.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Non-isocyanate coat or polyurethane <sup>3</sup>			
Total minimum DFT		280		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> If a tie-coat is applied according to the coating manufacturer's recommendations, it shall be performance tested as a part of the coating system.</p> <p><sup>2</sup> Zinc-rich primer shall be in accordance with ISO 12944-5 Clause 7.1.2 (minimum 80 % by mass zinc content in dry film).</p> <p><sup>3</sup> HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				



Add new table

**Table A.1.3 - CSDS No. 1C**

<b>0</b>	<b>CSDS No. 1C</b>	<b>Rev. 01 Page 1 of 1</b>	
Environment corrosivity (ISO 12944-2)	CX		
Substrate material	Carbon steel		
Application	Structures and structural components, equipment items, piping and valves.		
Service	Atmospheric zone offshore and coastal. Non-insulated.		
Minimum/maximum operating temperature	> 80 °C to 400 °C (> 176 °F to 752 °F)		
<b>Surface preparation</b>			
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10		
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)		
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>		
Steel preparation	Grade P3 (ISO 8501-3)		
<b>Coating system</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Zinc silicate <sup>1</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Silicone <sup>2</sup>	Top coat DFT as per qualified coating system.	
Total minimum DFT		80	
<b>Performance tests, Qualification and inspection</b>			
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2		
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12 and 11.15.		
Inspection	Table 3, all testing activities except 11.12 and 11.15.		
<b>Repair of damage on newly applied coating</b>			
<b>Coating damage exposing the steel surface</b>			
Surface preparation			
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10		
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Zinc silicate <sup>1</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by
2 (topcoat)	Silicone <sup>2</sup>	Top coat DFT as per qualified coating system.	

<b>0</b>	<b>CSDS No. 1C</b>	<b>Rev. 01 Page 1 of 1</b>	
Total minimum DFT		80	the coating manufacturer.
<b>Coating damage not exposing the steel surface</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$	
		Min	Max
1 (topcoat)	Silicone <sup>2</sup>	DFT of each coat as per qualified coating system.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		80	
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests. Some coating products may require heat cure.</p> <p><sup>1</sup> Zinc primer shall be in accordance with ISO 12944-5 Clause 7.1.2 (minimum 85 % by mass zinc content in dry film).</p> <p><sup>2</sup> A mist coat shall be applied according to the coating manufacturer's recommendations to minimise bubbling.</p>			

Add new table

**Table A.1.4 - CSDS No. 1D**

<b>Coating System Data Sheet</b>		<b>CSDS No. 1D</b>		<b>Rev. 01</b> <b>Page 1 of 1</b>
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel, stainless steel and non-ferrous alloys			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal. Insulated, continuous and cyclic service.			
Minimum/maximum operating temperature	-50 °C to +232 °C (-58 °F to +450 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Carbon steel Sa 2 1/2 (ISO 8501-1), SSPC-SP 10. Stainless steel and non-ferrous alloys SSPC-SP 16.			
Roughness	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy phenolic, epoxy novolac	125	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy phenolic, epoxy novolac	125		
Total minimum DFT		250		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activity 10.1.1, 10.1.8			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15			
Inspection	Table 3, all testing activities except 11.10 and 11.15			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		Carbon steel P Sa 2 1/2 (ISO 8501-2), SSPC-SP 10. Stainless steel and non-ferrous alloys SSPC-SP 16.		

<b>Coating System Data Sheet</b>		<b>CSDS No. 1D</b>		<b>Rev. 01 Page 1 of 1</b>	
Surface profile			Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
<b>Coat (minimum number of coats)</b>	<b>Type of coat / binder</b>	<b>DFT, µm</b>		<b>Min</b>	<b>Max</b>
1 (primer)	Epoxy phenolic, epoxy novolac	125			Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Epoxy phenolic, epoxy novolac	125			
Total minimum DFT		250			
<b>Coating damage not exposing the steel surface</b>					
<b>Coat (minimum number of coats)</b>	<b>Type of coat / binder</b>	<b>DFT, µm</b>		<b>Min</b>	<b>Max</b>
1 (topcoat)	Epoxy phenolic, epoxy novolac	125			Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		250			
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p>					

Add new table

**Table A.1.5 - CSDS No. 1E**

Coating System Data Sheet		CSDS No. 1E		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal. Insulated, continuous service <sup>1</sup>			
Minimum/maximum operating temperature	> 200 °C (> 392 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Silicone	25	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Silicone	25		
Total minimum DFT		50		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activity 10.1.1, 10.1.8			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15			
Inspection	Table 3, all testing activities except 11.10 and 11.15			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Silicone	25	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Silicone	25		
Total minimum DFT		50		
<b>Coating damage not exposing the steel surface</b>				

Coating System Data Sheet		CSDS No. 1E		Rev. 01 Page 1 of 1
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		Min	Max	
1 (topcoat)	Silicone	25		
Total minimum DFT		50		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests. Some coating products may require heat cure.</p> <p><sup>1</sup> For continuous service above 200°C only. Prolonged atmospheric exposure below this temperature (e.g. during equipment commissioning) shall be avoided.</p>				

Add new table

**Table A.1.6 - CSDS No. 1F**

Coating System Data Sheet		CSDS No. 1F		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	Im3			
Substrate material	Carbon steel			
Application	Piping and vessels			
Service	Buried in soil			
Minimum/maximum operating temperature	-50 °C to +80 °C (-58 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	> 75 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1</sup>	500	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy <sup>1,2</sup>	500		
Total minimum DFT		1000		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, all testing activities except 10.1.6, 10.1.7, 10.1.8.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15			
Inspection	Table 3, all testing activities except 11.10 and 11.15			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	> 75 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1</sup>	500	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy <sup>1,2</sup>	500		
Total minimum DFT		1000		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		

Coating System Data Sheet	CSDS No. 1F		Rev. 01 Page 1 of 1
		Min	Max
1 (topcoat)	Epoxy <sup>1, 2</sup>	500	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		1000	
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p>NOTE 2 Alternative coating systems qualified according to 10.1.6 may be used.</p> <p><sup>1</sup> Glass flake filled epoxy coat. In alternative, a high-build epoxy coating system with minimum total DFT &gt; 1500 µm may be used, subject to end-user approval.</p> <p><sup>2</sup> An additional non-isocyanate or polyurethane topcoat may be applied to increase chemical resistance and to avoid chalking on above ground transitions. HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>			



## A.2 Coating system No. 2

*Replace table with*

**Table A.2.1 - CSDS No. 2A**

Coating System Data Sheet		CSDS No. 2A		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX, CX+Im4, Im4, Im3			
Substrate material	Carbon steel, stainless steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal, splash zone, immersed service, buried environment. Non-insulated and insulated.			
Minimum/maximum operating temperature	-50 °C to +400 °C (-58 °F to +752 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (TSA coat)	Thermally sprayed aluminium <sup>1</sup>	200	Maximum DFT shall be as qualified by the CPT.	
2 (sealer coat)	Sealer <sup>2,4</sup>	- <sup>3</sup>	20 <sup>3</sup>	
Total minimum DFT		200	Maximum DFT shall be as qualified by the CPT <sup>3</sup> .	
<b>Performance tests, Qualification and inspection</b>				
Performance tests	N/A			
Coating procedure tests (CPT)	Table 2, all testing activities. Table 3, all testing activities except 11.10, 11.12, 11.15.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	

Coating System Data Sheet		CSDS No. 2A		Rev. 01 Page 1 of 1
1 (TSA coat)	Thermally sprayed aluminium <sup>1</sup>	200	Maximum DFT shall be as qualified by the CPT.	
2 (sealer coat)	Sealer <sup>2,4</sup>	- <sup>3</sup>	20 <sup>3</sup>	
Total minimum DFT		200	Maximum DFT shall be as qualified by the CPT <sup>3</sup> .	
<b>Coating damage not exposing the steel surface<sup>5</sup></b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (sealer coat)	Sealer <sup>2,4</sup>	- <sup>3</sup>	20 <sup>3</sup>	
Total minimum DFT		200	Maximum DFT shall be as qualified by the CPT <sup>3</sup> .	
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products and service conditions.</p> <p><sup>1</sup> TSA material shall comply with 8.2.</p> <p><sup>2</sup> The materials for sealing the metal coating shall be two-component epoxy for operating temperatures ≤ 120 °C, silicone for temperatures above 120 °C and up to 450 °C.</p> <p><sup>3</sup> The sealer shall fill the metal pores and it shall be applied until absorption is complete.</p> <p><sup>4</sup> The application of a sealer is not required for immersed (Im4), buried (Im3), insulated services.</p> <p><sup>5</sup> If the DFT of the TSA coat is reduced below the minimum specified thickness, the complete system shall be re-applied.</p>				

Add new table

**Table A.2.2 - CSDS No. 2B**

Coating System Data Sheet		CSDS No. 2B		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal. Non-insulated.			
Minimum/maximum operating temperature	-50 °C to +80 °C (-58 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (TSZ coat)	Thermally sprayed zinc <sup>1</sup>	100	Maximum DFT shall be as qualified by the CPT.	
2	Epoxy <sup>2,3</sup>	125	Maximum DFT shall be as qualified by the CPT <sup>3</sup> .	
3 (top coat)	Non-isocyanate coat or polyurethane <sup>3,4</sup>	75		
Total minimum DFT		300		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	N/A			
Coating procedure tests (CPT)	Table 2, all testing activities. Table 3, all testing activities except 11.10, 11.12, 11.15.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (TSZ coat)	Thermally sprayed zinc <sup>1</sup>	100	Maximum DFT shall be as qualified by the CPT.	
2	Epoxy <sup>2,3</sup>	125		

Coating System Data Sheet		CSDS No. 2B		Rev. 01 Page 1 of 1
3 (top coat)	Non-isocyanate coat or polyurethane <sup>3,4</sup>	75	Maximum DFT shall be as qualified by the CPT <sup>3</sup> .	
Total minimum DFT		300		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
2	Epoxy <sup>2,3</sup>	125	Maximum DFT shall be as qualified by the CPT <sup>3</sup> .	
4 (top coat)	Non-isocyanate coat or polyurethane <sup>3,4</sup>	75		
Total minimum DFT		300		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations.</p> <p><sup>1</sup> TSZ material shall comply with 8.2.</p> <p><sup>2</sup> A tie coat shall be applied in accordance with coating manufacturer's recommendation.</p> <p><sup>3</sup> Tie coat, intermediate coat and topcoat shall be performance tested as part of coating system no. 1A or 1B. The performance testing may be carried out at different film thicknesses.</p> <p><sup>4</sup> HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

### A.3 Coating system No. 3

*Replace table with*

**Table A.3.1 - CSDS No. 3A**

Coating System Data Sheet		CSDS No. 3A		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of tanks and process vessels.			
Service	Potable water.			
Minimum/maximum operating temperature	-20 °C to +40 °C (-4 °F to +104 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 3 (ISO 8501-1), SSPC-SP 5			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1,2</sup>	300	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy <sup>1,2</sup>	300		
Total minimum DFT		600		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	N/R			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14.			
Inspection	Table 3, all testing activities except 11.10, 11.14.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:			ISO 8501-2 P Sa 3 SSPC-SP 5	
Surface profile			50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2	
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1,2</sup>	300	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy <sup>1,2</sup>	300		
Total minimum DFT		600		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		

Coating System Data Sheet		CSDS No. 3A		Rev. 01 Page 1 of 1
		Min	Max	
1 (top coat)	Epoxy <sup>1,2</sup>	300		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		600		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Coating shall be certified to local regulatory requirements for material in contact with potable water.</p> <p><sup>2</sup> Solvent free epoxy shall be used.</p>				

Add new table

**Table A.3.2 - CSDS No. 3B**

Coating System Data Sheet		CSDS No. 3B		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of seawater filled compartments.			
Service	Seawater water, raw water, slops			
Minimum/maximum operating temperature	-20 °C to +50 °C (-4 °F to +122 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy			
Total minimum DFT		360		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, 10.1.1, 10.1.2, 10.1.3, 10.1.4. For operating temperature > 50 °C (122 °F) 10.1.5 shall also apply.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.15.			
Inspection	Table 3, all testing activities except 11.10, 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		ISO 8501-2 P Sa 2 ½, SSPC-SP 10		
Surface profile		50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the	Maximum DFT for each coat and coating system shall	
2 (top coat)	Epoxy			

<b>Coating System Data Sheet</b>		<b>CSDS No. 3B</b>		<b>Rev. 01 Page 1 of 1</b>	
		coating manufacturer.	be as qualified by the coating manufacturer.		
Total minimum DFT		360			
<b>Coating damage not exposing the steel surface</b>					
Coat (minimum number of coats)	Type of coat / binder	DFT, µm			
		Min	Max		
1 (top coat)	Epoxy	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.		
Total minimum DFT		360			
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p>NOTE 2 Coating qualified to IMO MSC.215 (82) are acceptable, except for the alternative systems qualification to IMO MSC.215 (82).</p> <p><sup>1</sup> Stripe coat on welds and edges shall be required after the first coat.</p>					



Add new table

**Table A.3.3 - CSDS No. 3C**

Coating System Data Sheet		CSDS No. 3C		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of tanks and process vessels.			
Service	Stabilised crude, diesel and condensate.			
Minimum/maximum operating temperature	-20 °C to +50 °C (-4 °F to +122 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 3 (ISO 8501-1), SSPC-SP 5			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy			
Total minimum DFT		250		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, 10.1.7.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14.			
Inspection	Table 3, all testing activities except 11.10, 11.14.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 3, SSPC-SP 5			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy			
Total minimum DFT		250		

<b>Coating System Data Sheet</b>		<b>CSDS No. 3C</b>		<b>Rev. 01 Page 1 of 1</b>	
<b>Coating damage not exposing the steel surface</b>					
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$			
		Min	Max		
1 (top coat)	Epoxy	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.		
Total minimum DFT		250			
<p><b>KEY</b>                      N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.                      NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.  <sup>1</sup> Stripe coat on welds and edges shall be required after the first coat.</p>					

Add new table

Table A.3.4 - CSDS No. 3D

Coating System Data Sheet		CSDS No. 3D		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)		-		
Substrate material		Carbon steel		
Application		Internal coating of process vessels.		
Service		Hydrocarbon liquids, vapour and produced water. Maximum operating pressure 0,3 MPa (45 psi), Maximum operating temperature 75 °C (167 °F).		
Minimum/maximum operating temperature		-20 °C to +75 °C (-4 °F to +140 °F)		
<b>Surface preparation</b>				
Surface cleanliness		Sa 3 (ISO 8501-1), SSPC-SP 5		
Roughness		50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)		
Level of total water-soluble salts (max)		20 mg/m <sup>2</sup>		
Steel preparation		Grade P3 (ISO 8501-3)		
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy, phenolic epoxy, epoxy novolac <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy, phenolic epoxy, epoxy novolac			
Total minimum DFT		250		
<b>Performance tests, Qualification and inspection</b>				
Performance tests		Table 1, 10.1.7.		
Coating procedure tests (CPT)		Table 3, all testing activities except 11.10, 11.14.		
Inspection		Table 3, all testing activities except 11.10, 11.14.		
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		ISO 8501-2 P Sa 3, SSPC-SP 5		
Surface profile		50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy, phenolic epoxy, epoxy novolac <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy, phenolic epoxy, epoxy novolac			
Total minimum DFT		250		

<b>Coating System Data Sheet</b>		<b>CSDS No. 3D</b>		<b>Rev. 01 Page 1 of 1</b>	
<b>Coating damage not exposing the steel surface</b>					
Coat (minimum number of coats)	Type of coat / binder	DFT, µm			
		Min		Max	
1 (top coat)	Epoxy, phenolic epoxy, epoxy novolac	Minimum DFT for each coat shall be as qualified by the coating manufacturer.		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT		250			
<p><b>KEY</b></p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p><b>NOTE 1</b> The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system.</p> <p><b>NOTE 2</b> Additional restrictions may apply on the operating temperature, pH, H<sub>2</sub>S concentration and concentration of organic and inorganic acids, aromatic and aliphatic hydrocarbons based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Stripe coat on welds and edges may be required after the first coat.</p>					

Add new table

**Table A.3.5 - CSDS No. 3E**

Coating System Data Sheet		CSDS No. 3E		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of process vessels.			
Service	Hydrocarbon liquids, vapour and produced water. Maximum operating pressure 7 MPa (1000 psi), Maximum operating temperature 80 °C (176 °F).			
Minimum/maximum operating temperature	-20 °C to +80 °C (-4 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 3 (ISO 8501-1), SSPC-SP 5			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Phenolic epoxy, epoxy novolac <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Phenolic epoxy, epoxy novolac			
Total minimum DFT		250		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, 10.1.7.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14.			
Inspection	Table 3, all testing activities except 11.10, 11.14.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		ISO 8501-2 P Sa 3, SSPC-SP 5		
Surface profile		50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Phenolic epoxy, epoxy novolac <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by	
2 (top coat)	Phenolic epoxy, epoxy novolac			

<b>Coating System Data Sheet</b>		<b>CSDS No. 3E</b>		<b>Rev. 01 Page 1 of 1</b>	
Total minimum DFT			250	the coating manufacturer.	
<b>Coating damage not exposing the steel surface</b>					
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$			
		Min		Max	
1 (top coat)	Phenolic epoxy, epoxy novolac	Minimum DFT for each coat shall be as qualified by the coating manufacturer.		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT			250		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system.</p> <p>NOTE 2 Additional restrictions may apply on the operating temperature, pH, H<sub>2</sub>S concentration and concentration of organic and inorganic acids, aromatic and aliphatic hydrocarbons based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Stripe coat on welds and edges may be required after the first coat.</p>					

Add new table

**Table A.3.6 - CSDS No. 3F**

<b>Coating System Data Sheet</b>		<b>CSDS No. 3F</b>		<b>Rev. 01</b> <b>Page 1 of 1</b>
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of process vessels.			
Service	Hydrocarbon liquids, vapour and produced water. Maximum operating pressure 3 MPa (435 psi), Maximum operating temperature 130 °C (266 °F).			
Minimum/maximum operating temperature	-20 °C to +130 °C (-4 °F to +266 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 3 (ISO 8501-1), SSPC-SP 5			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
<b>Coat (minimum number of coats)</b>	<b>Type of coat / binder</b>	<b>DFT, µm</b>		
		<b>Min</b>	<b>Max</b>	
1 (primer)	Phenolic epoxy, epoxy novolac <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Phenolic epoxy, epoxy novolac			
Total minimum DFT		250		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, 10.1.7.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14.			
Inspection	Table 3, all testing activities except 11.10, 11.14.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 3, SSPC-SP 5			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
<b>Coat (minimum number of coats)</b>	<b>Type of coat / binder</b>	<b>DFT, µm</b>		
		<b>Min</b>	<b>Max</b>	
1 (primer)	Phenolic epoxy, epoxy novolac <sup>1</sup>	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Phenolic epoxy, epoxy novolac			

Coating System Data Sheet		CSDS No. 3F		Rev. 01 Page 1 of 1
Total minimum DFT			250	
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$		
		Min	Max	
1 (top coat)	Phenolic epoxy, epoxy novolac	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT			250	
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system.</p> <p>NOTE 2 Additional restrictions may apply on the operating temperature, pH, H<sub>2</sub>S concentration and concentration of organic and inorganic acids, aromatic and aliphatic hydrocarbons based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Stripe coat on welds and edges may be required after the first coat.</p>				



Add new table

**Table A.3.7 - CSDS No. 3G**

Coating System Data Sheet		CSDS No. 3G		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of tanks and process vessels.			
Service	Methanol, ethanol, MEG, TEG.			
Minimum/maximum operating temperature	-20 °C to +40 °C (-4 °F to +104 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 3 (ISO 8501-1), SSPC-SP 5			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1	Zinc silicate <sup>1</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT		60		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, 10.1.7.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.14.			
Inspection	Table 3, all testing activities except 11.14.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		ISO 8501-2 P Sa 3, SSPC-SP 5		
Surface profile		50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1	Zinc silicate <sup>1</sup>	60	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT		60		
<b>Coating damage not exposing the steel surface</b>				

Coating System Data Sheet		CSDS No. 3G		Rev. 01 Page 1 of 1	
Coat (minimum number of coats)	Type of coat / binder	DFT, µm			
		Min	Max		
-	-	-	-		
Total minimum DFT		-	-		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Zinc primer shall be in accordance with ISO 12944-5 Clause 7.1.2. (minimum 85% by mass zinc content in dry film)</p>					

## A.4 Coating system No. 4

*Replace table with*

**Table A.4.1 - CSDS No. 4A**

Coating System Data Sheet		CSDS No. 4A		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Walkways, escape routes, decks and floors, helideck, non-skid. Heavy duty.			
Service	Atmospheric zone offshore and coastal. Heavy duty. Non-insulated.			
Minimum/maximum operating temperature	-20 °C to +80 °C (-4 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade coarse G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy			
Aggregate	Non-skid aggregate recommended by the coating manufacturer. <sup>1</sup>			
3 (topcoat)	Epoxy <sup>2</sup>			
Total minimum DFT	3000			
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12 and 11.15. Activity 11.14 (adhesion test) shall be performed on the painting system without aggregates.			
Inspection	Table 3, all testing activities except 11.12 and 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy			

Coating System Data Sheet		CSDS No. 4A		Rev. 01 Page 1 of 1
2	Epoxy	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Aggregate	Non-skid aggregate recommended by the coating manufacturer. <sup>1</sup>			
3 (topcoat)	Epoxy <sup>2</sup>			
Total minimum DFT		3000		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1	Epoxy	DFT of each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Aggregate	Non-skid aggregate recommended by the coating manufacturer. <sup>1</sup>			
2 (topcoat)	Epoxy <sup>2</sup>			
Total minimum DFT		3000		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Aggregate shall be non-sparking, pre-mixed in the liquid coat or evenly distributed over the surface. Particle size shall be between 1 mm to 5 mm. Friction coefficient for helideck coating shall comply with local aviation regulation.</p> <p><sup>2</sup> A secondary non-isocyanate coat or polyurethane topcoat may be applied for marking and to prevent chalking. HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

Add new table

**Table A.4.2 - CSDS No. 4B**

Coating System Data Sheet		CSDS No. 4B		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Decks and floors, non-skid. Normal and light duty.			
Service	Atmospheric zone offshore and coastal. Normal and light duty. Non-insulated.			
Minimum/maximum operating temperature	-20 °C to +80 °C (-4 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3). P2 is acceptable in indoor areas.			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	Minimum DFT for each coat shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy			
Aggregate	Non-skid aggregate recommended by the coating manufacturer. <sup>1</sup>			
3 (topcoat)	Epoxy <sup>2</sup>			
Total minimum DFT				500
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12 and 11.15. Activity 11.14 (adhesion test) shall be performed on the painting system without aggregates.			
Inspection	Table 3, all testing activities except 11.12 and 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	Minimum DFT for each	Maximum DFT for each	
2	Epoxy			

Coating System Data Sheet		CSDS No. 4B		Rev. 01 Page 1 of 1
Aggregate	Non-skid aggregate recommended by the coating manufacturer. <sup>1</sup>	coat shall be as qualified by the coating manufacturer.	coat and coating system shall be as qualified by the coating manufacturer.	
3 (topcoat)	Epoxy <sup>2</sup>			
Total minimum DFT		500		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$		
		Min	Max	
1	Epoxy	DFT of each coat shall be as as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Aggregate	Non-skid aggregate recommended by the coating manufacturer. <sup>1</sup>			
2 (topcoat)	Epoxy <sup>2</sup>			
Total minimum DFT		500		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Aggregate shall be non-sparking, pre-mixed in the liquid coat or evenly distributed over the surface. Particle size shall be between 1 mm to 5 mm.</p> <p><sup>2</sup> A secondary non-isocyanate coat or polyurethane topcoat may be applied for marking and to prevent chalking. HSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

Add new table

**Table A.4.3 - CSDS No. 4C**

Coating System Data Sheet		CSDS No. 4C		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	C1-C5			
Substrate material	Carbon steel			
Application	Decks and floors, non-skid. Normal and light duty.			
Service	Indoor areas. Light duty. Non-insulated.			
Minimum/maximum operating temperature	-20 °C to +80 °C (-4 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Sa 2 1/2 (ISO 8501-1), SSPC-SP 10			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P2 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
Refer to coating system 1A or 1B <sup>1,2</sup>				
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Refer to coating system 1A or 1B. Activity 11.14 (adhesion test) shall be performed on the painting system without aggregates.			
Coating procedure tests (CPT)				
Inspection				
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		Refer to coating system 1A or 1B.		
Surface profile				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
Refer to coating system 1A or 1B <sup>1,2</sup>				
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
Refer to coating system 1A or 1B <sup>1,2</sup>				
KEY				
N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.				
NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.				

<b>Coating System Data Sheet</b>	<b>CSDS No. 4C</b>	<b>Rev. 01 Page 1 of 1</b>
<p><sup>1</sup> Coating system 1A and 1B may be used for deck areas with the addition of a non-skid aggregate. A non-skid aggregate shall be added to the second last coat. Prior to applying the coating where the non-skid aggregates are added, the primer and the succeeding coat(s) shall be applied to a minimum DFT of 175µm and fully cured.</p> <p><sup>2</sup> Aggregate shall be non-sparking, pre-mixed in the liquid coat or evenly distributed over the surface. Particle size shall be between 1 mm to 5 mm.</p>		

## A.5 Coating system No. 5

*Delete clause*

## A.6 Coating system No. 6

*Replace table with*

**Table A.6.1 - CSDS No. 6A**

<b>Coating System Data Sheet</b>	<b>CSDS No. 6A</b>	<b>Rev. 01 Page 1 of 1</b>	
Environment corrosivity (ISO 12944-2)	CX		
Substrate material	Stainless steels, aluminium alloys and non-ferrous alloys <sup>1</sup>		
Application	Structures and structural components, equipment items, piping and valves.		
Service	Atmospheric zone offshore and coastal. Non-insulated.		
Minimum/maximum operating temperature	-50 °C to +80 °C (-58 °F to +176 °F) <sup>3</sup>		
<b>Surface preparation</b>			
Surface cleanliness	SSPC-SP 16 (sweep blast)		
Roughness	25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2)		
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>		
Steel preparation	Grade P3 (ISO 8501-3)		
<b>Coating system <sup>2</sup></b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Epoxy <sup>4, 5</sup>	50	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2	Epoxy <sup>4, 5</sup>	100	
3 (top coat) <sup>6</sup>	Non-isocyanate coat or polyurethane <sup>7</sup>	75	
Total minimum DFT		225	
<b>Performance tests, Qualification and inspection</b>			
Performance tests	-		
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12 and 11.15.		



Coating System Data Sheet		CSDS No. 6A		Rev. 01 Page 1 of 1
Inspection		Table 3, all testing activities except 11.10, 11.12 and 11.15.		
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:			SSPC-SP 16	
Surface profile			25 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2	
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>4,5</sup>	50	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy <sup>4,5</sup>	100		
3 (top coat) <sup>6</sup>	Non-isocyanate coat or polyurethane <sup>7</sup>	75		
Total minimum DFT		225		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1	Epoxy <sup>4</sup>	100	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat) <sup>6</sup>	Non-isocyanate coat or polyurethane <sup>7</sup>	75		
Total minimum DFT		225		
KEY				
N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.				
NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.				
<sup>1</sup> Aluminium and non-ferrous alloys items including handrail, ladders, actuators located outdoor in CX environment shall be painted only when specified by the purchaser or when required for HSSE reasons. Aluminium handrail located indoor shall be anodised.				
<sup>2</sup> In alternative, aluminium may be coated with a 75 µm polyester powder coating. Surface preparation of the aluminium prior to powder coating shall include a chromate conversion coating.				
<sup>3</sup> If coating is specified for operating temperature outside this range, coating system 1E, 1G or 2A shall be used.				
<sup>4</sup> Coatings for stainless steels shall not contain zinc.				
<sup>5</sup> For stainless steels, a high-solid, high-build epoxy coat with minimum DFT > 150 µm may be used in a two-coats system.				
<sup>6</sup> Only topcoats performance tested as part of coating system no. 1 shall be used.				
<sup>7</sup> HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.				

Add new table

Table A.6.2 - CSDS No. 6B

Coating System Data Sheet		CSDS No. 6B		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Hot dip galvanised steel <sup>1</sup>			
Application	Structures and structural components, stairways, railings, equipment items, piping, supports			
Service	Atmospheric zone offshore and coastal. Non-insulated.			
Minimum/maximum operating temperature	-50 °C to +80 °C (-58 °F to +176 °F)			
<b>Surface preparation</b>				
Surface cleanliness	De-grease using an alkaline, emulsifying detergent, followed by rinsing with clean potable water, before blasting in conformance with SSPC-SP 16.			
Roughness	25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>3</sup>	50	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy <sup>3</sup>	100		
3 (top coat) <sup>2</sup>	Non-isocyanate coat or polyurethane <sup>4</sup>	75		
Total minimum DFT		225		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	-			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12 and 11.15.			
Inspection	Table 3, all testing activities except 11.10, 11.12 and 11.15.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the HDG steel surface</b>				
Surface preparation				
Type and level of preparation:	SSPC-SP 16			
Surface profile	25 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy <sup>3</sup>	50	Maximum DFT for each	
2	Epoxy <sup>3</sup>	100		

Coating System Data Sheet		CSDS No. 6B		Rev. 01 Page 1 of 1
3 (top coat) <sup>2</sup>	Non-isocyanate coat or polyurethane <sup>4</sup>	75	coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT		225		
<b>Coating damage not exposing the HDG steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		Max
		Min		
1	Epoxy <sup>3</sup>	100	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat) <sup>2</sup>	Non-isocyanate coat or polyurethane <sup>4</sup>	75		
Total minimum DFT		225		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> In alternative, HDG steel may be coated with a 75 µm polyester powder coating. Surface preparation of the zinc prior to powder coating shall include a zinc manganese phosphate conversion coating.</p> <p><sup>2</sup> Only topcoats performance tested as as part of coating system no. 1 shall be used.</p> <p><sup>3</sup> A high-solid, high-build epoxy coat with minimum DFT &gt; 150 µm may be used in a two-coats system.</p> <p><sup>4</sup> HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

Add new table

**Table A.6.3 - CSDS No. 6C**

Coating System Data Sheet		CSDS No. 6C		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Stainless steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal. Insulated, continuous and cyclic service.			
Minimum/maximum operating temperature	-183 °C to +232 °C (-297 °F to +450 °F) <sup>1</sup>			
<b>Surface preparation</b>				
Surface cleanliness	SSPC-SP 16			
Roughness	25 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy phenolic, epoxy novolac	125	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy phenolic, epoxy novolac	125		
Total minimum DFT		250		
<b>Performance tests, Qualification and inspection</b>				
Performance tests	Table 1, testing activities 10.1.1 and 10.1.8 shall be carried out on coating systems for operating temperature range < -50°C (-58 °F) and in cryogenic service.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15			
Inspection	Table 3, all testing activities except 11.10 and 11.15			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:		SSPC-SP 16		
Surface profile		25 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Epoxy phenolic, epoxy novolac	125	Maximum DFT for each	
2 (topcoat)	Epoxy phenolic, epoxy novolac	125		

Coating System Data Sheet		CSDS No. 6C		Rev. 01 Page 1 of 1
Total minimum DFT		250	coat and coating system shall be as qualified by the coating manufacturer.	
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$		
		Min	Max	
1 (topcoat)	Epoxy phenolic, epoxy novolac	125		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		250		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p>NOTE 2 Coating system 1F may be used as an alternative to system 6C.</p> <p><sup>1</sup> If coating is specified for operating temperature outside this range, coating system 10 or 2A shall be used.</p>				

## A.7 Coating system No. 7

Replace table with

**Table A.7.1 - CSDS No. 7A**

Coating System Data Sheet	CSDS No. 7A	Rev. 01 Page 1 of 1	
Environment corrosivity (ISO 12944-2)	CX + Im4		
Substrate material	Carbon steel and stainless steel		
Application	Structures and structural components, equipment items, piping and valves.		
Service	Splash zone, tidal zone		
Minimum/maximum operating temperature	-50 °C to +50 °C (-58 °F to +122 °F)		
<b>Surface preparation</b>			
Surface cleanliness	Carbon steel Sa 3 (ISO 8501-1), SSPC-SP 5. Stainless steel and non-ferrous alloys SSPC-SP 16.		
Roughness	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>		
Steel preparation	Grade P3 (ISO 8501-3)		
<b>Coating system</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Epoxy or polyester based coating <sup>1,2</sup>	500	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Epoxy or polyester based coating <sup>1,2</sup>	500	
Total minimum DFT		1000	
<b>Performance tests, Qualification and inspection</b>			
Performance tests	Table 1, all testing activities except 10.1.6, 10.1.7, 10.1.8.		

<b>Coating System Data Sheet</b>	<b>CSDS No. 7A</b>	<b>Rev. 01 Page 1 of 1</b>	
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15		
Inspection	Table 3, all testing activities except 11.10 and 11.15		
<b>Repair of damage on newly applied coating</b>			
<b>Coating damage exposing the steel surface</b>			
Surface preparation			
Type and level of preparation:	Carbon steel P Sa 3 (ISO 8501-2), SSPC-SP 5. Stainless steel and non-ferrous alloys SSPC-SP 16.		
Surface profile	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Epoxy or polyester based coating <sup>1,2</sup>	500	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Epoxy or polyester based coating <sup>1,2</sup>	500	
Total minimum DFT		1000	
<b>Coating damage not exposing the steel surface</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (topcoat)	Epoxy or polyester based coating <sup>1,2</sup>	500	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		1000	
<p><b>KEY</b></p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p><b>NOTE 1</b> The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><b>NOTE 2</b> Anti-fouling may be required.</p> <p><sup>1</sup> Glass flake or fibre reinforced epoxy coat. In alternative, a high-build epoxy coat with minimum 1000 µm DFT may be used.</p>			

<b>Coating System Data Sheet</b>	<b>CSDS No. 7A</b>	<b>Rev. 01</b> <b>Page 1 of 1</b>
<sup>2</sup> Coatings for stainless steels shall not contain zinc.		

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Add new table

**Table A.7.2 - CSDS No. 7B**

Coating System Data Sheet	CSDS No. 7B	Rev. 01 Page 1 of 1	
Environment corrosivity (ISO 12944-2)	Im4		
Substrate material	Carbon steel and stainless steel		
Application	Structures and structural components, equipment items, piping and valves.		
Service	Submerged in seawater (subsea)		
Minimum/maximum operating temperature	-50 °C to +50 °C (-58 °F to +122 °F)		
<b>Surface preparation</b>			
Surface cleanliness	Carbon steel Sa 2 1/2 (ISO 8501-1), SSPC-SP 10. Stainless steel and non-ferrous alloys SSPC-SP 16.		
Roughness	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>		
Steel preparation	Grade P3 (ISO 8501-3)		
<b>Coating system</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Epoxy <sup>1,2</sup> , phenolic epoxy, epoxy novolac	175	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Epoxy <sup>1,2</sup> , phenolic epoxy, epoxy novolac	175	
Total minimum DFT		350	
<b>Performance tests, Qualification and inspection</b>			
Performance tests	Table 1, 10.1.1, 10.1.2, 10.1.3, 10.1.4.		
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15		
Inspection	Table 3, all testing activities except 11.10 and 11.15		
<b>Repair of damage on newly applied coating</b>			
<b>Coating damage exposing the steel surface</b>			
Surface preparation			
Type and level of preparation:		Carbon steel P Sa 2 1/2 (ISO 8501-2), SSPC-SP 10. Stainless steel and non-ferrous alloys SSPC-SP 16.	
Surface profile		Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85	

Coating System Data Sheet	CSDS No. 7B	Rev. 01 Page 1 of 1	
			µm (ISO 8503-5), grade fine G (ISO 8503-2).
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Epoxy <sup>1,2</sup> , phenolic epoxy, epoxy novolac	175	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Epoxy <sup>1,2</sup> , phenolic epoxy, epoxy novolac	175	
Total minimum DFT		350	
<b>Coating damage not exposing the steel surface</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (topcoat)	Epoxy <sup>1,2</sup> , phenolic epoxy, epoxy novolac	175	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
Total minimum DFT		350	
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> Glass flake or fibre reinforced epoxy coat or high solid, high-build epoxy coat with minimum 500 µm DFT may be used.</p> <p><sup>2</sup> Coatings for stainless steels shall not contain zinc.</p>			

Add new table

**Table A.7.3 - CSDS No. 7C**

Coating System Data Sheet	<b>CSDS No. 7C</b>	<b>Rev. 01 Page 1 of 1</b>	
Environment corrosivity (ISO 12944-2)	Im4		
Substrate material	Carbon steel and stainless steel		
Application	Structures and structural components, equipment items, piping and valves.		
Service	Submerged in seawater (subsea), including under wet thermal insulation.		
Maximum operating temperature	≤ 150 °C (≤ 302 °F)		
<b>Surface preparation</b>			
Surface cleanliness	Carbon steel Sa 2 1/2 (ISO 8501-1), SSPC-SP 10 <sup>1</sup> . Stainless steel and non-ferrous alloys SSPC-SP 16.		
Roughness	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>		
Steel preparation	Grade P3 (ISO 8501-3)		
<b>Coating system</b>			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm	
		Min	Max
1 (primer)	Epoxy, phenolic epoxy, epoxy novolac	175	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
2 (topcoat)	Epoxy, phenolic epoxy, epoxy novolac	175	
Total minimum DFT		350	
<b>Performance tests, Qualification and inspection</b>			
Performance tests	Table 1, 10.1.1, 10.1.2, 10.1.3, 10.1.4., 11.1.5.		
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10 and 11.15		
Inspection	Table 3, all testing activities except 11.10 and 11.15		
<b>Repair of damage on newly applied coating</b>			
<b>Coating damage exposing the steel surface</b>			
Surface preparation			
Type and level of preparation:	Carbon steel P Sa 2 1/2 (ISO 8501-2), SSPC-SP 10. Stainless steel and non-ferrous alloys SSPC-SP 16.		
Surface profile	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
<b>Coat (minimum number of coats)</b>	<b>Type of coat / binder</b>	<b>DFT, µm</b>	

Coating System Data Sheet		<b>CSDS No. 7C</b>		<b>Rev. 01</b> <b>Page 1 of 1</b>
		<b>Min</b>	<b>Max</b>	
1 (primer)	Epoxy, phenolic epoxy, epoxy novolac	175	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy, phenolic epoxy, epoxy novolac	175		
Total minimum DFT		350		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, $\mu\text{m}$		
		Min	Max	
1 (topcoat)	Epoxy, phenolic epoxy, epoxy novolac	175	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT		350		
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE The temperature range given in the data sheet corresponds to the maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests.</p> <p><sup>1</sup> If wet thermal insulation is applied, the surface preparation shall be Sa 3 (ISO 8501-1), SSPC-SP 5.</p>				

## A.9 Coating system No. 9

Delete clause

Add new clause

## A.10 Coating system No. 10

**Table A.10.1 - CSDS No. 1E**

Coating System Data Sheet		CSDS No. 10		Rev. 01 Page 1 of 1
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel, low-alloy steel, stainless steel and non-ferrous metals			
Application	Equipment items, piping and valves.			
Service	Atmospheric zone offshore and coastal. Non-insulated and insulated. Cold and cryogenic service.			
Minimum/maximum operating temperature	-196 °C to + 600 °C (-320 °F to +1112 °F)			
<b>Surface preparation</b>				
Surface cleanliness	Carbon and low-alloy steel Sa 2 1/2 (ISO 8501-1), SSPC-SP 10. Stainless steel and non ferrous alloys SSPC-SP 16.			
Roughness	Carbon and low-alloy steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m <sup>2</sup>			
Steel preparation	Grade P3 (ISO 8501-3)			
<b>Coating system</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Inorganic copolymer, inert multi polymeric matrix coating	Minimum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Inorganic copolymer, inert multi polymeric matrix coating			
Total minimum DFT				
<b>Performance tests, Qualification and inspection</b>				
Performance tests <sup>1</sup>	Table 1, testing activity 10.1.1, 10.1.2. CUI test (10.1.8) shall be required for insulated service.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.15. Holiday test (11.12) shall be required for insulated service.			
Inspection	Table 3, all testing activities except 11.15. Holiday test (11.12) shall be required for insulated service.			
<b>Repair of damage on newly applied coating</b>				
<b>Coating damage exposing the steel surface</b>				
Surface preparation				
Type and level of preparation:	Carbon and low-alloy steel P Sa 2 1/2 (ISO 8501-2), SSPC-SP 10. Stainless steel and non ferrous alloys SSPC-SP 16.			

<b>Coating System Data Sheet</b>		<b>CSDS No. 10</b>		<b>Rev. 01</b> <b>Page 1 of 1</b>
Surface profile		Carbon and low-alloy steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2). Stainless steel and non-ferrous alloys 25 - 85 µm (ISO 8503-5), grade fine G (ISO 8503-2).		
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (primer)	Inorganic copolymer, inert multi polymeric matrix coating	125	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Inorganic copolymer, inert multi polymeric matrix coating	125		
Total minimum DFT		250		
<b>Coating damage not exposing the steel surface</b>				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm		
		Min	Max	
1 (topcoat)	Inorganic copolymer, inert multi polymeric matrix coating	Minimum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total minimum DFT				
<p>KEY</p> <p>N/R = not required, N/A = not applicable, Min = minimum, Max = maximum.</p> <p>NOTE 1 The temperature range given in the data sheet corresponds to the minimum and maximum operating temperature for a generic coating system. Additional restrictions may apply for specific products based on coating manufacturer's recommendations and qualification tests. Some coating products may require heat cure.</p> <p>NOTE 2 In alternative, coating system 6C or 2A may be used.</p> <p><sup>1</sup> In addition to the performance tests in Table 1, high temperature testing according to ASTM D2485 Method B or alternative testing agreed with the end-user shall be required for operating temperatures exceeding 400 °C.</p>				

## Bibliography

- [1] ISO 14921 Thermal spraying — Procedures for the application of thermally sprayed coatings for engineering components
- [2] NACE SP0108 Corrosion control of offshore structures by protective coatings

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