

International Standard



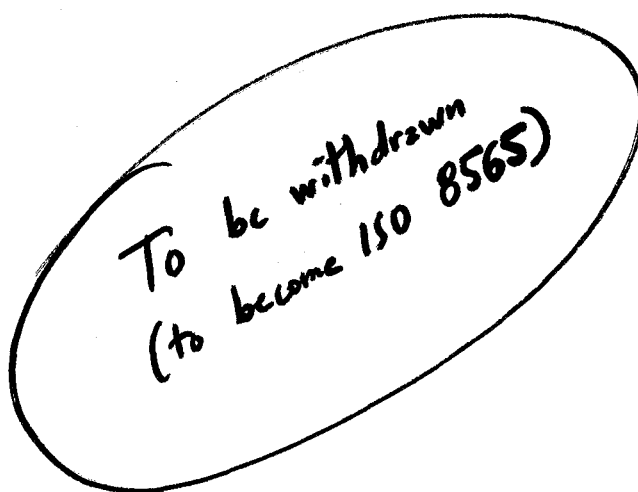
4542

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Metallic and other non-organic coatings — General rules for stationary outdoor exposure corrosion tests

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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 4542 was developed by Technical Committee ISO/TC 107, *Metallic and other non-organic coatings*, and was circulated to the member bodies in October 1978.

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

Australia	India	South Africa, Rep. of
Bulgaria	Ireland	Spain
Czechoslovakia	Israel	Sweden
Egypt, Arab Rep. of	Italy	Switzerland
France	Japan	United Kingdom
Germany, F. R.	Netherlands	USA
Hungary	Poland	USSR

No member body expressed disapproval of the document.

Metallic and other non-organic coatings — General rules for stationary outdoor exposure corrosion tests

0 Introduction

Corrosion testing under outdoor exposure conditions is carried out in order to :

- a) obtain data on the behaviour of protective coatings in natural atmospheric environments;
- b) assess the corrosion resistance of different protective coatings under particular types of atmospheric conditions;
- c) compare the results of testing under given laboratory and outdoor exposure conditions;
- d) investigate the mechanism of corrosion of particular protective coatings;
- e) determine the duration of effective protection;
- f) obtain information on the corrosivity of the atmosphere at various locations;
- g) show the influence of the design of components on resistance to corrosion.

It involves exposure of coated test specimens to the action of atmospheric factors under field conditions and periodic observations of the test specimens over a period that may extend for several years.

The atmospheric conditions at a field station depend not only on geographical location and atmospheric composition, but also on additional local factors which may either be constant or may vary periodically or accidentally in a particular micro-climate.

1 Scope and field of application

This International Standard gives guidance on methods of stationary testing, in natural outdoor atmospheric conditions, of protective metallic, conversion and other non-organic coatings. Mobile corrosion testing is not included in this International Standard, but it may be necessary, in some circumstances, to supplement stationary tests with mobile tests.

2 Reference

ISO 4540, *Metallic coatings — Coatings cathodic to the substrate — Rating of electroplated test specimens subjected to corrosion tests.*

3 Test specimens

3.1 Type

The following types of test specimens may be used :

- specially prepared specimens covered with the protective coating to be tested;
- coated production articles or parts thereof.

It should be noted, however, that the performance of specially prepared specimens may differ from that of production articles.

If production articles are used for testing, they should be selected to give the maximum possible information concerning the type of failure likely to affect the performance of the article in use.

3.2 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 cm² (5 cm × 10 cm).

If the coated articles used are smaller than 50 cm² 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.

3.3 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.

NOTE — If the effect of controlled damage, such as scribing or bending, is to be studied, it should be carried out at this stage.

3.4 Marking

Mark the test specimens in such a way that no confusion during the exposure test is possible. Markings should be legible and durable over the whole period of exposure.

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) a serial number;
- c) the place and conditions of testing.

The markings should be minimized, preferably by using a simple code that enables them to be associated with the information required (see clause 6).

3.5 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 cm². If the specimens have smaller surface areas, take a correspondingly greater number of test specimens.

3.6 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 locations have been established. The standard test specimens should be stored under the conditions specified in 3.7.

3.7 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.

4 Operating conditions

4.1 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 of metals, coatings or articles. Before exposure, assess the corrosion factors indigenous to the place 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 precipitation;
- d) solar radiation;
- e) hours of sunshine;
- f) period(s) of wetting of the surface;
- g) direction and speed of winds;
- h) atmospheric pollution, both chemical (such as the presence of gases and vapours) and physical (such as dust, smoke and foreign matter);
- j) dust composition.

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

4.2 Atmospheric field stations and types of exposure

4.2.1 Location of field stations

An outdoor field station comprises an area of ground (testing ground) or a building (i.e. a roof) where suitable equipment for fixing the test specimens is placed. A fence round the exposure site is recommended in order to prevent the possibility of interference with the specimens.

The location of the field station should be such as to permit periodic observations of the test specimens and daily recording or evaluation of the atmospheric factors specified in 4.1. It is advantageous to locate the field stations near to or at a meteorological station.