
Plastics — Methods for marine exposure

Plastiques — Méthodes d'exposition aux intempéries marines



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Contents

	Page
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	2
4.1 General.....	2
4.2 Significance.....	2
5 Requirements for apparatus	3
5.1 General requirements.....	3
5.2 Requirements for method A, floating exposure.....	3
5.3 Requirements for method B, partial-immersion exposure.....	4
5.4 Requirements for method C, shallow-immersion exposure.....	5
6 Test specimens	5
6.1 Form and preparation.....	5
6.2 Number of test specimens.....	7
6.3 Storage and conditioning.....	8
7 Procedure	8
7.1 General.....	8
7.2 Specific procedure for method A, marine floating exposure.....	9
7.3 Specific procedure for method B, partial-immersion exposure.....	9
7.4 Specific procedure for method C, shallow-immersion exposure.....	9
7.5 Evaluation of specimens after exposure.....	9
8 Test report	10
Bibliography	12

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

This second edition cancels and replaces the first edition (ISO 15314:2004), which has been technically revised.

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

- The term “sunlight” has been replaced by “solar radiation” or “global solar radiation”.
- ISO 293, ISO 294-1, ISO 294-2, ISO 294-3, ISO 295 and ISO 3167 have been moved to the bibliography.
- In [Clause 2](#), the withdrawn International Standard ISO 877 has been replaced by ISO 877-1, ISO 877-2, and ISO 877-3.

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

Plastics are often used in outdoor applications where they are immersed or partially immersed in water. In some cases, materials made from plastic are designed to float on water. In others, plastic articles that are discarded end up as floating debris. In addition to the effects of global solar radiation and heat, plastic polymers or products exposed in marine environments may be subjected to hydrolysis, water absorption, extraction of stabilizers, erosion by wave action, corrosion by salts and/or attack by seaborne microorganisms. These stresses are not simulated in typical weathering exposures conducted in accordance with ISO 877-1, ISO 877-2 and ISO 877-3. Therefore, it is necessary to define procedures that realistically and consistently stress plastic materials in the same way that they would be in products used or discarded in marine environments. This document describes three procedures for the exposure of plastic materials in the same way as they could be when used in marine environments.

There are four primary reasons why the rate of degradation of plastics exposed at sea can be different from that for the same plastic exposed on land:

- a) exposure in moist conditions is known to accelerate degradation of some polymers — small amounts of absorbed water can act as a plasticizer, increasing accessibility of the matrix to oxygen, or can leach out stabilizing additives;
- b) differences in heat build-up between plastics exposed in water or on the surface compared to plastics exposed on land;
- c) the action of microorganisms that can shield the plastic from UV radiation or can enhance biodegradation processes;
- d) the action of macroorganism settlements that can produce disfigurement of surfaces.

It is essential to establish appropriate exposure procedures in order to properly assess the performance of plastics used in marine environments, and to evaluate how long plastics discarded as litter will persist in marine environments.

Plastics — Methods for marine exposure

1 Scope

This document describes three methods for the exposure of plastics in a marine environment. Method A covers exposures where specimens float on the surface, method B covers exposures where specimens are partially immersed method C covers exposures where specimens are completely immersed. Although intended for marine (salt water) exposure, the methodology can be used with outdoor brackish water and fresh-water exposures as well. Direct weathering of plastics on land is described in ISO 877-1, ISO 877-2 and ISO 877-3.

Method A is particularly applicable to enhanced-degradability plastics where the environmental degradation under marine floating exposure is expected to be accelerated relative to that of regular plastic materials.

This document specifies the general requirements for the apparatus, and procedures for using the test methods described.

It lists properties that can be used to evaluate changes in plastics subjected to marine exposure. More specific information about methods for determining the changes in properties of plastics on exposure and reporting these results is given in ISO 4582.

2 Normative references

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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 877-1, *Plastics — Methods of exposure to solar radiation — Part 1: General guidance*

ISO 877-2, *Plastics — Methods of exposure to solar radiation — Part 2: Direct weathering and exposure behind window glass*

ISO 877-3, *Plastics — Methods of exposure to solar radiation — Part 3: Intensified weathering using concentrated solar radiation*

ISO 2818, *Plastics — Preparation of test specimens by machining*

ISO 4582, *Plastics — Determination of changes in colour and variations in properties after exposure to glass-filtered solar radiation, natural weathering or laboratory radiation sources*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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 <http://www.electropedia.org/>