

BS 8541-1:2012



BSI Standards Publication

Library objects for architecture, engineering and construction

Part 1: Identification and classification –
Code of practice

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 62, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 8541 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 June 2012. It was prepared by Technical Committee B/555, *Construction design, modelling and data exchange*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

BS 8541 comprises four parts as follows:

- Part 1 (this part), *Identification and classification*
- Part 2, *Recommended 2D symbols of building elements for use in building information modelling*
- Part 3, *Shape and measurement*¹⁾
- Part 4, *Attributes for specification and assessment*¹⁾

BS 1192 covers the management of collaborative design where the parties are well known to each other and typically have contractual relationships. This British Standard complements BS 1192 by covering the sharing of structured product data where the parties, such as a manufacturer and a designer or sub-contractor, might not have such relationships. In these circumstances, the use of common data standards ensures that information can be transmitted and used for a number of purposes.

Use of this document

As a code of practice, this part of BS 8541 takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this part of BS 8541 is expected to be able to justify any course of action that deviates from its recommendations.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

¹⁾ In preparation.

0 Introduction

0.1 General

BS 8541-1, BS 8541-3²⁾ and BS 8541-4²⁾ document best practice for the development and application of library objects to support Building Information Modelling (BIM) based design, standardization, specification and construction processes.

BS 8541-3 and BS 8541-4 give additional recommendations for specific use-cases.

0.2 Work within the International Organization for Standardization (ISO)

ISO has adopted the IFC schema (ISO/PAS 16739), and the STEP (ISO 10303-21) and XML representation (ISO 10303-28, edition 2:2007) for the representation of building models. These standards being used internationally to transmit partial building models and construction object libraries to support a wide range of use-cases and applications. Using these international standards, the resources required to prepare and maintain proprietary formats can be reduced.

0.3 UK work

The use of the IFC standard can be supplemented with UK-based identification and classification (BS 8541-1 and its recommended classifications), and UK specific quantification [BS 8541-3²⁾] and specification [BS 8541-4²⁾].

0.4 COBie

COBie examples are provided in Annex A.

COBie is formal schema that helps the sharing of structured information about new and existing facilities and their constituent products, see COBie standard [1], defined as the FM Handover MVD and documented in the COBie responsibility matrix [2]. It can be used to document both buildings and infrastructure assets and can be transmitted using a spreadsheet.

COBie is required as part of the UK Government BIM strategy.

0.5 Core maturity model

This British Standard assists the implementation of Building Information Modelling and Management [BIM(M)] in accordance with the UK Government's BIM maturity model, see Figure 1.

The levels categorise types of technical and collaborative working to enable a concise description and understanding of the processes, tools and techniques used. They are as follows:

- Level 0 – Unmanaged computer-aided design (CAD), probably 2D, and specifications on paper (or electronic paper) as the most likely data exchange mechanism.
- Level 1 – Managed CAD, in 2D or 3D format, using BS 1192 with a collaboration tool providing a common data environment and possibly some standard data structures and formats.

NOTE 1 Commercial data is managed by standalone finance and cost management packages with no integration.

²⁾ In preparation.

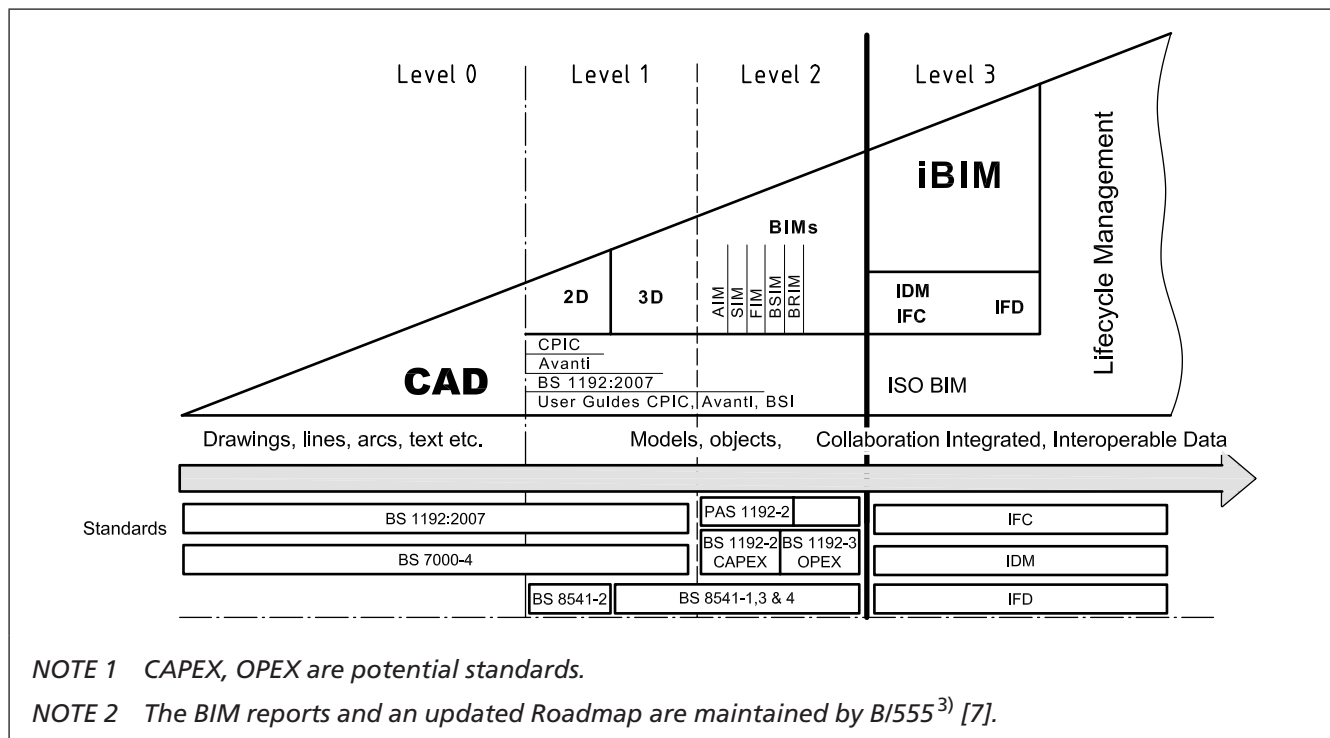
- Level 2 – Managed 3D environment held in separate discipline BIM tools with attached data.

NOTE 2 Commercial data is managed by enterprise resource planning (ERP). Integration by proprietary interfaces or bespoke middleware can be regarded as “pBIM” (proprietary). This approach may utilize 4D programme data and 5D cost elements.

- Level 3 – Fully open process and data integration enabled by IFC and managed by a collaborative model server.

NOTE 3 Can be regarded as integrated BIM ("iBIM") possibly employing concurrent engineering processes.

Figure 1 Core maturity model



This British Standard applies to Level 1, Level 2 and Level 3, as the use of construction objects is increasingly relevant as the sector progressed beyond Level 0.

1 Scope

This part of BS 8541 gives recommendations for defining format and content for library objects to support project briefing, design, tendering, construction and management of built assets.

NOTE 1 A library object is intended for re-use within project teams and across organizations. This improves accuracy and buildability of designs, and improves the handover of information to the procurement chain and to the owner/operator.

It is intended for all professionals and service providers using generic and product specific data.

NOTE 2 This group includes product manufacturers, architects, engineers, contractors, owner occupiers, maintainers and commissioners.

It gives recommendations for defining library template objects, generic objects and product objects in data-driven library and design processes.

³⁾ <http://www.bsigroup.com/en/sectorsandservices/Forms/BIM-reports/>

Where the adoption of data-driven design is partial or incomplete, this British Standard gives recommendations for best practice. Where a particular project is formally committed to integrated working, this British Standard may be adopted as a requirement.

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.

BS 1192:2007, *Collaborative production of architectural, engineering and construction information – Code of practice*

BS ISO 10303-21, *Industrial automation systems and integration – Product data representation and exchange – Part 21: Implementation methods: Clear text encoding of the exchange structure*

ISO 10303-28, *Industrial automation systems and integration – Product data representation and exchange – Part 28: Implementation methods: XML representations of EXPRESS schema and data*⁴⁾

ISO/PAS 16739, *Industry foundation classes (IFC2x) platform specification*⁵⁾

3 Terms and definitions

For the purposes of this part of BS 8541, the following terms and definitions apply.

3.1 object

3.1.1 template object

type object intended to guide the production of generic objects and product objects by providing schedules of classification values and a minimum set of attributes

NOTE Typically the measurement type is specified, but the values are not.

3.1.2 generic object

type object intended for use in stages of design when the object is not resolved into a product

3.1.3 product object

type object intended to represent an obtainable product, either as a requirement or exemplar or as-built

3.1.4 type (library) object

representation of the common features of a product or group, including its classifications and properties

NOTE 1 It can be a template object, generic object or product object.

NOTE 2 It is independent of any occurrence, and has no placement in space. It can represent a template, generic or product object.

3.1.5 occurrence object

representation of an actual occurrence (instance) of an object in a building

⁴⁾ In preparation.

⁵⁾ In the process of being converted to a full ISO standard.

Table 1 Information in names of library objects

Source	Library author or manufacturer (may be omitted for generic objects).
Type	First level of specialization.
Subtype/Product code	(optional) Used to convey additional specialization information not captured in attribute data. Can be the predefined (sub)type.

4.3.3 Objects without associated classification attribute(s)

Where the object does not carry classification information as data in its attributes, the name should identify the object in accordance with BS 1192:2007, Clause 5, which, in addition to 4.3.2, includes a role, an external classification and a presentation classification, see Figure 3 and Table 2.

The role may be "LB" for library provider or "MN" for manufacturer.

The classification code should be taken from Table 3 and Table 4. Where objects are intended for international distribution, the classification text may be used in place of the classification code.

NOTE 1 This extended name can be derivable from the attributes of the object.

The name may use the _ underscore character as the delimiter and use the _ underscore character within phrases. No spaces or other punctuation should be used.

NOTE 2 For example, a manufacturer's construction object without classification attributes might be named "MN-L74-M3-Acme-LightFitting-Ceiling_Pendant_P9999". Where the object is intended for international use, the name might be "MN-Lighting-M3-Acme-LightFitting-Ceiling_Pendant_P9999".

NOTE 3 The use of the hyphen can disrupt parametric programming.

Figure 3 File and object naming for otherwise unclassified objects

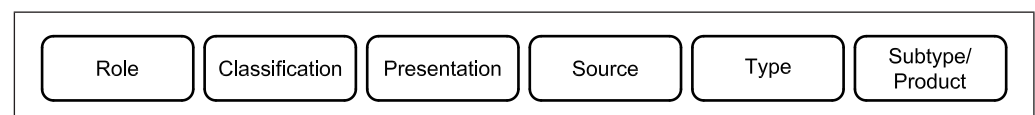


Table 2 Additional information in names for library objects

Role	Role of the object owner.
Classification (code or text)	Either a functional or product classification code from a UK system as in Table 3, or an equivalent generic classifying text.
Presentation	(optional) Indicating the "level of detail" or intended presentation of the model.
Source	See 4.3.1 and Table 1.
Type	See 4.3.1 and Table 1.
Subtype/product	See 4.3.1 and Table 1.

Table 3 UK Construction classification conventions

Name	Source	Basis
UK Uniclass Table L	www.cpic.org.uk [1] ^{A)}	Product
UK Uniclass Table G and Table H	www.cpic.org.uk [1] ^{A)}	Function
UK RICS BCIS Standard Form of Cost Analysis	www.bcis.co.uk [2] ^{A)}	Function
UK RICS BCIS Standard Form of Civil Engineering Cost Analysis	www.bcis.co.uk [2] ^{A)}	Function
UK RICS New Rules of Measurement	www.rics.org [3] ^{A)}	Function
UK Uniclass Table J and Table K	www.cpic.org.uk [1] ^{A)}	Work section

^{A)} See classification convention source for publication edition and dates.

NOTE Preference may be given to classification conventions based on product and function. It might be harder to assign classification conventions based on work sections.

Table 4 International and other classification conventions

Name	Source	Basis
UNSPSC	www.unspsc.org/ [4] ^{A)}	Product
Omniclass	www.omniclass.org/ [5] ^{A)}	Various

^{A)} See classification convention source for publication edition and dates.

4.3.4 Description

The description should include supporting information relevant to selection and scheduling. For product objects, the manufacturer's trade and catalogue name should be provided.

4.3.5 Unique identifier

The object should be given a randomly generated, globally unique 22-character identifier conforming to the IFC standard (ISO/PAS 16739).

NOTE See A.3, B.3 or C.3 for library object identification examples.

4.4 Origination

The origination of the library object should be clearly defined as the organization responsible. The organization should be identified by an email address and may be further identified by name, postal address and electronic address details. It may additionally include the departmental or individual's contact details.

The date and name of any application used in the preparation of the object should be provided.

NOTE 1 As with printed product data, library objects can be originated by product manufacturers under specific copyright and usage licences and disclaimers, which might restrict data alteration or interference with the origination information.

NOTE 2 See A.4, B.4 or C.4 for origination examples.

4.5 Classification

The classification system, code and description should be identified.

NOTE 1 Maintaining classification information for a construction object can enable increased accuracy and efficiency for subsequent processes.

At least one classification to a UK convention should be provided, see Table 3.

Where it is not possible to document these separately, the classification system and code should be separated from the descriptive text using a colon. The classification system may be omitted where it is implied by the classification code it may be omitted. The descriptive text should not contain punctuation.

NOTE 2 For example, a classification system "UK Uniclass 1999", classification code "L7473", and classification text "Fixed luminaires" may be presented as "UK Uniclass 1999 L7473: Fixed luminaires" or "L7473: Fixed luminaires".

NOTE 3 The IFC schema supports multiple classifications and supports the separate documentation of these three items of information.

Classification to international and other conventions may also be provided, see Table 4.

The classification code should be as specific as possible.

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

NOTE 4 See A.5, B.5 or C.5 for classification examples.

4.6 Supplementary information

The type object should be associated to an appropriate system of units of measure. It may also be related to an occurrence object.

If an occurrence object is provided, it should be given context by being located in a space, a building story, a building, site and project, sufficient for it to be recognized in a report or visualization.

An occurrence object should not appear without a type object.

NOTE See A.6, B.6 or C.6 for supplementary context examples.

4.7 Conformity

The library object should conform to:

- BS ISO 10303-21 or ISO 10303-28;
- ISO/PAS 16739 schema; and
- the additional rules defined by 4.1 to 4.6.

NOTE 1 Where library templates, and generic and manufacturer's library objects can be shown to generate models in accordance with this British Standard, they may be supplied in application-specific formats.

NOTE 2 Compliance to this British Standard does not warrant the data transmitted.

Annex A
(informative)**COBie examples****A.1 General**

COBie is formal schema that helps sharing structured information about new and existing facilities and their constituent products. It can be used to document both buildings and infrastructure assets. It can be transmitted using a spreadsheet.

NOTE For examples, see Table A.1 to Table A.7.

COBie is required as part of the UK Government BIM strategy.

See [5] for the COBie standard, which is defined as the FM Handover MVD and contains the terms of the COBie license. The COBie spreadsheet is a mapping of the FM Handover MVD as documented in the COBie responsibility matrix [6].

A.2 Header and footer example

Table A.1 COBie instruction sheet

Title	COBie
Version	2
Release	4
Status	IFC2x3
Region	en-UK

A.3 Object and identity example

Table A.2 COBie type sheet

Name	CreatedBy (lookup)	CreatedOn	Category (lookup)	Description	AssetType (lookup)	Manufacturer (lookup)	ModelNumber
MyCompany MC999 Basin 470w x 300d	sales@ MyCompany. co.uk	2012-01- 20T10:01:14	L72104 : Washbasins	MC180 basin has hidden services and through wall fixings made from the highest grade solid surface materials.	Fixed	sales@ MyCompany. co.uk	MC999

A.4 Origination example

Table A.3 COBie contact sheet

Email	CreatedBy (lookup)	CreatedOn	Category (lookup)	Company	Phone
sales@MyCompany. co.uk	sales@MyCompany. co.uk	2012-02-15T16:03:03	C3891: Manufacturers	MyCompany Ltd	01999 999 999

A.5 Classification example

See C.3.

A.6 Context example

Table A.4 COBie component (occurrence objects) sheet

Name	CreatedBy (lookup)	CreatedOn	TypeName (lookup)	Space
MyCompany MC999 Basin:470w x 300d:470w x 300d:211813	sales@MyCompany.co.uk	2012-01-19T12:27:24	MyCompany MC999 Basin 470w x 300d	L0-01A
MyCompany MC999 Basin:470w x 300d:470w x 300d:211808	sales@MyCompany.co.uk	2012-01-19T12:27:24	MyCompany MC999 Basin 470w x 300d	L0-02B

Table A.5 COBie space sheet

Name	CreatedBy (lookup)	CreatedOn	Category (lookup)	FloorName (lookup)	Description
L0-01A	sales@MyCompany. co.uk	2012-01-19T12:27:24	F D376: Detention secure facilities prisons	Level 0	Cell 1
L0-02B	sales@MyCompany. co.uk	2012-01-19T12:27:24	F D376: Detention secure facilities prisons	Level 0	Cell 2

Table A.6 COBie floor (sector) sheet

Name	CreatedBy (lookup)	CreatedOn	Category (lookup)
Level 0	sales@MyCompany.co.uk	2012-01-19T12:27:24	Floor

Table A.7 COBie facility sheet

Name	CreatedBy (lookup)	CreatedOn	Category (lookup)	ProjectName	SiteName
StandardCell	sales@MyCompany. co.uk	2012-01-19T12:27:24	D376: Detention secure facilities prisons	StandardCell	StandardCell

Annex B
(informative)**ISO 10303 part 28 “XML” format****B.1 General**

The header is defined in ISO 10303-28. It references the current IFC schema and other W3C and ISO 10303-28 schemas.

The content is defined by the IFC schema, which is documented at www.buildingsmart.org [8] and www.buildingsmart-tech.org [9].

B.2 Header example

<pre><?xml version="1.0" encoding="UTF-8"?> <ex:ISO_10303_28 xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:ex="urn:ISO.org:standard:10303:part (28):version (2):xmlschema:common" xmlns="http://www.iai-tech.org/ifcXML/IFC2x3/FINAL" xsi:schemaLocation="http://www.iai-tech.org/ifcXML/IFC2x3/FINAL IFC2X3.xsd" version="2.0"> <ex:ISO_10303_28_header> <ex:name>IFC Engine DLL test</ex:name> <ex:time_stamp>2006-03-31T16:51:19</ex:time_stamp> <ex:author>Architect</ex:author> <ex:organization>Building Designer Office</ex:organization> <ex:preprocessor_version>test</ex:preprocessor_version> <ex:originating_system>Windows System</ex:originating_system> <ex:authorization>The authorising person.</ex:authorization> <ex:documentation>IFC Engine 1.10</ex:documentation> </ex:ISO_10303_28_header> <uos id="uos_1" description="" edo="" configuration="default" xmlns="http://www.iai-tech.org/ifcXML/IFC2x3/FINAL" xsi:schemaLocation="http://www.iai-tech.org/ifcXML/IFC2x3/FINAL http://www.iai-tech.org/ifcXML/IFC2x3/FINAL/IFC2X3.xsd"></pre>	The ISO 10303-28 header section can be used to provide metadata about the file, see ISO/PAS 16739 for further guidance.
<pre></uos> </ex:ISO_10303_28></pre>	Insert data here, see B.2, B.3, B.4, B.5 and B.6:

B.3 Object and identity example (1 of 2)

<pre> <IfcLightFixtureType id="i1000005"> <GlobalId>1234567890123456789000</GlobalId> <OwnerHistory> <IfcOwnerHistory xsi:nil="true" ref="i1000006"/> </OwnerHistory> <Name>LightFixture_POINTSOURCE_UK</Name> <Description>Example light fixture point source</Description> <HasPropertySets ex:cType="set"> <IfcPropertySet pos="0" xsi:nil="true" ref="i1000007"/> </HasPropertySets> <RepresentationMaps ex:cType="list-unique"> <IfcRepresentationMap pos="0" xsi:nil="true" ref="i1000078"/> </RepresentationMaps> <Tag>Product Template </Tag> <ElementType/> <PredefinedType>pointsource</PredefinedType> </IfcLightFixtureType> </pre>	An IFC Type object, e.g. "IfcLightFixtureType" defines the library object. The "GlobalId" tag contains a unique 22-character string using the IFC recommended character set and encoding. The use of temporary "id" and "ref" keys is described in the XLINK section of the IFC IFCXML guidance. The keys are not numeric. The values allowed for the "PredefinedType" tag are listed in Annex D.
<pre> <IfcFlowTerminal id="i1000087"> <GlobalId>37N4UypQzHfXhrSJ8E8EP</GlobalId> <OwnerHistory> <IfcOwnerHistory xsi:nil="true" ref="i1000006"/> </OwnerHistory> <Name>LightFixture_POINTSOURCE_UK_Instance</Name> <Description>Light Fixture POINT SOURCE UK Instance</Description> <ObjectType>COMPONENT</ObjectType> </pre>	An IFC object, e.g. "IfcFlowTerminal", can be used to define the occurrence object with positioning within a building model.

B.3 Object and identity example (2 of 2)

<pre><ObjectPlacement> <IfcLocalPlacement xsi:nil="true" ref="i100088"/> </ObjectPlacement> <Representation> <IfcProductDefinitionShape xsi:nil="true" ref="i100094"/> </Representation> <Tag>element</Tag> </IfcFlowTerminal></pre>	
<pre><IfcRelDefinesByType> <GlobalId>1234567890123456789001</GlobalId> <OwnerHistory> <IfcOwnerHistory xsi:nil="true" ref="i100006"/> </OwnerHistory> <Name>Type_to_Instance</Name> <Description>relate Type to Instance</Description> <RelatedObjects ex:cType="set"> <IfcFlowTerminal pos="0" xsi:nil="true" ref="i100087"/> </RelatedObjects> <RelatingType></pre>	The relationship between the type (library) object and the occurrence object is explicit.
<pre><IfcLightFixtureType xsi:nil="true" ref="i100005"/> </RelatingType> </IfcRelDefinesByType></pre>	
NOTE For representation and object placement, see BS 8541-3 ⁶⁾ .	

⁶⁾ In preparation.

B.4 Origination example (1 of 5)

<pre><IfcOwnerHistory id="i1000006"> <OwningUser></pre>	Owner history may be associated to many IFC objects and relationships.
<pre> <IfcPersonAndOrganization id="i100124"> <ThePerson> <IfcPerson id="i100125"> <Id>nn@buildingsmart.org.uk</Id> <FamilyName>Nisbet</FamilyName> <GivenName>Nicholas</GivenName> <PrefixTitles ex:cType="list"></pre>	The "IfcPersonAndOrganization" tag may be replaced with an "IfcOrganization" tag if no person or role is specified.
<pre> <IfcLabel>Director</IfcLabel> </PrefixTitles> <SuffixTitles ex:cType="list"> <IfcLabel>Director of buildingSMART UKI</IfcLabel> </SuffixTitles> <Roles ex:cType="list"> <IfcActorRole pos="0" xsi:nil="true" ref="ar1"/> </Roles> <Addresses ex:cType="list"> <IfcTelecomAddress pos="0" xsi:nil="true" ref="tal"/> <IfcPostalAddress pos="1" xsi:nil="true" ref="pal"/> </Addresses> </IfcPerson> </ThePerson> </TheOrganization></pre>	An email address may be used as the identifier for a person or for an organization.