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**Paints and varnishes — Performance  
requirements for protective paint systems  
for offshore and related structures**

*Peintures et vernis — Exigences de performance relatives aux  
systèmes de peinture pour la protection des structures offshore et  
structures associées*

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 20340 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 14, *Protective paint systems for steel structures*.

This second edition cancels and replaces the first edition (ISO 20340:2003), which has been technically revised.

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## Introduction

Offshore and related structures require specific attention in order to be able to withstand the severe corrosion stresses to which they are exposed during their service life and to minimize the risk of failures that would impact safety, operating costs or capital cost.

In order to establish sufficient corrosion protection and ensure optimum performance of the coating, it is necessary to specify the requirements for the protective paint system(s) along with the relevant laboratory performance tests to assess its (their) likely durability.

In order to achieve the same performance as indicated by testing, proper application of the paint is essential. Close attention needs to be given to the execution of the work.

In ISO 12944, relevant requirements are given for:

- atmospheric-corrosivity categories (Part 2);
- suitable design properties (Part 3);
- type of surface and surface preparation (Part 4);
- application of the paint and the execution and supervision of the paint work during the construction and installation of the structure (Part 7);
- development of a specification (Part 8).

This International Standard (ISO 20340) covers the requirements for new work and any repairs necessary before start-up. It may also be used in relation to maintenance where complete refurbishment is carried out and the underlying metal substrate is completely exposed by abrasive blast-cleaning (see 4.4).

It does not address maintenance in general where methods of surface preparation other than abrasive blast-cleaning are typically used.

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# Paints and varnishes — Performance requirements for protective paint systems for offshore and related structures

## 1 Scope

**1.1** This International Standard deals with performance requirements for protective paint systems for offshore and related structures (i.e. those exposed to the marine atmosphere, as well as those immersed in sea or brackish water). Such structures are exposed to environments of corrosivity category C5-M and immersion category Im2 as defined in ISO 12944-2, with special stresses as given in Subclause 4.3 and Annex B of ISO 12944-2:1998. ISO 20340 can also be used for other structures, provided that the paints or protective paint systems selected comply with this International Standard.

This International Standard places emphasis on high-durability paint systems, with the aim of minimizing maintenance and hence reducing safety considerations and environmental impact. It specifies additional test requirements over and above those specified for corrosivity category C5-M in ISO 12944-6. Hence, a system fulfilling the requirements for C5-M high durability in ISO 12944-6 will not necessarily fulfil the requirements of this International Standard and might thus need further testing to do so.

The temperature range applicable for these paint systems is normally between  $-20\text{ }^{\circ}\text{C}$  and  $+80\text{ }^{\circ}\text{C}$ , and the performance testing is aimed at verifying suitability of the paint systems for this temperature range. The use of paint systems outside this temperature range shall be subject to agreement by the end user. Such agreement may include testing at the applicable temperatures.

The paint systems for submerged service (Im2) are aimed at ambient operating temperatures up to a maximum of  $50\text{ }^{\circ}\text{C}$ . For higher operating temperatures, specific evaluation and performance documentation is needed. The selection of performance requirements should be considered in conjunction with the cathodic-protection design parameters.

**1.2** This International Standard includes:

- the test methods to be used to determine the composition of the separate components of the protective paint system;
- the laboratory performance test methods for the assessment of the likely durability of the protective paint system;
- the criteria to be used to evaluate the results of performance tests.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods*

ISO 1514, *Paints and varnishes — Standard panels for testing*

## ISO 20340:2009(E)

ISO 1517, *Paints and varnishes — Surface-drying test — Ballotini method*<sup>1)</sup>

ISO 2063, *Thermal spraying — Metallic and other inorganic coatings — Zinc, aluminium and their alloys*

ISO 2811 (all parts), *Paints and varnishes — Determination of density*

ISO 2812-2, *Paints and varnishes — Determination of resistance to liquids — Part 2: Water immersion method*

ISO 3233, *Paints and varnishes — Determination of percentage volume of non-volatile matter by measuring the density of a dried coating*

ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content*

ISO 3270, *Paints and varnishes and their raw materials — Temperatures and humidities for conditioning and testing*

ISO 3549, *Zinc dust pigments for paints — Specifications and test methods*

ISO 3679, *Determination of flash point — Rapid equilibrium closed cup method*

ISO 4624, *Paints and varnishes — Pull-off test for adhesion*

ISO 4628 (Parts 2 to 6), *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance*

ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*

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 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

ISO 11507:2007, *Paints and varnishes — Exposure of coatings to artificial weathering — Exposure to fluorescent UV lamps and water*

ISO 12944-2:1998, *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 12944-4, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 4: Types of surface and surface preparation*

ISO 12944-5, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 5: Protective paint systems*

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1) Under revision as ISO 9117-3.



ISO 12944-6, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 6: Laboratory performance test methods*

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 14680-2, *Paints and varnishes — Determination of pigment content — Part 2: Ashing method*

ISO 15711:2003, *Paints and varnishes — Determination of resistance to cathodic disbonding of coatings exposed to sea water*

ISO 19840, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Measurement of, and acceptance criteria for, the thickness of dry films on rough surfaces*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **offshore and related structures**

permanently installed or moored structures with high requirements for long-term integrity

NOTE Typical examples are oil and gas production facilities.

#### 3.2

##### **coat**

continuous layer of a coating material resulting from a single application

#### 3.3

##### **corrosion**

physicochemical interaction between a metal and its environment that results in changes in the properties of the metal and that can often lead to impairment of the function of the metal, the environment or the technical system of which these form a part

#### 3.4

##### **durability**

expected life of a protective paint system to the first major maintenance painting

#### 3.5

##### **paint**

pigmented coating material in liquid, paste or powder form that, when applied to a substrate, forms an opaque film having protective, decorative or specific technical properties

#### 3.6

##### **protective coating system**

sum total of the coats of metal materials and/or paints or related products that are to be applied, or which have been applied, to a substrate to provide corrosion protection

#### 3.7

##### **protective paint system**

sum total of the coats of paints or related products that are to be applied, or have been applied, to a substrate to provide corrosion protection

**3.8  
substrate**

surface to which a coating material is applied or is to be applied

**3.9  
nominal dry film thickness**

**NDFT**  
dry film thickness specified for each coat or for the whole coating system

**3.10  
dry film thickness**

**DFT**  
thickness of a coat or coating system remaining on the surface after hardening

NOTE The DFT is measured in accordance with ISO 19840.

**3.11  
product technical-data sheet**

**product TDS**  
document designed to provide information on a specific paint product

NOTE 1 The type of information typically includes product uses, features, service properties, application properties, application instructions, packaging information and information on storage and handling.

NOTE 2 See 5.4 for specifically required minimum information.

**3.12  
material safety data sheet**

**MSDS**  
document designed to provide information regarding the health and safety aspects of a paint product or thinner

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NOTE The MSDS typically includes information concerning generic material identification, hazardous ingredients, physical data, fire and explosion data, health hazards, reactivity data, spill or leak procedures, special protection requirements and other special precautions.

**3.13  
qualification**

process for the evaluation of protective paint systems using test criteria which allow the selection of suitable paint systems for distinct environmental exposure conditions

NOTE The process comprises:

- description of the paint system (for an example, see Table 2);
- application testing (see Clause 7);
- laboratory performance testing and assessment of the results (see Clause 8);
- full identification of the paints (see Subclause 5.5.2 and Annex B).

**3.14  
shelf life**

period from the date of manufacture during which the paint can be transported and stored in undamaged and unopened packaging without any influence on its application or performance providing the ambient conditions are within the limits recommended by the paint manufacturer

NOTE 1 After exceeding this period, the paint is subject to re-inspection.

NOTE 2 Water-borne products have to be protected from freezing at all times during transportation and storage.

**3.15****volatile organic compound****VOC**

any organic liquid and/or solid that evaporates spontaneously at the prevailing temperature and pressure of the atmosphere with which it is in contact

NOTE Under U.S. government legislation, the term VOC is restricted solely to those compounds that are photochemically active in the atmosphere (see ASTM D 3960). Any other compound is then defined as being an exempt compound.

**3.16****splash and tidal zones**

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

**3.17****holding primer**

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

NOTE Primers which do allow the steel to be welded are called "pre-fabrication primers".

**4 Field of application****4.1 General**

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The field of application for which this International Standard has been developed is characterized by

- the type of structure; [ISO 20340:2009](https://standards.iteh.ai/catalog/standards/sist/3af67cbf-e353-49ef-ab5d-cf9da7331ff0/iso-20340-2009)
- the type of environment; <https://standards.iteh.ai/catalog/standards/sist/3af67cbf-e353-49ef-ab5d-cf9da7331ff0/iso-20340-2009>
- the type of surface and surface preparation;
- the type of paint.

**4.2 Type of structure**

This International Standard deals with structures, made of carbon or low-alloy steel of not less than 3 mm thickness, which are designed using an approved strength calculation.

Not covered by this International Standard are:

- structures built of stainless steel as well as those built of copper, titanium or aluminium or their alloys;
- steel cables;
- buried structures;
- pipelines;
- the interiors of storage tanks.

### 4.3 Type of environment

This International Standard deals with the atmospheric corrosivity category C5-M and the immersion category Im2 as defined in ISO 12944-2.

The structure may be divided into different zones based on the type of environment each zone is exposed to:

- One zone corresponds to the area exposed to atmospheric category C5-M.
- Another zone corresponds to the area that is permanently immersed in sea water, i.e. category Im2.
- Two further zones correspond to the tidal and splash zones which are a combination of category C5-M and Im2:
  - the tidal zone is the area in which the water level changes because of natural or artificial effects, thus giving rise to increased corrosion due to the combined effect of cyclic exposure to water and the atmosphere;
  - the splash zone is the area wetted by wave and spray action which can give rise to exceptionally high corrosion stresses, especially with sea water.

In this International Standard, the splash and tidal zones are combined for qualification purposes into one set of tests (see Table 3).

### 4.4 Type of surface and surface preparation

This International Standard deals with the following types of carbon or low-alloy steel surface (more information is given in ISO 12944-4):

- uncoated surfaces;
- metal-coated surfaces (thermally sprayed or hot-dip galvanized);
- surfaces painted with pre-fabrication primer;
- previously painted surfaces from which the existing paint system has been completely removed.

Except for metal-coated surfaces, surface preparation shall be by blast cleaning to preparation grade Sa 2½ or Sa 3 as defined in ISO 8501-1 and to surface profile “medium (G)” as defined in ISO 8503-1.

### 4.5 Type of paint

The generic types of paint widely used in paint systems for the protection of steel structures against corrosion are described in ISO 12944-5, but are not limited to those in ISO 12944-5.

## 5 Paints

### 5.1 General

The performance of protective paint systems shall be tested in accordance with Clause 8 and the separate components of the system (the paints) shall be identified in accordance with Subclause 5.5

Should third-party certification be requested, an independent laboratory shall be agreed on between the interested parties.