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## Library objects for architecture, engineering, construction and use

*Objets de bibliothèque pour l'architecture, l'ingénierie, la construction  
et l'utilisation*

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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 editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://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](http://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 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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 8, *Construction documentation*.

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](http://www.iso.org/members.html).

# Introduction

## 0.1 General

This document describes best practice for the development and application of library objects to support building information modelling (BIM) based design, specification and construction processes, including giving additional recommendations for specific use-cases such as assemblies.

The objective has been to develop an international standard giving principles and definitions for the symbolic and simplified visual presentation of library objects in connection with BIM, and their organization into libraries.

## 0.2 Purpose and justification

The purpose of this document is to offer a persistent standard for developers, library providers, designers and manufacturers, to improve the exchange and reuse of library objects.

Library objects and their corresponding graphical symbols (symbols) are today commonly provided in digital format by BIM authoring software. Traditional paper-based methods for symbols have therefore become less useful and are in some cases outdated. Several national standards have even been withdrawn due to lack of maintenance and conflicting international standards. Still, documentation of complex entities like buildings and civil engineering works requires clear and uniform presentation so as to be legible and easily understood. Library objects, by combining properties, shape and symbols, offer scope for greater accuracy and efficiency.

Current technology gives the opportunity to adjust the views of library objects (content and visual presentation) to the many purposes that occur during the lifecycle of a building information model, and to connect symbol graphics to library objects. This document is intended to give a framework for the presentation of model objects, with respect to those purposes, and also the structuring of symbols into symbol libraries.

## 0.3 Relationship to other standards

The increased adoption of data dictionaries, along with ISO 23386 and ISO 23387, is expected to facilitate the preparation of properties for the non-graphic aspects of library objects.

The EN 17412 series focuses on the specification of the level of information need for project deliverables, whereas this document is intended to support the preparation of libraries outside of any individual project.

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# Library objects for architecture, engineering, construction and use

## 1 Scope

This document gives requirements for defining format and content for library objects to support project inception, brief, design, tendering, construction, operations, use and demolition, supporting the development of information throughout the process, giving principles and definitions for the symbolic and simplified visual presentation of objects in connection with building information modelling (BIM) and their organization into libraries. It is intended for all professionals and service providers using generic and product-specific data, supporting the development of information throughout the process.

A library object is intended for reuse within project teams and across organizations. This serves to improve accuracy and constructability of designs, and to improve the handover of information through the supply chain to the owner or operator. Objects and their corresponding graphical symbols are today commonly provided in digital format. Objects combining properties, shape and symbols offer scope for greater accuracy and efficiency.

This document:

- establishes requirements for defining template objects, generic objects and product objects in data-driven library and design processes;
- establishes requirements for symbols and other graphic conventions for use on drawings for the construction industry. It also describes a rationale of symbolism which establishes rules for the design of symbols and other graphic conventions, and gives recommendations for the application of those rules and the ways in which symbolism should be used;
- covers purposes for characterizing the shape and measurement of library objects;
- covers purposes for specifying and assessing properties for library objects. It defines the information appropriate for specific uses including specification of the desired outcome (typically by designers and engineers) and the selection of identified products (typically by contractors and subcontractors). It also gives recommendations for the application of assemblies in integrated BIM working.

This document is intended for all professionals and service providers who produce and use library objects with generic and product-specific data. This group includes, but is not limited to, product manufacturers and suppliers, library authors, designers and engineers, contractors, owners, maintainers and commissioners.

## 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 13567-1, *Technical product documentation — Organization and naming of layers for CAD — Part 1: Overview and principles*

ISO 13567-2, *Technical product documentation — Organization and naming of layers for CAD — Part 2: Concepts, format and codes used in construction documentation*

ISO/TS 15926-4, *Industrial automation systems and integration — Integration of life-cycle data for process plants including oil and gas production facilities — Part 4: Initial reference data*

ISO 16739-1, *Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries — Part 1: Data schema*

ISO 80000-1, *Quantities and units — Part 1: General*

### 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/>

#### 3.1

##### library object

##### type object

representation of an object, being maintained as part of a collection with common features

Note 1 to entry: A library object can be a template object, generic object or product object.

Note 2 to entry: A library object is independent of any occurrence and has no placement in space.

Note 3 to entry: A library object may be referred to as a type object or class.

Note 4 to entry: See [Figure 1](#).

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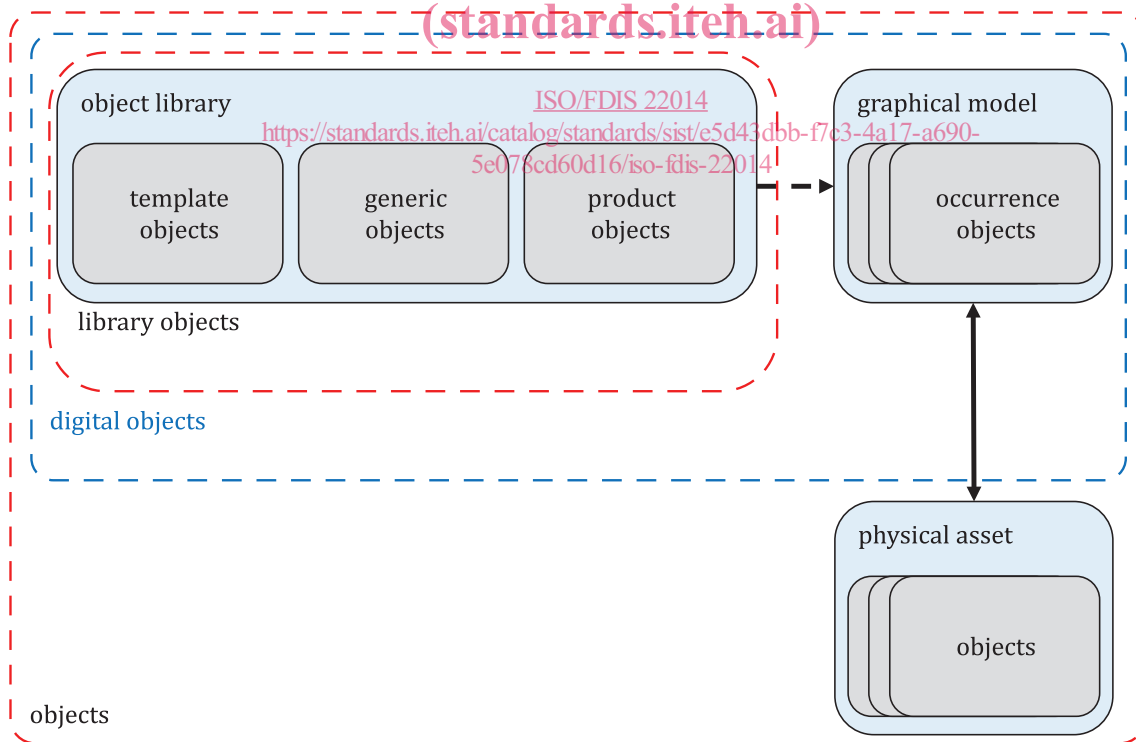


Figure 1 — Relationship between library objects

### 3.2 template object

*library object* (3.1) used as a guide to produce *generic objects* (3.3) and *product objects* (3.4)

Note 1 to entry: A template object typically provides schedules of classification values and a minimum set of properties. The measurement type (e.g. “area”) of properties (e.g. “effective area”) are specified, but the values and units (e.g. “0,300” and “m<sup>2</sup>”) are not.

Note 2 to entry: Data templates containing recommended properties and set(s) of properties could be available to support the development of template objects.

### 3.3 generic object

*library object* (3.1) used as a generalization

Note 1 to entry: A generic object is intended for use prior to being resolved into a product.

Note 2 to entry: Typically, shape and symbols will be provided and some property values with units.

### 3.4 product object

*library object* (3.1) used to represent a product

### 3.5 occurrence object

instance of a specific *library object* (3.1) that realizes a library object class

Note 1 to entry: Occurrence objects are part of a model of a built asset.

### 3.6 graphical symbol

visually perceptible figure with a particular meaning used to transmit information independently of language

Note 1 to entry: Typically, a symbol is a graphic entity without scale, used:

- a) on a drawing to indicate the occurrence and/or location of an *occurrence object* (3.5);
- b) in an annotation to indicate one or more of the *properties* (3.9) of a *library object* (3.1).

[SOURCE: ISO 22727:2007, 3.1, modified — Note 1 to entry added.]

### 3.7 graphical symbol element

part of a *graphical symbol* (3.6) with a particular meaning

[SOURCE: ISO 22727:2007, 3.5]

### 3.8 assembly

set of related types or components attached to each other

Note 1 to entry: Typically, an assembly is a partial model where both the overall assembly and the constituent parts are managed during design, construction or use, and the constituent parts are located relative to the overall assembly.

[SOURCE: ISO 6707-1:2017, 3.3.5.5, modified — “types or” and Note 1 to entry added.]

### 3.9 property

feature or quality of an object

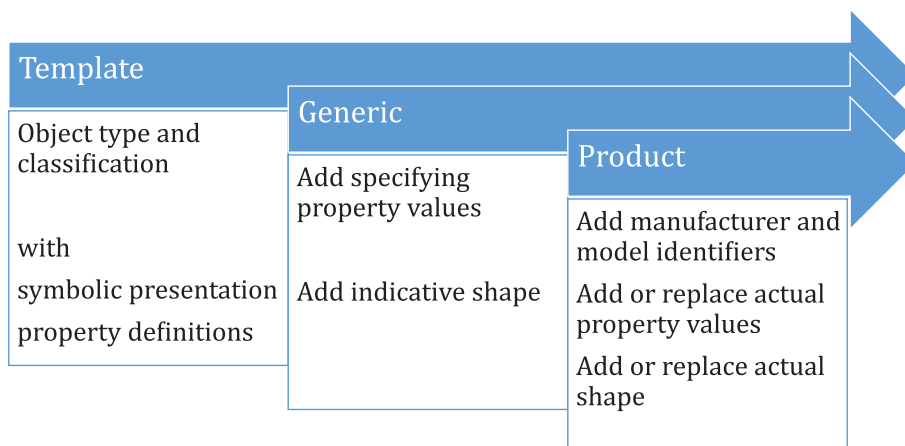
[SOURCE: ISO 6707-1:2017, 3.7.1.3, modified]

## 4 Applications

### 4.1 General

Library objects shall support the entire life cycle of the virtual representation of the built assets, including buildings and infrastructure.

Use of consistent template, generic and product objects can add efficiency and reduce risks associated with data loss or misinterpretation. See [Figure 2](#).



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**Figure 2 — Library objects upgrade processes**  
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### 4.2 Template objects

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Template objects shall be: <https://standards.iteh.ai/catalog/standards/sist/e5d43dbb-f7c3-4a17-a690-5e078cd60d16/iso-fdis-22014>

- created and shared, to guide library developers;
- used to illustrate best practice, define expectations for completeness and test generic and product library objects.

Template objects provide guidance for developers of generic objects and product objects and should contain only identification information and, wherever possible, properties without value. Shape and symbolic presentations are optional. Priority should be given to template objects created by international and regional bodies, professional and trade associations and other consensus-based bodies.

### 4.3 Generic objects

Generic objects shall be:

- based on published template objects where available;
- created and shared for example by application vendors and in-house application support teams;
- used from the earlier stages of design and specification;
- replaced with or upgraded to product objects when decided.

NOTE Generic objects support initial design and engineering, and so contain at least identification and specifying information to support the later selection of product library objects.

## 4.4 Product objects

### 4.4.1 General

Product objects shall be:

- based on published generic objects where available;
- created and shared by manufacturers and third parties;
- used to validate design intent;
- used as the basis for quantification and electronic procurement;
- used to document as-installed information to support operations, maintenance and replacement;
- able to support economic, functional and environmental assessments.

NOTE Product objects support the remaining stages of the project and asset lifecycle by representing procured products and materials.

### 4.4.2 Catalogue product objects

Catalogue product objects, representing a specific product with fixed properties, available from a catalogue, shall be designed to be:

- downloaded and used directly by applications;
- associated to unique product identifiers.

NOTE Catalogue product objects represent off-the-shelf products and commodity materials.

### 4.4.3 Parametric series product objects

Parametric series product objects, representing a controlled range or series of generic or product objects with variable properties, shall be designed to be:

- downloaded and configured to suit the design and engineering requirements;
- associated to unique series identifiers.

NOTE Parametric series product objects represent configurable variants defined in standards and manufacturers' catalogues.

### 4.4.4 Engineered-to-order product objects

Engineered-to-order product objects, representing a specific product, either as a requirement specification or a resolved solution that can be manufactured, shall be designed to be:

- downloaded and configured to document design and engineering requirements;
- used as the basis for requests for engineered solutions from suppliers and manufacturers;
- upgraded to engineered solutions supplied by a supplier/manufacturer.

NOTE Engineered-to-order product objects represent specified configurations which are then substituted by specific solutions provided by a manufacturer.

## 5 Principles

Library objects shall support use for the following purposes:

- identification of the product, its physical and virtual source, its classification and type (see [Clauses 4 and 6](#)) and its representation in schedules and quantity take-offs;
- use in the production of conventional drawings and projections (see [Clause 7](#));
- use in 3D projections, spatial coordination/clash detection, use simulation and visualizations, quantity take-off (see [Clause 8](#));
- use in specification, estimating and functional, environmental and economic analysis (see [Clause 9](#));
- use in assemblies where relevant (see [Clause 10](#)).

The information provided for these purposes shall be consistent and non-conflicting, and minimal but sufficient for the anticipated purposes. The library object, its symbols, shape and properties shall be associated to a consistent system of units of measure.

Where applicable, library objects shall correspond to real-world objects containing the information known and considered relevant at the current stage and purposes of the process. Predefined levels of detail, measurement and properties shall be considered so as to specify the relevance of the supplied information with respect to its purpose within a specific period of its lifecycle.

As far as possible, library objects should be created independent of the project stage or specific purposes, other than the generic to product upgrade process which may occur at any project stage.

Library objects shall have information associated so as to be selectable from the library by applying a value filter, using classification or other properties.

Occurrences of library objects shall have information associated so as to be selectable from the model by applying a value filter, using classification or other properties.

**NOTE** Any representation of a real-world (physical) object consists of a set of data corresponding to it. The same applies to any other (intangible) phenomenon which needs to be represented in a model-based construction process. The information in the library object is always a subset of the potential complete description of the object, containing a number of properties that are perceived. In most cases, the properties are a subset adapted to the intended use of the information.

Presentations in the form of text, drawings, images or other forms shall be derived from the library objects to be viewed on screen or printed.

Specific content requirements may be tested using an information delivery manual (IDM), according to ISO 29481-1.

## 6 Identification and origination of library objects

### 6.1 General

To ensure a qualitative and persistent exchange and reuse of library objects, aspects such as structure, format, object definition, identification, origination, classification and occurrence information should be addressed.

### 6.2 Format

A library object shall be published in a format that enables the transfer of information, both human and machine-readable.

### 6.3 Object definition

A library object shall be characterized to ensure that the object is unambiguously defined by choosing a type object and predefined type from the Industry Foundation Classes (IFC) schema as specified in ISO 16739-1.

If an appropriate IFC type is not available the (Ifc)BuildingElement(ProxyType), a user-defined predefined type or both may be used.

NOTE An example of a type object and predefined type could be "(Ifc)LightFixture(Type)" and "PointSource".

### 6.4 Identification

#### 6.4.1 Introduction

The library object shall be clearly named to aid identification and selection.

NOTE There could also be a need to identify each occurrence of an object. There are systematic approaches for identification, with the aim of ensuring that each object is uniquely identifiable. Relevant international standards for identification and reference designations of such occurrences are the ISO 4157 series and the IEC 81346 series, respectively.

#### 6.4.2 General

The library object shall be uniquely named and described.

NOTE 1 Maintaining identification information for a library object enables increased accuracy and repeatability for subsequent processes. A library object file might also have to conform to operating system file naming limitations.

The following characters may be used in names based on the Latin alphabets:

[A-Z] [a-z] [0-9] \_ -

Some applications, operating systems and information exchange formats do not accept or handle other characters or will interpret some of them with a specific meaning. The following characters are examples that should not be used in names:

— , . ! " £ \$ % ^ & \* ( ) { } [ ] + = < > : ? | \ / @ ' ~ # ~ ` `

NOTE 2 Other alphabets or character sets could have similar conventions. See [Annex B](#) on localization.

The \_ (underscore, Unicode U+005F) character shall be used as a delimiter to separate fields forming a hierarchical sequence where each field is of increasing specialization.

The - (minus, Unicode U+2212) character may be used where the separated fields do not form a hierarchical sequence.

#### 6.4.3 Naming (file and object)

##### 6.4.3.1 General

The same name shall be used for library objects and their file representation where possible, unless the file contains multiple library objects.

##### 6.4.3.2 Composition of names

The library object shall be named to identify the origination (source and/or manufacturer), object type and product or subtype, see [Figure 3](#) and [Table 1](#).