

Supplementary Specification to NORSOK M-501 Coating and Painting for Offshore, Marine Coastal and Subsea Environments

Revision history

VERSION	DATE	PURPOSE
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Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 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 environments 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 Coating and Painting for Offshore, Marine Coastal and Subsea Environments

This specification defines the technical requirements for the supply of the equipment and is written as an overlay to Norsok M-501, following the Norsok M-501 clause structure. Clauses from Norsok M-501 not amended by this specification apply as written to the extent applicable to the scope of supply.

Modifications to Norsok M-501 defined in this specification are identified as Add (add to clause or add new clause), Replace (part of or entire clause) or Delete.

IOGP S-715D: Data sheet for Coating and Painting for Offshore, Marine Coastal and Subsea Environments

The data sheet defines application specific requirements, attributes and options specified by the purchaser for the supply of equipment to the technical specification. The data sheet may also include fields for supplier provided information attributes subject to purchaser's technical evaluation. Additional purchaser supplied documents may also be incorporated or referenced in the data sheet to define scope and technical requirements for enquiry and purchase of the equipment.

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

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the data sheet or in the purchase order.

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

The IRS defines the information requirements, including contents, format, timing and purpose to be provided by the supplier. It may also define specific conditions which invoke information requirements.

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;
- e) Norsok M-501.

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),
- 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,
- 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 and informative references

2.1 Normative References

Add to section

API Specification Q1	Specification for quality management system requirements for manufacturing organizations for the petroleum and natural gas industry
ASTM A123/A123M	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 D4752	Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
ASTM D4940	Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blast Cleaning Abrasives
ASTM D7803	Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating
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
EN 15773	Industrial application of powder organic coatings to hot dip galvanized or sherardized steel articles [duplex systems] - Specifications, recommendations and guidelines
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 4618	Paint and varnishes - Terms and definitions

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 12944-9:2018	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 16961	Petroleum, petrochemical and natural gas industries - Internal coating and lining of steel storage tanks
ISO 18796-1:2018	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 29001	Petroleum, petrochemical and natural gas industries — Sector-specific quality management systems — Requirements for product and service supply organizations
NACE No. 1 / SSPC-SP 5	White metal blast cleaning
NACE No. 2 / SSPC-SP 10	Near-white metal blast cleaning
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 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 section

ISO 20340 Paints and varnishes - Performance requirements for protective paint systems for offshore and related structures

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

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

3 Terms, definitions and abbreviations

3.1 Terms and definitions

3.1.2 coat-back

Delete term

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 user

3.1.10 shop primer

Replace definition with

paint typically applied below 25 µm (1 mil) 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 engineering 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**

coating system applied to the internal surfaces of a tank or vessel to serve as a barrier to corrosion

[SOURCE: ISO 16961:2015, 4.1.19]

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 to IEC 60529

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 The 80/20 acceptance criterion according to ISO 19840 is used.

[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 applied as a part of an 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]

Add new term

3.1.30

tie coat

coat designed to improve intercoat adhesion

[SOURCE: ISO 4618:2014, 2.262]

Add new term

3.1.31

cyclic service

process operation with periodic variation in temperature, pressure and/or flowrate which may affect coating performance

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)
SDS	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
HDG	hot dip galvanized
CUI	corrosion under insulation
ENP	electroless nickel plating

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 documented field experience of the coating system.

Replace second paragraph with

Qualification of coating systems, coating contractors and personnel 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

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

- The atmospheric zone corrosivity category for offshore and coastal facilities shall be CX.
- The environmental corrosivity of offshore and coastal facilities permanently immersed in seawater shall be Im4.
- Offshore and coastal facilities exposed to the splash zone or the tidal zone shall meet the performance requirements of both corrosivity categories CX and Im4.
- Sea water filled compartments shall meet the performance requirements of both corrosivity categories CX and Im4.
- The environment corrosivity for underground piping, excluding pipeline, in coastal facilities shall be Im3.

Replace clause 4.2 heading with

4.2 Design and planning

Replace first paragraph with

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

Add to clause

Field coating of finished coated items shall be limited to touch-up and repair of damaged coating 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, except for surface preparation.

Add to clause

Environmental and short-term conditions affecting the coating performance shall be considered.

Add to clause

The conditions in ISO 18796-1:2018, 6.2.3 shall be considered for lining.

4.4 Ambient conditions

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

(5 °F)

Add after first sentence of first paragraph

Humidity shall be measured in accordance with ISO 8502-4.

Add after first sentence of first paragraph

Dew point shall be determined 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 different 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 PDS.

Add to clause

Final blast cleaning and 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 conditions fall outside the specified limits before the paint has cured.

4.5 Coating materials

Replace third paragraph with

Product containers shall bear the information required in ISO 12944-9:2018, 6.3.

Add after third paragraph

Product technical data sheets (TDSs) delivered with the coating material shall contain the information required in ISO 12944-9:2018, 6.4.

Delete second sentence of fourth paragraph

Delete fifth paragraph

Delete sixth paragraph

Add to clause

Damaged containers with breaching containment or materials that have exceeded their shelf life shall be rejected.

Add to clause

Material that has deteriorated (changes in viscosity, colour, visual appearance, excessive separation) during storage shall be segregated.

Add to clause

Segregated materials shall be tested by the coating manufacturer to confirm usability or rejected.

Add to clause

Coating materials, additives and equipment cleaners for each coat and coating system shall be from the same coating manufacturer including brand name.

Add to clause

Lining of process vessels shall comply with ISO 18796-1 and the additional requirements in this specification.

Add to clause

Lining of atmospheric storage tanks shall be qualified to ISO 16961 and the additional requirements in this specification.

Add to clause

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

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 mating surfaces;
- sealing area of flange and hub;

- ring joints contact surfaces;
- flange facing including wedge of compact flanges;
- internal surfaces of piping and equipment item, unless internal coating is specified;
- cables and cable trays;
- weld bevels after final machining;
- signs, tags, notices, nameplates, lettering;
- sight glasses and light fittings;
- valve stems;
- cylinder rods;
- active surfaces 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 tin and lead.

Add to clause

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

4.10 Qualification of products, personnel and procedures

Replace clause with

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

4.11 Metal coating

Add to end of first sentence of first paragraph

or ASTM A123/A123M.

Replace second sentence of first paragraph with

The minimum average coating thickness for structural items and outfitting steel shall be 100 µm (3,9 mils) or 705 g/m² (2,3 oz/ft²).

Replace third sentence of first paragraph with

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

Replace "6" in fourth sentence of first paragraph with

6B

Replace second paragraph with

Metal spraying shall be in accordance with clause 8.

4.12 Records and reports

Replace first sentence of first paragraph with

The results of measurements and inspections required by this specification shall be recorded.

Replace "paint report" in third sentence of first paragraph with

coating report

Add to third paragraph after "Defective work"

and repairs

Replace fourth paragraph with

An example coating report is given in Annex D or ISO 12944-8:2017, Annex H and Annex I.

Add to clause

PDSs, fingerprinting and batch testing certificates, and the coating manufacturer CSDS and SDSs 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 coating report to the purchaser.

Add to clause

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

Add to clause

Guarantee certificates shall be submitted with the paint report.

Replace clause 4.13 heading with

4.13 Additional requirements for equipment, piping and materials

Add new clause heading before first paragraph

4.13.1 General

Replace first paragraph with

Bolt holes, not suitable for coating, shall be preserved with wax.

Add after first paragraph

Unused threaded bolt holes shall be plugged or sealed.

Replace third paragraph with

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

Replace fourth paragraph with

Gaps and voids that cannot be blast cleaned and painted shall be sealed or closed in accordance with ISO 12944-3:2017, 5.3.

Add to clause

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

Add new clause

4.13.2 Stainless steels

Stainless steels under insulation with the exception of HVAC ducting shall be coated regardless of the temperature.

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 Supports and pipe penetration

4.13.4.1

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

4.13.4.2

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

4.13.4.3

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

4.13.4.4

Saddles, support plates, wear pads and belts not welded to the equipment or pipe shall be painted before installation.

Add new clause

4.13.5 Dissimilar materials

4.13.5.1

Uncoated stainless steel pipes shall be painted on the contact areas with carbon steel piping supports.

4.13.5.2

The coated surface shall extend 50 mm (2 in) either side of the support.

4.13.5.3

Where aluminium structural items, hot dip galvanized 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

4.13.6 Isolation joints

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

Add new clause

4.13.7 Manufacturer standard, off-the-shelf items

4.13.7.1

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

4.13.7.2

The equipment manufacturer's coating system for off-the-shelf items not listed in clause 14 shall comply with the performance requirements of ISO 12944-9 or ISO 19277 for the specified environmental corrosivity or CUI classification.

5 Health, safety and environment

Replace clause with

Materials, equipment and plants for surface preparation and coating application shall comply with the applicable HSSE law and regulations.

6 Surface preparation

6.1 Pre-blasting preparations

Add after third paragraph

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

Replace fifth paragraph with

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

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 and ISO 8503-2 or measured with a replica technique in conformance to ISO 8503-5 or ASTM D4417 Method C or NACE SP0287

Replace fourth sentence of second paragraph with

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-AB 1/AB 3 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 a	Staurolite	Iron/aluminium silicate	ISO 11126-9
	Garnet	Calcium iron silicate	ISO 11126-10
Synthetic mineral a	Coal slag	Aluminium silicate	ISO 11126-4
	Aluminium oxide	Crystalline corundum	ISO 11126-7
	Copper refinery slag	Iron silicate	ISO 11126-3

^a 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

A test report shall be supplied with each batch of abrasive.

Add to clause

Abrasives shall be stored away from possible contamination in accordance with the manufacturer's recommendation.

Add to clause

Abrasive products delivered in defective packaging shall be rejected.

Add to clause

The conductivity of abrasives shall be measured according to Table 3, Activity 11.

Add to clause

Reclaimed abrasives shall comply with the requirements of this clause.

Add to clause

Adjacent coated surfaces shall be preserved to prevent contamination and over-blast damage.

Add to clause

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

Add to clause

Compressed air quality shall be checked in accordance with Table 3, Activity 11.6.

6.3 Final surface condition

Add after first paragraph

Surface irregularities appearing after surface preparation shall be removed.

Add after first paragraph

Areas affected by surface irregularities shall be re-blasted.

In second paragraph, replace "rating 2 of" with

quantity rating 2, size class 2 according to

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
White metal abrasive blast cleaning	Sa 3	SP 5	No. 1
Near white abrasive blast cleaning	Sa 2 1/2	SP 10	No. 2

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.

6.4.3

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

6.4.4

Halide-free detergents and 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 potable water and sweep blasting using non-metallic abrasive in conformance to SSPC-SP 16.

6.4.6

No defects, break through or crusting 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 potable water and sweep blasting using non-metallic abrasive in conformance to SSPC-SP 16.

6.4.8

Emulsions and alkaline solutions for cleaning galvanized surfaces and 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

Power tool cleaning shall be permitted only for repair of single defective area of less than 25 cm² (4 in²).

6.5.1.2

The use of power tool shall be separately qualified according to 10.3.

6.5.1.3

Power tool cleaning shall be in accordance with SSPC-SP 11.

6.5.1.4

Power tools used to clean stainless steel, nickel and copper based alloys shall be made of stainless steel or higher alloyed corrosion resistant material.

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.

7.3 Application

Add to clause

Surfaces shall be re-blasted if the application of the primer cannot be completed within four hours of preparing the surface or within the time recommended by the coating manufacturer, whichever is shorter.

Add to clause

Surfaces shall be re-blasted if the requirement for surface preparation cleanliness is no longer satisfied at the time of coating application within the four hour window.

Add to clause

Successive coating shall be applied within the overcoating interval specified in the manufacturer's PDS.

Add to clause

If the existing coating has exceeded the maximum overcoating time or successive coat has been applied before the minimum overcoating time, the coating shall be repaired in accordance with clause 12.

Add to clause

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 qualified CPS shall be met for each individual coat and the coating system.

Add to clause

With the exception of inorganic zinc-rich primer, if the minimum DFT measured in accordance with 11.13 is not achieved, an additional layer of the same coat shall be applied in accordance with the coating manufacturer's recommendations.

Add to clause

The DFT shall not exceed the maximum value specified by the coating manufacturer.

Add to clause

Areas 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 be left uncoated or only coated with primer coat prior to installation, if coating is required.

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 lining on process vessels shall comply with ISO 18796-1 and this specification.

Add to clause

Application of lining on atmospheric storage tanks shall comply with ISO 16961 and this specification.

Add to clause

The applicator shall check the wet film thickness of individual coats 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 2063-1 and ISO 2063-2 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

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.

Add to third paragraph

, except for immersed service (Im4 to ISO 12944-2), buried service (Im3 to ISO 12944-2) and insulated services.

Add after third paragraph

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

8.3 Application of thermally sprayed coating

Add to clause

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

Add to clause

Sealers shall be applied within four hours.

Add to clause

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

Add to clause

Topcoats shall not be applied to the sealed TSA surface, except for safety markings in atmospheric zone.

Add to clause

The topcoat for safety markings shall have a maximum DFT of 40 µm (1,5 mil).

Add to clause

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

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

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 NDFT, the affected area shall be re-coated within four hours.

Add to clause

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

Add to clause

If the remaining thickness of the damaged area exceeds the specified NDFT, only the sealer coat shall be applied.

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 10.1 heading with

10.1 Performance testing of the coating system

Replace first paragraph first sentence with

Performance (pre-qualification) testing shall be carried out when it is required by the CSDS in Annex A.

Delete second sentence of first paragraph

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

performance testing report

Add before second paragraph

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 accredited to ISO 17025.

Replace third paragraph with

The end-user may waive performance testing of existing coating systems based on relevant, documented testing or field experience.

Delete fifth paragraph

Delete sixth paragraph

Delete seventh paragraph

Delete eighth paragraph

Delete ninth paragraph

Add to clause

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

Add to clause

Lining materials shall have five years of proven performance in the specific service and fluid.

Add to clause

All performance qualification documentation shall be submitted with the CPS.

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;
- description of the paint system including:
 - coating manufacturer;
 - environment, type of surface and material the painting system is designed for;
 - surface preparation requirements;
 - product designation or trade name for each paint in the paint system in the order of application, except for changes in the generic name of the paint;
 - DFT range 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 description ^a	Verification method	Acceptance criteria	Remarks
10.1.1	Fingerprinting	All environment	ISO 12944-9:2018, Annex C	ISO 12944-9:2018, Annex C	
10.1.2	Cyclic ageing test	CX (Offshore and coastal atmospheric zone) CX + Im4 (splash zone and tidal zone) Im3 (buried structures)	ISO 12944-9:2018, clause 9	ISO 12944-9:2018, clause 9 Supplementary requirements: Chalking to ISO 4628-6, maximum rating 2. Pull-off test to ISO 4624 or ASTM D4541 using equipment with an automatic centred pulling force and carried out when coating system are fully cured. All test panels shall be tested. Scored sample shall be used. Minimum 5,0 MPa (725 psi) and maximum 50 % reduction from value measured before ageing.	
10.1.3	Seawater immersion test	CX + Im4 (splash zone and tidal zone) Im4 (submerged zone)	ISO 12944-9:2018, clause 9	ISO 12944-9:2018, clause 9	
10.1.4	Cathodic disbonding test	CX + Im4 (splash zone and tidal zone) Im4 (submerged zone) Im3 (buried structures)	ISO 12944-9:2018, clause 9	ISO 12944-9:2018, clause 9	

Table 1 (continued)

Activity No.	Activity description	Environment description a	Verification method	Acceptance criteria	Remarks
10.1.5	High temperature cathodic disbonding test	CX + Im4 (splash zone and tidal zone) Im4 (submerged zone) Im3 (buried items).	<p>Cathodic disbonding testing for operating temperature > 50 °C (122 °F) shall conform to the following supplementary requirement to ISO 12944-9:</p> <p>The steel temperature shall be the maximum operating temperature anticipated during service;</p> <p>The electrolyte shall contain 3,5 % NaCl;</p> <p>The electrolyte bulk temperature shall be maintained at 30 °C (86 °F);</p> <p>The cathodic protection potential shall be -1200 mV (SCE)</p> <p>The oxygen concentration of the test solution shall be maintained at its saturation value at the electrolyte bulk temperature.</p> <p>Duration 4 weeks.</p> <p>Cathodic disbonding tests for operating temperature above 100 °C (212 °F) shall be done under pressure to prevent boiling of the solution on the steel surface.</p>	ISO 12944-9:2018, clause 9	
10.1.6	Buried pipe coating test	Im3 (buried pipe)	ISO 21809 or CSA Z245.20/30	ISO 21809 or CSA Z245.20/30	Applicable to pipeline-type coating when used for buried piping in coastal facilities.
10.1.7	Process vessels lining test	Internal surface of process vessels, tanks handling process fluids	ISO 18796-1:2018, 6.8	ISO 18796-1:2018, 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.

Table 1 (continued)

Activity No.	Activity description	Environment description a	Verification method	Acceptance criteria	Remarks
10.1.8	CUI testing	Coating under insulation	ISO 19277	ISO 19277	For cryogenic service, the testing requirements to ISO 19277:2018, 8.1 shall be mandatory.
10.1.9	Storage tank lining test	Internal surface of atmospheric storage tanks handling stabilized crude oil, hydrocarbons and water.	ISO 16961	ISO 16961	Applicable to lining of above ground welded steel atmospheric storage tanks.
10.1.10	Impact testing	CX + Im4 (splash zone and tidal zone).	ASTM G14	5.6 J (50 in-lbf)	Applicable to coating in the splash zone and boat landing area.
<p>KEY CP = cathodic protection. NOTE For the purpose of this specification ISO 4624 is considered equivalent to ASTM D4541. ^a Corrosivity categories are described according to ISO 12944-2.</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, FROSIO GuID-CP, NACE NIICAP AS-1S or SSPC QP-3.

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, ICATS 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 and coating application equipment.

Delete second paragraph

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 period of validity of the qualification shall be according to ISO 14918:2018, clause 8.

Add to clause

Thermal sprayer qualification records shall be according to ISO 14918:2018, clause 9, clause 10 and Annex D.

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 CPS.

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: One 1500 mm (59 in) long "T", "I" or "H" shaped profile of approximate dimensions 750 mm (30 in) high and 13 mm (0.5 in) thick. Another specimen shall be cut from a 1500 mm (59 in) long 50 mm (2 in) diameter pipe.	TSA: Minimum 200 µm (8 mil) on all specimen surfaces when a sealer is applied. Where CSDS 2A (Table A.2.1) permits the use of un-sealed TSA, the minimum coating thickness shall be in accordance with ISO 2063 Table C.1. TSZ: Minimum 100 µm (4 mil) on all specimen surfaces.
10.2.3.3	Adhesion test	ISO 4624 or ASTM D4541. 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 (0,2 in) thick panels. Scored sample shall be used. Test equipment with an automatic centred 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 (1305 psi). TSZ: No single measurement less than 5,0 MPa (725 psi). Re-testing is required if the failure occurs at the adhesive/coating interface.
10.2.3.4	Bend test	ISO 2063-2:2017 Annex G or AWS C2.23/NACE 12/SSPC-CS 23:2016 Appendix A. 13 mm (0,5 in) mandrel.	TSA: AWS C2.23/NACE 12/SSPC-CS 23. TSZ: not required.

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 certified in accordance with FROSIO, NACE CIP, SSPC PCI, ICorr, inspector level III or equivalent certification program accepted by the end-user.

Replace second paragraph with

Inspectors according to FROSIO, NACE CIP, SSPC PCI 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 certified in accordance with FROSIO, NACE CIP, SSPC PCI, Icorr, level II, or to an equivalent level by an organization specified by the end-user.

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

In fourth paragraph, replace first bullet with

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

Add to clause

Typical content of the CPS should follow the requirements of ISO 12944-8 or ISO 14921, Annex C for thermal spray procedure specification.

Replace section 10.3.2 title 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

Replace seventh paragraph with

CPTs shall remain valid for a period of three years.

Add to clause

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

Add to clause

Pre-production trials shall be carried out for internal coating work on storage tanks in accordance with ISO 16961.

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
Coating material identification						
11.1	Routine batch testing of painting material	Coating manufacturer ^a	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 $\leq 2,00 \text{ g/cm}^3$, $\pm 0,05 \text{ g/cm}^3$ from fingerprint of paint used for CPT. a2) For density $> 2,00 \text{ g/cm}^3$, $\pm 0,10 \text{ g/cm}^3$ 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 ^b	ISO 12944-9:2018, Annex C.	CPT coating material only, unless required to verify a paint batch ⁹ .	ISO 12944-9:2018, Annex C.	Coating material to be rejected. Re-blast and re-coat with material compliant with CPT.
Environmental conditions						
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 every four hours.	In accordance with specified requirements in 4.4 and coating manufacturer's technical data sheet.	No blasting nor coating.
Surface preparation						
11.4	Visual examination of surface	Applicator contractor	Visual inspection according to clause 6.	100 % of all surfaces.	No defects according to clause 6.	Defects to be removed or repaired.

Table 3 (continued)

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
11.5	Salt testing of abrasives	Applicator contractor	ASTM D4940.	At the start of each shift and every four hours.	150 μ S/cm (150 μ mho/cm).	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 every four hours and following every compressor re-start.	Free from any contamination.	Clean and service air delivery system. Clean and re-blast contaminated components since last acceptable test.
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 ² (1076 ft ²) 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 ² (1076 ft ²), with minimum three checks per day.	As per 6.3, maximum single 20 mg/m ² (2 μ g/cm ²).	Repeated washing of non-conforming area with potable water and retesting until acceptable followed by re-blasting.
11.9	Surface profile	Applicator contractor	ISO 8503-2 or ISO 8503-5 or ASTM D4417 Method C or NACE SP0287 (see 6.2 and 6.3).	Minimum one test for each component or batch of components for bulk supplied items, at least one test per 10 m ² (108 ft ²), a minimum of three 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.

Table 3 (continued)

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
Coating application						
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 ² (1076 ft ²).	Level 4 to 5.	Allow to cure.
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. Under insulation piping and equipment (if organic coating system is used): 100 % of coated area.	No holidays.	Repair and retesting.
11.13	Dry film thickness (individual coat and complete system)	Applicator contractor	ISO 19840 or SSPC PA 2.	ISO 19840.	ISO 19840 and Annex A, with DFT specified in the CSDS.	Repair, additional coats or re-coating as appropriate.

Table 3 (continued)

Activity No.	Activity description	Responsible party	Verification method	Frequency	Acceptance criteria	Management of non-conformance
11.14	Adhesion by pull-off test	Applicator contractor	ISO 4624 or ASTM D4541, using equipment with an automatic centred pulling force, and carried out when coating system are fully cured. Scored sample shall be used.	Test panel before each first component or batch of components for bulk supplied items, at least once per 100 m ² (1076 ft ²) 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	Applicator contractor	ISO 18796-1:2018, 10.7 or ISO 16961:2015, 9.11 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.
11.16	Adhesion - cross-cut test ^c	Applicator contractor	ISO 16276-2 or ASTM D3359 Method B.	Test panel before each first component or batch of components for bulk supplied items, at least once per 100 m ² (1076 ft ²) or once per week, whichever comes first.	ISO 16276-2 Classification 1 ASTM D3359 Classification 4B.	Coating applied since last acceptable test to be rejected. Re-blast and re-coat.
11.17	Bend test - TSA (not required on TSZ)	Applicator contractor	ISO 2063-2:2017, Annex G or AWS C2.23/NACE 12/SSPC CS-23:2016, Appendix A. 13 mm (0,5 in) mandrel.	Before start of each shift.	AWS C2.23/NACE 12/SSPC CS-23.	Verify and adjust application parameters. Repeat the test to confirm acceptance.

^a Additional batch testing may be carried out by the applicator or the purchaser on a random batch.

^b 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.

^c Cross-cut test shall be performed as an alternative to pull-off adhesion test only when permitted in the CSDS in Annex A.

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 HDG layer 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 NDFT is not achieved and the existing coating has exceeded the maximum overcoating time (see 7.3), the surface shall be either:

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

12.2.2

Except where a stripe coat is applied, areas exceeding the maximum DFT specified in the CSDS shall be re-blasted to bare metal and re-coated with the specified coating system.

12.3 Repair of damaged coating

12.3.1

Repair procedures shall cover the repair of partial thickness damage.

12.3.2

Repair procedures shall cover the 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 damaged area and extend to the surrounding coating surface for minimum 25 mm (1 in) all around.

12.3.5

Feathering of the edges of existing, sound coating shall be done over a width of at least 50 mm (2 in).

12.3.6

Prepared areas shall be cleaned from contaminants in accordance with 6.3 before re-coating.

Add new clause

13 Quality management and performance assurance

13.1 Quality management

13.1.1

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

13.1.2

Thermal spray contractors 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

Instruments and gauges shall be calibrated.

13.1.5

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

13.1.6

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, and 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.

13.2 Paint product identification

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

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 coating systems are numbered in accordance with Norsok M-501 Edition 6, February 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) to 400 °C (752 °F).

- d. System 1D for insulated condition and operating temperature from -50 °C (-58 °F) to 200 °C (392 °F).
 - e. System 1E for insulated condition and operating temperature from 200 °C (392 °F) to 600 °C (1112 °F).
 - f. System 1F for buried condition and operating temperature from -50 °C (-58 °F) to 80 °C (176 °F).
 - g. System 1G for non-insulated condition and operating temperature from 80 °C (176 °F) to 120 °C (248 °F).
2. System 4 is split into the following sub-systems:
- a. System 4A for heavy duty and helideck.
 - b. System 4B for light and normal duty.
3. System 10 for cold and cryogenic service with minimum operating temperature colder than -50 °C (-58 °F) and service up to 600 °C (1112 °F).

Add new table

Table 6 - Coating selection table – structural items

Substrate Material	Application or Item	Operating Environment	Coating System	
			Default	Alternative ^{a, b}
Carbon steel	Structures and structural components (general)	Atmospheric zone	1A	1B
		Unexposed area	1B	
		HVAC and dry indoor areas	8	Manufacturer's standard coating
		Splash zone and tidal zone	7A	
		Submerged ≤ 50 °C (122 °F)	7B	7C
		Submerged > 50 °C (122 °F)	7C	
		Between splash zone and underside cellar deck	7A	2A
		Underside of deck and atmospheric areas directly above sea	7A	2A
		Buried steel structures, piles	1F	
	Bridges	Atmospheric zone	1A	2A, 1B
	Exhaust stack, flare stack and boom	Atmospheric zone	2A	1C
	Crane boom and A-frame	Atmospheric zone	1A	2B, 1B
	Lifeboat stations/Rescue areas	Atmospheric zone	1A	2B, 1B
	Escape routes and solid walkways, heavy duty deck areas	Atmospheric zone	4A	
	Lay down areas	Atmospheric zone	4A	
	Deck (normal and light duty)	Atmospheric zone, exposed and unexposed areas	4B	4A
Deck	HVAC and dry, indoor areas	4B		
Permanent lifting beams and lugs	Atmospheric zone	1A	1B	
Caisson	External surface, all zones	7A	2A	
Caisson	Internal surface	7B	7A	
Stainless steel	Structure and structural components, outfitting	Atmospheric zone	N/R	6A
	Lifeboat stations/Rescue areas	Atmospheric zone	N/R	6A
	Caisson	External surface, all zones	7B	7A, 7C
	Caisson	Internal surface	7B	7A, 7C

Table 6 (continued)

Substrate Material	Application or Item	Operating Environment	Coating System	
			Default	Alternative ^{a, b}
Carbon steel HDG	Handrails and ladders	Atmospheric zone	6B	
		Unexposed area	N/R	6B
	Frames, foundations, structures	Atmospheric zone	6B	
		Unexposed area	N/R	6B
Aluminium	Structures and structural components (general)	Atmospheric zone	N/R	6A

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.
^a Alternative coating systems replace the default system only when specified in the data sheet.
^b Where multiple coating systems are listed, they shall not be regarded as equivalent.

Add new table

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

Substrate Material	Application or Item	Operating Environment	Coating System		Remarks
			Default	Alternative ^{a, b}	
Carbon steel	Pressure vessels, equipment, piping and valves, pumps	Atmospheric, non-insulated ≤ 80 °C (176 °F)	1A	1B, 2A	
		Atmospheric, non-insulated > 80 °C (176 °F) to 400 °C (752 °F)	1C	2A, 10, 1G	For system 10 and 1G refer to the temperature limitation in the CSDS.
		Atmospheric, non-insulated > 400 °C (752 °F)	10	2A	
		Atmospheric, insulated ≤ 200 °C (392 °F)	1D	2A	Coating system shall be selected as for un-insulated surfaces when perforated guards or sheets are used for personnel protection.
		Atmospheric, insulated 200 °C (392 °F) to 400 °C (752 °F)	10	2A, 1E	
		Atmospheric, insulated > 400 °C (752 °F)	10	2A, 1E	
		Buried piping	Coating systems qualified according to ISO 21809 or CSA Z245.20/30	1F	
		Splash zone and tidal zone	7A		
		Submerged ≤ 50 °C (122 °F), insulated and non-insulated	7B	7C	
		Submerged > 50 °C (122 °F), insulated and non-insulated	7C		
		Non-insulated HVAC and dry, indoor area	8	Manufacturer's standard coating	
		Cold and cryogenic service	6C	10, 2A	Minimum operating temperature colder than -50 °C (-58 °F).

Table 7 (continued)

Substrate Material	Application or Item	Operating Environment	Coating System	Remarks	Substrate Material
Carbon steel	Actuator, gear box	Atmospheric zone	1A	1B	
	Hand wheels	Atmospheric zone	6B		HDG wheel.
	Electric generators, motors, transformers	Atmospheric zone, low voltage motors	1B	1A, 2B, Manufacturer standard coating complying with ISO 12944-9 corrosivity category CX durability high	
		Atmospheric zone, high voltage motors	1A	2B	
		Unexposed area	1B	Manufacturer standard coating to ISO 12944-5 corrosivity category C5, durability high	
	Frames, foundations (above ground), 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	1B, 1C, 1G, Manufacturer standard coating complying with ISO 12944-9 corrosivity category CX high durability	
		Unexposed area	1B	1A, 1C, 1G, Manufacturer standard coating to ISO 12944-5 corrosivity category C5, durability high	
	Stainless steel	Pressure vessels, equipment, piping and valves, pumps	Non-insulated, atmospheric zone 300-series SS	6A	2A, 10
Non-insulated, atmospheric zone, duplex, superduplex and high alloyed austenitic stainless steels			2A	N/R, 10	
Non-insulated, splash zone			7A		

Table 7 (continued)

Substrate Material	Application or Item	Operating Environment	Coating System	Remarks	Substrate Material	
Stainless steel	Pressure vessels, equipment, piping and valves, pumps	Submerged ≤ 50 °C (122 °F), insulated and non-insulated	7B	7C, 7A		
		Submerged > 50 °C (122 °F), insulated and non-insulated	7C			
		Insulated, atmospheric zone	6C	2A	Coating system shall be selected as for un-insulated surfaces when perforated guards or sheets are used for personnel protection.	
		Cryogenic service	6C	10, 2A		
	Actuator, gear box	Non-insulated HVAC and dry, indoor area		N/R	6A	
			Atmospheric zone, non-insulated	N/R	6A	
		Atmospheric zone, insulated	6C			
	Instruments and instrument tubing	Non-insulated	N/R	6A		
	Aluminium	Actuator and other equipment items	Atmospheric zone	N/R	6A	
Carbon steel HDG	Miscellaneous equipment items, electrical equipment	Atmospheric zone	6B	N/R		
		Unexposed area	N/R	6B		

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.

^a Alternative coating systems replace the default system only when specified in the data sheet.

^b Where multiple coating systems are listed, they shall not be regarded as equivalent.

Table 8 - Coating selection table – lining of storage tanks and process vessels

Substrate Material	Application or Item	Operating Environment (internal)	Coating System	
			Default	Alternative ^{a, b}
Carbon steel	Storage tanks	Potable water	3A	
		Service water	3B	
		Demineralized water	3D	
		Diesel, condensate, stabilized crude	3C	Lining qualified to ISO 16961
		Hydrocarbons, unstabilized crude, produced water	3D	3E, 3F
		Seawater, firewater, raw water, slops, oily water tank	3B	
		Open drain	3B	3D
		Closed drain	3B	3D, 3E, 3F
		Methanol, ethanol, MEG, TEG	3G	3F
		Fuel, aviation fuel	3D	3E
	Sewage	3D	3E	
	Process vessels	Hydrocarbon liquids, vapour and produced water and seawater Operating pressure ≤ 0,3 MPa (44 psi) Operating temperature -20 °C (-4 °F) to 75 °C (167 °F)	3D	3E, 3F
		Hydrocarbon liquids, vapour and produced water and seawater Operating pressure ≤ 7 MPa (1015 psi) Operating temperature -20 °C (-4 °F) to 80 °C (176 °F)	3E	3F
Hydrocarbon liquids, vapour and produced water and seawater Operating pressure ≤ 3 MPa (435 psi) Operating temperature -20 °C (-4 °F) to 130 °C (266 °F)		3F		

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 shall be in accordance with the requirement in Table 6 and Table 7.

^a Alternative coating systems replace the default system only when specified in the data sheet.

^b 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 prequalified)

Replace table A.1.1 with

Table A.1.1 - CSDS No. 1A

Coating System Data Sheet		CSDS No. 1A		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Non-insulated, atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-50 °C to 80 °C (-58 °F to 176 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3) ^d			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Zinc silicate ^b	60 (2,5)		
2	Tie coat ^a	-		
3	Epoxy	Intermediate and top coat DFT as per qualified coating system.		
4 (topcoat)	Non-isocyanate coat or polyurethane ^c			
Total DFT		300 (12)		
Performance tests, qualification and inspection				
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, 11.15, 11.16 and 11.17.			
Inspection	Table 3, all testing activities except 11.12, 11.15, 11.16 and 11.17.			

Table A.1.1 (continued)

Coating System Data Sheet		CSDS No. 1A		Rev. 01
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Zinc-rich primer ^{b,e}	60 (2,5)		
2	Epoxy	Intermediate and top coat DFT as per qualified coating system.		
3 (topcoat)	Non-isocyanate coat or polyurethane ^c			
Total DFT		300 (12)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1	Epoxy	DFT of each coat as per qualified coating system.		
2 (topcoat)	Non-isocyanate coat or polyurethane ^c			
Total DFT		300 (12)		
KEY				
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.				
^a If a tie coat is not applied, the second coat shall be applied according by a mist coat, full coat method.				
^b Zinc silicate primer shall have minimum 85 % by mass zinc content in dry film.				
^c HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.				
^d Castings surface preparation grade P2 for ISO 8501-3 Table 1 Item 3.1 is permitted.				
^e Zinc silicate may also be used as primer for repair system.				

Add new table

Table A.1.2 - CSDS No. 1B

Coating System Data Sheet		CSDS No. 1B		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Non-insulated, unexposed areas, atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-50 °C to 80 °C (-58 °F to 176 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3) ^c			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Zinc-rich epoxy primer ^a	60 (2,5)		
2	Epoxy	Intermediate and top coat DFT as per qualified coating system.		
3 (top coat)	Non-isocyanate coat or polyurethane ^b			
Total DFT		300 (12)		
Performance tests, qualification and inspection				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16 and 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16 and 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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			

Table A.1.2 (continued)

Coating System Data Sheet		CSDS No. 1B		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Zinc-rich epoxy primer ^a	60 (2,5)	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 (top coat)	Non-isocyanate coat or polyurethane ^b			
Total DFT		300 (12)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1	Epoxy	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 ^b			
Total DFT		300 (12)		
<p>KEY 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>^a Zinc-rich primer shall have minimum 80 % by mass zinc content in dry film. ^b HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint. ^c Castings surface preparation grade P2 for ISO 8501-3 Table 1 Item 3.1 is permitted.</p>				

Add new table

Table A.1.3 - CSDS No. 1C

Coating System Data Sheet		CSDS No. 1C		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Non-insulated, non-cyclic service, atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	> 80 °C to 400 °C (> 176 °F to 752 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3) ^c			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Zinc silicate ^a	60 (2,5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Silicone ^{b, g}	20 (1)		
Total DFT		80 (3,5)		
Performance tests, qualification and inspection				
Performance tests ^d	Table 1, testing activity 10.1.1, 10.1.2 ^e			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12, 11.14 ^f , 11.15 and 11.17.			
Inspection	Table 3, all testing activities except 11.12, 11.14 ^f , 11.15 and 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	Zinc silicate ^a	60 (2,5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Silicone ^{b, g}	20 (1)		
Total DFT		80 (3,5)		

Table A.1.3 (continued)

Coating System Data Sheet		CSDS No. 1C		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (topcoat)	Silicone ^{b, g}	20 (1)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		80 (3,5)		
<p>KEY 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>^a Zinc silicate primer shall have minimum 85 % by mass zinc content in dry film.</p> <p>^b A mist coat shall be applied according to the coating manufacturer's recommendations to minimise bubbling.</p> <p>^c Castings surface preparation grade P2 for ISO 8501-3 Table 1, Item 3.1 is permitted.</p> <p>^d The coating manufacturer shall demonstrate suitability of the coating by additional testing and documented field experience at the maximum operating temperature.</p> <p>^e Cycling ageing test is not required, if the Zn silicate primer has been already qualified as part of CSDS 1A. Pull-off test according to Table 1, Activity 10.1.2 shall be carried out on the Zn-silicate primer coat.</p> <p>^f Cross-cut testing to Table 3, Activity 11.16 shall be performed on the complete system.</p> <p>^g For operating temperature below 120 °C (248 °F) , self-curing silicone shall be used.</p>				

Add new table

Table A.1.4 - CSDS No. 1D

Coating System Data Sheet		CSDS No. 1D		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Insulated, continuous and cyclic service in atmospheric zone.			
Minimum/maximum operating temperature	-50 °C to 200 °C (-58 °F to 392 °F)			
Surface preparation				
Surface cleanliness	Carbon steel Sa 2 ½ (ISO 8501-1), SSPC-SP 10.			
Roughness	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3) ^a			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)		
Total DFT		250 (10)		
Performance tests, qualification and inspection				
Performance tests	Table 1, testing activity 10.1.1, 10.1.8.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.15, 11.16 and 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.15, 11.16 and 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	Carbon steel P Sa 2 ½ (ISO 8501-2), SSPC-SP 10.			
Surface profile	Carbon steel 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2).			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)		
Total DFT		250 (10)		

Table A.1.4 (continued)

Coating System Data Sheet		CSDS No. 1D		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (topcoat)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		250 (10)		
<p>KEY 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 (CUI category). ^a Castings surface preparation grade P2 for ISO 8501-3 Table 1, Item 3.1 is permitted.</p>				

Add new table

Table A.1.5 - CSDS No. 1E

Coating System Data Sheet		CSDS No. 1E		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Equipment items, piping and valves.			
Service	Insulated, continuous service ^a in atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	200 °C (392 °F) to 600 °C (1112 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Silicone	25 (1)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Silicone	25 (1)		
Total DFT		50 (2)		
Performance tests, qualification and inspection				
Performance tests	Table 1, testing activity 10.1.1.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12, 11.14 ^b , 11.15 and 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.14 ^b , 11.15 and 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	Silicone	25 (1)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Silicone	25 (1)		
Total DFT		50 (2)		

Table A.1.5 (continued)

Coating System Data Sheet		CSDS No. 1E		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (topcoat)	Silicone	25 (1)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		50 (2)		
<p>KEY 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>^a Coating system for continuous service operation under insulation at temperature above 200 °C (392 °F). Prolonged exposure in CX environment at temperature below 200 °C (392 °F) shall be avoided. If this cannot be achieved system 2A or system 10 shall be used. Special precaution shall be taken to avoid damage during transportation and shipping.</p> <p>^b Cross-cut testing to Table 3, Activity 11.16 shall be performed if adhesion testing by pull-off test is not feasible according to coating manufacturer PDS.</p>				

Add new table

Table A.1.6 - CSDS No. 1F

Coating System Data Sheet		CSDS No. 1F		Rev. 01
Environment corrosivity (ISO 12944-2)	Im3			
Substrate material	Carbon steel			
Application	Structures and piping			
Service	Buried in soil			
Minimum/maximum operating temperature	-50 °C to 80 °C (-58 °F to 176 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (ISO 8501-1), SSPC-SP 10			
Roughness	75 µm to 100 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Glass flake epoxy ^a	500 (20)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Glass flake epoxy ^{a, b}	500 (20)		
Total DFT		1000 (40)		
Performance tests, qualification and inspection				
Performance tests	Table 1, all testing activities except 10.1.6, 10.1.7, 10.1.8, 10.1.9, 10.1.10.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.15, 11.16 and 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.15, 11.16 and 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10			
Surface profile	75 µm to 100 µm ISO 8503-5, grade medium G to coarse G to ISO 8503-2			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Glass flake epoxy ^a	500 (20)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Glass flake epoxy ^{a, b}	500 (20)		
Total DFT		1000 (40)		

Table A.1.6 (continued)

Coating System Data Sheet		CSDS No. 1F		Rev. 01	
Coating damage not exposing the steel surface					
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)			
		NDFT		Max	
1 (topcoat)	Glass flake epoxy ^{a, b}	500 (20)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		1000 (40)			
<p>KEY 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>^a In alternative, an epoxy coating system with minimum total DFT > 1500 μm may be used.</p> <p>^b 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>					

Add new table

Table A.1.7 - CSDS No. 1G

Coating System Data Sheet		CSDS No. 1G		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Non-insulated, non-cyclic service, atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	> 80 °C to 120 °C (> 176 °F to 248 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3) ^c			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Zinc silicate ^a	60 (2,5)		
2	Epoxy ^d	Intermediate and top coat DFT as per qualified coating system.		
3 (topcoat)	UV resistant coat ^d			
Total DFT		300 (12)		
Performance tests, qualification and inspection				
Performance tests	Table 1, testing activity 10.1.1, 10.1.2 ^d .			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.12, 11.14, 11.15 and 11.17.			
Inspection	Table 3, all testing activities except 11.12, 11.14, 11.15 and 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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			

Table A.1.7 (continued)

Coating System Data Sheet		CSDS No. 1G		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Zinc silicate ^a	60 (2,5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy ^d	Intermediate and top coat DFT as per qualified coating system.		
3 (topcoat)	UV resistant coat ^d			
Total DFT		300 (12)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1	Epoxy ^d	Intermediate and top coat DFT as per qualified coating system.	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	UV resistant coat ^d			
Total DFT		300 (12)		
<p>KEY 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>^a Zinc silicate primer shall have minimum 85 % by mass zinc content in dry film.</p> <p>^b A mist coat shall be applied according to the coating manufacturer's recommendations to minimize bubbling.</p> <p>^c Castings surface preparation grade P2 for ISO 8501-3 Table 1, Item 3.1 is permitted.</p> <p>^d The coating manufacturer shall demonstrate suitability of the coating by additional testing and documented field experience at the maximum operating temperature.</p>				

A.2 Coating system no. 2

Replace Table A.2.1 with

Table A.2.1 - CSDS No. 2A

Coating System Data Sheet		CSDS No. 2A		Rev. 01
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	Non-insulated and insulated items in atmospheric zone, immersed service, buried environment.			
Minimum/maximum operating temperature	-50 °C to 600 °C (-58 °F to 1112 °F)			
Surface preparation				
Surface cleanliness	Carbon steel: Sa 3 (ISO 8501-1), SSPC-SP 5 Stainless steel: SSPC-SP 16 (sweep blast)			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (TSA coat)	Thermally sprayed aluminium ^a	200 (8) ^f	Maximum DFT shall be as qualified by the CPT.	
2 (sealer coat)	Sealer ^{b, e}	- ^c	20 (1) ^c	
Total DFT		200 (8) ^f	Maximum DFT shall be as qualified by the CPT ^e .	
Performance tests, qualification and inspection				
Performance tests	N/R			
Coating procedure tests (CPT)	Table 2, all testing activities. Table 3, all testing activities except 11.10, 11.12, 11.14, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	ISO 8501-2 P Sa 2 ½, SSPC-SP 10 or SSPC-SP 16 (sweep blast) for stainless steel			
Surface profile	50 - 85 µm ISO 8503-5, grade medium G to ISO 8503-2			

Table A.2.1 (continued)

Coating System Data Sheet		CSDS No. 2A		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (TSA coat)	Thermally sprayed aluminium ^a	200 (8) ^f	Maximum DFT shall be as qualified by the CPT.	
2 (sealer coat)	Sealer ^{b, e}	- ^c	20 (1) ^c	
Total DFT		200 (8) ^f	Maximum DFT shall be as qualified by the CPT ^c .	
Coating damage not exposing the steel surface^d				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (sealer coat)	Sealer ^{b, e}	- ^c	20 (1) ^c	
Total DFT		200 (8) ^f	Maximum DFT shall be as qualified by the CPT ^c .	
<p>KEY N/R = not required, 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>^a TSA material shall comply with 8.2.</p> <p>^b The materials for sealing the metal coating shall be two-component epoxy for operating temperatures $\leq 80\text{ }^{\circ}\text{C}$ (176 $^{\circ}\text{F}$) or silicone/self-curing silicone for temperatures up to 600 $^{\circ}\text{C}$ (1112 $^{\circ}\text{F}$).</p> <p>^c The sealer shall fill the metal pores and it shall be applied until absorption is complete.</p> <p>^d If the DFT of the TSA coat is reduced below the minimum specified thickness, the complete system shall be re-applied.</p> <p>^e The application of a sealer is not required for immersed (Im4) service, buried (Im3) service and insulated services.</p> <p>^f Where application of a sealer is not required, the minimum coating thickness shall be in accordance with ISO 2063 Table C.1.</p>				

Add new table

Table A.2.2 - CSDS No. 2B

Coating System Data Sheet		CSDS No. 2B		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Non-insulated items in atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-50 °C to 80 °C (-58 °F to 176 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (TSZ coat)	Thermally sprayed zinc ^a	100 (4)		Maximum DFT shall be as qualified by the CPT.
2	Tie coat ^c	-		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer ^c .
3	Epoxy ^{b, c}	125 (5)		
4 (top coat)	Non-isocyanate coat or polyurethane ^{c, d}	75 (3)		
Total DFT		300 (12)		
Performance tests, qualification and inspection				
Performance tests	N/R ^c			
Coating procedure tests (CPT)	Table 2, all testing activities except 10.2.3.4. Table 3, all testing activities except 11.10, 11.12, 11.14, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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			

Table A.2.2 (continued)

Coating System Data Sheet		CSDS No. 2B		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (TSZ coat)	Thermally sprayed zinc ^a	100 (4)	Maximum DFT shall be as qualified by the CPT.	
2	Tie coat ^c	-	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer ^c .	
3	Epoxy ^{b, c}	125 (5)		
4 (top coat)	Non-isocyanate coat or polyurethane ^{c, d}	75 (3)		
Total DFT		300 (12)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1	Tie coat ^c	-	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer ^c .	
2	Epoxy ^{b, c}	125 (5)		
3 (top coat)	Non-isocyanate coat or polyurethane ^{c, d}	75 (3)		
Total DFT		300 (12)		
<p>KEY N/R = not required, 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>^a TSZ material shall comply with 8.2. ^b A tie coat shall be applied in accordance with coating manufacturer's recommendation. ^c 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. ^d HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

A.3 Coating system no. 3

Replace Table A.3.1 with

Table A.3.1 - CSDS No. 3A

Coating System Data Sheet		CSDS No. 3A		Rev. 01
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)			
Surface preparation				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy ^{a,b}	300 (12)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy ^{a,b}	300 (12)		
Total DFT		600 (24)		
Performance tests, qualification and inspection				
Performance tests	N/R ^a			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	Epoxy ^{a,b}	300 (12)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (top coat)	Epoxy ^{a,b}	300 (12)		
Total DFT		600 (24)		

Table A.3.1 (continued)

Coating System Data Sheet		CSDS No. 3A		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (top coat)	Epoxy ^{a,b}	300 (12)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		600 (24)		
<p>KEY N/R = not required, 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. ^a Coating shall be certified to local regulatory requirements for material in contact with potable water. ^b Solvent free epoxy with minimum 98 % solids by volume shall be used.</p>				

Add new table

Table A.3.2 - CSDS No. 3B

Coating System Data Sheet		CSDS No. 3B		Rev. 01
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of tanks			
Service	Seawater water, service water, slops, oily water, in combination with cathodic protection			
Minimum/maximum operating temperature	-20 °C to 50 °C (-4 °F to 122 °F)			
Surface preparation				
Surface cleanliness	Sa 3 (ISO 8501-1), SSPC-SP			
Roughness	50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	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 (top coat)	Epoxy			
Total DFT				350 (14)
Performance tests, qualification and inspection				
Performance tests ^a	Table 1, 10.1.1, 10.1.9.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	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 (top coat)	Epoxy			
Total DFT				350 (14)

Table A.3.2 (continued)

Coating System Data Sheet		CSDS No. 3B		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	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 DFT		350 (14)		
<p>KEY 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.3.3 - CSDS No. 3C

Coating System Data Sheet		CSDS No. 3C		Rev. 01
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of tanks.			
Service ^a	Stabilized crude, diesel and condensate			
Minimum/maximum operating temperature	-20 °C to 50 °C (-4 °F to 122 °F)			
Surface preparation				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	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 (top coat)	Epoxy			
Total DFT				300 (12)
Performance tests, qualification and inspection				
Performance tests ^b	Table 1, 10.1.1 and 10.1.9.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	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 (top coat)	Epoxy			
Total DFT				300 (12)

Table A.3.3 (continued)

Coating System Data Sheet		CSDS No. 3C		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	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 DFT		300 (12)		
<p>KEY 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>^a System to be applied to the flat bottom and up the shell above the specified highest water level, and to the roofs and upper 1 m (3 ft) of walls for floating roofs.</p> <p>^b In alternative, performance testing according to Table 1, activities 10.1.1 and 10.1.7 (ISO 18796-1) is acceptable.</p>				

Add new table

Table A.3.4 - CSDS No. 3D

Coating System Data Sheet		CSDS No. 3D		Rev. 01
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of process vessels.			
Service	Hydrocarbon liquids, vapour and produced water, aviation fuel. Maximum operating pressure 0,3 MPa (44 psi).			
Minimum/maximum operating temperature	-20 °C to 75 °C (-4 °F to 167 °F)			
Surface preparation				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy, phenolic epoxy, epoxy novolac	NDFT 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 DFT				250 (10)
Performance tests, qualification and inspection				
Performance tests	Table 1, 10.1.1, 10.1.7 ^a .			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	Epoxy, phenolic epoxy, epoxy novolac	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 DFT				250 (10)

Table A.3.4 (continued)

Coating System Data Sheet		CSDS No. 3D		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (top coat)	Epoxy, phenolic epoxy, epoxy novolac	NDFT 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 DFT		250 (10)		
<p>KEY</p> <p>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 and additional qualification tests may be required based on the pH, concentration of H₂S, organic and inorganic acids, aromatic and aliphatic hydrocarbons and in the presence of sand and solids.</p> <p>^a The coating system shall be certified for aviation fuel storage when used in fuel tanks.</p>				

Add new table

Table A.3.5 - CSDS No. 3E

Coating System Data Sheet		CSDS No. 3E		Rev. 01
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 (1015 psi),			
Minimum/maximum operating temperature	-20 °C to 80 °C (-4 °F to 176 °F)			
Surface preparation				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Phenolic epoxy, epoxy novolac	NDFT 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 DFT				250 (10)
Performance tests, qualification and inspection				
Performance tests	Table 1, 10.1.1, 10.1.7 ^a .			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1 (primer)	Phenolic epoxy, epoxy novolac	NDFT 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 DFT				250 (10)

Table A.3.5 (continued)

Coating System Data Sheet		CSDS No. 3E		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (top coat)	Phenolic epoxy, epoxy novolac	NDFT 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 DFT		250 (10)		
<p>KEY</p> <p>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 and additional qualification tests may be required based on the pressure, pH, concentration of H₂S, organic and inorganic acids, aromatic and aliphatic hydrocarbons and in the presence of sand and solids.</p> <p>^a The coating system shall be certified for aviation fuel storage when used in fuel tanks.</p>				

Add new table

Table A.3.6 - CSDS No. 3F

Coating System Data Sheet		CSDS No. 3F		Rev. 01
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of process vessels.			
Service	Hydrocarbon liquids, vapour and produced water, methanol, ethanol, MEG, TEG. 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				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Phenolic epoxy, epoxy novolac, vinyl ester	NDFT 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, vinyl ester			
Total DFT		250 (10)		
Performance tests, qualification and inspection				
Performance tests	Table 1, 10.1.1, 10.1.7 ^a .			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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			

Table A.3.6 (continued)

Coating System Data Sheet		CSDS No. 3F		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Phenolic epoxy, epoxy novolac, vinyl ester	NDFT 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, vinyl ester			
Total DFT		250 (10)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (top coat)	Phenolic epoxy, epoxy novolac, vinyl ester	NDFT 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 DFT		250 (10)		
<p>KEY 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, H₂S concentration, water content in methanol, ethanol, MEG and TEG solutions, concentration of organic and inorganic acids, aromatic and aliphatic hydrocarbons based on coating manufacturer's recommendations and qualification tests.</p> <p>^a For temperature exceeding 95 °C (203 °F), cathodic disbondment test shall be done at 95 °C (203 °F).</p> <p>^b Vinyl ester coating shall not be used at temperature exceeding 90 °C (194 °F).</p>				

Add new table

Table A.3.7 - CSDS No. 3G

Coating System Data Sheet		CSDS No. 3G		Rev. 01
Environment corrosivity (ISO 12944-2)	-			
Substrate material	Carbon steel			
Application	Internal coating of process vessels.			
Service ^a	Methanol, ethanol, MEG, TEG.			
Minimum/maximum operating temperature	-20 °C to 40 °C (-4 °F to 104 °F)			
Surface preparation				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1	Zinc silicate ^b	60 (2,5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		60 (2,5)		
Performance tests, qualification and inspection				
Performance tests	Table 1, 10.1.1, 10.1.7.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.14, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.14, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 (mil)		
		NDFT	Max	
1	Zinc silicate ^b	60 (2,5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		60 (2,5)		

Table A.3.7 (continued)

Coating System Data Sheet		CSDS No. 3G		Rev. 01
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
-	-	-	-	
Total DFT		-	-	
<p>KEY</p> <p>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>^a System 3G shall be used only for lean (maximum 3 % vol water) solutions. For water content > 3 % vol system 3F shall be used.</p> <p>^b Zinc primer shall have minimum 85 % by mass zinc content in dry film.</p>				

A.4 Coating system no. 4

Replace Table A.4.1 with

Table A.4.1 - CSDS No. 4A

Coating System Data Sheet		CSDS No. 4A		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Walkways, escape routes, decks and floors, helideck. Heavy duty.			
Service	Atmospheric zone offshore and coastal, heavy duty.			
Minimum/maximum operating temperature	-20 °C to 80 °C (-4 °F to 176 °F)			
Surface preparation				
Surface cleanliness	Sa 2 ½ (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 ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	NDFT 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 ^a			
3 (topcoat)	Epoxy ^b			
Total DFT		3000 (118)		
Performance tests, qualification and inspection				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17. Activity 11.14 (adhesion test) shall be performed on the painting system without aggregates.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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			

Table A.4.1 (continued)

Coating System Data Sheet		CSDS No. 4A		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	NDFT 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 ^a			
3 (topcoat)	Epoxy ^b			
Total DFT		3000 (118)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1	Epoxy	NDFT 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 ^a			
2 (topcoat)	Epoxy ^b			
Total DFT		3000 (118)		
<p>KEY 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>^a 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 shall comply with local HSSE or aviation regulation for helideck coating.</p> <p>^b 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
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Carbon steel			
Application	Decks and floors. Normal and light duty.			
Service	Atmospheric zone and indoor areas, normal and light duty.			
Minimum/maximum operating temperature	-20 °C to 80 °C (-4 °F to 176 °F)			
Surface preparation				
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 ²			
Steel preparation	Grade P3 (ISO 8501-3). Grade P2 is acceptable for indoor areas.			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	NDFT for each coat shall be as qualified by the coating manufacturer.		
2	Epoxy			
Aggregate	Non-skid aggregate recommended by the coating manufacturer ^a			
3 (topcoat)	Epoxy ^b			
Total DFT		500 (20)		
Performance tests, qualification and inspection				
Performance tests	Table 1, testing activity 10.1.1 and 10.1.2.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12, 11.15 and 11.16, 11.17. Activity 11.14 (adhesion test) shall be performed on the painting system without aggregates.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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			

Table A.4.2 (continued)

Coating System Data Sheet		CSDS No. 4B		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Zinc-rich epoxy or self-priming epoxy	NDFT 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 ^a			
3 (topcoat)	Epoxy ^b			
Total DFT		500 (20)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT		
1	Epoxy	NDFT 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 ^a			
2 (topcoat)	Epoxy ^b			
Total DFT		500 (20)		
<p>KEY</p> <p>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 1A or 1B may be used for light duty deck areas with the addition of a non-skid aggregate. The primer and the succeeding coat(s) shall be applied to a minimum DFT of 175 μm (7 mil) and fully cured. A non-skid aggregate shall be added to the second last coat.</p> <p>^a Aggregate shall be non-sparking, pre-mixed in the liquid coat or evenly distributed over the surface. Friction coefficient shall comply with local HSSE regulation.</p> <p>^b 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>				

A.5 Coating system no. 5

Delete clause

A.6 Coating system no. 6

Replace table with

Table A.6.1 - CSDS No. 6A

Coating System Data Sheet		CSDS No. 6A		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Stainless steels, aluminium alloys and non-ferrous alloys ^a .			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Non-insulated items in atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-50 °C to 80 °C (-58 °F to 176 °F) ^c			
Surface preparation				
Surface cleanliness	SSPC-SP 16 (sweep blast)			
Roughness	25 - 85 µm (ISO 8503-5), grade fine G to medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system ^b				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy ^{d, e}	50 (2)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2	Epoxy ^{d, e}	100 (4)		
3 (top coat) ^f	Non-isocyanate coat or polyurethane ^g	75 (3)		
Total DFT		225 (9)		
Performance tests, qualification and inspection				
Performance tests	N/R			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	SSPC-SP 16			
Surface profile	25 - 85 µm ISO 8503-5, grade fine to medium G to ISO 8503-2			

Table A.6.1 (continued)

Coating System Data Sheet		CSDS No. 6A		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Epoxy ^{d, e}	50 (2)		
2	Epoxy ^{d, e}	100 (4)		
3 (top coat) ^f	Non-isocyanate coat or polyurethane ^g	75 (3)		
Total DFT		225 (9)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1	Epoxy ^d	100 (4)		
2 (top coat) ^f	Non-isocyanate coat or polyurethane ^g	75 (3)		
Total DFT		225 (9)		
<p>KEY N/R = not required, 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>^a 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 anodized.</p> <p>^b In alternative, aluminium may be coated with a 75 μm (3 mil) polyester powder coating. Surface preparation of the aluminium prior to powder coating shall include a chromate conversion coating.</p> <p>^c If coating is specified for operating temperature outside this range, coating system 1E, 1G or 2A shall be used.</p> <p>^d Coatings for stainless steels shall not contain zinc.</p> <p>^e For stainless steels, a high-solid, high-build epoxy coat with minimum DFT > 150 μm (6 mil) may be used in a two-coats system.</p> <p>^f Only topcoats performance tested as part of coating system no. 1 shall be used.</p> <p>^g HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p>				

Add new table

Table A.6.2 - CSDS No. 6B

Coating System Data Sheet		CSDS No. 6B		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Hot dip galvanized steel ^a			
Application	Structures and structural components, stairways, railings, equipment items, piping, supports			
Service	Non-insulated items in atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-50 °C to 80 °C (-58 °F to 176 °F)			
Surface preparation				
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	Minimum 19 µm (ISO 8503-5) ^e			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Epoxy ^c	50 (2)		
2	Epoxy ^c	100 (4)		
3 (top coat) ^b	Non-isocyanate coat or polyurethane ^d	75 (3)		
Total DFT		225 (9)		
Performance tests, qualification and inspection				
Performance tests	N/R			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.12, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the HDG steel surface				
Surface preparation				
Type and level of preparation:	SSPC-SP 16			
Surface profile	Minimum 19 µm ISO 8503-5, grade fine G to ISO 8503-2			

Table A.6.2 (continued)

Coating System Data Sheet		CSDS No. 6B		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Epoxy ^c	50 (2)		
2	Epoxy ^c	100 (4)		
3 (top coat) ^b	Non-isocyanate coat or polyurethane ^d	75 (3)		
Total DFT		225 (9)		
Coating damage not exposing the HDG steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1	Epoxy ^c	100 (4)		
2 (top coat) ^b	Non-isocyanate coat or polyurethane ^d	75 (3)		
Total DFT		225 (9)		
<p>KEY 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>^a Alternatively, HDG steel may be coated with a 75 μm (3 mil) polyester powder coating in accordance with EN 15773 or ASTM D7803. Surface preparation of the zinc prior to powder coating shall include a zinc manganese phosphate conversion coating.</p> <p>^b Only topcoats performance tested as part of coating system no. 1 shall be used.</p> <p>^c A high-solid, high-build epoxy coat with minimum DFT > 150 μm (6 mil) may be used in a two-coats system.</p> <p>^d HSSE restrictions may apply in some jurisdictions on the use of polyurethane paint.</p> <p>^e The thickness of the galvanized coating remaining after blasting shall comply with 4.11.</p>				

Add new table

Table A.6.3 - CSDS No. 6C

Coating System Data Sheet		CSDS No. 6C		Rev. 01
Environment corrosivity (ISO 12944-2)	CX			
Substrate material	Stainless steel			
Application	Structures and structural components, equipment items, piping and valves.			
Service	Insulated, continuous and cyclic service in atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-183 °C to 200 °C (-297 °F to 392 °F) ^a			
Surface preparation				
Surface cleanliness	SSPC-SP 16			
Roughness	25 - 85 µm (ISO 8503-5), grade fine G to medium G (ISO 8503-2)			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)		
Total DFT		250 (10)		
Performance tests, qualification and inspection				
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, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.15, 11.16, 11.17			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	SSPC-SP 16			
Surface profile	25 - 85 µm ISO 8503-5, grade fine G to medium G to ISO 8503-2.			

Table A.6.3 (continued)

Coating System Data Sheet		CSDS No. 6C		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)		
2 (topcoat)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)		
Total DFT		250 (10)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (topcoat)	Epoxy, epoxy phenolic, epoxy novolac	125 (5)		
Total DFT		250 (10)		
<p>KEY</p> <p>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>^a 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
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 in combination with cathodic protection.			
Minimum/maximum operating temperature	-50 °C to 50 °C (-58 °F to 122 °F) °			
Surface preparation				
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 - 130 µm (ISO 8503-5), grade medium G to coarse G (ISO 8503-2). Stainless steel and non-ferrous alloys 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Glass flake epoxy or glass flake polyester based coating ^{a, b}	500 (20)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Glass flake epoxy or glass flake polyester based coating ^{a, b}	500 (20)		
Total DFT		1000 (40)		
Performance tests, qualification and inspection				
Performance tests	Table 1, all testing activities except 10.1.5, 10.1.6, 10.1.7, 10.1.8, 10.1.9.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.15, 11.16 and 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.15, 11.16 and 11.17.			

Table A.7.1 (continued)

Coating System Data Sheet		CSDS No. 7A		Rev. 01
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
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 - 135 µm (ISO 8503-5), grade medium G to coarse G (ISO 8503-2). Stainless steel and non-ferrous alloys 50 - 85 µm (ISO 8503-5), grade medium G (ISO 8503-2).			
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Glass flake epoxy or glass flake polyester based coating ^{a, b}	500 (20)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Glass flake epoxy or glass flake polyester based coating ^{a, b}	500 (20)		
Total DFT		1000 (40)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (topcoat)	Glass flake epoxy or glass flake polyester based coating ^{a, b}	500 (20)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		1000 (40)		
<p>KEY 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 Anti-fouling may be required.</p> <p>^a In alternative, a high-build epoxy with NDFT 1500 µm (60 mil) may be used.</p> <p>^b Coatings for stainless steels shall not contain zinc.</p> <p>^c If this system is used at higher temperature, in addition to the tests specified in this CSDS testing to Table 1, activity 10.1.5 shall be performed.</p>				

Add new table

Table A.7.2 - CSDS No. 7B

Coating System Data Sheet		CSDS No. 7B		Rev. 01
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) in combination with cathodic protection.			
Minimum/maximum operating temperature	-50 °C to 50 °C (-58 °F to 122 °F)			
Surface preparation				
Surface cleanliness	Carbon steel Sa 2 ½ (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 to medium G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy ^{a, b} , phenolic epoxy, epoxy novolac	175 (7)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy ^{a, b} , phenolic epoxy ^c , epoxy novolac ^c	175 (7)		
Total DFT		350 (14)		
Performance tests, qualification and inspection				
Performance tests	Table 1, 10.1.1, 10.1.3, 10.1.4.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	Carbon steel P Sa 2 ½ (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 to medium G (ISO 8503-2).			

Table A.7.2 (continued)

Coating System Data Sheet		CSDS No. 7B		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Epoxy ^{a, b} , phenolic epoxy, epoxy novolac	175 (7)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy ^{a, b} , phenolic epoxy ^c , epoxy novolac ^c	175 (7)		
Total DFT		350 (14)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (topcoat)	Epoxy ^{a, b} , phenolic epoxy ^c , epoxy novolac ^c	175 (7)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
Total DFT		350 (14)		
<p>KEY 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>^a Glass flake or fibre reinforced epoxy coat or high solid, high-build epoxy coat may be used.</p> <p>^b Coatings for stainless steels shall not contain zinc.</p> <p>^c If equipment is expected to be stored in yards or laydown areas for long periods prior to installation, measure shall be taken to avoid UV degradation of phenolic epoxy and epoxy novolac coating.</p>				

Add new table

Table A.7.3 - CSDS No. 7C

Coating System Data Sheet		CSDS No. 7C		Rev. 01
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, in combination with cathodic protection.			
Maximum operating temperature	≤ 150 °C (≤ 302 °F)			
Surface preparation				
Surface cleanliness	Carbon steel Sa 2 ½ (ISO 8501-1), SSPC-SP 10 ^a . 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 to medium G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Epoxy ^b , phenolic epoxy, epoxy novolac	175 (7)	Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.	
2 (topcoat)	Epoxy ^b , phenolic epoxy ^c , epoxy novolac ^c	175 (7)		
Total DFT		350 (14)		
Performance tests, qualification and inspection				
Performance tests	Table 1, 10.1.1, 10.1.2, 10.1.3, 10.1.4, 10.1.5.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.10, 11.15, 11.16, 11.17.			
Inspection	Table 3, all testing activities except 11.10, 11.15, 11.16, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	Carbon steel P Sa 2 ½ (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 to medium (ISO 8503-2).			

Table A.7.3 (continued)

Coating System Data Sheet		CSDS No. 7C		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (primer)	Epoxy ^b , phenolic epoxy, epoxy novolac	175 (7)		
2 (topcoat)	Epoxy ^b , phenolic epoxy ^c , epoxy novolac ^c	175 (7)		
Total DFT		350 (14)		
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		Maximum DFT for each coat and coating system shall be as qualified by the coating manufacturer.
		NDFT	Max	
1 (topcoat)	Epoxy ^b , phenolic epoxy ^c , epoxy novolac ^c	175 (7)		
Total DFT		350 (14)		
<p>KEY 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>^a If wet thermal insulation is applied, the surface preparation shall be Sa 3 (ISO 8501-1), SSPC-SP 5.</p> <p>^b Coatings for stainless steels shall not contain zinc.</p> <p>^c If equipment is expected to be stored in yards or laydown areas for long periods prior to installation, measures shall be taken to avoid UV degradation of phenolic epoxy and epoxy novolac coating.</p>				

A.9 Coating system no. 9

Delete clause

Add new clause

A.10 Coating system no. 10

Table A.10.1 - CSDS No. 10

Coating System Data Sheet		CSDS No. 10		Rev. 01
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	Non-insulated at T ≥ 200 °C and insulated items in atmospheric zone offshore and coastal.			
Minimum/maximum operating temperature	-196 °C to 600 °C (-320 °F to 1112 °F) b			
Surface preparation				
Surface cleanliness	Carbon and low-alloy steel Sa 2 ½ (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 to medium G (ISO 8503-2).			
Level of total water-soluble salts (max)	20 mg/m ²			
Steel preparation	Grade P3 (ISO 8501-3)			
Coating system				
Coat (minimum number of coats)	Type of coat / binder	DFT, µm (mil)		
		NDFT	Max	
1 (primer)	Inorganic copolymer, inert multi polymeric matrix coating	NDFT 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 DFT				
Performance tests, qualification and inspection				
Performance tests a, b	Table 1, testing activity 10.1.1, 10.1.2.			
Coating procedure tests (CPT)	Table 3, all testing activities except 11.14 c, 11.15, 11.17.			
Inspection	Table 3, all testing activities except 11.14 c, 11.15, 11.17.			
Repair of damage on newly applied coating				
Coating damage exposing the steel surface				
Surface preparation				
Type and level of preparation:	Carbon and low-alloy steel P Sa 2 ½ (ISO 8501-2), SSPC-SP 10. Stainless steel and non ferrous alloys SSPC-SP 16.			
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 to medium G (ISO 8503-2).			

Table A.10.1 (continued)

Coating System Data Sheet		CSDS No. 10		Rev. 01
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (primer)	Inorganic copolymer, inert multi polymeric matrix coating	NDFT 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 DFT				
Coating damage not exposing the steel surface				
Coat (minimum number of coats)	Type of coat / binder	DFT, μm (mil)		
		NDFT	Max	
1 (topcoat)	Inorganic copolymer, inert multi polymeric matrix coating	NDFT 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 DFT				
<p>KEY 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>^a In addition to the performance tests in Table 1, high temperature testing according to ASTM D2485 Method B or alternative testing specified by the purchaser shall be required for operating temperatures exceeding 200 °C (392 °F).</p> <p>^b Additional qualification testing shall be required for coating under insulation operating in the temperature range -50 °C (-58 °F) to 200 °C (392 °F).</p> <p>^c Cross-cut testing to Table 3, Activity 11.16 shall be performed if adhesion testing by pull-off test is not feasible according to coating manufacturer PDS.</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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