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Protection of metallic materials against corrosion – Corrosion likelihood in atmospheric environments – Classification, determination and estimation of corrosivity of atmospheric environments

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Swedish Standards corresponding to documents referred to in this Standard are listed in "Catalogue of Swedish Standards", issued by SIS. The Catalogue lists, with reference number and year of Swedish approval, International and European Standards approved as Swedish Standards as well as other Swedish Standards.

Korrosionsskydd av metalliska material – Korrosionsrisk i atmosfärisk miljö – Klassificering, bestämning och skattning av korrosivitet hos atmosfäriska miljöer

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English version

Protection of metallic materials against corrosion - Corrosion likelihood in atmospheric environment - Classification, determination and estimation of corrosivity of atmospheric environments

Protection des matériaux métalliques contre la corrosion -
Risque de corrosion dans un environnement
atmosphérique - Classification, détermination et
appréciation de la corrosité des environnements
atmosphériques

Korrosionsschutz metallischer Werkstoffe -
Korrosionswahrscheinlichkeit in einer atmosphärischen
Umgebung - Einteilung, Bestimmung und Abschätzung der
Korrosivität von atmosphärischen Umgebungen

This European Standard was approved by CEN on 12 May 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 262 "Metallic and other inorganic coatings", the secretariat of which is held by BSI.

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 December 2000, and conflicting national standards shall be withdrawn at the latest by December 2000.

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.

Introduction

Metals, alloys and metallic coatings can suffer atmospheric corrosion when their surfaces are wetted. The nature and the rate of corrosion effect depend on the corrosion system, which comprises:

- the metallic material(s);
- the atmospheric environment (characterized by time of wetness and the chemical composition of the electrolyte formed on the metallic surface influenced by type and level of air pollution);
- technical parameters (design, profile and mass, manufacture, joining techniques, etc.);
- operation conditions.

The choice of metals, alloys or metallic coatings, and the corrosion resistance of the manufactured products are influenced by the required service life and service conditions, as well as by the corrosivity of the atmosphere.

A classification system for corrosivity of atmospheric environments should be simple and user friendly. This European Standard is based on a quantitative determination of corrosivity (see ISO 9223). When experimental data are unavailable, a qualitative estimation of corrosivity categories is possible. However, a qualitative description of an atmospheric environment can give rise to serious problems because identically described atmospheric environments can cover a wide range of corrosivity. Therefore the determination of corrosivity based on exposure of standard specimens of reference metals is strongly recommended.

This European Standard should be considered a basis document because it does not take into account other technical parameters and operation conditions.

1 Scope

This European Standard establishes a classification system for the corrosivity of atmospheric environments. It:

- defines corrosivity categories of the atmospheric environments taking into account ISO 9223;
- describes the determination of corrosivity based on assessment of mass loss of standard specimens after the first year of exposure;
- can be used to estimate the corrosivity of an environment based on knowledge of local conditions or of specific data that characterize the local conditions, where it is not possible to make an experimental determination.

It cannot be used to determine corrosivity categories from exposure periods of less than or greater than the first year.

The classification system contributes to:

- the knowledge and comparison of corrosivity of atmospheric environments at different locations;
- the choice of materials and corrosion protection measures.

This European Standard does not characterize the corrosivity of special service atmospheric environments, e.g. chemical and metallurgical plants and environments with extreme chloride deposition such as splash zones.

2 Normative references

This European Standard incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ISO 8407, *Corrosion of metals and alloys — Removal of corrosion products from corrosion test specimens*.

ISO 8565, *Metals and alloys — Atmospheric corrosion testing — General requirements for field tests*.

ISO 9224, *Corrosion of metals and alloys — Corrosivity of atmospheres — Guiding values for the corrosivity categories*.

3 Terms and definitions

For the purposes of this European Standard, the following terms and definitions apply. 3.1 and 3.2 are taken from EN ISO 8044 and are repeated here for convenience.

3.1 corrosivity

ability of an environment to cause corrosion of a metal in a given corrosion system

[EN ISO 8044:1999]

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3.2 corrosion likelihood

qualitative and/or quantitative expression of the expected corrosion effects in a defined corrosion system

[EN ISO 8044:1999]

3.3 type of atmospheric environment

characterization of the atmospheric environment on the basis of corrosive agents present and their levels

NOTE Principle corrosive agents are gases (especially sulfur dioxide) and salts (especially chlorides and sulfates).

3.4 category of location

conventionally defined typical exposure conditions of a component or structure, e.g. in the open air, under shelter, in closed space

3.5 time of wetness

period during which a metal surface is covered by a film of electrolyte that is capable of initiating atmospheric corrosion

NOTE Guidance values for time of wetness can be calculated from the temperature and relative humidity (RH) by summing the hours when RH > 80 % and the temperature is > 0 °C.

4 Classification of corrosivity of atmospheric environments

The corrosivity of an atmospheric environment shall be classified either by determination of the corrosivity in accordance with clause 5 or, where this is not possible, by estimation of the corrosivity in accordance with clause 6.

Estimation of corrosivity as described in clause 6 and annex E can lead to misinterpretation, which in turn, can result in inappropriate corrosion protection. Therefore, the determination of corrosivity by exposure of standard specimens of reference metals is strongly recommended.

For the purposes of this European Standard, atmospheric environments shall be classified into five corrosivity categories for metallic materials, denoted C1 to C5, in accordance with Table 1.

5 Determination of corrosivity categories

Corrosivity categories shall be determined from measurements of mass loss per unit surface area of standard specimens of carbon steel, zinc, copper and aluminium after the first year of exposure in accordance with Table 1. Flat standard specimens shall be treated prior to and after exposure and shall be evaluated in accordance with annexes A and B.

A given atmospheric environment shall be characterized by four figures corresponding to corrosivity categories for the four reference metals, in the following order: carbon steel, zinc, copper, aluminium. To apply these corrosivity categories to these and other materials, ISO 9224 shall be taken into account as well as the expertise of a corrosion specialist.

The mass loss per unit surface area after the first year of exposure given in Table 1 shall not be extrapolated to predict long-term corrosion behaviour.