BS 8541-4:2012

BSI Standards Publication

Library objects for architecture, engineering and construction –

Part 4: Attributes for specification and assessment – Code of practice

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Publishing and copyright information

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Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 12, an inside back cover and a back cover.

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

BS 8541-1, BS 8541-3 and BS 8541-4 document best practice for the development and application of construction library objects to support Building Information Modelling (BIM)-based design, standardization, specification and construction processes, see BS 8541-1:2012, **0.4** and Figure 1.

The IFC standard (ISO/PAS 16739) includes recommendations for the association of base quantities and geometry for objects. The use of the IFC standard can be supplemented by using UK specific recommendations, such as are published by buildingSMART UK on behalf of RIBAE NBS under its UK national BIM Library initiative. For further information on work within ISO, see BS 8541-1:2012, Clause **0**.

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 in 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.

The word "should" is used to express recommendations of this standard. The word "may" is used in the text to express permissibility, e.g. as an alternative to the primary recommendation of the clause. The word "can" is used to express possibility, e.g. a consequence of an action or an event.

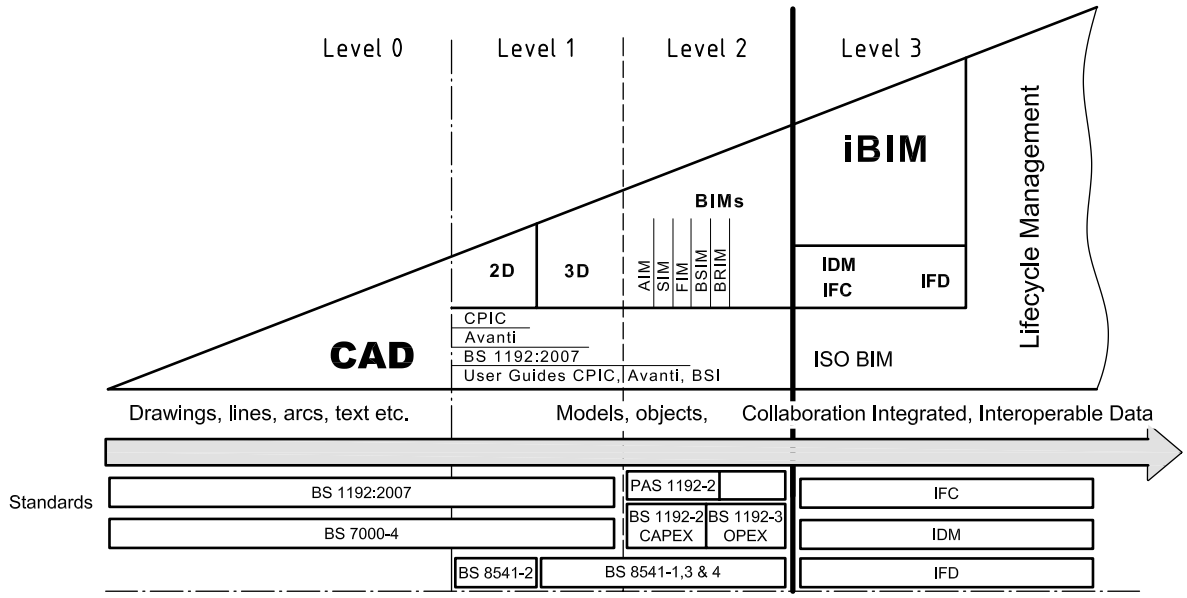
Notes and commentaries are provided throughout the text of this standard. Notes give references and additional information that are important but do not form part of the recommendations. Commentaries give background information.

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.

Figure 1 **Core maturity model**



NOTE 1 Reproduced with kind permission of Mark Bew and Mervyn Richards.

NOTE 2 The BIM reports and an updated Roadmap are maintained by BIS[1)]

[1)] Available at http://www.bsigroup.com/en/sectorsandservices/Forms/BIM-reports/

1 Scope

This part of BS 8541 builds on the recommendations in BS 8541-1 to cover purposes for specifying and assessing attributes for construction library objects for use in the building construction and facility industry. It applies to the design of generic objects and manufacturer's specific products.

This British Standard gives recommendations for the application of construction objects in integrated BIM working for specification and selection. It defines the level of 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 sub-contractors). It covers both common attributes (colour, material, finish, etc.) and examples of specific attributes (fire resistance, etc.). It also gives recommendations for the assessment of expected impacts.

Where a project is formally committed to integrated working, this British Standard may be adopted as a requirement on the design team and/or the procurement chain. For other situations, this British Standard gives recommendations of best practice.

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 8541-1:2012, *Library objects for architecture, engineering and construction – Part 1: Identification and classification – Code of practice*

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

3 Terms and definitions

For the purposes of this part of BS 8541, the terms and definitions given in BS 8541-1 and the following 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

3.2 level of attributing
categorization based on a minimum content of attributing information on a library object

NOTE Identification and classification are covered in BS 8541-1; shape and measurement are assessed in BS 8541-3.

3.3 specification
identification of the requirements on objects including the subsequent the selection of products during installation and replacement

4 Specification and simulation for construction library objects

4.1 Levels of attributing

4.1.1 General

The level of attributing of library objects should be determined by their intended uses.

For construction object templates, the measurement type of the attribute should be defined. Preferences for particular units should be included in the attribute description.

Generic and proprietary library objects should have the same attributes defined.

NOTE 1 This allows enhanced management of the product selection and comparison processes.

For generic objects and products, units should be named for any numeric attribute. Units for angle, length, area, volume and mass should be used consistently across attribute, shape and measurement.

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

NOTE 2 IFC provides guidance on the generic property sets, attributes and units of measure for many object types.

Attributes should be named in camelcase and should indicate the data type expected.

NOTE 3 The reason for this is to ensure that internal and external databases are able to represent property names unambiguously

4.1.2 Specification level of attributing

A library object should be characterized by attributes sufficient to select and replace the object without reference to external data sets.

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

4.1.3 Assessment level of attributing

A library object should be characterized by attributes sufficient to assess the object's economic and environmental impacts without reference to external data sets. Assessment may include initial (embedded) impacts or life-cycle (in-use and end-of-life) impacts.

NOTE See BS EN 15804, BS EN 15978 and BS ISO 15686-6 and local or national assessment practice.

4.1.4 Simulation level of attributing

To support simulation, a library object should be characterized by its performance attributes.

5 Use of level of attributing

5.1 General

A library object should be characterized by attributes, with a level of attributing appropriate to its intended uses.

NOTE 1 The use of the levels of attributing are summarized in Table 1.

Table 1 **Expected levels of attributing for construction library objects**

	Specification	Assessment	Simulation
Template objects	required	optional	optional
Generic objects	required	optional	optional
Product objects	required	required	optional

*NOTE 2 See **A.2, B.2** and **C.2** to **C.4** for attributing examples.*

5.1.1 Library object types

Library templates and generic library objects should have the specification level of attributes; values might not be necessary, and some may have suggested values, with technical guidance on these options.

NOTE 1 Example use of a generic object:

Pedestal *wash basin*

Manufacturer	*Contractor's choice*
Model	*XX_001, XX_002, XX_003, YY_A, YY_B, ZZ_1*
Standard	*BS 1188*
Form	*Full pedestal*
Size	*540 × 410 mm*

NOTE 2 Example *use of a product object:*

Pedestal wash basin

Manufacturer	*XX*
Model	*XX_002*
Form	*Full pedestal* *Full pedestal corner basin* *Semi pedestal* *Semi pedestal corner basin*
Materials	
Body	*Stainless steel* *Vitreous china to BS 3402*
Colour and finish	*Polished* *Self finished* *White*
Size	*540 × 410 mm* *560 × 440 mm* *600 × 465 mm*

Water supply, overflow and waste holes.	
Water supply	*Single taphole, centred*
	Single taphole, offset
	Two tapholes
	None
Overflow	*Rear overflow hole*
	None
Waste	*Chainstay hole*

Products should have the specifying and assessment level of attributes with values provided; some may have suggested values with technical guidance on these options.

NOTE 3 Example of a manufacturers library object:

Pedestal wash basin

Manufacturer	*XX*
Model	*XX_002*
Standard	*BS EN 14688*
Form	*Full pedestal.*
Materials	
Body	*Vitreous china to BS 3402*
Colour and finish	*White*
Size	*540 × 410 mm*
Water supply, overflow and waste holes	
Water supply	*Single taphole, offset.*
Overflow	*Rear overflow hole.*
Waste	*Chainstay hole*

Simulation attributes might be required for specific applications.

NOTE 4 See Annex D for an example of a recommended property set.

5.2 Occurrence within projects

Not all attributes require completion when instantiated within a project; this extent of completion should be defined by the project's requirements and the stage of the project.

Not all property values require an absolute numerical value, but they should have "maximum", "minimum" and "in the range of".

NOTE 1 Example use of a generic object:

Pedestal wash basin

Manufacturer	*Contractor's choice*
Model	*XX_001, XX_002, XX_003, YY_A, YY_B, ZZ_1*
Standard	*BS 1188*
Form	*Full pedestal*
Size	*540 × 410 mm*

NOTE 2 Example *use of a product object:*

Pedestal wash basin

Manufacturer	*XX*
Model	*XX_002*

- *Compressive strength: 3.6 MPa minimum.*

At contract specification stage, attributes might deliberately not be shared and only a manufacturer name and a product reference provided; however, the client may require the specifying information to support later replacement.

5.3 Compliance

The library object should be tested in accordance with:

- BS 8541-1; and
- the additional rules implied by the recommendations in **4.1** to **5.2**.

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

Annex A (informative) COBie 2.4 presentation

A.1 General

Table A.1 to Table A.3 give examples of the data required using the COBie representation, e.g. in a standard spreadsheet. Definitive information is contained in the current COBie documentation [1].

A.2 Specifying level of attributes

Table A.1 **COBie attribute sheet**

Name	CreatedBy (lookup)	CreatedOn	Category (lookup)	SheetName (lookup)	RowName (lookup)	Value	Unit
DrainSize	sales@ MyCompany. co.uk	2012-02-11T18:31:28	Approved	Type	MyCompany MC999 Basin 470w × 300d	13	millimetre

A.3 Assessment level of attributes

Table A.2 **COBie impact sheet**

Name	CreatedBy (lookup)	CreatedOn	ImpactType (lookup)	ImpactStage (lookup)	SheetName (lookup)	RowName (lookup)	Value	ImpactUnit (lookup)
MyCompany MC999 Basin 470w × 300d Ozone destruction	sales@ MyCompany. co.uk	2012-02-11T18:31:28	Stratospheric OzoneLayer Destruction	production	Type	MyCompany MC999 Basin 470w × 300d	0.5	kg

A.4 Simulation level of attributes

Table A.3 **COBie attribute sheet**

Name	CreatedBy	CreatedOn	Category	SheetName	RowName	Value	Unit
Water supply pressure	sale@ MyCompany. co.uk	2012-02-11T18:31:28	Approved	Type	MyCompany MC999 Basin 470w x 300d	1,10	bar

Annex B (informative) ISO 10303-28 "XML" format

B.1 General

Definitive information is contained in the current IFC documentation [2].

B.2 Attribute examples

<IfcPropertyEnumeratedValue id="i100009"> <Name>Standards</Name> <Description>Standards</Description> <EnumerationValues ex:cType="list"> <IfcLabel pos="0">notdefined</IfcLabel> </EnumerationValues> <EnumerationReference> <IfcPropertyEnumeration > <Name>PEnum_LightFixture_Standards_UK</Name> <EnumerationValues ex:cType="list-unique"> <IfcLabel pos="0">to bs en 60598-1</IfcLabel> <IfcLabel pos="1">to bs 4533-102-1.</IfcLabel> <IfcLabel pos="2">to bs en 60598-2-2.</IfcLabel> <IfcLabel pos="3">to bs en 60598-2-3.</IfcLabel> <IfcLabel pos="4">to bs en 60598-2-5.</IfcLabel> <IfcLabel pos="5">to bs en 60598-2-13.</IfcLabel> <IfcLabel pos="6">to bs 4533-102.19.</IfcLabel> <IfcLabel pos="7">to bs en 60598-2-23.</IfcLabel> <IfcLabel pos="8">notdefined</IfcLabel> </EnumerationValues> </IfcPropertyEnumeration> </EnumerationReference> </IfcPropertyEnumeratedValue>	Specifying level of attributes (with values).
<IfcPropertySingleValue id="i100080"> <Name>StratosphericOzoneLayerDestruction</Name> <Description>Gases destructing the stratospheric ozone layer calculated in ODP equivalent CFC-R11 mass. waste</Description> <NominalValue> <IfcMassMeasure>8.50612E-6</IfcMassMeasure>	Assessment level of attributes.

</NominalValue> <Unit> <IfcSIUnit > <UnitType>massunit</UnitType> <Prefix>kilo</Prefix> <Name>gram</Name> </IfcSIUnit> </Unit> </IfcPropertySingleValue>	
<IfcPropertySingleValue id=”i100040”> <Name>TotalWattage</Name> <Description>Wattage on whole light fitting device with all sources intact.</Description> <NominalValue> <IfcPowerMeasure>100.</IfcPowerMeasure> </NominalValue> </IfcPropertySingleValue>	Simulation level of attributes.

Annex C (informative) BS ISO 10303-21 "STEP file" format

C.1 General

Definitive information is contained in the current IFC documentation [2].

C.2 Specifying level of attributes

#100009 = IFCPROPERTYENUMERATEDVALUE('Standards', 'Standards', (IFCLABEL('notdefined')), #100010);

C.3 Assessment level of attributes

#100048 = IFCPROPERTYSINGLEVALUE('StratosphericOzoneLayerDestruction',

'Gases destructing the stratospheric ozone layer calculated in ODP equivalent CFC-R11 mass. waste ', IFCMASSMEASURE(2.109282657E-4), #100009);

C.4 Simulation level of attributes

#100040 = IFCPROPERTYSINGLEVALUE('TotalWattage', 'Wattage on whole light fitting device with all sources intact.', IFCPOWERMEASURE(100.0), $);

Annex D (informative) Attribute sets

Definitive information is contained in the current IFC documentation [2].

NOTE In the USA, product templates have been published for 1 200 construction library objects based on buildingSMART IFC [2] and national practice. Similar templates are planned for the UK.

Table D.1 **Example of expected IFC attribute sets**

Subject	Example	Full IFC name	Notes	Definition
IFC type	Light fixture	IfcLightFixtureType	An IFC type object has Name and Description attributes	A light fixture is a container designed for housing one or more lamps and, optionally, devices that control, restrict or vary their emission.
Predefined type	Point source	POINTSOURCE	An IFC type object has PredefinedType attribute	A point source is a light fixture that is considered to have a negligible area and that emits light with approximately equal intensity in all directions, e.g. a light fixture containing a tungsten, halogen or similar bulb.
Property set	Light fixture type common	Pset_LightFixtureTypeCommon	Properties required for the IFC type object	
Property set	Light fixture point source	Pset_LightFixturePointSource	Additional properties specific to the predefined type	
Quantity set	Light fixture	Qto_LightFixtureBaseQuantities	Properties defining physical measures such as mass	
Property set	Electrical device common	Pset_ElectricalDeviceCommon	Additional properties associated to any electrical device	
Property set	Light fixture UK	NBL_LightFixture_UK	Additional properties required by UK practice	
Property set	Manufacturer type information	Pset_ManufacturersTypeInformation	Additional properties identifying the manufacturer's product	
Property set	Manufacturer's occurrence	Pset_ManufacturerOccurrence	Attached to the occurrence to hold serial numbers, etc.	
Property set	Specification	COBie_Specification	Attached to the Type to hold COBie Type attributes	
Classification	UK RICS NRM 1 2011 [3]	05 08 03	Lighting installations	
Classification	UK NBS 2012 [4]	70 80 35	General lighting systems	

Table D.1 **Example of expected IFC attribute sets** *(continued)*

Subject	Example	Full IFC name	Notes	Definition
Classification	UK Uniclass G 1999	G541	General lighting	
Classification	UK Uniclass J 1999	JV21	General lighting	
Classification	UK Uniclass L 1999	L74731	Fixed luminaires for general lighting	

NOTE IFC objects are named without spaces, in camel case in IFCXML and upper case in IFC without spaces. Predefined types are named without spaces, in lower case in IFCXML and upper case in IFC. Attributes are named in camel case without spaces or punctuation.

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 4533-102.1, *Luminaires – Part 102: Particular requirements – Section 102.1 Specification for fixed general purpose luminaires*

BS 4533-102.19, *Luminaires – Part 102: Particular requirements – Section 102.19 Specification for air-handling luminaires (safety requirements)*

BS 8541-2, *Library objects for architecture, engineering and construction – Part 2: Recommended 2D symbols of building elements for use in building information modelling*

BS 8541-3, *Library objects for architecture, engineering and construction – Part 3: Shape and measurement – Code of practice*

BS EN 771-1, *Specification for masonry units – Part 1: Clay masonry units*

BS EN 60598-1, *Luminaires – Part 1: General requirements and tests*

BS EN 60598-2-2, *Luminaires – Part 2: Particular requirements – Section 2: Recessed luminaires*

BS EN 60598-2-3+A1, *Luminaires – Part 2-3: Particular requirements – Luminaires for road and street lighting*

BS EN 60598-2-5, *Luminaires – Part 2: Particular requirements – Floodlights*

BS EN 60598-2-13+A1, *Luminaires – Part 2-13: Particular requirements – Ground recessed luminaires*

BS EN 60598-2-23, *Luminaires – Part 2-23: Particular requirements – Extra low voltage lighting systems for filament lamps*

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*

BS ISO 15686-6, *Buildings and constructed assets – Service life planning – Part 6: Procedures for considering environmental impacts*

ISO 10303-28, *Industrial automation systems and integration – Product data representation and exchange – Part 28: Implementation methods: XML representations of EXPRESS schema and data* [2)]

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

Other publications

[1] NATIONAL INSTITUTE OF BUILDING SCIENCES, Construction Operation Building Information Exchange (COBie), Washington, 2012 [3)]

[2] BUIILDINGSMART INTERNATIONAL, *IFC Documentation* [4)]

[3] ROYAL INSTITUTION OF CHARTERED SURVEYORS, *RICS New rules of measurement detailed measurement for building works*, Coventry, RICS 2012

[4] ROYAL INSTITUTE OF BRITISH ARCHITECTS, NBS National BIM Report, RIBA, London, 2012 [5)]

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2) In preparation.

3) Available from http://www.wbdg.org/resources/cobie.php

4) Available at http://buildingsmart-tech.org/specifications/ifc-releases

5) Available at https://docs.google.com/viewer?url=http%3A%2F%2Fwww.thenbs.com%2Fpdfs%2FNBS-NationalBIMReport12.pdf

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