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Paints and varnishes — Corrosion protection of steel structures by protective paint systems —

Part 3: Design considerations

Peintures et vernis — Anticorrosion des structures en acier par systèmes de peinture —

Partie 3: Conception et dispositions constructives

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document 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 12944-3:1998), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the terms and definitions which were not used in the main part of the standard have been deleted;

— the normative references have been updated;

— 5.1 "General" has been added;

— the requirement for gap sealing material has been added in 5.3;

— the requirements for surface preparation in case of high and very high durabilities for C4 and higher, as well as Im1 to Im4, have been added;

— the title of Table A.1 has been corrected;

— a key has been added to Figure B.1;

— Figure D.1 c) has been deleted;

— the requirements for the radius in Figures D.5 and D.7 have been added;

— a bibliography has been added;

— the text has been editorially revised.

A list of all parts in the ISO 12944 series can be found on the ISO website.

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Introduction

Unprotected steel in the atmosphere, in water and in soil is subjected to corrosion that can lead to damage. Therefore, to avoid corrosion damage, steel structures are normally protected to withstand the corrosion stresses to which they will be subjected during the service life required of the structure.

There are different ways of protecting steel structures from corrosion. ISO 12944 (all parts) deals with protection by paint systems and covers, in the various parts, all features that are important in achieving adequate corrosion protection. Additional or other measures are possible but require particular agreement between the interested parties.

In order to ensure effective corrosion protection of steel structures, owners of such structures, planners, consultants, companies carrying out corrosion protection work, inspectors of protective coatings and manufacturers of coating materials need to have at their disposal state-of-the-art information in concise form on corrosion protection by paint systems. It is vital that such information is as complete as possible, unambiguous and easily understandable to avoid difficulties and misunderstandings between the parties concerned with the practical implementation of protection work.

ISO 12944 (all parts) is intended to give this information in the form of a series of instructions. It is written for those who have some technical knowledge. It is also assumed that the user of ISO 12944 (all parts) is familiar with other relevant International Standards, in particular those dealing with surface preparation.

Although ISO 12944 (all parts) does not deal with financial and contractual questions, attention is drawn to the fact that, because of the considerable implications of inadequate corrosion protection, non-compliance with requirements and recommendations given in ISO 12944 (all parts) can result in serious financial consequences.

ISO 12944-1 defines the overall scope of ISO 12944. It gives some basic terms and definitions and a general introduction to the other parts of ISO 12944. Furthermore, it includes a general statement on health, safety and environmental protection, and guidelines for using ISO 12944 (all parts) for a given project.

This document gives guidance on how to minimize the risk of corrosion by appropriate design measures for steel structures to be coated by protective paint systems.

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Paints and varnishes — Corrosion protection of steel structures by protective paint systems —

Part 3:
Design considerations

1 Scope

This document deals with the basic criteria for the design of steel structures to be coated by protective paint systems in order to avoid premature corrosion and degradation of the coating or the structure. It gives examples of appropriate and inappropriate design, indicating how problems of application, inspection and maintenance of paint systems can be avoided. Design measures which facilitate handling and transport of the steel structures are also considered.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 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 8501-3, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 3: Preparation grades of welds, edges and other areas with surface imperfections*

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 12944-4, *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*

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 c paint oating systems — Part 7: Execution and supervision of paint work*

ISO 12944-8, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 8: Development of specifications for new work and maintenance*

ISO 12944-9, *Paints and varnishes — Corrosion protection of steel structures by protective paint systems — Part 9: Protective paint systems and laboratory performance test methods for offshore and related structures*

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ISO 14713-1, *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures — Part 1: General principles of design and corrosion resistance*

ISO 14713-2, *Zinc coatings — Guidelines and recommendations for the protection against corrosion of iron and steel in structures — Part 2: Hot dip galvanizing*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12944-1, ISO 12944-2, ISO 12944-4, ISO 12944-5, ISO 12944-6, ISO 12944-7, ISO 12944-8, ISO 12944-9 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
design
way in which a structure is built up, as represented by a detailed plan of the structure, considering corrosion protection

4 General

The objective of designing a structure is to ensure that the structure is suitable for its function, has adequate stability, strength and durability, is constructed at an acceptable cost and is aesthetically pleasing.

The overall design shall be planned to facilitate surface preparation, painting, inspection and maintenance.

The shape of a structure can influence its susceptibility to corrosion. Therefore, structures should be designed such that corrosion cannot easily establish a foothold (a corrosion trap) from which it can spread. It is therefore strongly recommended that the designer consult a corrosion protection expert at a very early stage in the design process. Ideally, the corrosion protection system should be selected at that time, with due consideration to the type of service of the structure, its service life and maintenance requirements.

The shapes of the structural elements and the methods used to join them should be such that fabrication, joining and any subsequent treatment will not promote corrosion. Similarly, consideration should be given to the shape of the structure and its elements with respect to the category of its environment (see ISO 12944-2) when specifying a protective paint system.

Designs should be simple and excessive complexity should be avoided. Where steel components are in contact with, embedded in or enclosed in other building materials, e.g. brickwork, they are no longer accessible. Therefore, the corrosion protection measures shall be effective throughout the service life of the structure.

Steelwork to be hot dip galvanized shall be designed in accordance with the requirements of ISO 1461, ISO 14713-1 and ISO 14713-2.

5 Basic design criteria for corrosion protection purposes

5.1 General

The surfaces of steel structures exposed to corrosion stresses should be small in extent. The structure should have the smallest possible number of irregularities (e.g. overlaps, corners, edges). Joints should

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