BRITISH STANDARD

BS EN ISO 12944-1:1998

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

Part 1: General introduction

The European Standard EN ISO 12944-1:1998 has the status of a British Standard

ICS 87.020; 91.080.10

National foreword

This British Standard is the English language version of EN ISO 12944-1:1998. It is identical with ISO 12944-1:1998. Together with the other seven parts of BS EN ISO 12944, it partially supersedes BS 5493:1977 which is declared obsolescent.

The UK participation in its preparation was entrusted to Technical Committee STI/27, Paint systems for metallic substrates, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Attention is drawn to the fact that CEN and CENELEC Standards normally include an annex which lists normative references to international publications with their corresponding European publications. The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, the EN ISO foreword page, the ISO title page, pages ii to iv, pages 1 to 6, an inside back cover and a back cover.

This British Standard, having been prepared under the direction of the Sector Committee for Materials and Chemicals, was published under the authority of the Standards Committee and comes into effect on 15 November 1998

ISBN 0 580 30344 6

Amendments issued since publication

Amd. No.	Date	Text affected

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 12944-1

May 1998

ICS 87.020

Descriptors: see ISO document

English version

Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction (ISO 12944-1:1998)

Peintures et vernis - Anticorrosion des structures en acier par systèmes de peinture - Partie 1: Introduction générale (ISO 12944-1:1998)

Beschichtungsstoffe - Korrosionsschutz von Stahlbauten durch Beschichtungssysteme - Teil 1: Allgemeine Einleitung (ISO 12944-1:1998)

This European Standard was approved by CEN on 16 June 1997.

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Ref. No. EN ISO 12944-1:1998 E

Foreword

The text of the International Standard ISO 12944-1:1998 has been prepared by Technical Committee ISO/TC 35 "Paints and varnishes" in collaboration with Technical Committee CEN/TC 139 "Paints and varnishes", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1998, and conflicting national standards shall be withdrawn at the latest by November 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO 12944-1:1998 was approved by CEN as a European Standard without any modification.

EN ISO 12944-1:1998

INTERNATIONAL STANDARD

ISO 12944-1

First edition
1998-05-15

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

Part 1: General introduction

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

Partie 1: Introduction générale

Reference number
ISO 12944-1:1998(E)

Contents

Descriptors: paints, varnishes, steel construction, corrosion, corrosion prevention, protective coatings, generalities.

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.

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.

International Standard ISO 12944-1 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes,* Subcommittee SC 14, *Corrosion protection of steel structures by protective paint systems.*

ISO 12944 consists of the following parts, under the general title *Paints and varnishes — Corrosion protection of steel structures by protective paint systems*:

— *Part 1: General introduction*

— *Part 2: Classification of environments*

— *Part 3: Design considerations*

— *Part 4: Types of surface and surface preparation*

— *Part 5: Protective paint systems*

— *Part 6: Laboratory performance test methods*

— *Part 7: Execution and supervision of paint work*

— *Part 8: Development of specifications for new work and maintenance*

Annex A of this part of ISO 12944 is for information only.

Introduction

Unprotected steel in the atmosphere, in water and in soil is subject to corrosion that may lead to damage. Therefore, to avoid corrosion damage, steel structures are normally protected to withstand the corrosion stresses during the service life required of the structure.

There are different ways of protecting steel structures from corrosion. ISO 12944 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, it is necessary for owners of such structures, planners, consultants, companies carrying out corrosion protection work, inspectors of protective coatings and manufacturers of coating materials to have at their disposal state-of-the-art information in concise form on corrosion protection by paint systems. Such information has to be as complete as possible, unambiguous and easily understandable to avoid difficulties and misunderstandings between the parties concerned with the practical implementation of protection work.

This International Standard — ISO 12944 — 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 is familiar with other relevant International Standards, in particular those dealing with surface preparation, as well as relevant national regulations.

Although ISO 12944 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 this standard may result in serious financial consequences.

ISO 12944-1 defines the overall scope of all parts 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 for a given project.

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

Part 1:
General introduction

1 Scope

1.1 ISO 12944 deals with the corrosion protection of steel structures by protective paint systems.

1.2 ISO 12944 covers only the corrosion-protective function of paint systems. Other protective functions, like the protection against:

— microorganisms (marine fouling, bacteria, fungi, etc.),

— chemicals (acids, alkalis, organic solvents, gases, etc.),

— mechanical action (abrasion, etc.) and

— fire

are not covered by ISO 12944.

1.3 The field of application is characterized by:

— the type of structure,

— the type of surface and surface preparation,

— the type of environment,

— the type of protective paint system,

— the type of work and

— the durability of the protective paint system.

Although ISO 12944 does not cover all types of structure, surface and surface preparation, it may, by agreement, also be applied to those cases which are not covered by the standard.

The various aspects of the field of application are described in more detail in 1.3.1 to 1.3.6.

1.3.1 Type of structure

ISO 12944 concerns structures made of carbon or low-alloy steel (e.g. in accordance with EN 10025) of not less than 3 mm thickness, which are designed using an approved strength calculation.

Not covered by ISO 12944 are concrete structures reinforced with steel.

1.3.2 Type of surface and surface preparation

ISO 12944 deals with the following types of surface consisting of carbon or low-alloy steel, and their preparation:

— uncoated surfaces;

— surfaces thermally sprayed with zinc, aluminium or their alloys;

— hot-dip-galvanized surfaces;

— zinc-electroplated surfaces;

— sherardized surfaces;

— surfaces painted with prefabrication primer;

— other painted surfaces.

1.3.3 Type of environment

ISO 12944 deals with:

— six corrosivity categories for atmospheric environments,

— three categories for structures immersed in water or buried in soil.

1.3.4 Type of protective paint system

ISO 12944 covers a range of paint products which dry or cure at ambient conditions.

Not covered by ISO 12944 are:

— powder coating materials,

— stoving enamels,

— heat-cured paints,

— coatings of more than 2 mm dry-film thickness,

— linings of tanks,

— products for the chemical treatment of surfaces (e.g. phosphating solutions).

1.3.5 Type of work

ISO 12944 covers both new work and maintenance.

1.3.6 Durability of the protective paint system

ISO 12944 considers three different durability ranges (low, medium and high). See 3.5 and clause 4.

The durability range is not a "guarantee time".

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12944. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12944 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4628-1:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 1: General principles and rating schemes.*

ISO 4628-2:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 2: Designation of degree of blistering.*

ISO 4628-3:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 3: Designation of degree of rusting.*

ISO 4628-4:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 4: Designation of degree of cracking.*

ISO 4628-5:1982, *Paints and varnishes — Evaluation of degradation of paint coatings — Designation of intensity, quantity and size of common types of defect — Part 5: Designation of degree of flaking.*

EN 10025:1990, *Hot-rolled products of non-alloy structural steels — Technical delivery conditions.*

3 Definitions

For the purposes of ISO 12944, the following definitions apply. Additional definitions are given in the other parts of ISO 12944.

NOTE — Some of the definitions have been taken from ISO 8044:1989, *Corrosion of metals and alloys — Vocabulary,* and EN 971-1:1996, *Paints and varnishes — Terms and definitions for coating materials — Part 1: General terms,* as indicated.

3.1 coat: A continuous layer of metal material or a continuous film of paint (3.7), resulting from a single application.

3.2 corrosion: Physicochemical interaction between a metal and its environment which results in changes in the properties of the metal and which may often lead to impairment of the function of the metal, the environment or the technical system of which these form a part. [ISO 8044]

3.3 corrosion damage: Corrosion effect which is considered detrimental to the function of the metal, the environment or the technical system of which these form a part. [ISO 8044]

3.4 corrosion stresses: The environmental factors which promote corrosion.

3.5 durability: The expected life of a protective paint system to the first major maintenance painting. See also 4.4.

3.6 lining: A protective coating on the inner surface of a tank.

3.7 paint: A pigmented coating material, in liquid or in paste or powder form, which, when applied to a substrate, forms an opaque film having protective, decorative or other specific properties. [EN 971-1]

3.8 protective coating system: The sum total of the coats of metal materials and/or paints or related products which are to be applied or which have been applied to a substrate to provide corrosion protection.

3.9 protective paint system: The sum total of the coats of paints or related products which are to be applied or which have been applied to a substrate to provide corrosion protection.

3.10 substrate: The surface to which the coating material is applied or is to be applied. [EN 971-1]

4 General considerations and requirements

4.1 Since the period during which the protection provided by paint systems is effective is generally shorter than the expected service life of the structure, due consideration shall be given at the planning and design stage to the possibility of their maintenance or renewal.

4.2 Structural components which are exposed to corrosion stresses and which are no longer accessible for corrosion protection measures after assembly shall be provided with corrosion protection that will remain effective, and hence ensure the stability of the structure, for the duration of the service life of the structure. If this cannot be achieved by means of protective coating systems, other measures shall be taken (for example manufacturing components from corrosion-resistant material, designing components so that they are replaceable or the specification of a corrosion allowance).

4.3 The cost-effectiveness of a given corrosion protection system will generally be in direct proportion to the length of time for which effective protection is maintained, since the amount of maintenance or replacement work required during the service life of the structure will be reduced to a minimum.

4.4 The level of coating failure before the first major maintenance painting shall be agreed by the interested parties and shall be assessed in accordance with ISO 4628-1 to ISO 4628-5, unless otherwise agreed between the interested parties.

In this standard, durability is expressed in terms of three ranges:

low (L)	2 to 5 years
medium (M)	5 to 15 years
high (H)	more than 15 years

The durability range is not a "guarantee time". Durability is a technical consideration that can help the owner set up a maintenance programme. A guarantee time is a consideration that is the legal subject of clauses in the administrative part of the contract. The guarantee time is usually shorter than the durability range. There are no rules that link the two periods of time.

4.5 For quality management purposes, the ISO 9000 series of standards should preferably be taken into account.

5 Health and safety and environmental protection

It is the duty of clients, specifiers, contractors, paint manufacturers, inspectors and all other personnel involved in a project to carry out the work for which they are responsible in such a manner that they do not endanger the health and safety of themselves or others.

In pursuance of this duty, each party shall ensure that all the statutory requirements of the country in which their work, or any part of their work, is to be carried out are complied with.

NOTE — Items that will need particular attention are for example:

— not specifying or using toxic or carcinogenic substances;

— reduction of emissions of volatile organic compounds (VOCs);

— measures against harmful effects of fumes, dust, vapours and noise, as well as fire hazards;

— protection of the body, including the eyes, the skin, the ears and the respiratory system;

— protection of water and soil during corrosion protection work;

— recycling of materials and waste disposal.

6 Information on the other parts of ISO 12944

6.1 ISO 12944-2 describes the corrosion stresses produced by the atmosphere, by different types of water and by soil. It defines atmospheric-corrosivity categories and indicates the corrosion stresses to be expected in situations where steel structures are immersed in water or buried in soil. The corrosion stresses to which a steel structure is exposed represent one essential parameter governing the selection of appropriate protective paint systems in accordance with ISO 12944-5.

6.2 ISO 12944-3 gives information on basic design criteria for steel structures for the purpose of improving their resistance to corrosion. It gives examples of suitable and unsuitable designs, indicating, with the help of diagrams, which structural elements and combinations of elements are likely to cause accessibility problems during surface preparation work and when applying, inspecting and maintaining paint systems. In addition, design features which will facilitate the handling and transport of steel structures are discussed.

6.3 ISO 12944-4 describes different types of surface to be protected and gives information on mechanical, chemical and thermal surface preparation methods. It deals with surface preparation grades, surface profile (roughness), assessment of prepared surfaces, temporary protection of prepared surfaces, preparation of temporarily protected surfaces for further coatings, preparation of existing metal coatings, and environmental aspects. As far as possible, reference is made to the basic International Standards on the surface preparation of steel substrates before application of paints and related products. ISO 12944-4 is intended to be read in conjunction with ISO 12944-5 and ISO 12944-7.

6.4 ISO 12944-5 describes different generic types of paints on the basis of their chemical composition and the type of film formation process. It gives examples of various protective paint systems that have proved suitable for structures exposed to corrosive stresses and corrosivity categories described in ISO 12944-2, reflecting current knowledge on a world-wide scale. ISO 12944-5 is intended to be read in conjunction with ISO 12944-6.

6.5 ISO 12944-6 specifies laboratory test methods that are to be used when the performance of protective paint systems is to be assessed. It is particularly intended for paint systems for which sufficient practical experience is not yet available and covers testing of paint systems designed for application to steel prepared by blast-cleaning, to hot-dip-galvanized steel and to thermally sprayed metallic coatings. Atmospheric environments and immersion in water (fresh, brackish or sea water) are also covered.

6.6 ISO 12944-7 describes how paint work is to be carried out in the workshop or on site. It describes methods for the application of coating materials. Handling and storage of coating materials before application, inspection of the work and follow-up of the resulting paint system, as well as preparation of reference areas, are also covered. It does not cover surface preparation work (see ISO 12944-4).

6.7 ISO 12944-8 gives guidance for developing specifications for corrosion protection work, describing everything that has to be taken into account when a steel structure is to be protected against corrosion. For the convenience of the user, ISO 12944-8 distinguishes between project specification, paint system specification, paint work specification, and inspection and testing specification. Various annexes deal with particular aspects such as planning of the work, reference areas and inspection, and offer models of forms intended to facilitate the work.

Annex A
(informative)

Guidelines for using ISO 12944 for a given project

In order to ensure effective corrosion protection, it is important that suitable specifications are written for the project (ISO 12944-8), taking the following items as the basis:

a) Analyse or estimate the corrosivity of the environment in the area where the structure is located or is to be located (ISO 12944-2).

b) Establish any special conditions which may affect the choice of paint system to be used (ISO 12944-5).

c) Examine the design of the structure and make sure that corrosion traps have been avoided and adequate access has been provided for corrosion protection work. Avoid galvanic corrosion by insulating dissimilar metals from each other (ISO 12944-3).

d) For maintenance painting, assess the condition of the surface to be treated (ISO 12944-4).

e) Identify those paint systems with the required durability from those listed as being suitable for the relevant environment (ISO 12944-5), or from results of laboratory performance testing if no long-term experience is available (ISO 12944-6).

f) Select, from the paint systems identified, the optimum one, taking into consideration the method of surface preparation which will be used (ISO 12944-4).

g) Make sure that damage to the environment and all health and safety risks are minimized (ISO 12944-1, ISO 12944-8).

h) Draw up a plan of work and select a method of application (ISO 12944-7).

i) Establish a programme of inspections to be carried out during and after the work (ISO 12944-7, ISO 12944-8).

j) Establish a maintenance programme covering the whole service life of the structure.

NOTE — For detailed planning, see ISO 12944-8, annexes C and D.

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