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Title: BS ISO 15686-1 Buildings and constructed assets — Service life planning

Part 1: General principles and framework

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

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Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

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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	Commend (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 15686-1

Buildings and constructed assets — Service life planning —

Part 1: General principles and framework

ICS: 91.040.01

ISO/TC 59/SC 14

Secretariat: **BSI**

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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 rules given in the ISO/IEC Directives, Part 2. (see www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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 ISO/TC 59, *Buildings and Constructed Assets*, Subcommittee SC 14, *Service Life Planning*.

This third edition cancels and replaces the first and second editions (ISO 15686-1:2011), which has been technically revised to condense ISO 15686-1 into a more generic process of service life planning and to better reflect the other parts of ISO 15686.

The main changes are as follows:

- The relationship to the revised text in Part 1 (Concepts and Principles) and Part 3 (Methods, data and communication) as well as former parts and retained parts of ISO 15686 is indicated. Processes to do with performance audits and reviews, Reference Service Life and estimation, as well as some processes to do with Service Life Prediction are described, although the details of the methodology of these are dealt with in the revised Part 3. It covers who is involved in the processes, what is involved in the processes, and when they take place over the lifespan of the building or civil engineering works.

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

- *Part 1: General principles, concepts and framework for Service life planning*
- *Part 2: Process Considerations Part 3: Methods, data and communication*
- *Part 5: Life-cycle costing*
- *Part 7: Performance evaluation for feedback of service life data from practice*

Introduction

0.1 Service life planning

Service life planning is a design process that seeks to ensure that the service life of a building or other constructed asset will equal or exceed its design life. If required, service life planning can take into account the life-cycle cost(s) of the building and its life-cycle environmental impact(s). Service life planning provides a means of comparing different building options. During the project delivery phase, to ensure that the design meets the functional requirement levels, consideration of different conceptual design solutions can be used to assess the impact of design changes on the design life.

This part of ISO 15686 is intended primarily, but not exclusively, for the following user groups, who are also the primary actors in the processes described:

1. building owners and users;
2. design, construction and facilities management teams;
3. manufacturers who provide data on long-term performance of building products;
4. maintainers of buildings;
5. value appraisers of buildings;
6. insurers of buildings;
7. technical auditors of buildings;
8. developers of building product standards;
9. clients, funders, and sponsors of buildings.
10. users of reference service life data as inputs to assessments of sustainability such as Environmental Product Declarations (EPD's) or Life Cycle Assessment (LCA) or Life Cycle Costing (LCC).
11. Regulators of any group included in the listing above.

By requiring an estimate or prediction of how long each component of a building, or other constructed asset, will last, service life planning aids the making of decisions concerning specifications and design detailing. Also, when the service life of the building, or other constructed asset, and its components are estimated or predicted, life-cycle cost and maintenance planning as well as value engineering techniques can be applied, thereby increasing the reliability and flexibility of use of the building, or other constructed asset, and as well, reducing the likelihood of early obsolescence.

[Figure 1](#) indicates how the parts of ISO 15686 are intended to relate to each other and their associated topics.

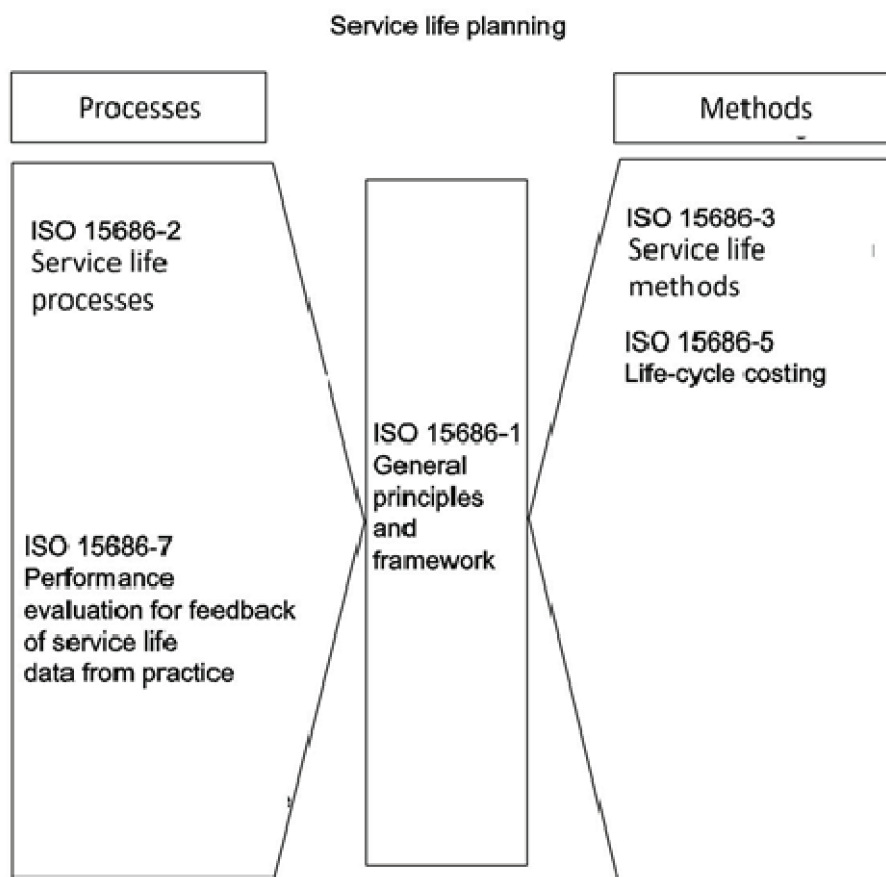


Figure 1 — Relationships between the parts of ISO 15686 and the service life planning of buildings

0.2 Structure of ISO 15686

This part of ISO 15686 specifies the general principles of service life planning of a building or other constructed asset and presents a framework for undertaking service life planning. These general principles can also be used to make decisions on maintenance and replacement requirements. ISO 15686-1 serves as a guide to other parts, including general principles to be applied. Together, they provide requirements and guidance on the estimation or prediction of the building, or constructed asset, component service life, that contribute to the service life of the building, or other constructed asset.

ISO 15686-2 provides guidance on use of service life predictions or reference service-life data and on the application of these data for the purposes of calculating estimated service life using the factor method. It does not give guidance on how to estimate the modification part or the values of factors A to G, using given reference in-use conditions and the object-specific in-use conditions. The reliability of the predicted or estimated service life will depend on the evidence it was based upon (see note 1 below).

In ISO 15686-2, the means to establish when to specify or verify functional performance requirements during the service life of buildings and civil engineering works is provided, and as well, when to check the capability of buildings and works to meet identified requirements.

Note 1 Service Life 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. These predictions form the basis of Reference Service Lives, and therefore of estimates of service life also.

This part is applicable to:

- Any scope of holdings, whether a set (or portfolio), a single building (large or small) or a facility which is part of a building (such as one group of spaces, one floor or several floors) or part of a network forming a civil engineering structure.

— To the range of roles of stakeholders, from the owners and managers to the occupants, tenants or other users.

ISO 15686-2, does not:

- Describe specific test methods.
- Cover limitation of service life due to obsolescence caused by changing performance requirements
- Consider other non-measurable or unpredictable performance states.

In ISO 15686-3, information and guidance is provided on the methods, data, and communication of service life planning of facilities and constructed assets and their components as well as the required supporting data.

The main audience is product, facility and Information managers

In this part, the structure and representation of service life data is specified. It is focused on key exchange requirements underlying four common transactions.

This document may be used for a variety of purposes, including to:

1. achieve and maintain a common understanding within the national and project contexts;
2. establish the desired outcomes and to define appropriate quality;
3. identify appropriate management effort and tools;
4. identify necessary effort and resourcing.

In ISO 15686-5, procedures are specified for performing life-cycle cost (LCC) analyses of buildings and their parts. These assessments take into account cost or cash flows, i.e., relevant costs (and income and externalities if included in the agreed scope) arising from acquisition through operation to disposal. This assessment typically includes a comparison between options or an estimate of future costs at portfolio, project or component level. The assessment is over an agreed period of analysis, which can be a time frame that is less than the full life-cycle of the constructed asset.

ISO 15686-7 provides a generic basis for performance evaluation for feedback of service life data from existing buildings, including a definition of the terms to be used and the description of how the (technical) performance can be described and documented to ensure consistency.

0.3 Purpose of ISO 15686

ISO 15686 is relevant to service life planning of new and existing buildings. In existing buildings, service life planning will apply principally to the estimation of residual service lives of components that are already in service, and to the selection of components for, and the detailing of, repairs and new work.

The informative annexes to this part of ISO 15686 provide supplementary information and illustrate the use of methods specified in the normative clauses. Differences in climatic conditions and building techniques in different parts of the world require separate aspects of service life planning to be developed for specific circumstances, and to take account of locality and microclimate.

NOTE 1 The approach to service life planning presented in ISO 15686 is based on documents published by CIB and RILEM, standards published in the UK, Japan, Canada and the USA, and on practical studies carried out in many countries.

NOTE 2 In the European Community, the Construction Products Directive includes a requirement that the “essential requirements” of construction products be retained for an “economically reasonable working life”, if necessary by maintenance.

Buildings and constructed assets — Service life planning —

Part 1: General principles and framework

1 Scope

This part of ISO 15686 identifies and establishes general principles for service life planning and a systematic framework for undertaking service life planning of other constructed assets, throughout its life cycle (or remaining life cycle other constructed assets).

The life cycle incorporates initiation, project definition, design, construction, commissioning, operation, maintenance, refurbishment, replacement, deconstruction and ultimate disposal, recycling or re-use of the asset (or parts thereof), including its components, systems and building services.

This part of ISO 15686 is applicable to the service life planning of individual constructed assets.

NOTE A series of service life plans can be used as input data to the strategic property management of a number of buildings, or other constructed assets.

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 6707-1, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

ISO 15686-3, *Building and civil engineering works – Service Life Planning – Part 2 Process Considerations*

ISO 15686-3, *Building and civil engineering works – Service Life Planning – Part 3 Methods, data and communication*

ISO 15686, *Buildings and constructed assets — Service life planning*

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

3 Terms and definitions

As part of ISO 15686, a complete set of the specific terms and definitions of concepts that have been compiled in this Clause, have been applied and standardized in the documents developed to date under ISO/TC 59/SC 14 related to design life and service life planning in buildings and other types of constructed assets. The terms and definitions, and related abbreviations, in this Clause are for concepts that have been standardized and/or applied through publication of individual parts of ISO 15686 within ISO/TC 59/SC 14.¹⁾

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

1) The preamble to ISO 15686/TR Part-11, Terminology, can be found in the Appendix D.

3.1

3.1.1

accelerated short-term exposure

short-term exposure ([3.1.119](#)) in which the *agent intensity* ([3.1.6](#)) is raised above the levels expected in service

[SOURCE: ISO 15686-2:2012, 3.1.1]

3.1.2

acquisition cost

all costs included in acquiring an asset (3.1.7.1) (3.1.7.2) by purchase/lease or construction procurement (ISO 10845-1:2010, 3.30) route, excluding costs during the occupation and use or end-of-life phases of the *life cycle* ([3.1.60](#)) of the *constructed asset* ([3.1.15](#))

[SOURCE: ISO 15686-5:2008, 3.1.1]

3.1.3

ageing

degradation ([3.1.17](#)) due to long term influence of *agents* ([3.1.5](#)) related to use

[SOURCE: ISO 15686-2:2012, 3.1.2]

3.1.4

ageing exposure

procedure in which a product (ISO 6707-1:2014, (6.1.2) ([3.1.92](#)) is exposed to *agents* ([3.1.5](#)) believed or known to cause *ageing* ([3.1.3](#)) for the purpose of undertaking/initiating a *service life prediction* ([3.1.117](#)) or comparison of relative *performance* ([3.1.78.1](#)) ([3.1.78.2](#))

[SOURCE: ISO 15686-2:2012, 3.1.3]

3.1.5

agent

whatever acts on a building (ISO 6707-1:2014, (3.1.3) ([3.1.10](#)) or its parts to adversely affect its *performance* ([3.1.78.1](#)) ([3.1.78.2](#))

EXAMPLE Person, water load, heat.

[SOURCE: ISO 15686-2:2012, 3.1.4]

3.1.6

agent intensity

measure (ISO 6707-1:2014, 9.1.7) of the extent to or level at which an *agent* ([3.1.5](#)) is present

Note 1 to entry: In ISO 15686-2, 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, SO₂ concentration, freeze–thaw rate and mechanical pressure, etc.

[SOURCE: ISO 15686-2:2012, 3.1.5]

3.1.8

availability

period(s) during which a *facility* ([3.1.37](#)) or service is serviceable

[SOURCE: ISO 15686-3:2002, 4.11]

3.1.9

behaviour in service

how a whole building (ISO 6707-1:2014, (3.1.3) ([3.1.10](#)), structure (ISO 6707-1:2014, 3.1.4) or unit of construction works (ISO 6707-1:2014, 3.1.1) , or a system or *component* ([3.1.13](#)) or part thereof actually functions in its intended place and use

[SOURCE: ISO 15686-10:2010, 3.2]

3.1.10 building

construction works (ISO 6707-1:2014, (3.1.1)) that has the provision of shelter for its occupants or contents as one of its main purposes and is usually enclosed and designed to stand permanently in one place

[SOURCE: ISO 15686-1:2011, 3.1]

3.1.11 capital cost

initial construction costs (ISO 6707-1:2014, 9.3.85) and the costs of initial adaptation where these are treated as capital expenditure

Note 1 to entry: The capital cost may be identical to the *acquisition cost* ([3.1.2](#)) if initial adaptation costs are not included.

[SOURCE: ISO 15686-5:2008, 3.1.2]

3.1.12 client

<construction> person or organization responsible for initiating and financing a project, and approving the brief

Note 1 to entry: Adapted from ISO 6707-1:2014, definition 8.3.

Note 2 to entry: In some countries, the role and qualification of “construction client” is defined by law and regulation, according to the scope and complexity of a project (see Reference [43]).

[SOURCE: ISO 15686-10:2010, 3.3]

3.1.13 component

product (ISO 6707-1:2014, 6.1.2) manufactured as a distinct unit to serve a specific *function* ([3.1.43](#)) or functions

[SOURCE: ISO 6707-1:2014, 6.1.3]

3.1.14 consequence degree

expression of the seriousness of consequences in relation to a defined reference level

[SOURCE: ISO 15686-7:2006, 3.1]

3.1.15 constructed asset

anything of value that is constructed or results from construction operations, e.g., whole building (ISO 6707-1:2014, (3.1.3) ([3.1.10](#)), structure (ISO 6707-1:2014, 3.1.4) or unit of construction works (ISO 6707-1:2014, 3.1.1), or a system or *component* ([3.1.13](#)) or part thereof

[SOURCE: ISO 15686-1:2011, 3.2; ISO 15686-5:2008, 3.4.1; ISO 15686-10:2010, 3.1]

3.1.16 data record

set of *reference service life data* ([3.1.102.1](#)) ([3.1.102.2](#)) ([3.1.102.3](#)) compiled into a prescribed format

[SOURCE: ISO 15686-8:2008, 3.1]

3.1.17 degradation

process whereby an action on an item causes a deterioration of one or more properties (ISO 6707-1:2014, 9.1.3)

Note 1 to entry: Properties affected may/can be, for example, physical, mechanical or electrical.

[SOURCE: ISO 15686-8:2008, 3.4]

3.1.18

degradation indicator

deficiency which shows when a *performance characteristic* ([3.1.80.1](#)) ([3.1.80.2](#)) 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.

[SOURCE: ISO 15686-2:2012, 3.1.8]

3.1.19

demand

<of a facility> requirement for *functional performance* ([3.1.44](#))

[SOURCE: ISO 15686-10:2010, 3.5]

3.1.20

design life DL

DEPRECATED: intended service life DEPRECATED: expected service life *service life* ([3.1.113.1](#)) ([3.1.113.2](#)) intended by the designer

Note 1 to entry: As stated by the designer to the *client* ([3.1.12](#)) to support specification decisions.

[SOURCE: ISO 15686-1:2011, 3.3]

3.1.21

design option

one of several product (ISO 6707-1:2014, 6.1.2) ([3.1.92](#)) alternatives that is a candidate for inclusion into the design, including *functionality* ([3.1.46](#)) and service provided

[SOURCE: ISO 15686-6:2004, 3.2]

3.2.22

design team

individuals involved in the decision-making process affecting the *service life* ([3.1.113.1](#)) ([3.1.113.2](#)) of the *constructed asset* ([3.1.15](#))

[SOURCE: ISO 15686-6:2004, 3.3]

3.1.23

detailed design

drawings (ISO 6707-1:2014, 7.2.10) , data, calculations and specifications from which constructed works, *components* ([3.1.13](#)) and assemblies (ISO 6707-1:2014, 5.5.5) can be constructed

[SOURCE: ISO 15686-3:20 02, 4.5]

3.1.24

discount rate

factor or rate reflecting the *time value of money* ([3.1.127](#)) that is used to convert cash flows occurring at different times to a common time

Note 1 to entry: This can be used to convert future values to present-day values and vice versa.

[SOURCE: ISO 15686-5:2008, 3.3.1]

3.1.25

discounted cost

resulting cost when the *real cost* ([3.1.96](#)) is discounted by the *real discount rate* ([3.1.97](#)) or when the *nominal cost* ([3.1.71](#)) is discounted by the *nominal discount rate* ([3.1.72](#))

[SOURCE: ISO 15686-5:2008, 3.1.3]

3.1.26.1 disposal

<status change> transfer of ownership of, or responsibility for, the object of consideration

[SOURCE: ISO 15686-10:2010, 3.6]

3.1.26.2 disposal

<end of life> transformation of the state of a building (ISO 6707-1:2014, 3.1.3) ([3.1.10](#)) or *facility* ([3.1.37](#)) that is no longer of use

Note 1 to entry: Transformation can include, either individually or in some combination, the decommissioning, deconstruction, recycling and demolition of the object of consideration.

[SOURCE: ISO 15686-10:2010, 3.7]

3.1.27 disposal cost

costs associated with *disposal* ([3.1.26.1](#)) ([3.1.26.2](#)) of the asset (3.1.7.1) (3.1.7.2) at the end of its *life cycle* ([3.1.60](#)), including taking account of any asset transfer obligations

Note 1 to entry: Asset transfer obligations could include bringing the assets up to a predefined condition.

Note 2 to entry: Income from selling the asset is part of *WLC* ([3.1.133](#)), where the *residual value* ([3.1.109](#)) of the building *components* ([3.1.13](#)), materials (ISO 6707-1:2014, 6.1.1) and appliances can be included.

[SOURCE: ISO 15686-5:2008, 3.1.4]

3.1.28 dose-response function

function that relates the dose(s) of a *degradation* ([3.1.17](#)) *agent* ([3.1.5](#)) to a *degradation indicator* ([3.1.18](#))

[SOURCE: ISO 15686-2:2012, 3.1.9]

3.1.29 end-of-life cost

net cost or fee for disposing of an asset (3.1.7.1) (3.1.7.2) at the end of its *service life* ([3.1.113.1](#)) ([3.1.113.2](#)) or interest period, including costs resulting from decommissioning, deconstruction and demolition of a building (ISO 6707-1:2014, 3.1.3) ([3.1.10](#)), recycling, making environmentally safe and recovery and *disposal* ([3.1.26.2](#)) of *components* ([3.1.13](#)) and materials (ISO 6707-1:2014, 6.1.1), and transport and regulatory costs

[SOURCE: ISO 15686-5:2008, 3.1.5]

3.1.30 environment

natural, man-made or induced external and internal conditions that may influence *performance* ([3.1.78.1](#)) ([3.1.78.2](#)) and use of a building (ISO 6707-1:2014, 3.1.3) ([3.1.10](#)) and its parts

[SOURCE: ISO 6707-1:2014, 10.3, modified — to also apply to internal conditions and to remove reference to civil engineering works.]

3.1.31 environmental aspect

element of an organization's (ISO 14050:2009, 3.4) activities or products (ISO 14050:2009, 6.2) ([3.1.92](#)) or services that can interact with the environment (ISO 14050:2009, 3.1) ([3.1.30](#))

[SOURCE: ISO 14001:2004, 3.6, modified — to remove the Note.]

3.1.32**environmental impact**

any change to the environment (ISO 14050:2009, 3.1) [\(3.1.31\)](#), whether adverse or beneficial, wholly or partially resulting from an organization's (ISO 14050:2009, 3.4) *environmental aspects* [\(3.1.31\)](#)

[SOURCE: ISO 14001:2004, 3.7]

3.1.33**escalation rate**

positive or negative factor or rate reflecting an estimate of differential increase/decrease in the general price level for a particular commodity, or group of commodities, or resource

Note 1 to entry: An escalation rate is derived by tracking the change in price over time of a single commodity, or group of commodities or resource, which might or might not be one of the items in the typical "basket" of goods that is used to derive a general *inflation/deflation* [\(3.1.49\)](#) factor.

[SOURCE: ISO 15686-5:2008, 8, 3.3.2]

3.3.2**escalation rate**

positive or negative factor or rate reflecting an estimate of differential increase/decrease in the general price level for a particular commodity, or group of commodities, or resource

Note 1 to entry: An escalation rate is derived by tracking the change in price over time of a single commodity, group or commodities or resource, which might or might not be one of the items in the typical "basket" of goods that is used to derive a general inflation/deflation factor.

3.1.34**estimated service life / ESL**

service life [\(3.1.113.1\)](#) [\(3.1.113.2\)](#) that a building (ISO 6707-1:2014, 3.1.3) [\(3.1.10\)](#) or parts of a building would be expected to have in a set of specific *in-use conditions* [\(3.1.53.1\)](#) [\(3.1.53.2\)](#) [\(3.1.53.3\)](#), determined from the *reference service life data* [\(3.1.102.1\)](#) [\(3.1.102.2\)](#) [\(3.1.102.3\)](#) after taking into account any differences from the *reference in-use conditions* [\(3.1.100\)](#)

[SOURCE: ISO 15686-1:2011, 3.7]

3.1.35**external costs**

costs associated with an asset (3.1.7.1) [\(3.1.7.2\)](#) that are not necessarily reflected in the transaction costs between provider and consumer and that, collectively, are referred to as *externalities* [\(3.1.36\)](#)

Note 1 to entry: These costs may include business staffing, productivity and *user* [\(3.1.131\)](#) costs; these can be taken into account in a *LCC* [\(3.1.62\)](#) analysis but should be explicitly identified.

[SOURCE: ISO 15686-5:2008, 3.1.6]

3.1.36**externality**

quantifiable cost or benefit that occurs when the actions of organizations and individuals have an effect on people other than themselves

EXAMPLE Non-construction costs, income and wider social and business costs.

Note 1 to entry: Externalities are positive if their effects are benefits to other people and negative, or *external costs* [\(3.1.35\)](#), if the external effects are costs on other people. There may be external costs and benefits from both production and consumption. Adding the externality to the private cost/benefit, the total social cost or benefit.

[SOURCE: ISO 15686-5:2008, 3.4.2]