SLOVENSKI STANDARD
SIST EN ISO 4543:1999

01-oktober-1999

Kovinske in druge anorganske prevleke - Splošna pravila za korozijske preskuse, ki so uporabna v razmerah skladiščenja (ISO 4543:1981)

Metallic and other non-organic coatings - General rules for corrosion tests applicable for storage conditions (ISO 4543:1981)

Metallische und andere anorganische Überzüge - Allgemeine Richtlinien für Korrosionsversuche, anwendbar auf Lagerungsbedingungen (ISO 4543:1981)

Revetements métalliques et autres revetements non organiques - Directives générales pour les essais de corrosion applicables aux conditions de stockage (ISO 4543:1981)

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ICS:

25.220.20	Površinska obdelava	Surface treatment
25.220.40	Kovinske prevleke	Metallic coatings

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English version

Metallic and other non-organic coatings - General rules for corrosion tests applicable for storage conditions (ISO 4543:1981)

Revêtements métalliques et autres revêtements non organiques - Directives générales pour les essais de corrosion applicables aux conditions de stockage (ISO 4543:1981)

Metallische und ander anorganische Überzüge - Allgemeine Richtlinien für Korrosionsversuche, anwendbar auf Lagerungsbedingungen (ISO 4543:1981)

This European Standard was approved by CEN on 1994-10-26. 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.

The European Standards exist 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Foreword

This European Standard was taken over by the Technical Committee CEN/TC 262 "Protection of metallic materials against corrosion" from the work of ISO/TC 107 "Metallic and other inorganic coatings" of the International Standards Organization (ISO).

CEN/TC 262 had decided to submit the final draft for Formal Vote. The result was positive.

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 April 1995, and conflicting national standards shall be withdrawn at the latest by April 1995.

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

Endorsement notice

The text of the International Standard ISO 4543:1981 has been approved by CEN as a European Standard without any modification.

International Standard 4543

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Metallic and other non-organic coatings — General rules for corrosion tests applicable for storage conditions

Revêtements métalliques et autres revêtements non organiques — Directives générales pour les essais de corrosion applicables aux conditions de stockage

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4543 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in November 1978.

It has been approved by the member bodies of the following countries :

Australia	India	South Africa, Rep. of
Bulgaria	Italy	Spain
Czechoslovakia	Japan	Sweden
Egypt, Arab Rep. of	Netherlands	Switzerland
France	New Zealand	Turkey
Germany, F. R.	Poland	USA
Hungary	Romania	USSR

The member body of the following country expressed disapproval of the document on technical grounds :

United Kingdom

Printed in Switzerland

Metallic and other non-organic coatings — General rules for corrosion tests applicable for storage conditions

0 Introduction

Corrosion testing under storage conditions is carried out in order to :

a) assess the corrosion resistance of different protective coatings to environments encountered under particular storage conditions;

b) compare the corrosion resistance of two or more protective coatings;

c) determine the type and optimum thickness of a protective coating and type of protective wrapping;

d) evaluate the relationship between the results of testing under laboratory and storage conditions.

It involves exposure of coated test specimens to the action of corrosive factors encountered in storage and periodic observation of the test specimens.

The aggressiveness of corrosion in storage rooms depends upon the humidity and temperature of the atmosphere and upon the action of other environmental factors which may either be constant or may vary periodically or accidentally in a particular microclimate.

1 Scope and field of application

This International Standard gives guidance on methods of corrosion testing of protective metallic, conversion and other non-organic coatings, with or without additive protection, in heated and unheated storage rooms in all microclimates with or without control of climatic parameters.

Specimens and articles may be tested separately or in bulk, and with or without protective wrappings.

2 Test specimens

2.1 Type

The following types of test specimen may be used :

— specially prepared specimens covered with the protective coating to be tested;

— coated production articles or parts thereof.

Depending on the purpose of the examinations, specimens may be tested with or without wrappings and with or without temporary protective films.

2.2 Shape and dimensions

To minimize edge effects and to obtain representative corrosion, the surface area of the test specimens should be as large as possible and in any case not less than 50 cm^2 (5 cm × 10 cm).

If the coated articles used are smaller than 50 cm^2 in area, specimens of the same kind may be combined to total the required minimum surface area, but the results obtained will not necessarily be strictly comparable with those obtained on specially prepared test specimens of the specified minimum area.

2.3 Preparation

Clean the test specimens thoroughly before exposure to remove any contaminants that may affect the performance of the coating system being tested. The cleaning method to be employed depends upon the nature of the surface and the contaminants , but shall not include the use of any abrasives or solvents which may attack the surfaces of the test specimens.

However, if testing coatings with additional temporary protective films, do not clean the surface.

2.4 Handling

The handling of test specimens prepared for testing (installation on racks, hanging, etc.) shall be carried out with clean, cotton-gloved hands.

2.5 Marking

Mark the test specimens in such a way that no confusion during the storage test is possible. Markings should be legible and durable over the whole period of testing and should be made on those areas of the test specimens that are not subjected to visual assessment and that have no functional purpose.

Test specimens may be marked by one of the following methods :

a) positional notch coding before the protective coating is applied (preferred method);

b) stamping appropriate numbers (with a numbering stamp);

c) hanging on the test specimen a number plate made of a corrosion-resistant material, hanging free of the specimen and attached by means of a loose-fitting, non-metallic thread, for example nylon thread;

d) painting with suitably durable paints on the reverse side of the test specimen.

Numbers should preferably be marked on the front (test) side of the test specimens, at their bottom edge. The holes on which number plates are hung should be situated near the bottom edge of the specimen so that the plate itself cannot come into direct contact with either the test specimen to which the plate is attached or with neighbouring test specimens after they have been positioned in the frame.

Mark test specimens with figures and letters so that the following information is indicated :

a) the type of coating;

b) the type of wrapping or packaging;

c) the type of temporary protective coating, if any;

d) a serial number;

e) the place and conditions of storage.

The markings should be minimized, preferably by using a simple code that enables them to be associated with the information required (see clause 5).

2.6 Number

Select the number of test specimens in any one series of tests according to the type of specimen, the number required to evaluate a particular physical property and the number expected to be removed for examination during the period of exposure. The number of test specimens of each type used for a given evaluation should not be less than three for test specimens having a surface area of at least 50 cm^2. If the specimens have smaller surface areas, take a correspondingly greater number of test specimens.

2.7 Standard specimens

It is desirable that standard test specimens of solid metals, for example zinc, copper or low alloy steel, should be included alongside the test specimens of the coating system being examined, in order to be able to assess the prevailing corrosive conditions. Therefore, such metals should be chosen from those for which data concerning performance in a variety of storage rooms have been established. The standard test specimens should be stored under the conditions specified in 2.8.

2.8 Storage

Store the test specimens before exposure in a clean, dry atmosphere in an air-conditioned, temperature-controlled room with a relative humidity of 50 % or less, or sealed in a desiccator, or by sealing the specimens into evacuated plastics bags containing a desiccant.

3 Operating conditions

3.1 Corrosion environment

Select the test conditions bearing in mind that the data obtained for a given set of test specimens should correspond with, or be similar to, the actual conditions of use or storage of metals, coatings or articles. Before exposure, assess the corrosion factors indigeneous to the storage room where testing is to be carried out.

The factors affecting corrosion vary with the nature of the material being tested and may include any or all of the following :

a) atmospheric humidity and its fluctuations;

b) air temperature and its fluctuations;

c) atmospheric pollution, both chemical (such as the presence of gases and vapours) and physical (such as dust, smoke and foreign matter);

d) value of, and the fluctuations in, the temperature of the test specimens;

e) quality of surface cleaning of the test specimens;

f) exposure to biological species;

g) corrosive properties of the materials in direct contact with the surface of the specimen;

h) type and quality of the packaging and its imperviousness.

The recommended methods and frequency of monitoring these factors are given in the annex.

3.2 Storage room and method of exposure

3.2.1 Location

The test specimens should be placed in particular areas of the storage room, for example on shelves. It is advisable to separate off the exposure site in order to avoid damaging the test specimens, but without affecting the environmental conditions.

The location of the test specimens should be such that none of them will be unduly influenced by local heat sources, vents, circulating fans, etc.

The exposure site should be chosen so that it provides the storage conditions to be evaluated.

Storage room floors should be covered with a dust absorbing substance.

3.2.2 Shelves, racks and frames

The structure of the shelves, racks and frames is not specified, but the following requirements should be observed.

Wrapped test specimens should be placed on shelves and frames, while bare specimens should be fixed in frames and placed in racks to enable a larger number of test specimens to be exposed.

The construction of the shelves, racks and frames should :

a) be made of corrosion-resistant material that has no corrosive action on the test specimens;

b) if made of wood, have a moisture content of not more than 15 % and not emit vapours of corrosive organic compounds;

c) be secured so as to prevent undesirable displacement and movement of the test specimens;

d) be designed in such a way that, unless otherwise specified, the test specimens placed on them are as far away from the floor as possible and not less than 0,5 m from the roof;

e) if made of wood, be designed so as to minimize the effect of wood preservatives on metals and temporary protectives.

3.2.3 Measuring instruments

Instruments should be positioned and operated in accordance with their service and maintenance instructions. If testing packaged specimens, it is advisable to measure the internal and external humidities, particularly for boxes.

The following measuring instruments may be used to record the exposure conditions :

a) hygrothermograph, to record the temperature and the absolute and relative humidities;

b) instruments to determine and record the sulphur dioxide content and the degree of pollution of the atmosphere by dust and chloride ions.

3.2.4 Exposure of test specimens in storage rooms

The test specimens should be exposed under actual conditions of storage that will be experienced.

If the test specimens are production articles coated with protective agents and/or are wrapped or packaged, position them in accordance with the generally accepted manner of storing such articles.

Place the test specimens in such a way that :

a) contact does not occur either between individual test specimens or between the test specimens and any material that would affect their corrosion under the test conditions; this may be achieved by fixing the test specimens to the rack(s) or to the frame(s) by means of suitable holders, hooks or clamps, made of non-metallic materials, resistant to atmospheric corrosion and that do not corrode the test specimens, and so that the area of contact between the test specimens and their holders is as small as possible;

b) there is easy access to the surfaces of the test specimens;

c) they are easy to remove;

d) they are protected from falling out (for example by the action of wind), accidental contamination or damage;

e) they are all exposed to the same conditions with uniform access of air from all directions.

4 Test procedure

4.1 Positioning of test specimens

Draw up a scheme for the positioning of test specimens on the racks, indicating the positions of particular specimens.

If the test programme calls for periodic removal of certain sets of test specimens of the same kind, place these test specimens in the order of their removal.

Place test specimens undergoing periodic visual or functional assessment in such a way that a set of the same specimens forms a separate entity.

If testing is carried out in different storage rooms, maintain the exposure conditions as similar as possible in order to obtain, as far as possible, comparable results, particularly insofar as the positioning of test specimens, and the dimensions and design of shelves, racks and frames, are concerned. If testing metals, coatings and articles, the results of which are to be compared with the result of testing carried out at other times, place comparative standard specimens similarly to the test specimens so as to enable the corrosion resistance of the test specimens and standard specimens to be compared.

4.2 Duration of tests

The total test duration depends on the type of test specimen and the purpose of examination. In principle, continue testing until the first signs of corrosion appear. If the test specimens are to be removed periodically, the time interval between removals is governed by the number of test specimens and the purpose of testing. Assessment should be carried out at regular intervals, the frequency depending upon the corrosion resistance of the coating being tested. The recommended periods are : 1 week, 2 weeks, 2, 3, 6, 12, 18, 24, 36, 48 and 60 months.