

International BIM Object Standard

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Foreword

In September 2014, the NBS published the NBS BIM Object Standard to create a benchmark for manufacturers and designers on the format and properties of BIM objects laying down the foundations for robust, consistent information. That standard, which involved engagement with industry professionals as well as leading software vendors Autodesk, Bentley, Graphisoft, Nemetschek and buildingSMART UK, is freely available to the construction industry.

Working in partnership with NATSPEC and Masterspec, and using the NBS BIM Object Standard as the basis of a new core standard, this International BIM Object Standard has been developed for use by all construction professionals – from specifiers to manufacturers and BIM content developers to assist in the creation of BIM objects. Nation-specific annexes, where produced, take into consideration local regional differences in regulations, standards and practices.

About NBS



NBS is the trusted source of specification, product information, BIM and practice management solutions for the UK construction industry. Its specification system is already recognised as the UK's preferred standard.

NBS products and services are at the heart of coordinating information about an asset. **NBS Create** is the latest specification system which has been developed for BIM. The award-winning **NBS National BIM Library** is the primary source of free-to-use BIM content in the UK, and is also now used internationally.

NBS is at the very forefront of BIM development, and its experts hold key positions in groups and organisations that are shaping the UK BIM landscape and starting to attract interest on a global stage.

NBS is a member of the **BIM Technologies Alliance**, which supports the Government's Construction Strategy **BIM Task Group**, and is also represented on key groups such as the **BSI B/555 BIM** standards committee, **CPIc**, **ICIS** and **BuildingSMART**. It also publishes the internationally respected **NBS National BIM Report**.

A wealth of free BIM information can be found on thenbs.com/bim

About NATSPEC



NATSPEC is an Australian not-for-profit organisation owned by government and industry with the objective of improving the construction quality and productivity of the built environment through leadership of information.

NATSPEC believes that digital information, including 3-D Modelling and Building Information Modelling, will provide improved methods of design, construction and communication for the industry. Further, NATSPEC supports open global systems. This will result in improved efficiency and quality.

NATSPEC's primary focus is on the "i" (information) in BIM and how it is linked to digital models. NATSPEC's areas of interest include how specification information can be best integrated with BIM and the development of BIM guidelines and standards beneficial to the construction industry.

For the National BIM Guide and other information visit the NATSPEC website at www.natspec.com.au and click on the BIM logo.

About Masterspec New Zealand



Masterspec (Construction Information Ltd) is industry-owned by the New Zealand Institute of Architects and the Registered Master Builders' Association. Masterspec is New Zealand's market leader in providing specification systems and related information resources to the construction industry.

Masterspec NZ is a strong advocate for the use of technology and connectivity to improve productivity and quality in the construction sector. With this objective in mind, Masterspec NZ is actively involved in helping BIM grow in New Zealand and developing this standard for New Zealand is an important step in this. Find out more at www.masterspec.co.nz.

Introduction

There are many definitions of Building Information Modelling (BIM) but it is simply the means by which everyone can understand a built asset through the use of a digital model. Modelling a built asset in digital form enables those who interact with the asset to optimise their actions, resulting in a greater whole life value for the asset.

Through BIM, the construction industry is undergoing its very own digital revolution. BIM is a way of working; it is information modelling and information management in a team environment, all team members should be working to the same standards as one another. BIM creates value from the combined efforts of people, policy, process and technology.

More and more assets are being 'built with BIM' and this provides an opportunity to revolutionise the way in which users take advantage of the information contained in those assets.

To achieve this, the digital building blocks that are used to create virtual assets need to be standardised. These building blocks are commonly known as BIM objects.

Achieving standardisation between generic and proprietary information is key. **Manufacturer objects** need to work in a structured manner that consistently connect with **generic objects** and associated technical specifications. This standardisation of information is at the heart of BIM.

Being able to compare construction data across numerous built assets will help to assess greater whole life value. By comparing projects, decision optimisation becomes possible; lessons can be learned from what works well, and this knowledge can influence future projects, refurbishment works and maintenance activities.

A BIM **object** is a combination of many things:

- Information content that defines the **product**
- Model geometry representing the product's physical characteristics
- Behavioural data such as detection, interaction with other elements, maintenance and clearance zones, that enables the BIM **object** to be positioned in, or function in the same manner as, the real world **product**
- Visualisation data giving the **object** a recognisable appearance

For each of these BIM **object** essentials, a standardised approach allows the creation of digital assets that are more efficient to use, compare and exchange information.

The **Construction Operations Building information exchange (COBie)** standard has been included in this standard as an information exchange data **schema**. COBie is used as a **container** for non-graphical information. Being spreadsheet based it is inexpensive to implement with tools readily available and has forward compatibility with international open standards such as ISO 16739.

Information exchange facilitated by the staged COBie data drops is fundamentally concerned with collecting information that can be compared in various ways. With COBie, construction data can be compared across project stages: has the supplier changed, or is the model number different? These are typical stage-to-stage questions.

The use of this standard will provide BIM objects with a core **property set** that:

- Aligns with COBie requirements
- Adopts a consistent approach to classification
- Applies a standard naming convention for ease of use
- Standardises the approach to graphical detail and object **presentation**

All of which support efficient workflows and enable the creation of high-quality, digital building assets.

By standardising the information recorded within objects, they can be compared and an appropriate selection made for the project. Common approaches to the modelling of the physical characteristics of products make the BIM objects simple to use, affording the designer a reliable, consistent and intuitive experience. The hard work is in the detail, for example BIM objects in **Industry Foundation Classes** (Ifc) format; these IFC files are manipulated so that they have their information properties consistently grouped and organised. This makes their use in various BIM platforms easier and consistent. Another example is the use of standardised properties. The benefits of this become obvious when using objects from more than one manufacturer in the same project. When creating schedules that span products from many manufacturers, the use of a standardised **property set** enables information relating to each of these products to be displayed in a single column. This is the start of the common data environment.

With each **BIM platform** vendor having their own approach to information handling, the importance of setting minimum requirements for information transfer is vital to achieving collaboration and interoperability.

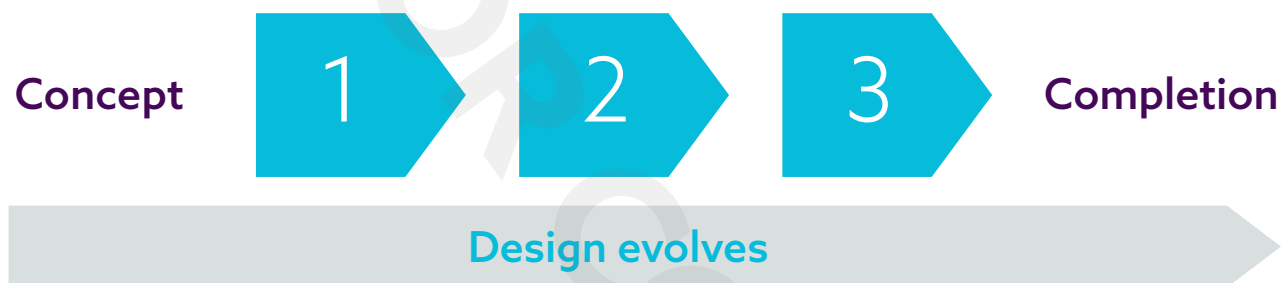
Concept to Design Completion

The BIM Object Standard provides for objects that reflect how the design develops from concept to design completion by providing objects that represent the stage of development of the design. Designers working on a concept design only need a very broad **representation** of the element and limited details. As the design advances the designers may want to specify more detail like materials and “clash accurate” geometric size information before moving to a manufacturer specific branded object.

This process flow has implications into the **object** design and **metadata**. In this context, **metadata** is additional information about BIM objects in the form of properties, material definitions, and material images. The **object** may start with simple geometry and then may, but not always, develop into a more detailed graphical **object** as the design is resolved. Similarly it may start with a few properties populated but as decisions are made the detail is completed reflecting the development from a generic **placeholder object** through to a fully specified proprietary **object**.

It could well be that the **generic object** remains in the design through the life of the project and becomes manufacturer specific through the addition of manufacturer specific **metadata**.

Looking at a roof example of this approach in a traditional procurement model:



1. Allows initial definition of spaces so the designer can concentrate on the design of the spaces in the buildings. The graphical detail is basic with no specific materials and a few properties to broadly define what is likely to be used.



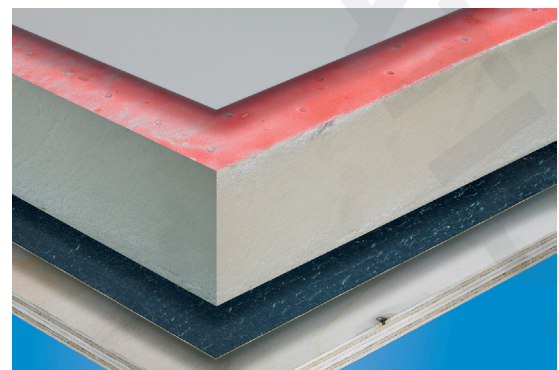
Concept roof

2. Contains material build-ups that specifies the intended composition. The **property** values are generally empty, the user can define these **values** as the project progresses. The graphical detail is sufficient to recognise the type of **object** but most likely be graphically generic.



Generic type of flat roof

3. These have the defined material build-ups from a specific manufacturer. Most **property** values are complete. During construction and commissioning, the user can fill the final values for items such as installation date. The graphical detail is at least sufficient to recognise the **type** of **object** and may be graphically specific to the branded product.



Flat roof from a specific manufacturer

Scope

This International standard specifies requirements for the information, geometry, behaviour and **presentation** of BIM objects to enable consistency, efficiency and interoperability across the construction industry.

This International standard sets a framework for **object** authors when naming BIM objects and creating **object** properties. If a **property** is not relevant to a particular **object**/project then it may be omitted. An example of which may be **COBie** properties, which may not be a requirement for a particular project. This standard simply defines a framework to use if the properties included are required.

Objects being created for an **object library** that is available to the public should allow for all the properties defined within this standard, if relevant to that **object** type, to be available when downloading the **object** from the **object library**.

This International standard is intended for all construction professionals, service providers, product manufacturers and other BIM content developers to assist in the creation of both generic and manufacturer BIM objects that are shared in a Common Data Environment (CDE).

Section 1 - General requirements: Describes the general requirements for BIM objects. The scope of this section includes general requirements such as object categorisation, IfcObjectType and **PredefinedType** requirements. In addition, this section defines the graphical detail within the BIM object.

Section 2 - Information requirements: Defines the requirements for the information contained within a BIM object. The scope of this section includes general requirements such as property sets, properties and values, as well as **COBie** and IFC properties.

Section 3 - Geometry requirements: Defines the minimum geometry requirements of the BIM object to describe the physical form of the **product**. The scope of this section includes general requirements such as geometric detail. In addition, this section defines dimensional and measurement requirements.

Section 4 - Functional requirements: Describes the functional requirements that can be embedded within the BIM object, to represent behavioural characteristics, **constraints** and connectivity.

Section 5 - Metadata requirements: Defines metadata requirements for BIM objects. The scope of this section includes naming conventions for files, objects, properties, materials, values and images.

Presentation Conventions

Words in bold are explained in the Terms and Definitions section of this document.

The word 'shall' is used to express requirements of this standard. The word 'should' is used to express recommendations. 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.

Referenced documents

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:

ISO 15686-4:2014	Building Construction – Service life planning – Part 4: Service life planning using Building Information Modelling
ISO 16739:2013	Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries
ISO/PAS 16739:2005	Industry Foundation Classes Release 2x, Platform Specification (Ifc2x Platform)
ISO 80000-1:2009	Quantities and units – Part 1: General

International BIM Object standard

Section 1: General requirements

This section describes the general requirements for BIM objects. The scope of this section includes general requirements such as object categorisation, **IfcObjectType** and **PredefinedType** requirements. In addition, this section defines the graphical detail within the BIM object.

1.1 General

1.1.1 Object designation

The BIM object shall be:

- a) Created as either a **generic object** or **manufacturer object**.
- b) Modelled as either a **component object** or **layered object**.

1.1.2 Assembly

The BIM object may be:

- a) Part of a larger collection of objects with a defined purpose that form an **assembly**.
- b) Collected within an **assembly** to represent the context in which the object is used.

1.2 Graphical Detail

1.2.1 Generic objects

Generic objects shall graphically represent the extent of the object and its connectivity. The object can be represented by a 3D bounding box to show its location, size, and spatial relationship in the model but preferably be recognisable without containing excessive graphical detail. Important connections can be represented as wireframe **lines** or connection points.

1.2.2 Manufacturer objects

Manufacturer objects shall be graphically sufficient to recognise the object, indicate its connections and to allocate space but not contain excessive graphical detail. This allows for correct location, determination of potential clashes, construction coordination and visualisation, but still be efficient to use.

1.2.3 Dimensions

Generic objects shall include nominal or expected dimensions where actual dimensions are unknown. **Manufacturer objects** shall include accurate overall dimensions and any further dimensions necessary for the object to fulfill its intended purpose.

1.3 Object Type

1.3.1 Identification

The BIM object type shall be identifiable within the associated **BIM platform** and assigned using the appropriate **IfcTypeObject** and **PredefinedType** from the BuildingSMART International Ifc 2x Edition 3 Technical Corrigendum 1 (Ifc2x3 TC1) schema.(ISO/PAS 16739).

If an appropriate type does not exist, the following shall be used:

- a) **IfcBuildingElementProxyType** for the **IfcTypeObject**.
- b) **USERDEFINED**, in upper case, for the **PredefinedType**. The type name created shall follow the IFC naming convention, PascalCase with Ifc Prefix.

1.3.2 Parametric objects

Where **parametric geometry** is being used to create a BIM object that is to represent multiple **products**, which could be assigned to multiple **IfcTypeObject's** and **PredefinedType's**, objects shall be created for each individual **IfcTypeObject**.

1.3.3 IFC export

The BIM object shall include all necessary IFC properties appropriate to the Model View Definition (MVD) to allow complete export to IFC from the **BIM platform**.

Section 2:

Information Requirements

This section defines the requirements for the information contained within a BIM object. The scope of this section includes general requirements such as **property sets**, properties and **values**, as well as COBie and IFC properties.

2.1 General

2.1.1 Property assignment

Properties shall be assigned to an object that are relevant to the **product** that it is representing. If the **BIM platform** supports type properties, common properties shall be assigned to the type and not to the **instance**.

NOTE: Instance is similar to the term "component" in the COBie schema.

2.1.2 Facilities management properties

The BIM object may include properties derived from COBie Version 2 Release 4 (see 2.6 COBie Properties) or properties derived from buildingSMART Ifc2x3 FM Basic Handover Model View Definition (ISO/PAS 16739). Properties shall be consistently selected from the chosen source.

2.1.3 Completed values

Property values shall be completed where known. The appropriate value to a **property** shall be used if the **datatype** restricts the use to numeric values. e.g. '0' instead of 'nil'.

2.1.4 Units of measurement

The BIM object shall:

- a) Use units of measurements that are appropriate to its type, intended use and specific domain.
- b) Use metric dimensions and units; the only exceptions are where the construction industry has (without dispute) retained imperial terms, e.g. bar as a unit of pressure or where a specific unit has been required by an information schema such as COBie or IFC.
- c) Imply the property unit by the value type, e.g. length = mm, where the BIM object **property** unit has not been given or is not stated within the value, e.g. IFC and COBie properties.

NOTE: The BIM object may provide information for characteristic functional measures and quantities of service life planning to ISO 15686-4.

2.1.5 Unit symbols

BIM object values shall use base unit symbols as defined in ISO 80000-1.

2.1.6 Hard coded performance properties

Hard coded properties within the specific **BIM platform** which allow for tasks such as performance analysis and calculations of specific functionality, shall be retained.

2.1.7 Dimensional properties

The BIM object shall include properties providing dimensional information limited to that necessary to define unambiguously the nominal geometry of the **product**, with the exception of clause 2.9.1 (f).

2.2 Values

2.2.1 General

Completion of a **property** value shall infer information accuracy. Objects being created for an **object library** shall include pre-determined sizes, multiple sizes, and configurations that are accurately represented and easily available for selection within the **BIM platform**. Where a dimension property affects the geometric size or shape of the object it shall change the size or shape of the object in the model when the **property** value is changed.

2.2.2 Property values

The BIM object **property** value shall:

- a) Be assigned an alphanumeric data type, where the **property** has no restrictions on allowing both numbers and characters to be entered.
- b) Be separated from its units by a space, with the exception of degree Celsius, percentage and angular degree, where the unit is required to be expressed within the value.
- c) Be capitalised consistently using sentence case without text formatting (e.g. no bolding or italics). Conjunctions, acronyms, model numbers and units of measure shall adopt common practice.
- d) Not end in a full stop.

2.2.3 Dependence

The BIM object **property** value can be expressed as a formula where the **value** is dependent upon other properties.

2.2.4 Product variants

The BIM object can represent **product variants** using a **property** with a **value** comprising of one of the following:

- a) A single **value** where a value has a single selection. Predetermine and complete the value where the value is available and known.
- b) A list **value** where several unique values of the same type are given in an ordered list, the order of which is significant e.g. 200, 400, 600, 800.
- c) A bounded **value** where a value has an upper and lower limit (range). Present the lowest bound first followed by the highest bound, e.g. 175kW – 200kW. Where the range uses positive and negative signs, separate the numbers using 'to', e.g. -10°C to +20 °C. If the value is not given, it indicates an open bound, e.g. 175kW – <nil> (i.e. all values to be greater than or equal to LowerBoundValue 175 kW).
- d) An enumerated **value** where a value has a choice of fixed values selected from a defined list of enumerators. Separate individual items from each other using a comma and a single space, e.g. a, b, c, d.

2.3 Set Grouping and Usage

2.3.1 Groups

Properties shall be organised so that they are easily viewed and retrieved, and consistently located within the **BIM platform**, where possible. Properties shall be grouped in property sets as defined in Table 1.

Table 1 - Property Set Grouping

Property Set Grouping	IFC, Graphisoft® ArchiCAD®, Nemetschek® Vectorworks®, Bentley® AECOsim® & others	Autodesk® Revit® Display Group
IFC	Pset_	IFC Parameters
COBie	COBie_	Other
General	General	General
User defined data sets	User defined property set name	Data

NOTE: Where COBie properties are used instead of native IFC FM Basic Handover Model View Definition (MVD) properties then group them under the COBie property set.

2.3.2 Occurrence

The BIM object shall include only one occurrence of a property.

2.3.3 Order of priority

Where a property exists in multiple property sets, the BIM object shall include a single property occurrence based upon the order of priority defined in Table 2. If the BIM platform contains a hard coded property that is identical to a property included in this standard, then the property from this standard shall be omitted.

Table 2 - Order of Priority

Order of Priority	Property Set
1	IFC
2	COBie
3	General
4	User defined data

2.3.4 Identical property information

Where properties have different names but the same definition and value requirement, they shall be used based upon the order of priority in clause 2.3.3.

2.3.5 Precedence

Where a property exists with the same name at type and component level, the type property shall take precedence.

2.4 Property and Property Set Naming

2.4.1 General

Property names shall be entered as PascalCase, without units. Where a parent-child relationship occurs, prefix the child with the corresponding parent property so they sort logically.

2.4.2 Suffix

Where the **BIM platform** supports properties on **materials**, a '_mtrl' suffix shall be included in the name of the properties associated with **materials**.

2.4.3 Boolean data

Properties with values having boolean (Yes/ No) data types shall be named so that they clearly imply that they require a Yes/ No value, e.g. HasHandle.

2.4.4 Mapping hard coded properties

Hard coded properties that do not conform to the naming conventions in clause 2.4.1 and clause 5.1 shall have a correctly spelt **property**, based upon the order of selection in clause 2.3.3, mapped to them. e.g. 'Fire Rating' (**hard coded**) should have the IFC property 'FireRating' mapped to it.

2.4.5 Property set naming

The **property set** shall be suitably named to reflect its purpose as defined in table 3. Property set field names shall be separated using an underscore and ordered as follows:

<Schema>_<Purpose>_<Differentiator>

For IFC property sets, the IFC set name shall be used.

Table 3 - Property Set Naming Fields

Field	Description
Scheme	An abbreviation for the coding system or schema that the property set relates to. These could be IFC (as Pset_), COBie, ANZ Revit standard (ANZRS), UK Product Declaration Schema, or other information conventions. If no schema is relevant, 'DATA' shall be used. E.g. DATA_ , Pset_ , ANZRS_ , CPR_
Purpose	The primary reason for adding the properties in this group to the object . This could identify the object type, the system the set describes, the specification section or the like. E.g. DATA_Window , DATA_Door
Differentiator (Optional)	The sub type or sub system, sub schema or secondary reason or purpose for the information may be added. E.g. DATA_Window_Frame , DATA_Window_Features

2.5 IFC Property Sets

2.5.1 Common property sets

The BIM object shall include Ifc2x3 TC1 common property sets (Pset xxxxCommon) that are relevant to the **product** and associated **IfcTypeObject**, where available.

2.5.2 Proxy

The BIM object may include Pset BuildingElementProxyCommon if no IFC common property set (Pset xxxxCommon) exists for that object in IFC 2x3. Where Pset BuildingElementProxyCommon is used, the BIM object shall include a 'Reference' property completed with an alphanumeric value acting as an identifier for the specific object type.

2.5.3 IFC4

The BIM object can include additional information from IFC4 Add1 (ISO 16739) in addition to Ifc2x3 (see 2.9 Supplementary).

2.6 COBie Properties

2.6.1 Requirement

The following **COBie** type and component properties shall be included for objects being created for inclusion in a **public object library** or when the recording of **COBie** data is a project, or in-house or client **object library**, requirement.

NOTE: Where the recording of **COBie** data is a requirement, it is only necessary to include **COBie** data for **managed assets**.

2.6.2 Type properties

The BIM object may include the type properties defined in Table 4. The **property** shall be completed with the detailed property requirement. Where the **property** relates to manufacturer or warranty information for a **generic object**, or where the **value** is not known, the **property** shall be completed with 'n/a'.

Table 4 - COBie Type properties

Property name	Property requirement	Data type	Example
Name	A unique human readable alphanumeric name that begins with the product type	Text	Hand dryer
Category	A classification code , e.g. Uniclass2015. Complete the value with a single text string with the classification number, a colon, and the classification name	Text	Pr_40_70_62_37: Hand driers
Description	An alphanumeric value giving a concise description of the product represented by the BIM object . Manufacturer objects shall include factual information only and may include the manufacturer's trade and catalogue name	Text	Light weight hand dryer
AssetType	An alphanumeric default value of: <ul style="list-style-type: none">- 'Fixed' to indicate fixed equipment and products attached and integral to the buildings function, e.g. heating, plumbing, elevators- 'Movable' to indicate standalone equipment and products, e.g. a chair, table, lamp	Text	Fixed

Property name	Property requirement	Data type	Example
Manufacturer	A valid email address for the organisation responsible for supplying or manufacturing the product	Text	company@email.com
ModelNumber	An alphanumeric value representing the product , item or unit number assigned by the manufacturer of the product . This could be a part number, SKU, catalogue number or equivalent.	Text	553
Warranty GuarantorParts	A valid email address for the organisation responsible for the parts warranty	Text	company@email.com
Warranty DurationParts	A numerical value representing the duration of the parts warranty, the units are recorded by WarrantyDurationUnit	Numeric	5
Warranty GuarantorLabor	A valid email address for the organisation responsible for the labour warranty	Text	company@email.com
Warranty DurationLabor	A numerical value representing the duration of the labour warranty, the units are recorded by WarrantyDurationUnit	Numeric	5
Warranty DurationUnit	The units used to record warranty durations, typically this is 'year'	Text	Year
ReplacementCost	A numerical value representing the cost to replace the product in the project currency. If the project currency is not known, provide in local currency.	Numeric	300
ExpectedLife	A numerical value representing the expected serviceable life of the product, the units are recorded by DurationUnit	Numeric	10
DurationUnit	The units used to record durations, typically this is 'year'	Text	Year
Warranty Description	An alphanumeric value providing a concise description of the warranty content and any exclusions	Text	Onsite warranty and advanced replacement warranty
NominalLength	A numerical value of the nominal length (typically the primary or larger of the two perpendicular horizontal dimensions of the product) in millimetres	Numeric	310
NominalWidth	A numerical value of the nominal width (typically the secondary or smaller of the two perpendicular horizontal dimensions of the product) in millimetres	Numeric	180

Property name	Property requirement	Data type	Example
NominalHeight	Anumerical value of the nominal height (typically the vertical characteristic dimension of the product) in millimetres	Numeric	240
ModelReference	An alphanumeric value for the name of the manufactured item as used by the manufacturer	Text	Light weight hand dryer
Shape	An alphanumeric value representing the characteristic shape of the product	Text	Rectangular
Size	An alphanumeric value representing the characteristic size of the product	Text	310mm x 240mm x 180mm
Color	An alphanumeric value representing the primary colour of the product	Text	White
Finish	An alphanumeric value representing the characteristic primary finish of the product	Text	Matt
Grade	An alphanumeric value representing the standard grading(s) to which the product corresponds	Text	Class 1 appliance
Material	An alphanumeric value representing the characteristic or primary material of the product	Text	Die-cast aluminium
Constituents	An alphanumeric value with details of the various parts of the product	Text	n/a
Features	An alphanumeric value representing the primary features or other important characteristics relevant to the product specification	Text	Quite operation, temper resistant locking screws
Accessibility Performance	An alphanumeric value representing the accessibility issue(s) which the product satisfies	Text	Automatic
Sustainability Performance	An alphanumeric value describing sustainability issue(s) which the product satisfies	Text	Fully earthed
CodePerformance	An alphanumeric value representing the code compliance requirement(s) which the product satisfies	Text	Low-energy

2.6.3 Component properties

The BIM object may include the component properties defined in Table 5. The **property** shall be completed with the detailed property requirement.

Table 5 - COBie Component properties

Property name	Property requirement	Data type
SerialNumber	An alphanumeric default value 'n/a'	Text
InstallationDate	The default value '1900-12-31T23:59:59'	Text
WarrantyStartDate	The default value '1900-12-31T23:59:59'	Text
TagNumber	An alphanumeric default value 'n/a'	Text
Barcode	An alphanumeric default value 'n/a'	Text
AssetIdentifier	An alphanumeric default value 'n/a'	Text

2.7 General

2.7.1 General properties

The BIM object shall include the general properties defined in Table 6, grouped in the General **property set** (see Clause 2.3). The **property** shall be completed with the detailed property requirement.

Table 6 - General properties

Property name	Property requirement	Data type	Example
Author	An alphanumeric value of the name of the person, organisation or library provider that authored the object	Text	Company
AuthorURL	A valid uniform resource locator (URL) hyperlink to the object author's website	Text	http://www.company.com
ProductInformation	A valid URL hyperlink to further product information, such as technical documentation, installation guides, certificates, product catalogues or literature and an alphanumeric value of a description of the location, where the document can be found	Text	http://www.company.com/HandDryer
ManufacturerURL	A valid URL hyperlink to the manufacturer's website	Text	http://www.company.com

Property name	Property requirement	Data type	Example
ManufacturerName	An alphanumeric value of the name of the manufacturer of the product	Text	Company
Revision	For completion within the project environment	Text	n/a
Version	A numerical value , stated as a whole number, representing the sequence of the object publication	Text	1

2.7.2 Classification properties

The BIM object shall include the classification properties defined in Table 7, grouped in the General **property set** (see Clause 2.3). The property shall be completed with the detailed property requirement.

Table 7 - Classification properties

Property name	Property requirement	Data type	Example
Uniclass2015Code	An alphanumeric value of the appropriate Uniclass2015 classification code	Text	Pr_40_30_25_42
Uniclass2015Title	An alphanumeric value of the appropriate Uniclass2015 classification title	Text	Interactive whiteboards
Uniclass2015Version	An alphanumeric value of the appropriate Uniclass2015 classification table name and version	Text	Products v1.1

NOTE: The 'Uniclass2015Version' property shall be included for public object library objects but may be omitted otherwise.

2.7.3 Specification properties

The BIM object may include the specification properties defined in Table 8, grouped in the General **property set** (see Clause 2.3). Replace <SpecificationSystemName> within the property name with the name of the specification system being used. The **property** shall be completed with the detailed property requirement.

Table 8 - Specification properties

Property name	Property requirement	Data type
<SpecificationSystemName> Reference	An alphanumeric value of the appropriate specification system clause reference	Text
<SpecificationSystemName> Description	An alphanumeric value of the appropriate specification system clause title	Text

NOTE: Examples of correctly named properties would be 'NBSReference', 'NATSPECDescription', 'MasterspecNZReference'.

2.7.4 Multiple specification systems

The BIM **object** can have multiple specification systems assigned to it by including properties in accordance with Clause 2.7.3. and replacing <SpecificationSystemName> with the relevant name of the additional specification systems to be assigned to the **object**.

2.8 User Defined Data

2.8.1 Container

Additional properties can be added to objects in a User defined data **property set** (see Clause 2.3). Each User defined data property set should consist of related properties that extend the **metadata** available from the **object**.

NOTE: Once attached to an object, a property set becomes the **container** for the property data associated with the object.

2.9 Supplementary

2.9.1 Additional properties

The BIM object may include additional properties that are appropriately assigned to the most relevant **property set** (see Clause 2.3). Suggested properties may include:

- a) Characteristic selection and performance properties to ISO 15686-4.
- b) **Property sets** relevant to the IfcPredefinedType where applicable.
- c) Properties to assess economic and environmental impacts of a product.
- d) Additional properties derived from the relevant specification system clause and completed with the appropriate property name and value.
- e) Additional properties derived from the product manufacturer.
- f) Properties providing dimensional information that relate to required clearance, operation, maintenance or installation zones or connection points of the **product**. (See 3.5.1 Installation and maintenance)
- g) Properties providing information concerning all objects forming an **assembly**, as well as properties that characterise the overall **assembly**.

Section 3: Geometry Requirements

This section defines the minimum geometry requirements of the BIM object to describe the physical form of the product. How detailed the geometry is depends on a number of factors such as the type of object and how it is intended to be used; together with the practicalities of working with contemporary **BIM platforms**. The scope of this section includes general requirements such as geometric detail. In addition, this section defines dimensional and measurement requirements.

Geometric information is divided into:

- General geometry data
- Graphical control
- Shape data
- Symbolic data
- Spatial requirements data
- Surface/ material data

3.1 General

3.1.1 Model performance

The geometry and graphical detail of an object shall not compromise the performance of the project model in which it is placed.

3.1.2 Object modelling requirements

When geometrically modelling BIM objects, the BIM object shall:

- a) Have geometry modelled at a scale of 1:1.
- b) Include an insertion point that is suitable for its intended use.
- c) Minimise the use of temporary modelling information such as construction **lines** and reference material.
- d) Have **parametric geometry**, where supported by the **BIM platform** and where appropriate, that is locked and aligned to appropriate reference elements such as planes, **lines**, levels and points.
- e) Include dimensions that are constrained to reference elements and derived automatically using **associative dimensioning functions** within the **BIM platform**.
- f) Include labels that are constrained to reference elements. Labels on 2D drawings that present the same information as contained in the object **metadata** shall match the **metadata** value.
- g) Use metric geometry with units of millimetres.
- h) Represent the actual thickness of a layer within a **layered object**, unless unsupported by the **BIM platform**, in which case the minimum thickness supported by the **BIM platform** shall be used.
- i) Incorporate best practice modelling techniques for the **BIM platform** to minimise file size, ensuring that the object is as efficient and compact as possible and that any redundant materials, **line types**, fills, external CAD content, or the like that are not used by the object are removed.
- j) Be purged or compacted, where supported by the **BIM platform**.
- k) Only include previews, thumbnails, or attached images that are of an appropriate resolution and image file size.

3.2 Graphical control

3.2.1 View management

Where the **BIM platform** supports user configurable tools that provide for the management of views or graphical control of groups of objects (using concepts such as layers or subcategories), the BIM object shall:

- a) Only include view control groups that improve the object's functionality.
- b) Have view control groups named using PascalCase within **fields** (avoiding the use of material names), an underscore between **fields** and be composed of:

<UsageGroup>_<UsageSubGroup>_<Differentiator>

Table 9 - View control group naming fields

Field	Description
UsageGroup	Primary use or purpose of group. E.g. Electrical
UsageSubGroup	If the group covers a wide range of uses, use a sub group to break up. E.g. Electrical_Lights.
Differentiator	If further segmentation is required, a differentiator can be used. E.g. Electrical_Lights_Interior

3.3 Shape Data

3.3.1 Shape modelling requirements

The shape of a **product** shall be represented by including the following:

- a) A **geometric representation** of the object shape, defined by the product's external boundary.
- b) Essential openings, geometric details and connection points from which meaningful information can be gained, e.g. outlet and inlet locations.

3.3.2 Fixed geometry

Fixed geometry shall be used where the product is not intended to be modifiable, has a fixed form or is available in one size and shape only (i.e. object shall be modelled without parametric behaviour being permitted/available).

3.4 Symbolic Data

3.4.1 Displaying Objects

To allow coherent viewing of BIM objects the following shall be included:

- a) A means of displaying a graphical **convention** (a **representation**, a **simplified representation** or a **symbol**) at scales 1:20, 1:50 and 1:100. Use an appropriate graphical **convention** for the **product** and scale.
- b) Default lines, **line types**, hatching and fill patterns, as appropriate to the **BIM platform**, to distinguish between geometric features such as depth and product parts.

3.4.2 Supplementary symbolic data

The BIM object may include the following:

- a) **Information devices** or supplementary geometry to show abstract items and convey geometric information that would not otherwise be modelled, such as directional arrows and opening directions.
- b) 2D lines where required to convey relevant geometric details that are not otherwise modelled in 3D.

3.5 Spatial Requirements Data

3.5.1 Installation and maintenance

The BIM object may include 2D and 3D data, which is clearly segregated from physical geometry in the object by either **material** or by geometry definition that relates to the space required around the product, such as:

- Minimum operation space (clearance zones)
- Access space
- Placement and transportation space
- Installation space
- Detection zone space
- Zones for non-modelled applied finishes (e.g. fire protection to column)

3.6 Surface and Material Data

3.6.1 Visual representation

The BIM object may include colours, hatching, fill patterns or texture image files, to an appropriate scale, to reflect the product material and appearance in the relevant **graphical view**, e.g. elevation, section, isometric and animation views.

3.6.2 Generic object colour

Generic objects may use representative colours for the product, or white if it exists in a variety of colours.

3.6.3 Control and selection

Individual control and selection of textures and colours for a material's constituent parts shall be provided where functionally possible within the **BIM platform**.

3.6.4 Default materials

The BIM object may include default **materials** provided by the **BIM platform**.

Section 4: Functional Requirements

This section describes the functional requirements that can be embedded within the BIM object, to represent behavioural characteristics, constraints and connectivity.

4.1 General

4.1.1 Behaviour

The BIM object shall be modelled so that its use and functional behaviour:

- a) Reflects its relationship with associated objects within the **BIM platform**.
- b) Does not compromise the performance of the project model in which it is placed.
- c) Is not reliant upon another object, unless placement on another object is a specific requirement of the product.

4.1.2 Constraints

The BIM object may include **constraints** that limit selection criteria to those variations or accessories that are available in the product. **Constraints** shall not have a detrimental effect or confuse the object's use.

4.1.3 Associated objects

The BIM object shall be modelled so that it can be associated and connected with other objects where the association is appropriate to the project model and its analysis.

Section 5: Metadata Requirements

This section defines **metadata** requirements for BIM objects. The scope of this section includes naming conventions for files, **objects**, properties, **materials**, **values** and images.

5.1 Naming Conventions

5.1.1 Spelling

Properties shall be named using the spelling approach taken by the parent resource of those properties, e.g. this standard uses the Shorter Oxford English Dictionary (SOED) as the default spelling guide, **COBie** and IFC use North American English.

5.1.2 Composition

Unique names composed of PascalCase alphanumeric characters (e.g. a-z, A-Z, 0-9) shall be used. Names shall be limited to a maximum of 50 characters.

5.1.3 Abbreviations

Where the **BIM platform** has file name character limitations, the values within the **fields** can be abbreviated. An abbreviation can be created using no more than 7 characters, using upper-case lettering without full stops and spaces. Use the same abbreviation for its singular or plural contexts.

5.2 File and BIM Object Naming

5.2.1 General

In a naming **field** the underscore character (_) shall be used as a delimiter and the dash character (-) within phrases. PascalCase shall be used for information within each **field**. Do not use spaces or any other punctuation.

5.2.2 Name composition

The file and BIM object name shall be composed of the **fields** defined in Table 10 and ordered as follows:

<Type>_<Subtype>_<Productcode>_<Differentiator>

Note for consultation: We believe that <Source> should also be included within the file name composition in one of the two following configurations:

<Source>_<Type>_<Subtype>_<Product code>_<Differentiator>

Generic example: Door_Timber_2100x900

Manufacturer example: Bettadoors_Door_Timber_T523_2100x900

Or

<Type>_<Subtype>_<Source>_<Product code>_<Differentiator>

Generic example: Door_Timber_2100x900

Manufacturer example: Door_Timber_Bettadoors_T523_2100x900

We ask for your input here and have provided some explanation behind the two schools of thought regarding this issue in the supporting information to this draft. Please read this supporting information and provide your opinion.

Table 10 - File naming fields

Field	Description	Example
Type	Used to identify the object type or material type.	Door
Subtype	Used to identify the predefined (Sub)type.	Timber
Source	Used to identify the product manufacturer. For a generic object omit this field.	BettaDoors
Product code	Used to convey the code used by the manufacturer to identify the product . For a generic object omit this field.	T523
Differentiator (Optional)	Used to convey additional specialisation information not captured in the property data.	2100x900

5.2.3 Additional fields

The file and BIM object name may include any of the additional **fields** as defined in Table 11 and arranged in line with recognised local industry practice.

Table 11 - Additional file naming fields

Field	Description	Example
Classification	Used to identify the classification code of the primary component within the object .	4511
Originator	Used to convey the library object author by a 3-6 digit code . Where an object is provided through a public object library but developed by another party, include a code to convey the library.	ABC

5.3 Naming of Materials

5.3.1 Material name composition

The material name shall be composed of the **fields** described in Table 10 and ordered as follows:

<Type>_<Subtype>_<Product code>_<Differentiator>

Note for consultation: We believe that <Source> should also be included within the material name composition in one of the two following configurations:

<Source>_<Type>_<Subtype>_<Product code>_<Differentiator>

Generic example: MineralWoolSlabInsulation_Cavity_80mm

Manufacturer example: BettalInsulationLtd_MineralWoolSlabInsulation_Cavity_80mm

Or

<Type>_<Subtype>_<Source>_<Product code>_<Differentiator>

Generic example: MineralWoolSlabInsulation_Cavity_80mm

Manufacturer example: MineralWoolSlabInsulation_Cavity_BettalInsulationLtd_80mm

We ask for your input here.

5.3.2 Additional fields

The **material** name may include any of the additional **fields** in Table 11 that are organised in line with recognised local industry practice.

5.3.3 Material image file name

The **material** image file shall be named the same as the **material** name (see Clause 5.3.1), with a .bmp or .jpg file format extension to identify the file as an image file.

5.4 Image Tiling

5.4.1 Image shape

Where the **material** image file is to be repeated, it shall be either square or rectangular to allow the image to be repeated and tiled with no overlaps or gaps (tessellation).

5.4.2 Image quality

The **material** image file shall have a minimum quality of:

a) 512 x 512 pixels for square images.

b) 512 pixels on its longest side for rectangular images.

c) 150 dpi.

Terms and Definitions

For the purpose of this document, the following terms and definitions apply.

Term	Definition
Assembly	A collection of objects combined into a group to be used as one object. EXAMPLE: An accessible toilet may be an assembled group of the following objects: toilet, handrails, cubical walls, door.
Associative dimensioning	Dimension that adjusts to changes in the geometric objects that they measure. Associative dimensioning automatically adjusts the location, orientation, and measurement value of dimensions when the geometric objects associated with them are modified.
BIM platform	Application used in design for generating data for multiple uses. EXAMPLE: Autodesk® Revit®, Bentley® AECOsim®, Graphisoft® ArchiCAD®, Nemetschek® Vectorworks® and Tekla® Structures.
COBie (Construction Operation Building information exchange)	Subset of ISO 16739 IFC documented as a buildingSMART model view definition (MVD) which includes operational information. Note 1: The definition of COBie is maintained by buildingSMART International. Note 2: see also FM Basic Handover Model View Definition (MVD).
Code (BS 1192)	Sequence of characters, often a mnemonic, having defined meaning when interpreted in the context of the field in which it is entered, used to concisely convey meta-data.
Component Object	Individual object that has unique geometry and does not rely on any other object to be understood. Note 1: The term component is sometimes referred to as instance, occurrence or element.
Components	Specific instances of each type, that may require management such as inspection, maintenance, service or replacement during in 'in-use' phase.
Constraint	Can be: <ul style="list-style-type: none">- a 'Geometric constraint' whereby geometric properties are limited and controlled e.g a dimension can be constrained by fixed length or by range, or two lines can be constrained to be parallel- an 'Information constraint' whereby non graphical properties are limited, e.g. product value can only be 'blue' Note 1: IFC: Restriction for a specified reason.
Container (BS 1192)	Named persistent set of data within a file system or application data storage hierarchy including, but not limited to, directory, sub-directory, data file, or district sub-set of a data file, such as a chapter or section, layers or symbol.
Convention (BS 8541-2)	Accepted way of drawing an item which may have the nature of a representation , a simplified representation or a symbol .
Datatype (ISO 29481-1)	Named types of data that may be used including labels, text description, identifiers, enumerated ranges of possible values from which a selection should be made and select types for alternative routing through a schema.

Term	Definition
Enumeration (ISO 29481-1)	Construct that allows an attribute value to be one of multiple predefined values identified by name.
Field (BS 1192)	Part of a container name reserved for meta-data.
FM Basic Handover Model View Definition (MVD)	<p>An IFC View Definition, or FM Basic Handover Model View Definition, MVD, defines a subset of the IFC schema, that is needed to satisfy one or many Exchange Requirements of the AEC industry. The basic FM hand overview definition developed by buildingSMART exchanges facility management information among building models.</p> <p>Note 1: The COBie spreadsheet is a mapping of the FM Basic Handover Model View Definition (MVD) of the current Ifc 2x3 schema as documented in the COBie responsibility matrix.</p> <p>Note 2: http://projects.BuildingSMARTalliance.org/files/?artifact_id=4093</p>
Generic object	<p>Object type intended for use in stages of design when the finalised solution has not yet been completely resolved.</p> <p>EXAMPLE: Generic – Hand-Drier 285x200x250 (electric device)</p>
Geometric representation	<p>Geometric representation of the space defined by a product's external boundaries.</p> <p>Note 1: The term geometric representation is sometimes referred to as product shape or shape representation.</p>
Graphical view	Includes elevation, plan, section, front, side, isometric and animation views
Hard coded	Fixed data or property in a BIM platform that cannot be altered.
IfcBuildingElement ProxyType	This defines a list of commonly shared property set definitions of a building element proxy and an optional set of product representations. It is used to define an element specification EXAMPLE: The specific product information that is common to all occurrences of that product type
PredefinedType	Defines the particular type.
IfcTypeObject	<p>Defines the specific information about a type, that is common and shared by multiple object occurrences. The object type is represented by a set of property set definitions.</p> <p>Note 1: Similar to class, template and type.</p>
Industry Foundation Classes (Ifc)	<p>Open vendor-independent neutral file format that defines an extendable set of consistent data representing building information for exchange and interoperability between AEC software applications.</p> <p>Note 1: The IFC specification is developed and maintained by buildingSMART International as its "Data standard".</p> <p>Note 2: IFC is registered with ISO as ISO 16739.</p>
Information device (BS 8541-2)	Convention indicating an abstract item.
Instance (BS 1192)	<p>Occurrence of an entity at a particular location and orientation within a model</p> <p>Note 1: Sometimes referred to as occurrence.</p>

Term	Definition
Layered object	<p>Object typically constructed from a number of layers of materials to form a system, modelled without fixed geometry. EXAMPLE: Walls, floors, roofs and ceilings</p> <p>Note 1: A layered object may consist of one layer e.g. waterproof membrane, insulation, metal decking or consist of a number of layers combined to form a multi layered object.</p> <p>Note 2: A multi layered object is often used where it is more practical to model multiple layers together rather than model each layer individually.</p> <p>Note 3: The layers can represent specific manufactured products or generic materials.</p>
Line (ISO 128 -20)	<p>Geometrical object, the length of which is more than half of the line width and which connects an origin with an end in any way, e.g. straight or curved, and without interruptions.</p> <p>Note 1: The term "line width" is also synonymous with "line weight" or "pen weight"</p>
Line types	<p>Collection of lines.</p> <p>Note 1: Synonym for "line pattern"</p>
Managed assets	Assets which will require maintenance, regular inspection and checks and in some cases, replacement parts.
Manufacturer object	<p>Type object intended to represent an obtainable product, either as a requirement or exemplar or as-built.</p> <p>Note 1: The term manufacturer object is also synonymous with "proprietary object" or "product object".</p>
Material (object)	<p>May carry information regarding identity, performance and appearance. Material may be assigned a specific colour, surface pattern or designated render appearance and specific line work for 2D representation to control the outward appearance of the product or geometrical representation in graphical views.</p> <p>Note 1: Materials can be used on their own as finishes and coatings, as products within an object, or to represent an option within an object.</p> <p>Note 2: The term material is often synonymous with building material, construction material and surface.</p>
Metadata (BS 1192)	<p>Data used for the description and management of documents and other containers of information</p> <p>Note 1: Each item of metadata resides in a field. Codes are the values allowed for fields.</p>
Object	Item having state, behaviour and unique identity – for example, a wall object.
Object library	<p>Collection of BIM objects to be used on multiple projects.</p> <p>EXAMPLE 1: Public object library where objects are provided by a library curator for use by the public on their projects</p> <p>EXAMPLE 2: In-house object library where objects are used by a particular company for use on their projects</p> <p>EXAMPLE 3: Project object library for use on a particular project</p> <p>EXAMPLE 4: Client object library for use on a particular client's projects</p>
Parametric geometry	Geometry is that is defined and controlled by the metadata (properties) within the object .
Placeholder object	Simplified or generic representation of a 3D object .

Term	Definition
Presentation (ISO 13567-2)	Information which may relate to particular elements or to the model or drawing, and which may need to be switched on or off. Note 1: Presentation information is related primarily to the graphical appearance on screen and paper, as opposed to element information which is related to the physical structure.
Product (ISO 16739)	Physical object (manufactured, supplied or created) for incorporating into a project Note 1: It is specialization of the general term object .
Property	Generalisation of all characteristics (either types or partial type, i.e. property sets that may be assigned to objects). Shared among object instances , it reflects the specific information of an object type, but it may also represent the occurrence information of the actual object in the project context, if it is assigned only to a single object instance . Note 1: Properties are used to represent technical data and functions for designing, calculating and simulating the product . Note 2: The term property is synonymous with parameter and attribute within this standard. Note 3: The term parameter is often used by BIM platforms to describe the property information type that has been used to define a BIM object .
Property set	Collection of properties associated with an object and grouped together based on some principle, e.g. viewpoint, lifecycle stage.
Representation (BS 8541-2)	Scale view of an object. Note 1: Representation is often also referred to as visibility or display. Note 2: The terms 'Low/ symbolic/ simple/ Course, Medium, High/ detailed/ fine/ realistic' are often used as a substitute for 1:20, 1:50 and 1:100
Type	Common characteristics shared by multiple object occurrences. The named specification for equipment, products and materials . Note 1: Similar to object class, template, style, category, subcategory, functional type, library part, or subtype in other publications.
Schema	Data model in a formal machine-readable notation. Note 1: IFC specification consists of such a schema and associated informal human-readable semantic definitions. The schema describes a set of data types and their possible relationships.
Section (ISO 10209-1)	Representation showing only the outlines of an object lying in one or more cutting planes. Note 1: Synonym for cut .
Simplified representation (BS 8541-2)	Scale view incorporating only the essential shape, size or features of an object .
Specification	Description of the quality of, and requirements of, the product .

Term	Definition
Supplementary geometry (ISO 16792)	Geometric elements included in product definition data to commutate design requirements but not intended to represent a portion of the manufactured product.
Symbol (BS 8541-2)	Graphical device (without scale) used on a drawing to indicate the occurrence and/or location of an item or in annotation to indicate one or more of the properties of that item.
System	Consists of products defined by technical function, form and/or material . EXAMPLE: Masonry, insulation, blockwork Note 1: ISO 16739 describes a system as organised combinations of related parts, composed for a common purpose or function or to provide a service. System is essentially a functionally related aggregation of products.
Value	Information given against a property . EXAMPLE: Text, Boolean, Length, Look up table, Real, Units, Volume.
Variations/ Variants	Form or version that differs in some respect from other forms of the same things or from a standard.
Visibility	See representation .

Bibliography

The following documents are referred to as the source of a number of terms and definitions included within this document:

BS 1192:2016	Collaborative production of architectural, engineering and construction information. Code of practice
BS 8541-2:2011	Library objects for architecture, engineering and construction. Recommended 2D symbols of building elements for use on building information modelling
ISO 128-20:1996	Technical drawings – General principles of presentation – Part 20: Basic conventions for lines
ISO 10209:2012	Technical product documentation – Vocabulary – Terms relating to technical drawings, product definition and related documentation
ISO 13567-2:1998	Technical product documentation. Organization and naming of layers for CAD – Part 2: Concepts, format and codes used in construction documentation
ISO 16792:2015	Technical product documentation – Digital product definition data practices
ISO 29481-1:2010	Building information modelling – Information delivery manual – Part 1: Methodology and format

Useful website links:

www.bim.natspec.org
www.bimtaskgroup.org
www.BuildingSMART-tech.org/ifc/IFC2x3/TC1/html/index.htm
www.BuildingSMART-tech.org/ifc/IFC4/final/html/index.htm
www.cpic.org.uk
www.masterspec.co.nz
www.miproducts.co.nz
www.nationalbimlibrary.com
www.nationalbimlibrary.com/bim-explained
www.nationalbimlibrary.com/about-bim-objects
www.nationalbimlibrary.com/what-is-nbs-national-bim-library
www.natspec.com.au
www.nibs.org
www.omniclass.org
www.thenbs.com/bim

