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**Buildings and constructed assets —  
Service life planning —**

**Part 2:  
Service life prediction procedures**

*Bâtiments et biens immobiliers construits — Conception prenant en  
compte la durée de vie —*

*Partie 2: Procédures pour la prévision de la durée de vie*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 15686-2 was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 14, *Design life*.

This second edition cancels and replaces the first edition (ISO 15686-2:2001), which has been technically revised.

ISO 15686 consists of the following parts, under the general title *Buildings and constructed assets — Service life planning*:

- *Part 1: General principles and framework*
- *Part 2: Service life prediction procedures*
- *Part 3: Performance audits and reviews*
- *Part 5: Life-cycle costing*
- *Part 6: Procedures for considering environmental impacts*
- *Part 7: Performance evaluation for feedback of service life data from practice*
- *Part 8: Reference service life and service-life estimation*
- *Part 9: Guidance on assessment of service-life data* [Technical Specification]
- *Part 10: When to assess functional performance*

The following parts are under preparation:

- *Part 4: Service Life Planning using IFC based Building Information Modelling* [Technical Report]
- *Part 11: Terminology*

## Introduction

The ISO 15686 series on buildings and constructed assets, including service life planning, is an essential contribution to the development of a policy for design life. A major impetus for the preparation of the ISO 15686 series is the current concern over the industry's inability to predict costs of ownership and maintenance of buildings. A secondary objective of service life planning is to reduce the likelihood of obsolescence and/or to maximize the re-use value of the obsolete building components.

The purpose of this part of ISO 15686 is to describe the principles of service life prediction (SLP) of building components and their behaviour when incorporated into a building or construction works considering various service environments. The SLP methodology is developed to be generic, i.e. applicable to all types of building components, and is meant to serve as a guide to all kinds of prediction processes. The methodology may be used in the planning of SLP studies regarding new and innovative components, whose performance is little known, or may be the guiding document in the assessment of already performed investigations in order to appraise their value as knowledge bases for SLP and reveal where complementary studies are necessary.

This part of ISO 15686 is intended primarily for

- manufacturers who wish to provide data on in-use performance of their products,
- test houses, technical approval organizations, etc.,
- those who develop or draft product standards, and
- users who may not be directly involved in making service life predictions, but who use them as inputs to reference service lives, within audits or reviews of service life planning, as information in environmental product declarations (EPDs), as inputs to service life prediction of assets and facilities in life-cycle costing, etc.

**NOTE** For this part of ISO 15686 to be used for service life evaluation at the scale of complex products or at the scale of construction works, a guidance document could be necessary.

For an improved understanding of the context of this part of ISO 15686, it is useful to read the other parts, in particular ISO 15686-1, which is the umbrella document of the ISO 15686 series.

Data obtained in accordance with the methodology described in this part of ISO 15686 can be used in any context where appropriate, and specifically to obtain reference or estimated service life data as described in ISO 15686-8.

Predictions can be based on evidence from previous use, on comparisons with the known service life of similar components, on tests of degradation in specific conditions or on a combination of these. Ideally, a prediction will be given in terms of the service life as a function of the in-use condition. In any case, the dependence of the service life on the in-use condition will be quantified in a suitable way. The reliability of the predicted service life of a component (PSLC) will depend on the evidence it is based on.

The methods described in the ISO 15686 series are based on work carried out in many countries. In general terms, they are a development of the current standards on durability published by the Architectural Institute of Japan, the British Standards Institution (BSI), the Canadian Standards Association (CSA), and the Italian Organization for Standardization (UNI). Specifically, this part of ISO 15686 is an extension and modification of the RILEM recommendation 64, "Systematic Methodology for Service Life Prediction", developed by RILEM<sup>1)</sup> TC 71-PSL and TC 100-TSL. It also results from the work carried out in the CIB<sup>2)</sup> W080.

1) The International Union of Testing and Research Laboratories for Materials and Structures.

2) International Council for Building Research, Studies and Documentation.

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# Buildings and constructed assets — Service life planning —

## Part 2: Service life prediction procedures

### 1 Scope

This part of ISO 15686 describes procedures that facilitate service life predictions of building components, based on technical and functional performance. It provides a general framework, principles and requirements for conducting and reporting such studies.

It does not cover limitation of service life due to obsolescence or other non-measurable or unpredictable performance states.

### 2 Normative references

The following referenced documents are indispensable for the application 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 6241:1984, *Performance standards in building — Principles for their preparation and factors to be considered*

ISO 6707-1, *Building and civil engineering — Vocabulary — Part 1: General terms*

ISO 15686-1, *Buildings and constructed assets — Service life planning — Part 1: General principles and framework*

ISO 15686-7, *Buildings and constructed assets — Service life planning — Part 7: Performance evaluation for feedback of service life data from practice*

ISO 15686-8, *Buildings and constructed assets — Service-life planning — Part 8: Reference service life and service-life estimation*

### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1, ISO 15686-1 and the following apply.

##### 3.1.1

##### **accelerated short-term exposure**

**short-term exposure** (3.1.19) in which the **agent intensity** (3.1.5) is raised above the levels expected in service

##### 3.1.2

##### **ageing**

degradation due to long-term influence of **agents** (3.1.4) related to use

##### 3.1.3

##### **ageing exposure**

procedure in which a product is exposed to **agents** (3.1.4) believed or known to cause ageing for the purpose of undertaking/initiating a **service life prediction** (3.1.18) or comparison of relative performance

### 3.1.4

#### **agent**

whatever acts on a building or its parts to adversely affect its performance

EXAMPLE Person, water, load, heat.

### 3.1.5

#### **agent intensity**

measure of the extent to or level at which an **agent** (3.1.4) is present

NOTE In this part of ISO 15686, the term “agent intensity” refers figuratively to any quantity that conforms to the requirements for a measure, i.e. not only to UV radiation and rain intensity, etc., but also to relative humidity, SO<sub>2</sub> concentration, freeze–thaw rate and mechanical pressure, etc.

### 3.1.6

#### **component**

product manufactured as a distinct unit to serve a specific function or functions

[ISO 6707-1:2004, definition 6.1.3]

### 3.1.7

#### **degradation**

process whereby an action on an item causes a deterioration of one or more properties

NOTE Properties affected can be, for example, physical, mechanical or electrical.

[ISO 15686-8:2008, definition 3.4]

### 3.1.8

#### **degradation indicator**

deficiency which shows when a **performance characteristic** (3.1.14) fails to conform to a requirement

EXAMPLE When gloss is a performance characteristic, gloss loss is the corresponding degradation indicator. When mass (or thickness) is a performance characteristic, mass loss is the corresponding degradation indicator.

### 3.1.9

#### **dose-response function**

function that relates the dose(s) of a **degradation** (3.1.7) **agent** (3.1.4) to a **degradation indicator** (3.1.8)

### 3.1.10

#### **inspection of buildings**

performance evaluation or assessment of residual service life of building parts in existing buildings

### 3.1.11

#### **in-use condition**

any circumstance that can impact the performance of a building or other constructed asset, or a part thereof under normal use

### 3.1.12

#### **long-term exposure**

**ageing exposure** (3.1.3) under **in-use conditions** (3.1.11) and with a duration of the same order as the service life anticipated

### 3.1.13

#### **mechanism**

process causing change over time in the composition or microstructure of a component or material that can cause degradation

**3.1.14****performance characteristic**

physical quantity that is a measure of a critical property

EXAMPLE A performance characteristic can be the same as the critical property, for instance reflectance. On the other hand, if the critical property is strength, then thickness or mass can in certain cases be utilized as a performance characteristic.

**3.1.15****performance requirement****performance criterion**

minimum acceptable level of a critical property

**3.1.16****predicted service life**

service life predicted from recorded performance over time

EXAMPLE As found in service life models or ageing tests.

**3.1.17****predicted service life distribution**

probability distribution function of the **predicted service life** (3.1.16)

**3.1.18****service life prediction****SLP**

generic methodology which, for a particular or any appropriate performance requirement, facilitates a prediction of the service life distribution of a building or its parts for the use in a particular or in any appropriate environment

**3.1.19****short-term exposure**

**ageing exposure** (3.1.3) with a duration considerably shorter than the service life anticipated

NOTE A term sometimes used and related to this type of exposure programme is "predictive service life test". A predictive service life test is a combination of a specifically designed short-term exposure and a performance evaluation procedure.

**3.1.20****terminal critical property**

in an established set of critical properties for a building or a part, critical property that first fails to maintain the corresponding performance requirement when subjected to exposure in a particular service environment

**3.1.21****time acceleration factor**

number or function used to transform the results of ageing of a component(s) derived from accelerated short-term exposure testing to a predicted service life or predicted service life distribution

**3.2 Abbreviated terms**

|       |                                                    |
|-------|----------------------------------------------------|
| ESLC  | estimated service life of a component              |
| PSLDC | predicted service life distribution of a component |
| PSLC  | predicted service life of a component              |
| RSLC  | reference service life of a component              |
| SLP   | service life prediction                            |