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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

DRAFT INTERNATIONAL STANDARD

ISO/DIS 5929

ISO/TC 156

Secretariat: SAC

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2024-01-23

Voting terminates on:
2024-04-16

Corrosion of Metals and Alloys — Test and evaluation method for the corrosion of steel bar embedded in concrete structure exposed to total corrosion zones in marine environments

ICS: 77.060

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee [or Project Committee] ISO/TC [or ISO/PC] ###, [name of committee], Subcommittee SC ##, [name of subcommittee].

This second/third/... edition cancels and replaces the first/second/... edition (ISO #####:#####), which has been technically revised.

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

— xxx xxxxxxxx xxx xxxxx

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

A large number of concrete buildings and structures (such as docks, bridge piers, etc.) in coastal areas around the world are affected by multiple corrosive environments such as marine atmospheric zones, splash zones, tidal zones, and immersion zones in the vertical direction. Due to the different environmental effects on the corrosion areas of steel bars in different vertical directions, the corrosion rate of steel bars in different vertical environmental sections is different, and the vertical direction of steel bars forms an uneven deterioration state, which affects the safety of structural use. Foreign experts have also conducted research in this field and established experimental methods in this area. Our standard has a theoretical and practical foundation.

The existing methods for steel bar corrosion and corrosion resistance testing in simulated marine environments mainly focus on detailed research on a certain environmental section of steel bars, especially in the splash zone, such as ISO 21062 standards. Due to the alternation of dryness and wetness in this area, the corrosion of steel bars is relatively severe, which is the most unfavorable state. If only this data is used for the design of concrete structures, the components such as piers and columns need to be made very coarsely, which belongs to excessive protection and causes economic waste. In addition, with the development of information technology, the testing methods for steel bar corrosion have been further updated, providing more new methods for accurately measuring the corrosion of steel bars. Based on the current use of steel bar weight loss rate methods for corroded steel bars, some new technologies can be selected as auxiliary means to accurately describe and verify the three-dimensional corrosion of steel bars.

In order to reproduce the corrosion distribution of steel bars in concrete under chloride salt erosion in actual multi corrosion zones, it is necessary to propose a corrosion resistance test method for steel bars in simulated marine environments with full corrosion zones. The method describes the dimensions, standard configuration methods, and test standard processes of standard components such as concrete structural components and steel bars, in order to truly simulate the impact of different chloride salt environments on the vertical direction of steel bars in reinforced concrete components, and scientifically calculate safety Economical durability indicators such as the thickness of the protective layer for concrete structures, reducing excessive protection of concrete and achieving effective design; Furthermore, based on the existing evaluation methods for steel corrosion in a certain environmental section, combined with the environmental impact of vertical multi corrosion sections where concrete buildings and structures are located in coastal areas, a comprehensive evaluation method for steel corrosion in a fully corroded area environment is proposed, providing a basis for the life prediction and evaluation of concrete structures and the durability design of new structures.

The deterioration of durability of reinforced concrete structures has become an issue all over the world and the main reason for the deterioration is environmental effects. In marine environment, the corrosion of the steel bar induced by chloride attack causes a large number of reinforced concrete structures damaged.

There are many different corrosion zones in the vertical direction of marine environment, including atmospheric zone, splash zone, tidal zone, immersion zone, and buried zone. The environmental effects of each zones are different, resulting in different corrosion rates and uneven corrosion distribution of the steel bars in marine environment. Nowadays corrosion tests mainly take the corrosion behaviors of the steel bars in a certain marine environment into consideration, and there is no uniform standard on the overall corrosion of steel bars in total corrosion zones. It is necessary to put forward specific test and evaluation methods for corrosion of steel bar exposed to total corrosion zones in marine environments.

Corrosion of the steel bars in marine environment with total corrosion zones can be test according to the device and procedure proposed in this document. Furthermore, a method for evaluating the overall corrosion of steel bar is also provided for on-site assessment in engineering practice.

Corrosion of Metals and Alloys — Test and evaluation method for the corrosion of steel bar embedded in concrete structure exposed to total corrosion zones in marine environments

1 Scope (*mandatory*)

This document specifies the apparatus, materials, specimen preparation, procedures, results and reports for corrosion test of steel bars in marine environments with total corrosion zones.

This document includes the evaluation method for the corrosion test of steel bar in marine environments with total corrosion zones.

This standard is applicable to the corrosion test of steel bar in concrete structure exposed to total corrosion zones in marine environments.

In order to illustrate the methodology, [Annex A](#) provides examples of experimental apparatus, and [Annex B](#) provides examples of experimental results.

2 Normative references (*mandatory*)

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 1920-3, *Testing of concrete — Part 3: Making and curing test specimens*

ISO 1920-4, *Testing of concrete — Part 4: Strength of hardened concrete*

ISO 3673-1, *Plastics — Epoxy resins — Part 1: Designation*

ISO 6935-2, *Steel for the reinforcement of concrete — Part 2: Ribbed bars*

ISO 8407:2009, *Corrosion of metal and alloys—Removal of corrosion products from corrosion test specimens*

ISO 22965-1, *Concrete — Part 1: Methods of specifying and guidance for the specifier*

ISO 22965-2, *Concrete — Part 2: Specification of constituent materials, production of concrete and compliance of concrete*

EN 197-1, *Cement—Part 1:Composition, specifications, and conformity criteria for common cements*

ISO 8044:2015, *Corrosion of metals and alloys — Basic terms and definitions*

ISO 9227:2017, *Corrosion tests in artificial atmospheres—Salt spray tests*

ISO 9226:2012, *Corrosion of metals and alloys — Corrosivity of atmospheres — Determination of corrosion rate of standard specimens for the evaluation of corrosivity*

ISO 11845:2020, *Corrosion of metals and alloys — General principles for corrosion testing*

ISO 21062:2020, *Corrosion of metals and alloys — Determination of the corrosion rates of embedded steel reinforcement in concrete exposed to simulated marine environments*

3 Terms and definitions (*mandatory*)

For the purposes of this document, the terms and definitions given in ISO 8044 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1 **simulated marine environmental chamber**

a confined chamber that can place test specimens and simulate marine environment with total corrosion zones.

3.2 **environmental parameter control chamber**

a chamber that can place the apparatus to simulate marine environment and can be maintained manually on a regular basis.

4 Apparatus

4.1 Simulated marine environmental chamber

The simulated marine environmental chamber shall be designed to simulate marine environment with total corrosion zones in the vertical direction, including atmospheric zone, splash zone, tidal zone, immersion zone, and buried zone and the environmental parameters can be set, monitored and adjusted.

According to the requirements of test time, test purpose and specimen number, the size and quantity of test cells are chosen. Necessary monitoring and alarm devices shall be set in the simulated marine environmental chamber to monitor and feed back the temperature, humidity, salt spray concentration, solution chloride concentration, pH value and liquid level in real time.

Test temperature will be selected depending on user's conditions and recorded during testing.

A typical design of simulated marine environmental chamber is shown in [Annex A](#).

4.2 Environmental parameter control chamber

The environmental parameter control chamber shall contain necessary equipments for controlling the indoor environmental parameters of the simulated marine environmental chamber, which can be allowed for test personnel to enter and exit at any time. Necessary electrical and fire-fighting devices shall be installed as required.

4.3 Atmospheric zone: Spraying device

The spraying device can be set in accordance with ISO 9227.

The ambient temperature and humidity should be taken into account in the atmospheric zone. A constant temperature and humidity can be chosen or a temperature and humidity cycle can be set considering the temperature and humidity changes in the day and night, according to the test requirements.

A following method can be adopted as the salt spray device in atmospheric area: Ultrasonic atomizer is set in the environmental parameter control chamber, and chloride solution spray device is set in the simulated marine environmental chamber.

The salt spray concentration, mist particle size and sedimentation amount should be considered to ensure that the device can produce a fine mist or small droplets falling on the test object evenly.