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1 FOREWORD

This standard has been developed by the NORSOK Standardisation Work Group for the widest possible national and international application.

2 SCOPE

This Standard gives the requirements for the selection of coating materials, surface preparation, application procedures and inspection for protective coatings to be applied during the construction and installation of offshore installations and associated facilities. The document covers both paints and thermally sprayed metallic coatings.

The aim of the document is to obtain a system which ensures:

- Optimal protection of the installation with a minimum need for maintenance.
- That the coating system is maintenance friendly.
- That the coating system is application friendly.
- That health, safety and environmental impacts are evaluated and documented.

The document is not applicable to pipelines and pipeline risers.

3 NORMATIVE REFERENCES

ASTM D823 Method of producing films of uniform thickness of paint, varnish, lacquer and related products on test panels.
ASTM D1650 Method of sampling and testing shellac varnish.
ASTM G8 Test method for cathodic disbonding of pipeline coatings.
BS 5493 Code of practice for protection of iron and steel structures against corrosion.
DIN 8566 Zusätze für das termische Spritzen
DIN 32521 Acceptance test and quality control for thermal spraying equipment.
ISO 1461 Metallic coatings - Hot-dip galvanized coating on fabricated ferrous Products - Requirements.
ISO 1513 Paints and varnishes - Examination and preparation samples for testing.
ISO 1514 Paints and varnishes - Standard panels for testing.
ISO 1515 Paints and varnishes - Determination of volatile and non-volatile matter.
ISO 2811 Paints and varnishes - Determination of density.
ISO 2814 Paints and varnishes - Comparison of contrast ratio (hiding power) of paint of the same type and colour.
ISO 4624  Paints and varnishes - Pull-off test for adhesion.
ISO 4628  Paints and varnishes - Evaluation of degradation of paint coatings -
Designation of intensity, quantity and size of common type of defects.
ISO 6270  Paints and varnishes - Determination of resistance to humidity
(continuous condensation).
ISO 7253  Paints and varnishes - Determination of resistance to neutral salt
spray.
ISO 8501  Preparation of steel substrates before application of paints and related
products - Visual assessment of surface cleanliness.
ISO 8502-3  Preparation of steel substrates before application of paints and related
products - Test for the assessment of surface cleanliness - Assessment
of dust on steel surfaces prepared for painting, pressure sensitive tape
method.
ISO 8502-6  Preparation of steel substrates before application of paints and related
products - Test for the assessment of surface cleanliness - Sampling
of soluble impurities on surfaces to be painted - The Bresle method.
ISO 8503  Preparation of steel substrates before application of paints and related
products - Surface roughness characteristics of blast cleaned
substrates.
ISO 8504-2  Preparation of steel substrates before application of paints and related
products - Surface Preparation Methods - Abrasive blast-cleaning.
NACE TM0184  Accelerated test procedures for screening atmospheric surface coating
systems for offshore platforms and equipment.
NACE RP0188  Discontinuity (holiday) testing of protective coatings.
NS 476  Rules for the Approval of Surface Treatment Inspectors.
RAL-1K  Farbenübersicht.
SSPC Vol.2  Steel Structures Painting Manual

4DEFINITIONS AND ABBREVIATIONS

Feathered: A gradual taper in thickness from a coated surface to an uncoated
surface.

Holiday: A discontinuity in a coating which exhibits electrical conductivity
when exposed to a specific voltage.

MDFT: Minimum dry film thickness.

NDFT: Nominal dry film thickness.

NACE: National Association of Corrosion Engineers.
RAL: Colour definitions issued by RAL Deuches Institut für Gütesicherung und Kennzeichnung e.V.
Shop primer: A thin protective coating for protection during transport and storage applied at the steel suppliers facilities.
Stripe Coat: Coat of paint applied to welds, edges, etc. by brush, to ensure adequate film thickness of areas of difficult access.
SSPC: Steel Structures Painting Council.

5 GENERAL REQUIREMENTS

5.1 General

Selection of coating systems and application procedures shall be made with due consideration to conditions during fabrication, installation and service of the installation.

5.2 Planning

All activities shall be fully incorporated in the fabrication plan.

Details of management, inspectors, operators, facilities, equipment and qualified procedures shall be established and documented before commencing work.

Steel surfaces shall be blast cleaned and coated, i.e. metal sprayed or coated with primer and the succeeding coat of the applicable system, prior to installation.

5.3 Equipment protection and clean up

All equipment and structures shall be fully protected from mechanical damages, ingress of abrasives and dust from blast cleaning. Sags, droplets and paint overspray (incl. dryspray) shall be avoided. Adjacent areas not to be painted or already finished, shall be protected. On completion of the work in any area, all masking materials, spent abrasives, equipment etc. shall be removed.

5.4 Ambient conditions

No final blastcleaning or coating application shall be done if the relative humidity is more than 85 % and when the steel temperature is less than 3 °C above the dew point. No coating shall be applied or cured at temperatures below 0 °C.

The coating manufacturer shall specify the maximum and minimum application and curing temperature and other relevant limitations regarding application and curing conditions for each product in any coating system.
5.5 Coating materials

The selected coating materials shall be suitable for the intended use and shall be selected after an evaluation of all relevant aspects such as:

- Corrosion protective properties.
- Requirements to health, safety and environment.
- Properties related to application conditions, equipment and personnel.
- Availability and economics of coating materials.

All coating materials and solvents shall be stored in the original container bearing the manufacturer's label and instructions. Each product shall have a batch number showing year and month of manufacture and giving full traceability of production. Shelf life shall be included in the technical data sheet.

Applicable coating systems are tabulated in Annex A. Alternative coating systems may be used if the requirements of this document are fulfilled.

Top coat colours should be in accordance with Annex B.

5.6 Steel materials

Steel subject to surface preparation on site shall as a minimum requirement be in accordance with Rustgrade B according to ISO 8501-1. Shop primer applied by the steel manufacturer shall be regarded as temporary corrosion protection and shall be removed prior to the application of the coating systems herein.

5.7 Unpainted surfaces

The following items shall not be coated unless otherwise specified:

- Aluminium, titanium, stainless steel, chrome plated, nickel plated, copper, brass, lead, plastic or similar.
- Jacketing materials on insulated surfaces.

5.8 Handling and shipping of coated items

Coated items shall be carefully handled to avoid damage to coated surfaces. No handling shall be performed before the coating system is cured to an acceptable level. Packing, handling and storage facilities shall be of non-metallic type.

5.9 Prequalification of products, personnel and procedures

Prequalification requirements as described in clause 10 of this document shall be fulfilled and documented prior to commencement of any work in accordance with this document.
5.10 Metal coating

Hot-dip galvanising shall be in accordance with ISO 1461. When hot-dip galvanised items are painted, coating system 6 in this document shall be used.

Metal spraying shall be in accordance with the requirements in this document.

6 HEALTH, SAFETY AND ENVIRONMENT

The following documentation shall be provided and used when evaluating coating systems:

- Chemical name of organic solvent, OAR number (Occupational Air Requirements) according to Norwegian regulations and VOC content (Volatile Organic Components g/l).
- Percentage of low molecular epoxy (molecular weight < 700).
- Specification of hazardous thermal degradation components.
- Combustibility.
- Special handling precautions and personal protection.

All coating products as applied, shall as a minimum, be in accordance with relevant Norwegian regulatory requirements regardless of where the coating operation takes place. Content of quartz and heavy metals in blast cleaning media (ISO 8504-2) shall be given.

7 SURFACE PREPARATION

7.1 Pre-blasting preparations

Sharp edges, fillets, corners and welds shall be rounded or smoothed by grinding (min R = 2 mm).

Hard surface layers, e.g. resulting from flame cutting, shall be removed by grinding prior to blast cleaning.

The surfaces shall be free from any foreign matter such as weld flux, residue, slivers, oil, grease, salt etc. prior to blast cleaning.

Any oil and grease contamination shall be removed by solvent or alkali cleaning prior to blasting operations, ref. SSPC-SP-1.

Any major surface defects, particularly surface laminations or scabs detrimental to the protective coating system, shall be removed by suitable dressing. Where such defects have been revealed during blast cleaning, and dressing has been performed, the dressed area shall be reblasted to the specified standard. All welds shall be inspected and if necessary repaired prior to final blast cleaning of the area.
7.2 | **Blast cleaning**

Blasting abrasives shall be dry, clean and free from contaminants which will be detrimental to the performance of the coating.

Size of abrasive particles for blast cleaning shall be such that the prepared surface profile height (anchor pattern profile) is in accordance with the requirements for the applicable coating system. The surface profile shall be graded in accordance with ISO 8503.

The cleanliness of the blast cleaned surface shall be as referred to for each coating system, i.e. Sa 2 1/2 or Sa 3 in accordance with ISO 8501-1.

7.3 | **Final surface condition**

The surface to be coated shall be clean, dry, free from oil/grease and have the specified roughness and cleanliness until the first coat is applied.

Dust, blast abrasives etc. shall be removed from the surface after blast cleaning such that the particle quantity and particle size do not exceed rating 2 of ISO 8502-3.

The maximum content of soluble impurities on the blasted surface as sampled using ISO 8502-6 and distilled water, shall not exceed a conductivity corresponding to a NaCl content of 20 mg/m². Equivalent methods may be used.

8 | **PAINT APPLICATION**

8.1 | **General**

Contrasting colours shall be used for each coat of paint.

The coating manufacturer shall provide a Coating System Data Sheet (CSDS) for each coating system to be used, containing at least the following information for each product:

- Surface pre-treatment requirements.
- Wet film thickness/dry film thickness (max, min. and specified).
- Maximum and minimum recoating intervals at 5 °C, 10 °C and 23 °C.
- Information on thinners to be used (quantities and type).
- Mixing, handling and application requirements/recommendations.
- Hiding power of top coat for specified colours according to ISO 2814. Contrast ratio shall not be less than 94% at the specified top coat thickness.

8.2 | **Application equipment**

The method of application shall be governed by the coating manufacturer's recommendation for the particular coating being applied.

Roller application of the first primer coat is not acceptable. When paints are applied by brush, the brush shall be of a style and quality acceptable to the coating manufacturer.
8.3 Application

Prior to the application of each coat, a stripe coat shall be applied by brush to all welds, corners, behind angles, sharp edges of beams etc. and areas not fully reachable by spray in order to obtain the specified coverage and thickness.

Edges of existing coating shall be feathered towards the substrate prior to overcoating.

Each coat shall be applied uniformly over the entire surface. Skips, runs, sags and drips shall be avoided. Each coat shall be free from pinholes, blisters and holidays.

Contamination of painted surfaces between coats shall be avoided. Any contamination shall be removed.

8.4 Repairs

All repair of coating shall be conducted in accordance with the original surface preparation and coating application requirements.

9 THERMALLY SPRAYED METALLIC COATINGS

9.1 General

Relevant requirements provided in this Standard are applicable for thermally sprayed metallic coatings. Specific requirements valid for thermally sprayed metallic coatings are provided below.

9.2 Coating materials

The materials for metal spraying shall be in accordance with the following standards:

- Aluminium: Type Al 99.5 of DIN 8566/2 or equivalent.

- Aluminium alloy: Aluminium alloy with 5 % Mg, DIN 8566/2 AlMg5 or equivalent.

All coating metals shall be supplied with product data sheets and quality control certificates, and be marked with coating metal manufacturer's name, manufacturing standard, metal composition, weight and manufacture date.

The materials for sealing the metal coating shall be in accordance with BS 5493 (1977), chapter 11, table 4C. Type CP3-6 shall be used below 60 °C and type CP7 above 60 °C.
9.3 **Application of thermally sprayed coating**

Each coat shall be applied uniformly over the entire surface. The coat shall be applied in multiple layers and shall overlap on each pass of the gun.

Application should follow guidelines given in DIN 32521.

For items that will be welded after spraying, 5-10 cm measured from the bevel area shall be left uncoated.

The coating shall be firmly adherent. The surface after spraying shall be uniform and free of lumps, loosely adherent spattered metal, bubbles, ash formation, defects and uncoated spots.

Before application of any further coat, any damage to the previous coat shall be repaired.

9.4 **Field coating of pipes and coating of infill steel**

Before the metal spraying operation starts, the metal coated area 30-40 cm in distance from the weld zone shall be sweepblasted to ensure that all contaminations are removed. The uncoated welding zone shall be blast cleaned as specified for coating system no 2. The metal coating shall be performed according to the requirements above, ref. 9.3. The metal spraying operation shall always start in the weldzone, not on the previously metallised area.

9.5 **Repairs**

All requirements, including adhesion, applicable to metal spraying, shall apply.

The treating and handling of the substrate shall be done in such a manner that the product in its final condition will have a continuous and uniform coating.

10 **QUALIFICATION REQUIREMENTS**

10.1 **Pre-qualification of products**

The requirements for pre-qualification prior to use is applicable to coating system No 1, 3, 4 and 7. Tests shall be carried out on 5 mm thick steel panels of a type in accordance with ISO 1514. Reference shall also be made to ASTM D 823 and ISO 1513. The tests shall be carried out on complete coating systems and in accordance with table 10.1.

Each coating product to be qualified shall be identified by the following:

1. An infrared scan (fingerprint).
2. Specific gravity of base and curing agent (ref ISO 2811).
3. Ash content (ASTM D1650), volatile and non-volatile matters (ISO 1515) of each component.
Pre-qualification of products shall be carried out at an independent laboratory or verified by an independent laboratory.

### Table 10.1 - Pre-qualification tests for coating materials.

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Method</th>
<th>Duration</th>
<th>Acceptance Criteria</th>
</tr>
</thead>
</table>
| Salt Spray                                       | ISO 7253    | 6000 h   | - Disbonding: max 3 mm  
- Blistering (ISO 4628): rating 0  
- Chalking (ISO 4628): rating 2  
- Rusting (ISO 4628): rating 0  
- Cracking (ISO 4628): rating 0  
- Adhesion (ISO 4624): Min 5.0 MPa and max. 50 % reduction from original value. |
| Condensation chamber                             | ISO 6270    | 6000 h   | - Overcoatable without mechanical treatment obtaining minimum adhesion of 5 MPa. (Applicable only for the NACE TM0184 test). |
| Salt spray: 100 h                                | NACE TM0184 | 20 cycles à 200 h = 4000 h | - Overcoatable without mechanical treatment obtaining minimum adhesion of 5 MPa. (Applicable only for the NACE TM0184 test). |
| Drying in air: 16 h                              |             |          |                                                                                    |
| UV-B Weatherometer: 84 h                         |             |          |                                                                                    |
| One cycle: 200 h                                 |             |          |                                                                                    |
| Cathodic disbonding (Applicable to coating system 7 only) | ASTM G8    | 30 days  | Max. disbonding 10 mm                                                              |
| NOTE 1: Adhesion testing shall be performed with pneumatic or hydraulic equipment. |             |          |                                                                                    |
| NOTE 2: For coating system 3, max. 30% reduction in adhesion from original value is acceptable. Absolute minimum is 5 MPa. |             |          |                                                                                    |
| NOTE 3: In the NACE TM0184 cyclic test, the electrolyte shall be synthetic seawater in accordance with ASTM D1141. |             |          |                                                                                    |

### 10.2 Qualification of personnel

#### 10.2.1 Qualification of paint operators

Operators shall be qualified to tradesman level as blastcleaner, painter, applicator etc. The personnel shall have relevant knowledge of health and safety hazard, coating materials, use of protection equipment, etc.

If not qualified to tradesman level, personnel shall carry out a test in accordance with the Coating Procedure Specification for coating system no 1. The test shall be supervised by a qualified supervisor and inspected and accepted by qualified QC personnel. A test certificate shall be issued.
The test shall be carried out on a test panel (minimum 1 x 1 m) containing at least 1 pipe-end, 2 pipes, 1 angle and 1 flat bar. Alternatively a location providing similar geometrical complexity on the component to be coated may be used.

The acceptance criteria are the requirements to the coating system described in this document. Variation in the film thickness shall be within the limits described in the Coating System Data Sheet as supplied by the coating manufacturer. Operators failing to meet the requirements shall not be allowed to carry out work in accordance with this document.

### 10.2.2 Qualification of metal spray operators

Prior to commencement of work in accordance with this document, the operator shall pass the prequalification test described in table 10.2. The results from the qualification test specified below are valid for maximum 6 months without regular coating work.

<table>
<thead>
<tr>
<th>Test</th>
<th>Acceptance criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual examination of coating</td>
<td>All test panels shall be examined without magnification and with 10X magnification.</td>
</tr>
<tr>
<td></td>
<td>Ref. 9.3.</td>
</tr>
<tr>
<td>Film thickness and shape test</td>
<td>(Note 2)</td>
</tr>
<tr>
<td>SSPC-PA 2</td>
<td>Minimum 200 µm on all specimen surfaces</td>
</tr>
<tr>
<td>Adhesion</td>
<td>(Note 3)</td>
</tr>
<tr>
<td>ISO 4624. All test panels shall be</td>
<td>No single measurement less than 9.0 MPa.</td>
</tr>
<tr>
<td>tested. Examination of the test</td>
<td>Re-testing is required if the failure occurred at the adhesive/coating interface.</td>
</tr>
<tr>
<td>specimens shall be conducted</td>
<td>Pneumatic or hydraulic adhesion test equipment shall be used.</td>
</tr>
<tr>
<td>after rupture to determine the</td>
<td></td>
</tr>
<tr>
<td>cause of failure.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** General: Test materials shall be of a comparable grade to be used in production. The coating shall be applied in accordance with this document and the proposed procedure.

**NOTE 2:** Specimens for shape test: One specimen shall be cut from a 150 cm long "T", "I" or "H" shaped profile with approximate dimensions 75 by 75 by 13 cm. Another specimen shall be cut from a 150 cm long 5 cm diameter pipe.

**NOTE 3:** Specimens for adhesion test: Five specimens for the adhesion test shall be prepared according to the requirements of ISO 4624 using minimum 5 mm thick plates.
10.2.3 **Qualification of supervisors and QC personnel**

Personnel carrying out inspection or verification shall be qualified in accordance with NS 476 (Inspector level), NACE (inspector certificate level III) or equivalent.

Assistant Inspectors according to NS 476 may carry out the inspection work under the supervision of an Inspector.

Supervisors shall be qualified to tradesman level and should be qualified as Inspector in accordance with NS 476, NACE or equivalent.

10.3 **Qualification of procedures**

**Coating Procedure Specification (CPS)**

Supplier shall establish a detailed CPS based on the requirements of this document. The CPS shall contain the following:

- Identification of equipment for surface preparation and application.
- Information given on Coating System Data Sheet.
- Personal protective equipment to be used.
- Safety data sheets for each product.
- Product data sheets.

The qualified CPS shall be followed during all coating work.

The following changes in the coating application parameters requires the CPS to be requalified:

- Any change of coating material.
- Change of method and equipment for surface preparation and coating application.

**Coating Procedure Test (CPT)**

A CPT shall be used to qualify all coating procedures. A test panel (ref. 10.2.1 or 10.2.2 as applicable), alternatively a suitable location on the component to be coated, shall be selected on which the CPT shall be carried out.

The coating procedures shall be qualified under realistic conditions likely to be present during coating application.

Inspection and testing requirements for the CPT, including acceptance criteria, shall be as given in clause 11. For metal spray, additional acceptance criteria provided in table 10.2 shall also apply.
## 11 INSPECTION AND TESTING

Testing and inspection shall be carried out in accordance with table 11.1. Surface shall be accessible until final inspection is carried out.

### Table 11.1 - Inspection and testing.

<table>
<thead>
<tr>
<th>Test type</th>
<th>Method</th>
<th>Frequency</th>
<th>Acceptance criteria</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Conditions</td>
<td>Ambient and steel temperature. Relative humidity. Dew point</td>
<td>Before start of each shift + Twice per shift.</td>
<td>In accordance with specified requirements</td>
<td>No blasting or coating</td>
</tr>
<tr>
<td>Visual examination</td>
<td>Visual for sharp edges weld spatter slivers, rustgrade, etc.</td>
<td>100 % of all surfaces</td>
<td>No defects Ref. specified requirements</td>
<td>Defects to be repaired</td>
</tr>
<tr>
<td>Cleanliness</td>
<td>a) ISO 8501-1</td>
<td>a) 100 % visual of all surfaces</td>
<td>a) In accordance with specified requirements b) Max. quantity and size rating</td>
<td>a) Reblasting b) Recleaning and retesting until acceptable</td>
</tr>
<tr>
<td></td>
<td>b) ISO 8502-3</td>
<td>b) Spot checks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salt test</td>
<td>ISO 8502-6 or equivalent.</td>
<td>Spot checks</td>
<td>Max conductivity corresponding to 20 mg/m² NaCl</td>
<td>Recleaning and retesting until acceptable</td>
</tr>
<tr>
<td>Roughness</td>
<td>Comparator or Stylus Instrument (ISO 8503)</td>
<td>Each component or once per 10 m²</td>
<td>As specified.</td>
<td>Reblasting</td>
</tr>
<tr>
<td>Visual Examination of coating</td>
<td>Visual to determine: - curing - contaminations - solvent retention - pinholes/popping - sagging - surface defects</td>
<td>100 % of surface after each coat.</td>
<td>According to specified requirements</td>
<td>Repair of defects</td>
</tr>
<tr>
<td>Holiday Detection</td>
<td>NACE RP0188 Voltage, ref. table 1</td>
<td>As per system specification</td>
<td>No holidays</td>
<td>Repair and retesting.</td>
</tr>
<tr>
<td>Film thickness</td>
<td>SSPC-PA 2 calibration on smooth surface</td>
<td>SSPC-PA 2</td>
<td>SSPC-PA 2 and Coating System Data Sheet.</td>
<td>Repair, additional coats or recoating as appropriate.</td>
</tr>
<tr>
<td>Adhesion</td>
<td>ISO 4624 using pneumatic or hydraulic equipment</td>
<td>Spot checks</td>
<td>Ref notes below.</td>
<td>Coating to be rejected</td>
</tr>
</tbody>
</table>

### NOTES:
- For system no 2, adhesion during qualification shall be minimum 9.0 MPa. Adhesion measured during production shall be minimum 7.0 MPa for any single measurement.
- For system 3, max. 30% reduction from the CPT is acceptable. Absolute minimum value is 5 MPa.
- For the remaining coating systems, 50 % reduction of average adhesion value from the CPT is acceptable as minimum during production coating. Absolute minimum value is 5 MPa.
ANNEX A - Coating systems

COATING SYSTEM NO. 1

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon steel with operating temperature ≤ 120 °C</td>
<td>Cleanliness: Sa 2½</td>
<td>1 coat zinc rich epoxy:</td>
<td>60</td>
</tr>
<tr>
<td>- Structural steel</td>
<td>Roughness: Grade Medium G (50-85 µm Rₚ)</td>
<td>1 coat two component aluminium pigmented epoxy mastic:</td>
<td>200</td>
</tr>
<tr>
<td>- Exteriors of equipment, vessels, piping &amp; valves (not insulated)</td>
<td></td>
<td>1 coat top coat:</td>
<td>75</td>
</tr>
<tr>
<td>- All carbon steel surfaces in non-corrosive areas (e.g. Living Quarters)</td>
<td></td>
<td>MDFT (µm):</td>
<td>335</td>
</tr>
<tr>
<td>- Deck areas</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GENERAL NOTES:

- If the epoxy mastic is not applied immediately after the primer has cured, or if the primer is exposed to humid or outdoor conditions prior to application of the epoxy mastic, a tie-coat shall be applied on top of the zinc rich epoxy primer immediately after the primer has cured.
- A non-skid aggregate shall be added to the intermediate coat when this coating system is used for deck areas.
- In ventilated and heated rooms, the top coat may be omitted.
- The 200 µm epoxy mastic may be applied as 2 x 100 µm.
- Chalking rating 1 (table 10.1) or better should be preferred for externally exposed surfaces.

COATING SYSTEM NO. 2

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>Thickness (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon steel:</td>
<td>Cleanliness: ISO 8501 Sa 3</td>
<td>Thermally sprayed aluminium or alloys of aluminium.</td>
<td>Minimum 200 µm</td>
</tr>
<tr>
<td>- Operating temperature &gt; 120 °C.</td>
<td>Roughness: ISO 8503 Grade Coarse G (85 - 130 µm, Rₚ)</td>
<td>Sealer</td>
<td></td>
</tr>
<tr>
<td>- All insulated surfaces of tanks, vessels, piping.</td>
<td></td>
<td></td>
<td>Ref notes below.</td>
</tr>
<tr>
<td>- Flare booms.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underside of bottom deck, included piping, jacket above splash zone, crane booms, life boat stations are optional areas (to be decided in each project).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GENERAL NOTES:

- All metallised surfaces shall be sealed by an adequate sealer in accordance with British Standard BS 5493 (1977), chapter 11, table 4C. CP3-6 below 60 °C and CP7 above 60 °C operating temperature.
- For items that will be welded after coating, 30-40 cm measured from the bevel area shall be left without sealer coat.
### COATING SYSTEM NO. 3

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal surface of carbon steel vessels.</td>
<td>According to coating manufacturers recommendation.</td>
<td>Lining materials for carbon steel vessels are subject to special evaluation.</td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
- All products used internally in potable and fresh water tanks shall be approved for such use by the Norwegian health authorities.
- 100 % holiday inspection in accordance with NACE RP0188 (table 1) is required.
- Adhesion test shall be carried out on separate test plates, minimum adhesion values in accordance with ISO 4624 shall be 5.0 MPa when using pneumatic or hydraulic test equipment.
- All welds and other steel surfaces shall be ground smooth such that all sharp edges, corners, weld ripple, etc. achieve a minimum radius, both for convex and concave surface of 4 mm.
- External of lined vessel shall be marked clearly in black letters: **LINED VESSEL, NO HOT WORK**

### COATING SYSTEM NO. 4

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkways, escape routes and other deck areas as specified.</td>
<td>Cleanliness: ISO 8501 Sa 2½ Roughness: ISO 8503 Grade Medium G (50 - 85 µm, Rₜₙ)</td>
<td>Non skid epoxy screed.</td>
<td>3000</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
- Light colour non-skid aggregates shall be used.
- Particle size of non-skid aggregate to be 1 - 5 mm.
- This system may be applied on top of other coatings, e.g. zinc rich epoxy primer, if accepted in writing by the coating manufacturer and Purchaser.
## COATING SYSTEM NO. 5A

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under epoxy based fire protection.</td>
<td>Cleanliness:</td>
<td>I) 1 coat epoxy primer:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISO 8501 Sa 2½</td>
<td>or</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Roughness:</td>
<td>II) 1 coat zinc rich epoxy:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISO 8503</td>
<td>1 x epoxy tie coat:</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Grade Medium G</td>
<td>MDFT (µm):</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>(50 - 85 µm, R₅)</td>
<td></td>
<td>85</td>
</tr>
</tbody>
</table>

### GENERAL NOTES:
- Stud welding shall be done before final blast cleaning.
- If the passive fire protection material is not applied immediately after the primer has cured, or if the primer is exposed to humid or outdoor conditions prior to application of the passive fire protection material, coating alternative II) shall be used.
- The coating system and products shall be approved by the manufacturer of the passive fire protection coating.
- Topcoating on top of the passive fire protection shall be in accordance with the passive fire protection manufacturers recommendation.

## COATING SYSTEM NO. 5B

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under cement based fire protection.</td>
<td>Cleanliness:</td>
<td>1 coat zinc rich epoxy:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ISO 8501 Sa 2½</td>
<td>1 coat two component epoxy mastic:</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Roughness:</td>
<td>MDFT (µm):</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>ISO 8503</td>
<td></td>
<td>260</td>
</tr>
<tr>
<td></td>
<td>Grade Medium G</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(50 - 85 µm, R₅)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### GENERAL NOTES:
- Stud welding shall be done before final blast cleaning.
- If the epoxy mastic is not applied immediately after the primer has cured, or if the primer is exposed to humid or outdoor conditions prior to application of the epoxy mastic, a tie-coat shall be applied on top of the zinc rich epoxy primer immediately after the primer has cured.
- The 200 µm epoxy mastic may be applied as 2 x 100 µm.
- The coating system and products shall be approved by the manufacturer of the passive fire protection coating.
- Topcoating on top of the passive fire protection shall be in accordance with the passive fire protection manufacturers recommendation.
### COATING SYSTEM NO. 6

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel: Insulated surface on piping, tanks and vessels.</td>
<td>Sweep blasting with non-metallic and chloride free abrasive to obtain anchor profile of approximately 25 - 45 µm</td>
<td>≤120 °C operating temperature: 2 coats air dry modified epoxy phenolic, each:</td>
<td>150</td>
</tr>
<tr>
<td>Uninsulated stainless steel when painting is required.</td>
<td></td>
<td>MDFT (µm):</td>
<td>300</td>
</tr>
<tr>
<td>Galvanised steel.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminium when painting is required.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
- Coatings not to contain zinc.
- For stainless steel with operating temperatures above 120 °C, 30 microns (NDFT) of a high temperature modified silicone paint suitable for the operating temperatures shall be used.
- Aluminium handrails located in living quarter shall be anodised.

### COATING SYSTEM NO. 7

<table>
<thead>
<tr>
<th>Application (if not specified under others)</th>
<th>Surface preparation</th>
<th>Coating system</th>
<th>NDFT (µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submerged carbon steel and carbon steel in the splash zone.</td>
<td>Cleanliness: ISO 8501 Sa 2½</td>
<td>1 coat two component aluminium pigmented epoxy mastic:</td>
<td>225</td>
</tr>
<tr>
<td>Submerged stainless steel and stainless steel in the splash zone.</td>
<td>Roughness: ISO 8503 Grade Medium G (50 - 85 µm, R₅₅)</td>
<td>1 coat two component epoxy mastic:</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MDFT (µm):</td>
<td>450</td>
</tr>
</tbody>
</table>

**GENERAL NOTES:**
- Antifouling may be required as top coat.
- Piping embedded in concrete shall be corrosion coated at least 300 mm into concrete.
- Application using an additional number of coats with lower film thicknesses is acceptable provided each coat is applied and cured in accordance with the coating manufacturers recommendation and provided all other requirements in this document are fulfilled.
ANNEX B - Colours

The below top coat colours should be selected:

<table>
<thead>
<tr>
<th>Colour</th>
<th>RAL - 1K designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>RAL 9002 (Grauweiss)</td>
</tr>
<tr>
<td>Blue</td>
<td>RAL 5015 (Himmelblau)</td>
</tr>
<tr>
<td>Grey</td>
<td>RAL 7038 (Achalgrau)</td>
</tr>
<tr>
<td>Green</td>
<td>RAL 6002 (Laubgrün)</td>
</tr>
<tr>
<td>Red</td>
<td>RAL 3000 (Feuerrot)</td>
</tr>
<tr>
<td>Yellow</td>
<td>RAL 1004 (Goldgelb)</td>
</tr>
<tr>
<td>Orange</td>
<td>RAL 2004 (Reinorange)</td>
</tr>
<tr>
<td>Black</td>
<td>RAL 9017 (Verkehrsschwarz)</td>
</tr>
</tbody>
</table>