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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

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This document was prepared by Technical Committee ISO/TC 10, *Technical product documentation*, Subcommittee SC 8, *Construction documentation*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 442, *Building Information Modelling (BIM)*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

## 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, construction and operational processes, including giving additional recommendations for specific use cases such as assemblies.

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 in a digital format combining properties, shape and graphical symbols offer scope for greater accuracy and efficiency.

This document includes 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 standard for developers, library providers, designers and manufacturers to improve the exchange and reuse of library objects.

Library objects and their corresponding graphical symbols are now commonly provided in a digital format by model authoring software. Traditional paper-based methods for graphical symbols have therefore become less useful and are in some cases outdated. Several national standards have been withdrawn due to lack of maintenance and conflicting International Standards. Still, documentation of complex entities such as buildings and civil engineering works requires clear and uniform presentation so as to be legible and easily understood. This document is intended to give a framework for the presentation of library objects, with respect to those purposes, and also the structuring of graphical symbols into libraries.

Library objects, by combining properties, shape and graphical 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 life cycle of a information model and to connect symbol graphics to library objects.

## 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 data templates with properties for the non-graphical aspects of library objects and ISO 7817-1 to facilitate specifying the level of information need for geometrical and alphanumerical information and documentation.

The ISO 7817-1 concepts and principles can be applied for a general information exchange and, while in progress, for a generally agreed way of information exchange between parties in a collaborative work process, as well as for an appointment with specified information delivery. Therefore, ISO 7817-1 concepts and principles support the preparation of libraries outside of any individual project and are applied in this document.

This document recommends that ISO 16739-1 is used as a basis for the naming of objects.

Project and asset information references provided by the appointing party, such as object libraries, are covered in ISO 19650-2:2018, 5.1.6, and ISO 19650-3:2020, 5.1.8.

Guidance on graphical presentation for specific types of objects is provided by ISO 7519-1.

# Library objects for architecture, engineering, construction and use

## 1 Scope

This document specifies requirements for defining structure 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, in connection with building information modelling (BIM) and the organization of the objects into libraries.

This document does the following:

— Establishes requirements for defining template objects, generic objects and product objects in data-driven library and design processes.

— Establishes requirements for graphical symbols and other graphic conventions for use on drawings for the built environment, giving principles and definitions for the symbolic and simplified visual presentation of objects. It also describes a rationale of symbolism which establishes rules for the design of graphical symbols and other graphic conventions and gives recommendations for the application of those rules and the ways in which symbolism should be used.

— Defines the purposes of characterizing the shape and measurement of library objects.

— Defines the purposes of 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.

— Refers to the Industry Foundation Classes (IFC) schema as a common object model.

This document is applicable to all professionals and service providers who produce and use library objects with generic and product-specific information. 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 16739-1, *Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries — Part 1: Data schema*

ISO 23386, *Building information modelling and other digital processes used in construction — Methodology to describe, author and maintain properties in interconnected data dictionaries*

ISO 23387, *Building information modelling (BIM) — Data templates for construction objects used in the life cycle of built assets — Concepts and principles*

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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://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* (3.2), *generic object* (3.3) or *product object* (3.4).

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 can be referred to as a type object or class.

Note 4 to entry: See Figure 1.

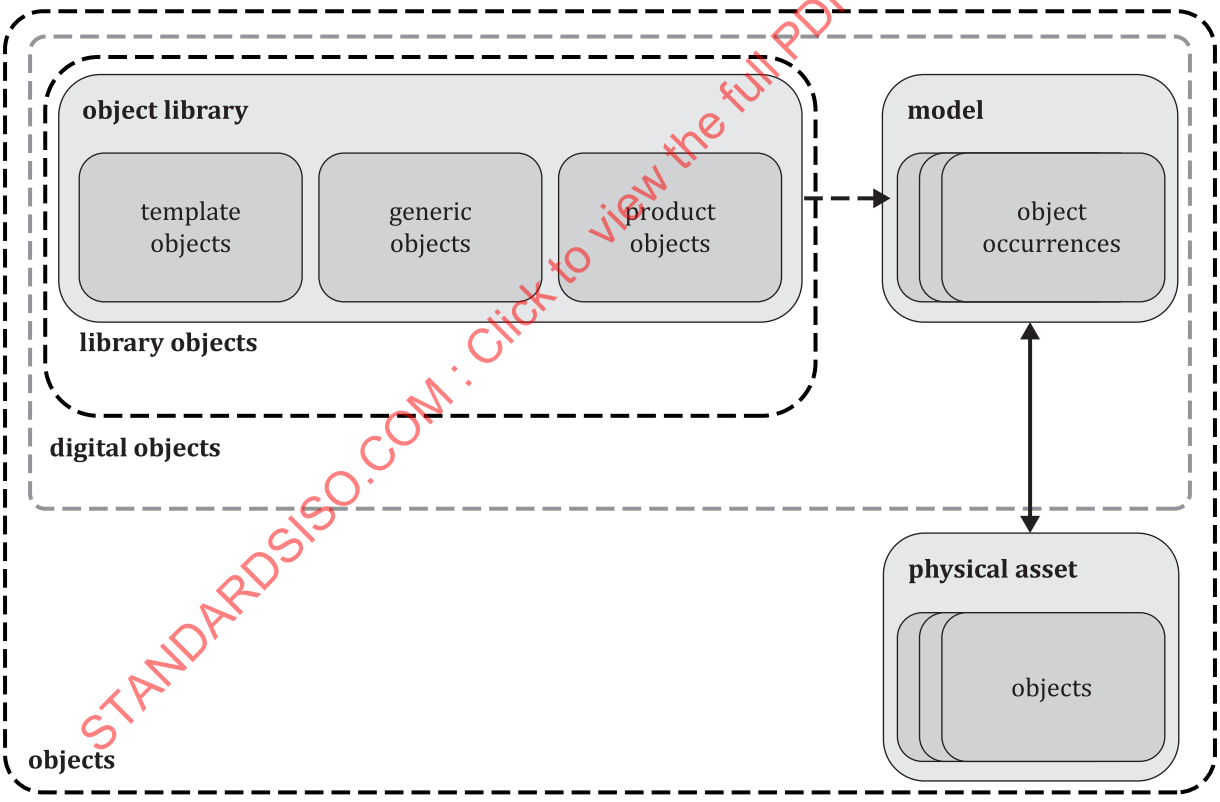



**Figure 1 — Relationship between library objects**

**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 “$m^2$”) are not.

Note 2 to entry: Data templates containing recommended properties and set(s) of properties can 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* (3.5).

Note 2 to entry: Typically, shape and *graphical symbols* (3.6) will be provided and some property values with units.

**3.4**
**product object**
*library object* (3.1) used to represent a *product* (3.5)

Note 1 to entry: A product object is specific to a manufacturer and model identity.

**3.5**
**product**
item manufactured or processed for incorporation into construction works

[SOURCE: ISO 6707-3:2022, 3.3.1, modified — Admitted term "construction product" deleted. Note 1 to entry deleted.]

**3.6**
**graphical symbol**
visually perceptible figure with a particular meaning used to transmit information independently of language

Note 1 to entry: The graphical symbol may represent objects of interest, such as *products* (3.5), functions or requirements for manufacturing, quality control, etc.

Note 2 to entry: A graphical symbol is not to be confused with the *simplified representation* (3.10) of products which is normally drawn to scale and which can look like a graphical symbol.

Note 3 to entry: Typically, a graphical symbol is a graphic entity independent of scale, used:

a) on a drawing to indicate the occurrence and/or location of a *library object* (3.1);

b) in an annotation to indicate one or more of the *properties* (3.9) of a library object.

[SOURCE: ISO 81714-1:2010, 3.1, modified — Note 3 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 6707-1:2020, 3.3.5.5, modified — "types or" and Note 1 to entry added.]

**3.9**
**property**
data element for the computer-sensible description of a property, a relation or a class

**3.10**
**simplified representation**
representation drawn in accordance with the valid rules of projection and on which individual elements of the *product* (3.5) are not shown, provided this does not present difficulties in understanding the drawing

[SOURCE: ISO/TS 128-71:2010, 3.2]

# 4 Applications

## 4.1 General

Library objects shall support the entire life cycle of the digital representation of the asset.

Use of consistent template, generic and product objects can add efficiency and reduce risks associated with information loss or misinterpretation. See Figure 2 for an example upgrade process.

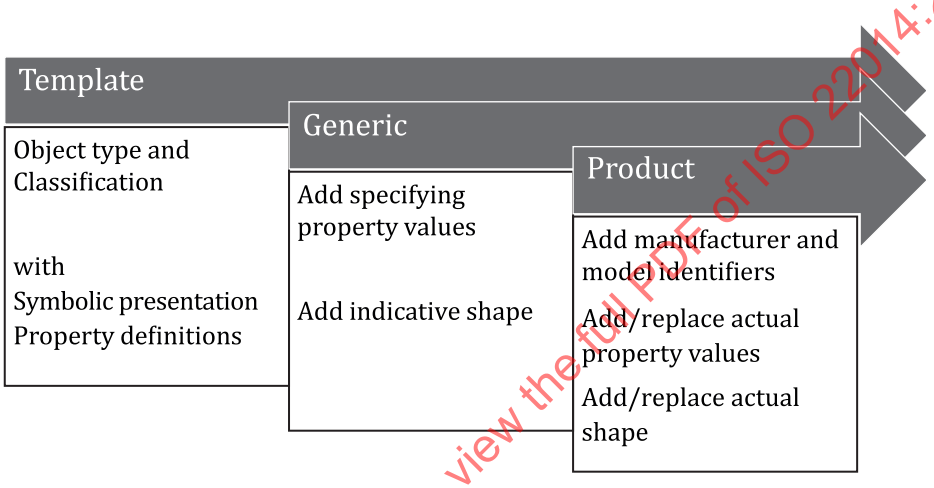



**Figure 2 — Example of upgrading a library object**



## 4.2 Template objects

Template objects shall be:

— 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, in particular those which conform to ISO 23386, ISO 23387 and ISO 12006-3.

## 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;

— used to answer the level of information need of each information deliverable according to its purpose;

— 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 procurement;

— used to document as-installed information to support operations, maintenance and replacement;

— used to answer the level of information need of each information deliverable according to its purpose:

— able to support economic, functional and environmental assessments.

NOTE 1 Product objects support the remaining stages of the project and built asset life cycle by representing procured products and materials.

NOTE 2 Data templates for environmental product declarations are specified in ISO 22057.

### 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:

— accessed 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:

— accessed and configured to suit the level of information need of each information deliverable according to its purpose during the entire life cycle;

— 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:

— accessed and configured to document the level of information need of each information deliverable according to its purpose during the entire life cycle;

— used as the basis for requests for engineered solutions from suppliers and manufacturers;

— upgraded to engineered solutions supplied by a supplier or 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 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 or 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 shall be of sufficient quality for these purposes; it shall be consistent and non-conflicting, and minimal but sufficient for the anticipated purposes. The library object, its graphical 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. The amount of information will increase during the life cycle stages. 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 life cycle.

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 can 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 1 Any representation of a real-world (physical) object consists of a set of information 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.

NOTE 2 Specific content requirements can be tested using an information delivery manual (IDM), in accordance with ISO 29481-1.

NOTE 3 The ISO 16757 series includes recommendations for building services components.

# 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 data format, object definition, identification, origination, classification and occurrence information should be addressed.

NOTE See Table A.1 for examples.

## 6.2 Data format

A library object shall be published in a data 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 IFC schema as specified in ISO 16739-1.

If an appropriate IFC entity is not available, the (Ifc)BuildingElement(ProxyType) may be used. If an appropriate IFC PredefinedType is not available, the library object shall be typed as USERDEFINED and the ObjectType attribute may be used instead.

NOTE 1 An example of a type object and predefined type is "(Ifc)LightFixture(Type)" and "PointSource".

NOTE 2 Authors can notify buildingSMART International about any difficulties with the IFC schema.

## 6.4 Identification

### 6.4.1 Clear naming

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

NOTE There can 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 include the ISO 4157 series and the IEC 81346 series, respectively.

### 6.4.2 Unique naming

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 can also be required to conform to operating system file naming limitations.

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

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

Some applications, operating systems and information exchange formats do not accept or handle other characters or 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 can 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 – (hyphen-minus, Unicode U+002D) 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, unless:

— the file contains multiple library objects;

— a naming convention for files is applied generally;

— a naming convention within the project type library is applied.

#### 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.

The name shall be formatted using the delimiter and use PascalCase to simplify phrases. No spaces or other punctuation shall be used.

The restrictions on character set may be disregarded for the optional fourth field if it does not form part of the file name, so, for example, "." (full stop) and "/" (forward slash) can be used. The abbreviations "ft" and "in" should be used instead of the disallowed "and ".

EXAMPLE

A generic object is named "GGG_LightFixture_PointSource".

Use of underscore: GGG_Door_Internal_Single.

Use of hyphen: GGG_Wall_External-215Brick.

Generic: NBL_Door_Door.

Product: ABCltd_Door_Door.

NOTE 1 This convention can be summarized as {Source}_{Type}_{Subtype/Product}(_{Further }), further information can also be preceded by an underscore.

NOTE 2 When an object is applied in a project, it can be identified by an identifier other than its name, such as a globally unique identifier (GUID) or a designator.

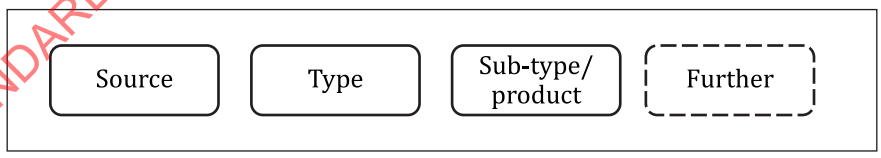



**Figure 3 — Data file and library object naming**

**Table 1 — Information in names of library objects**

| File naming field | Description |
|---|---|
| Source | Library object author or manufacturer |
| Type | Initial specialization (see 6.3) |
| Subtype or product code | Used to convey additional specialization information not captured in property data<br>Can be the predefined (sub)type (see 6.3) |
| Further information | (Optional) selected fixed property such as size or material, or behaviour such as wall-clinging<br>Values of parametric properties should not be included |

### 6.4.4 Description

The description, as human-readable text, shall include information relevant to:

a) selection;

b) reporting.

For product objects, the manufacturer's trade and catalogue name shall be provided.

The description may be in the local language.

### 6.4.5 Unique identifier

The library object shall be given a random software-generated, 128-bit GUID represented as a 22-character string conforming to ISO 16739-1.

NOTE For a detailed explanation, see ISO 16739-1 content on ifcgloballyuniqueid.

The 36-character representation is not recommended.

### 6.4.6 Other identifiers

Products shall include their global trade item number (GTIN) or a similar assigned identifier.

NOTE The GTIN identifier is suitable for representation as a barcode. The coding is made up of a manufacturer's code, product code and a check digit. See Reference [40].

Library objects should not contain serial numbers. See 6.7.

## 6.5 Origination

### 6.5.1 General

Origination covers sourcing the information and the applications used to prepare the information. See Annexes A and B for origination examples.

### 6.5.2 Source

The origination shall be provided as the organization responsible for authoring the library object. The organization shall be identified by an email address and can be further identified by name, postal address and electronic address details.

Information may additionally include the departmental contact details but should not include individuals' contact details.

NOTE 1 The originator of a library object can, for example, be a standards organization or other industry body (for template objects), a software provider or information provider (for generic objects), a manufacturer or vendor (for product objects). As objects are upgraded (see 4.1), the origination can be changed accordingly.

NOTE 2 As with printed product information, library objects can be originated by product manufacturers under specific copyright and usage licences and disclaimers, which can restrict data alteration or interference with the origination information.

### 6.5.3 Library object version and date

The version and date of preparation of each library object shall be clearly documented, relating to revisions to the library object.

### 6.5.4 Product version and date

The version and date on product objects shall be clearly documented, relating to the physical versions of the product.

### 6.5.5 Further information (references or links)

References shall be provided to obtain additional product information, ideally as hyperlinks.

### 6.5.6 Updates (references or links)

References shall be provided to obtain updates and verification of the information provided, ideally as hyperlinks.

### 6.5.7 Software

The name of any software, with its version or date, used in the preparation of the library object shall be provided.

NOTE Distribution in open data schema and formats facilitates sharing.

## 6.6 Classification

### 6.6.1 General

Each library object shall, where possible, have at least one classification based on an International Standard or convention. Preference shall be given to tables that are based on ISO 12006-2. Examples are given in Table A.2.

NOTE Classification is a key property for objects, grouping them according to some subdivision that is useful for a certain purpose. Graphical symbols are classified by their reference to objects.

### 6.6.2 Classification schemes

The classification scheme and version, code and description shall be identified. Where it is not possible to document these separately, the classification scheme and code shall be separated from the descriptive text using a colon. The descriptive text shall not contain punctuation likely to be mistaken for lists or delimiters used in the codes.

EXAMPLE A classification system “UNSPSC”, classification code “39101600” and classification text “Lamps and lightbulbs” can be presented as “39101600: Lamps and lightbulbs.

NOTE 1 Classification schemes specify the structure of the classification and define the individual classes. Classification schemes are mostly hierarchical, meaning that there are some general classes divided into subclasses, on two or, usually, more levels. When a hierarchical scheme is used, this means that the object is positioned in the hierarchical context and can be grouped or sorted on the suitable level.

NOTE 2 For implementation of an internationally standardized construction-related classification, the buildingSMART Data Dictionary (bSDD) is expected to play a central role to strengthen interoperability of exchanged product data for information models of a facility. bSDD development is based on ISO 12006-3 and considered to be well adapted to cope with ISO 12006-2 and its table-oriented classification schema.

NOTE 3 ISO 16739-1 supports multiple classifications and supports the separate documentation of these three items of information.

NOTE 4 A convention to record this information is included in IEC 82045-2.

The classification code shall be as specific as possible.

The classification conventions shall be used accurately, particularly with regard to the punctuation, character case and spaces in the classification code.

### 6.6.3 Multiple classifications

The concept of multiple classifications means that an object can belong to only one class within a specific classification table, but that it can be classified by more than one classification table.

Classification can also be faceted, combining multiple concepts. Because objects are used for different purposes along the construction and facility management process, there is a need for classifying an object in more than one way.

Multiple classifications shall be allowed. The multiple classifications shall support the purposes of:

— search and retrieval of a library object in a repository;

— filtering library objects (and their occurrences) for presentation;

— linking library objects (and their occurrences) to other resources, such as specification clauses and costing data;

— managing both the functional and physical aspects of the facility.

EXAMPLE 1 In a project, national tables for two countries are used, to integrate with other systems in each country. For example, the client from one country and the main contractor from another country both need to use their own systems for procuring services and material.

EXAMPLE 2 A part of the building is classified according to the building element table for design and for management purposes, and according to the production result table for construction purposes.

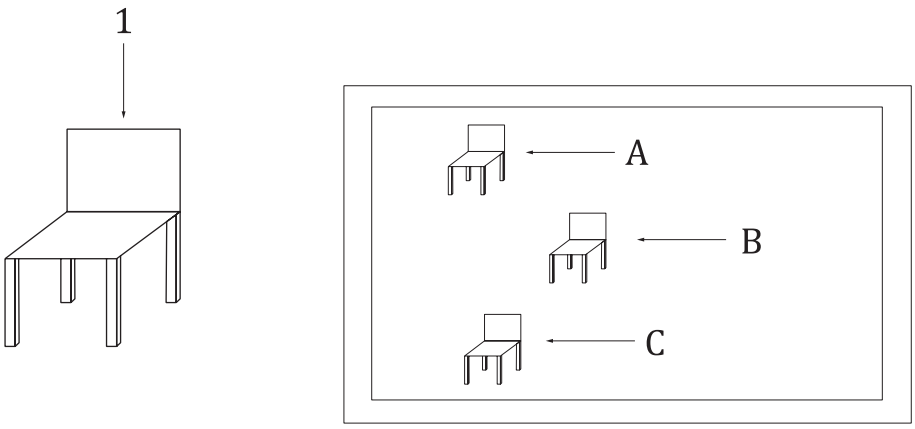
NOTE See Table A.2 for classification examples.

## 6.7 Occurrence information

### 6.7.1 General

When an occurrence of a library object is provided with a type in a design model, it shall be given context by being contained in and being positioned relative to a space, a region or building story, a structure or building, within a site and a project, sufficient for it to be recognized in a report or visualization.

When an occurrence is derived from a library object, it shall be referenced to the defining library object and may share its shape representation, see Figure 4.




**Key**

1 library object named with source, type, subtype or product and possible further information

A, B, C occurrences of library objects, each with specific position, orientation, asset tag and/or installation date

**Figure 4 — Relationship of library object and occurrences**

Occurrences of library objects may be assigned serial numbers and other asset identifiers.

When an occurrence of a library (type) object is provided, it may be given further context, including relevant objects, such as walls or floors. These context objects may exist without an associated library object.

NOTE See Table A.3 for examples of identification of an occurrence, and Table A.4 for examples of manufacturer properties for occurrences.

### 6.7.2 Reference designations

Reference designations combine classification with the identity of an individual occurrence of a library object.

A national standard or International Standard shall be used for reference designations. IEC 81346-1, IEC 81346-2 and ISO 81346-12 provide a framework and syntax for reference designations.

## 7 Graphical symbols and simplified representation

### 7.1 General

Technical documentation relies heavily on graphics, whether it is presented on paper as drawings or displayed on a computer screen. Graphics can be in the form of symbols or simplified representation. A graphical symbol is a shape or a sign which represents something without representing its geometry, like the flag that symbolizes a light switch, while simplified representation resembles the object, and has physical dimensions equal to the object. In this document, the term “graphical presentation” is used as a common term including graphical symbols and simplified representation.

Standardized graphical symbols and simplified representation play the role of a uniform (non-lexical) language that is understood in the same way by different readers. The potential benefits of using standardized graphical symbols and simplified representation include savings in producing models and documentation, but above all these symbols serve to facilitate the efficient use of the documentation and to avoid costly mistakes caused by misinterpretation.

A graphical symbol is a specialized visual model of an object with an intentional view of how to communicate the desired aspects of the object to relevant parties. A graphical symbol of an object has a mapping relationship with the original object, which can be a 3D, 2D or non-dimensional (no geometry) or abstract

existence. The graphical symbol is considered to be a displayable object for communication and can be either 3D or 2D in existence, although 2D symbols are by far the most common.

EXAMPLE 1 North point: 2D symbol for a non-dimensional object.

EXAMPLE 2 3D house or cube: 3D symbol for viewing projection.

EXAMPLE 3 Door: 2D simplified representation in plan (most common) or elevation for a 3D object.

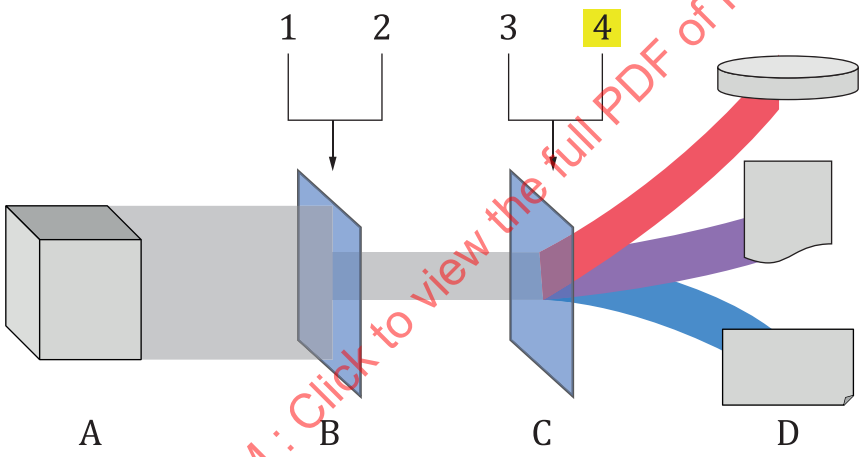
The graphical symbol or simplified representation of an object shall be based on the intention to visualize the object for specific purposes, including:

— identification;

— location;

— principal properties and options.

Drawings, documents and other forms of presentation are increasingly being derived from information models containing objects, instead of being produced independently. The content, text and graphics of the presentation are defined by applying rules (filters) to the model and its objects, as illustrated by Figure 5.




**Key**

1 properties
2 classes
3 views
4 graphics
A model containing objects
B content filter
C presentation filter
D presentation containing symbols

**Figure 5 — A presentation consists of a view of the model, filtered for relevant content and appearance**

A content filter is used for selecting the objects relevant for the intended purpose. Appearance, using the presentation filter, is defined by selecting views, including formatting of content, and applying graphics. The graphics can be derived directly from the design model but are often simplified and/or made more distinct by using graphical symbols or simplified representation.

The presentation is a view of the object data, intended for a specific purpose. A graphical symbol is a graphical presentation of the object, suited for use on a drawing or diagram.

In addition to line graphics, selected properties can also be displayed as annotation. Graphical symbols and simplified representation aim at improving readability of the document for the intended use, by being easily recognizable as opposed to the geometry of the physical object – which can be similar for widely different functions – and by sorting out irrelevant information.

Type and occurrence are two states of the representation. A library object defines the properties but may exist without containing the actual data for each property. When an object occurs in a model, the library object is populated with individual property data, such as its location, individual identity and perhaps also colour, size and connections to other objects. The graphics presented as a symbol are specified by the type, but the definitive appearance can be modified for a specific occurrence by setting properties that affect the graphics.

The symbol illustrates one or more of the properties of a represented object. The presentation is also often adjusted to the individual situation, with respect to the occurrence as well as to the intended use of the document where the graphical symbol appears.

Graphical symbols shall follow the conventions for naming of principal dimensions in 8.2.7.

## 7.2 Defining factors for graphical presentations

### 7.2.1 General

Graphical presentations shall address several essential properties to be identified and communicated to address the presentation requirements for a specific or intended purpose. Major factors are:

— presentation contents (7.2.2);

— dimension (7.2.3);

— projection method (7.2.4);

— scale (7.2.5);

— presentation style (7.2.6).

For systems using layer-based graphics, ISO 13567-1 and ISO 13567-2 shall be used to specify the graphic properties of different representations. The fields of ISO 13567-2, representing different types of information, can also be applied as properties in object-based systems.

### 7.2.2 Presentation contents

Presentation contents are those graphic elements which should be delivered to receivers. They shall be identified in advance with common understanding between information providers and information receivers.

### 7.2.3 Dimension

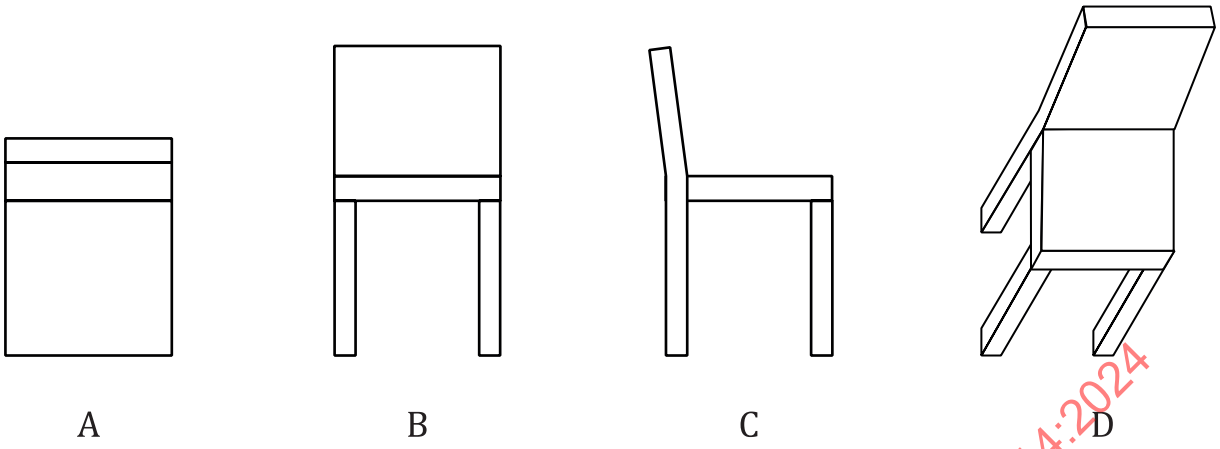
Object libraries shall be implemented with the ability to bring in graphical presentations in both 2D and 3D.

NOTE The dimension of the presentation is also a main factor of the presentation view. 2D presentations have long been used in conventional presentation using paper drawings, but the advancing use of information and communication technologies (ICT) makes it quite useful to present information in 3D visualizations on screens. Graphical presentations can be 3D objects and displayed as such with flexibility of viewing control methods. Virtual reality (VR) and augmented reality (AR) present new possibilities for utilizing this kind of presentation.

### 7.2.4 Projection method

The projection is a key factor for the graphical presentation of an object, as illustrated by Figure 6. The ISO 5456 series includes the fundamental theories and various kinds of individual projection methods. 2D object symbols must be referred by a specific projection method for practical use in paper-oriented drawing sheets or monitors. A drawing sheet can have several presentation viewports with different projection

methods or scales. There is a possibility to handle it in a sophisticated way, but how to manage this issue depends on individual software.




**Key**

A horizontal
B front
C side
D isometric

**Figure 6 — Examples of projections for graphical presentation of a library object**

3D symbol objects can be dealt with in two different ways. One way is similar to 2D symbols, where conventional projections of the original 3D symbol model are derived by calculation and used as such. The other way is without an intrinsic projection method, where the object is displayed dynamically on screen by altering the presentation view using a view control system.

### 7.2.5 Scale

The intended scale of the screen display or the printed drawing shall affect how objects are presented. For non-parametric objects, it shall be decided in advance of usage which values to allocate. The size of displayed graphical symbols shall be determined by the original size of stored graphical symbols and required presentation of scale. Coordinate systems shall also be transformed through source coordinate systems, viewport coordinate systems and drawing sheet coordinate systems.

Presentation contents shall be optimized in scale and shall be changeable according to various scales used for presentation. At a small scale, the graphical presentations should be simplified compared with presentation at a larger scale. For layer-based CAD, ISO 13567-2 provides the Scale field for this purpose. The same attribute can also be applied when using other ways of storing and sharing library objects.

### 7.2.6 Presentation style

Presentation style is the function to individually deal with presentation of objects and their appearance. Presentation styles normally consist of, for example, line type and line width, colour and hatching or texture.

Line types and line widths are defined in ISO 128-2.

The style can be adjusted to suit the purpose of the presentation (e.g. an object can be presented differently by the architect and the heating, ventilation, and air conditioning (HVAC) designer, or depending on whether the object is to be added or removed or demolished).

The style shall be predefined and conform to standardized conventions. ISO 13567-2 uses the Presentation field for this purpose.

## 7.3 Features

### 7.3.1 General

Although all the features of an object – subject to the limitations of the scale of the drawing – can be shown on a detailed graphical presentation, there are usually other properties of the object which need to be described, annotated or referred to in other documents and resources. Figure 7 illustrates the combination of graphical representation and properties connected to a library object.

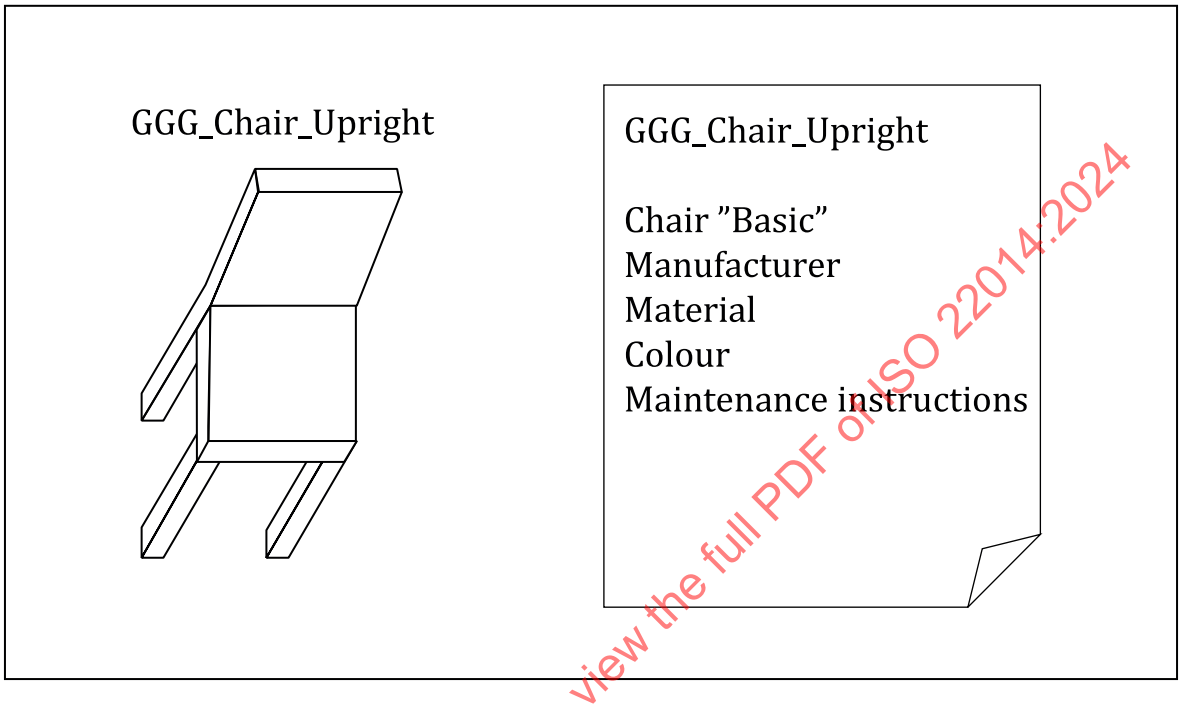



**Figure 7 — Graphical presentation with type designation referring to detailed description in another document**



### 7.3.2 Limited indication of the features of an object

To ensure clarity, a graphical presentation for an occurrence such as that described in 6.7 can sometimes, as appropriate, be a simplified representation but can still need a description, annotation or reference.

### 7.3.3 Symbolic indication of objects

To ensure clarity for an object of which the size is not significant on a drawing, especially if many such objects occur, the object can be represented by using a graphical symbol.

## 7.4 Graphic simplicity

The amount of detail in a graphical presentation shall be appropriate to the purposes and scale of the drawing. The amount of detail in a simplified representation shall be limited to the essential properties of the object.

A geometric shape shall not be used if its meaning is not determined by context and experience.

Over-complexity of information devices, elements and graphical symbols shall be avoided by one of the following methods:

a) omitting unnecessary information (e.g. if all the occurrences of library objects in a project are of the same type);

b) annotating differences between one occurrence of a library object and another;

c) referring differences to a schedule or other document.

## 7.5 Graphical symbols (including elements of symbols)

### 7.5.1 General

The following basic principles of designing of graphical symbols and graphical symbol elements should apply:

— The size of a graphical symbol does not necessarily relate to the size of an object or to the scale of a drawing.

— The shape of a graphical symbol does not necessarily relate to the shape of an object.

— A graphical symbol does not necessarily indicate graphically all the properties of an occurrence of a library object.

— A graphical symbol can be combined with an element or a graphical symbol to form another graphical symbol.

— A graphical symbol can be added to a convention, a representation, a simplified representation or another graphical symbol.

### 7.5.2 Graphical symbols sharing common subsidiary features

Some graphical symbols share common subsidiary features; this document refers to these features as graphical symbol elements. The principals are often part of local drawing or draughting conventions.

EXAMPLE Most pump graphical symbols consist of an outer circle, with specialized interior additions such as arrows.

Graphical symbol elements shall be combined in graphical symbols according to consistent principles. A graphical symbol element shall not be used in isolation.

### 7.5.3 Constant size

Some graphical symbols should always be presented with a constant size regardless of scale. Object libraries shall be implemented which allow graphical symbols to be presented with a constant size.

For example, schematic graphical symbols for pumps and valves should always be presented with a constant size, in diagrams as well as drawings.

### 7.5.4 Fixed orientation

Some graphical symbols should always be presented with the same orientation and not rotated. Object libraries shall be implemented with the ability for which allow graphical symbols to be presented with a fixed orientation.

Graphical symbols on evacuation plans, indicating, for example, fire extinguishers, should always be presented with the same orientation.

## 7.6 Graphics

Graphics should be created with printing and on-screen viewing in mind, considering readability in the presented scale. Graphics should also be readable in black-and-white print.

NOTE The ISO 128 series contains recommendations concerning graphics.

# 8 Shapes and measurements

## 8.1 General

The physical properties of library objects shall be well defined in terms of detail and measurement.

## 8.2 Detail

### 8.2.1 General

Library objects shall be delivered with shape information appropriate to the intended uses, based on the completeness and accuracy of a digital shape representation compared with the physical and functional characteristics of the actual object.

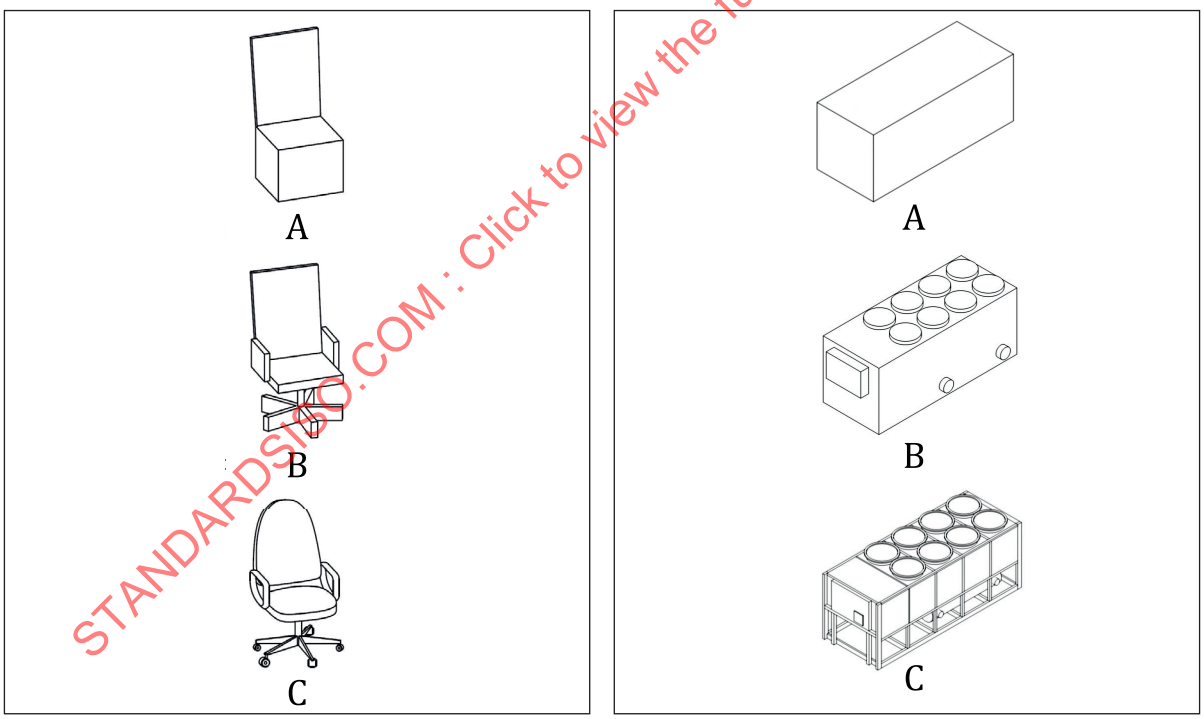
A library object shall be characterized by a 3D representation of its shape, with detail appropriate to its intended uses. Material objects may have indicative shape and symbology independent of their occurrences.

Unless there is a specific purpose-driven rationale as provided in an appointment (see EN 17412-1), varying detail for graphical presentation shall be provided to avoid loss of clarity due to the range of scale (see Figure 8).

In general, the level of detail required for manufacturing purposes shall not be provided.

NOTE 1 See Annex A for representation examples.

NOTE 2 The detail corresponds to the presentation scale as specified by the Scale field in ISO 13567-2.




**Key**

A low detail
B medium detail
C high detail

**Figure 8 — Detail for library objects**

### 8.2.2 Low detail

At a simplified low-level representation, a library object shall be characterized by the following:

— Extent, using a small number of simple geometric shapes. The outer shell is represented just by some bounding primitive. No inner geometries are represented.

— Key connections and connectivity, using either a single-line representation or specific connection points, so its location, size and adjacencies are visible. No features that alter the shape are represented.

### 8.2.3 Medium detail

At a simplified medium-level representation, a library object shall be characterized by the following:

— Its outer shell, showing major visible features. The shell is represented by a single shape without operating zones and without openings or penetrations.

— Its inner geometry, with layers, skins and large cavities represented. Major fillets, chamfers and holes are represented.

### 8.2.4 High detail

At a high-level representation, a library object shall be characterized by the following:

— Its more detailed shape, sufficient to create a recognizable image, showing all visible features. The form is represented by a set of shapes, including operating zones and all openings and penetrations (cavities).

— Its inner geometry, with layers, skins and large cavities represented. All protrusions, fillets, chamfers, holes and other details are represented.

NOTE If the detail is too complex, it does not always reproduce on the plotted facsimile or it can obscure other information. Excessive geometric detail in representations can also be counterproductive and have a negative impact on model interaction.

### 8.2.5 Library object types and detail

The detail shall be adapted to the type of library object, considering that multiple representations can be included, as in Table 2.

NOTE See Annex A for examples.

**Table 2 — Detail for library objects**

| Library object | Low | Medium | High |
|---|---|---|---|
| Template objects | required | optional | optional |
| Generic objects | optional | required | optional |
| Product objects | optional | required | optional |

### 8.2.6 Orientation

The orientation of the library object shall align the X direction with its characteristic direction. Columns and wall fixtures are exceptions (see Table 3). The characteristic direction shall be local to curved objects such as road and rail.

Consistent orientation of library objects should facilitate the substitution process during design development.

**Table 3 — Orientation determined by direction of characteristic flow**

| Grouping | Characteristic | Direction |
|---|---|---|
| Column | Structural support | Z |
| Wall fixture | Attachment | Y |
| Slab | Span | X |
| Distribution object | Air, water, power | |
| Walls | Enclosure | |
| Others | (varies) | |

### 8.2.7 Insertion points and principal dimensions

Insertion (origin) point shall be consistent:

— across all levels of detail and shall usually be on or within the extent of the object;

— across library object groupings;

— with graphical symbols (see Clause 7);

— with the insertion point and principal dimensions of the default convention and specific exceptions for insertion points and for the naming of the principal dimensions in Tables 4 and 5.

Consistent insertion and principal dimensions of library objects facilitates the substitution process during design development.

Naming of primary dimensions shall be consistent with the symbols' property (see Clause 9).

**Table 4 — Insertion and principal dimensions**

| Grouping | Insertion point | X | Y | Z |
|---|---|---|---|---|
| Default | Left (X)<br>Lower (Y)<br>Bottom (Z) | Length | Width | Height |
| Distribution object | Left (X) Axis (YZ) | Length | Width | Depth |
| Column | Centre (XY) Base (Z) | Width | Depth | Length |
| Slab | Left (X)<br>Lower (Y)<br>Top (Z) | Length | Width | Depth (thickness) |
| Other member | Left (X) Centre (YZ) | Length | Width | Depth |
| Wall | Left (X)<br>Lower (Y)<br>Bottom (Z) | Length | Thickness | Height |
| Door | Left (X)<br>Lower (Y)<br>Bottom (Z) | Width | Depth | Height |
| Opening or window | Left (X)<br>Lower (Y)<br>Top (Z) | Width | Depth | Height |
| Wall fixture | Primary fixing point (XYZ) | Length | Width | Height |

**Table 5 — Principal dimensions**

| Term | Suggested interpretation |
|---|---|
| Length | Primary or horizontal dimension |
| Width | Characteristic or secondary horizontal dimension |
| Height | Vertical or secondary dimension |
| Depth | Characteristic vertical dimension |
| Thickness | Secondary dimension of layered or homogenous object |

### 8.2.8 Behaviour

When used in software, a library object shall behave in a manner that reflects its relationship with associated objects within the software or have properties that indicate the desired behaviour.

EXAMPLE Attachment to other object types, ability to mirror or stretch.

## 8.3 Levels of measurement

### 8.3.1 General

A library object shall be characterized by measurements describing its physical properties, with a detail appropriate to its intended uses, based on the completeness and accuracy of a digital measurement compared with the physical and functional characteristics of the actual object.

NOTE 1 See Table A.5 for measurement examples, including service life.

Library objects without specific sizing, such as materials, shall be described at a unit size by volume, area, length or mass.

For template objects, the type of measurement (e.g. length, area, mass, power) shall be defined. Any conventional preferences for particular units shall be documented in the measurement property description.

For generic objects and product objects, units shall be defined for any given numeric property. Units for angle, length, area, volume and mass shall be used consistently across shape and measurement.

Nominal sizes, used conventionally to identify products, shall not be documented as actual measurements.

NOTE 2 ISO 80000-1 provides guidance on the naming of units of measure.

NOTE 3 ISO 16739-1 provides guidance on the naming of measurement types and units of measure.

NOTE 4 Three levels of measurement are defined in 8.3.2 to 8.3.4.

### 8.3.2 Characteristic measurement

A library object shall be characterized by its overall dimensions, mass and/or volume.

EXAMPLE Nominal length, nominal width, nominal height, mass, volume.

### 8.3.3 Standard measurement

To support generalized measurements, a library object shall be characterized by its actual principal dimensions, areas and/or volume.

Occurrences of any library object can additionally be counted.

### 8.3.4 Method-based measurement

To support specific methods of measurement, a library object shall additionally be characterized by method-based measures, such as “Effective Area” or “Effective Length”.

A library object can also be characterized by its estimated or reference service life. Service lives shall be given in years, or in hours for those objects whose service life depends on their use.

NOTE 1 Method-based measurements are typically made to a local or national methodology. The purposes of method-based measurement include contractually required early-stage elemental cost plans and quantity take-off reports prepared in accordance with standards.

NOTE 2 Examples of hour-based measurements for service life are lightbulbs and mechanical equipment.

NOTE 3 See ISO 15686-4.

#### 8.3.5 Measurements for library objects

The measurement shall be adapted to the type of library object as in Table 6.

**Table 6 — Measurement for library objects**

| Library object | Characteristic | Standard | Method-based |
|---|---|---|---|
| Template objects | required | optional | optional |
| Generic objects | required | required | optional |
| Product objects | required | required | required |

## 9 Properties

### 9.1 General

Library objects need a number of properties describing various specific features and thus enhancing their usability.

Logical, numeric and enumerated values shall be used with supplementary notes or descriptions held in separate text properties. All numeric values shall be provided with appropriate measures and values with appropriate units. Distinct values shall be provided, rather than ratios, where possible.

While more information is expected during later project stages, library objects should have a consistent set of properties.

To secure the consistency of properties characterizing construction objects, they shall be defined, authored and maintained in accordance with ISO 23386. Data templates for construction objects represented in interconnected dictionaries shall follow the data template structure defined in ISO 23387.

### 9.2 Example purposes

#### 9.2.1 General

Properties and group of properties shall be associated to a product object to support specific purposes envisaged for the information by the customers and the user.

If the following purposes are supported, then the requirements given in 9.2.2 to 9.2.9 apply.

#### 9.2.2 Specification and selection

Specification using generic objects and selection using product objects shall be supported by the ability to compare, rank, select and contrast. Object shall include information necessary for replacement.

EXAMPLE Material, finish.

### 9.2.3 Performance analysis and simulation

Performance analysis and simulation using product objects shall be supported by the provision of testable logical, numeric and enumerated text values.

### 9.2.4 Costing

Costing using product objects shall be supported by the provision of distinct properties that allow the selection of costing information from generic and supplier information.

Cost information shall be sufficient to give a first order costing, without necessarily providing parametric or secondary cost variants, nor commercial or trade discounts.

### 9.2.5 Environmental impacts and recycling

Environmental impacts, certifications, and recycling and waste potential shall be provided. All measures shall relate to the quantities (see Clause 7).

NOTE ISO 22057 describes properties for environmental product declarations.

### 9.2.6 Procurement, work planning and execution

Batch weights, procurement times and labour requirements may be provided.

### 9.2.7 Commissioning, operation and use

The following properties may be provided:

— task purposes with duration, labour and skill requirements and frequency;

— start-up, shut-down, emergency procedures, inspection, maintenance, replacement;

— process sequences;

— operating limits.

### 9.2.8 Expected life and replacement

The following properties may be provided:

— expected life, service life;

— process sequences;

— operating limits.

NOTE ISO 15686-4 includes information for service life planning.

### 9.2.9 Declarations and third-party information

Properties may be provided as required to identify the testing method, degree of attestation and organization(s) responsible.

NOTE Users of information deliveries based on library objects need to know if a third party has verified and/or approved the contained information and if that is based upon or the result of a systemic work process.

## 9.3 Property identification

Names for properties obtained from a data template library shall be maintained unchanged.

Otherwise, properties shall be named concisely (e.g. in “UpperCamelCase”) and shall indicate the data type. Units shall not be included in the property name.

Names should conform with the conventions in 6.4.2.

Concise naming serves to ensure that internal and external databases are able to represent property names unambiguously. The indication of data type can be implicit (e.g. “IsWaterproof”, “HasWeatherstripping”, “NominalWidth”, “PanelHeight” or “WaterPressure”) or can be obtained from property definitions.

Properties shall have descriptions in clear language.

Properties may have a GUID provided by ISO 12006-3 or a similar resource.

## 9.4 Choice of properties

### 9.4.1 General

The properties of library objects shall be determined by their intended uses:

— For template objects, the type of measurement of the property shall be defined. Preferences for particular units shall be included in the property description.

— Product objects shall at least have the same properties defined as generic library objects.

— For generic objects and product objects, units shall be named for any numeric property. Units for angle, length, area, volume and mass shall be used consistently across property, shape and measurement.

Units of measure shall be named in accordance with ISO 80000-1.

NOTE 1 A consistent use of properties allows enhanced management of the product selection and comparison processes.

NOTE 2 Groups of properties can be defined by other standards which provide guidance on properties and units of measure, such as ISO 16739-1, ISO 12006-3 and ISO/TS 15926-4.

### 9.4.2 Specification properties

To support technical specification, a library object shall be characterized by properties sufficient to select and replace the object without reference to external data sets.

NOTE Typically, these properties are identified in the specifications and schedules prepared by consultants, contractors and maintainers.

### 9.4.3 Assessment properties

To support assessment, a library object shall be characterized by properties describing the object’s economic and environmental impacts. Assessment may include initial (embedded) impacts or life cycle (in-use and end-of-life) impacts.

NOTE See the ISO 15686 series, EN 15804, EN 15978 and local or national assessment practice.

### 9.4.4 Simulation properties

To support simulation, a library object shall be characterized by its performance properties.

## 9.5 Use of properties

### 9.5.1 General

A library object shall be characterized by properties, with a property appropriate to its intended uses, as shown in Table 7.

NOTE See Annex A for examples of properties.

**Table 7 — Properties for library objects**

| Library object | Specification | Assessment | Simulation |
|---|---|---|---|
| Template objects | required | optional | optional |
| Generic objects | required | optional | optional |
| Product objects | required | required | required |

### 9.5.2 Library object types

Library templates and generic library objects shall have the specification properties. Values are not always necessary; some may have suggested values, with technical guidance on these options.

Product objects shall have the specifying and assessment properties with values provided; some may have suggested values, with technical guidance on these options.

During contract specification, properties are sometimes deliberately not shared and only a manufacturer name and a product reference provided; however, the client can require the specifying information to support later replacement.

NOTE See Table A.6 for an example of a property set.

## 9.6 Occurrence within projects and use

The extent of completion of properties of objects shall be defined by the project's requirements and the stage of the project. Some occurrence properties shall be captured during the construction stage and the operational phase.

# 10 Assemblies

## 10.1 General

This clause gives recommendations for the process and information involved in the preparation and use of assemblies, where both the owning assembly and the constituent parts are library objects.

## 10.2 Uses

### 10.2.1 General

Figures 9 and 10 illustrate the uses for assemblies. Figure 9 shows the relationships within an assembly, Figure 10 explains the difference between library objects and occurrences.

NOTE See Annex A.

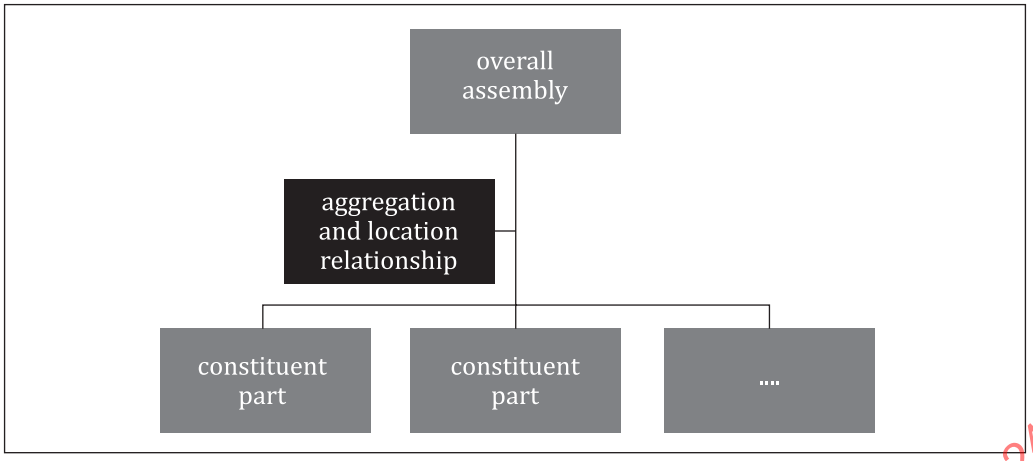



**Figure 9 — The assembly relationship**

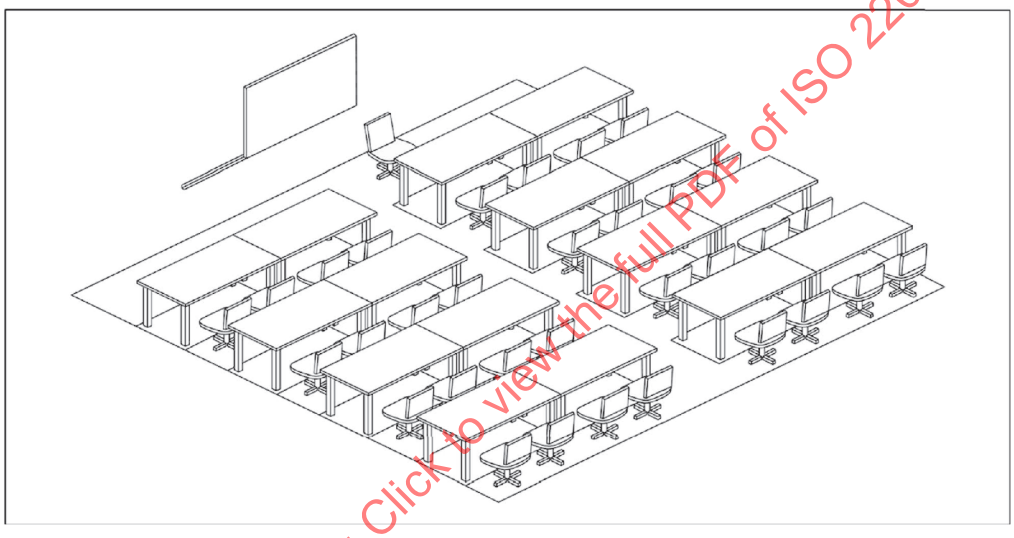


**Figure 10 — An assembly is a type within an object library and a component (occurrence) within an information model of a facility**



### 10.2.2 Repetitive facility types

Design information can be presented as assemblies. Repetitive types of facility can be designed using libraries of assemblies of materials, types, components and space, with the aim of replacing or complementing drawings, design guides and written specifications.

### 10.2.3 Prefabricated products

The adoption of modern methods of construction, including prefabrication, can be supported by providing assemblies as library objects. The overall assembly has a key role in achieving spatial coordination and correct interfaces with the facility systems. Once installed and in use, the constituent parts can be managed.

### 10.2.4 Details and connections

Generic and manufacturer details can be transmitted as assemblies. Some constituent parts can be provided as context for manufacturers' products.

### 10.2.5 Fabrication and manufacturing

Assemblies are indicative only, provided with only sufficient detail to recognize and coordinate the objects. Product properties, such as the model number or order code, can be used to reference the detailed geometry required for fabrication and manufacture.

NOTE This document does not cover the use of assemblies to control fabrication and manufacturing, where different levels of detail and specification are required.

### 10.2.6 Layered constructions

Generic and manufacturer-suggested layered constructions can be transmitted as assemblies. Additional constituent components are provided as context for manufacturers' products.

## 10.3 Processes

### 10.3.1 Preparation and publication

Information providers such as library providers, manufacturers, retailers and designers shall prepare library objects representing assemblies to support the management of their subsequent design, installation and use.

Assemblies shall be shared and published as other library objects.

### 10.3.2 Design and development

Assemblies shall be incorporated into designs through the steps of selection, insertion or substitution and subsequent development. The process of specification, comparison and selection shall be similar to any other library object.

Assemblies shall retain their structure when incorporated, keeping both the overall assembly and their constituent parts accessible. Both the overall assembly and the constituent parts with all positioning and properties shall be:

a) visible in plans and other views;

b) scheduled in reports and tables;

c) documented fully when mapped to and from IFC (see ISO 16739-1) or other information exchange schemas.

Where model authoring software can represent assemblies, it is sometimes necessary to check that export and import functionality preserves the assembly information.

### 10.3.3 Measurement

Software shall analyse the assembly or its constituent parts.

NOTE Unless there is clarity as to whether either one or both levels of detail are being analysed, there can be ambiguity or error in the coordination and material take-off processes.

### 10.3.4 Use in asset management

Information about an assembly shall be offered for use in asset management with both the overall assembly and its constituent parts.

NOTE Some receiving software does not always retain information about the constituent parts or the overall assembly.

## 10.4 Implementation

Both the overall assembly and the constituent parts shall be identified and have relevant groupings associated.

NOTE It is not always necessary for the overall assembly to have a graphical symbol or shape (see Table 8) or for the constituent parts to have specifying properties (see Table 9).

**Table 8 — Content of overall assemblies**

| Library object | Identification and grouping (10.5.1) | Graphical symbol and shape (10.5.2) | Properties (10.5.4) |
|---|---|---|---|
| Template objects | not applicable | not applicable | not applicable |
| Generic objects | required | optional | required |
| Product objects | required | optional | required |

**Table 9 — Content of constituent parts**

| Library object | Identification and grouping (10.5.1) | Graphical symbol and shape (10.5.2) | Properties (10.5.4) |
|---|---|---|---|
| Template objects | not applicable | not applicable | not applicable |
| Generic objects | required | required | optional |
| Product objects | required | required | optional |

## 10.5 Identification and grouping of assemblies

### 10.5.1 General

As a library object, an assembly shall function within software as a type and shall function as an occurrence when inserted into information models of an asset.

Both the overall assembly and any constituent parts shall be distinct library objects with appropriate naming, description, authorship and classification.

NOTE 1 See Clause 4.

The assembly shall be named and described based on the overall assembly, unless there is a dominant constituent, as when a single product is shown in its context. The applicability of the overall assembly shall be clearly identified in its description.

To ensure accurate scheduling and selection, any classification given to the overall assembly shall reflect the range of classifications of the contained parts by classifying the overall assembly at a more general level.

The overall assembly shall be separable from all of the constituent parts by means of this classification(s) or other means.

NOTE 2 Sometimes it is also possible to anticipate the assignment of the overall assembly and the constituent parts to systems and zones within a facility.

### 10.5.2 Graphical symbols

For clarity in presentation and efficient drawing production, both the overall assembly and the constituent parts shall be given graphical symbols that do not conflict. The overall assembly shall suffice as a graphical symbol, as shall the graphical symbols on all the constituent parts.

NOTE 1 The provision of a graphical symbol on the overall assembly is optional.

NOTE 2 See Clause 7 for more details.