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Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Framework for specification of BIM implementation

Organisation et numérisation des informations relatives aux bâtiments et ouvrages de génie civil, y compris modélisation des informations de la construction (BIM) — Cadre pour la spécification de la mise en œuvre du BIM

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works*, Subcommittee SC 13, *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)*.

This first edition cancels and replaces the Technical Specification ISO/TS 12911:2012, which has been technically revised.

The main changes are as follows:

— formalization of requirements;

— references updated.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Information management processes for the built environment sector have been defined through several international standards (e.g. the ISO 19650 series and the ISO 29481 series). These standards can be supported by creating structured and checkable technical specifications for the inputs to, controls on and outputs from those processes.

Structured and checkable technical specifications cover a wide range of situations. They can be used to define:

— the structure of an information planning document (e.g. a BIM execution plan);

— an information management control (e.g. the convention for a file name);

— the contents of an information container (e.g. the specified level of information need in a particular type of design model, drawing or schedule).

Some of these applications are already subject to standardized definitions but these definitions are usually in the form of textual descriptions which means they cannot be used by rule-based software to check for the expected outcomes.

This document defines a systematic approach through which a structured specification for any type of BIM implementation document can be created. Once created, these BIM implementation specifications can be shared amongst those providing and receiving information to enable deliverables to be checked, ideally through automated processes. The BIM implementation specifications are designed so that they can be both human-readable and machine-readable. This is done through the clear definition of the requirements that the deliverable has to meet, the applicable situation(s) that each specification is for, any selection of subsets, and any exceptions that need to be stated. This structured process is referred to as "RASE" (requirement, application, selection, exception).

Use of this document is expected to help organizations and individuals at all points during information management processes to explain their own expectations and to understand the expectations of others.

Authors of BIM implementation specifications, including international and national institutions as well as individual organizations, can use this framework to document their expectations in a way that is clear, concise and checkable. Those supporting specific software application usage can also conform to the framework.

Implementers of information management processes will benefit from the clear structure and the ability to compare and merge BIM implementation specifications, potentially from multiple sources, to mobilize, execute and check their internal BIM implementations.

BIM implementation specifications can be used:

— internally within an organization, to standardize the production of planning documents or to encode the rules to be used during the production of information containers;

— in appointment documentation to convey requirements from one organization to another;

— by discipline or sector-wide organizations to capture consensus on specific aspects of information management and production (e.g. the expected contents of detailed design drawings for structural steelwork or architectural floor plans).

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Framework for specification of BIM implementation

1 Scope

This document establishes a framework for providing specifications for the internal commissioning and implementation of building information modelling (BIM) during both delivery and operational phases. It identifies a structured approach so as to encourage clarity during development, management and checking processes for use by organizations that develop and apply these specifications.

This document does not provide specific content but it does provide examples.

It is applicable to buildings, infrastructure, facilities and managed landscapes, of any size or complexity.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6707-1, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

ISO 12006-2, *Building construction — Organization of information about construction works — Part 2: Framework for classification*

ISO 12006-3, *Building construction — Organization of information about construction works — Part 3: Framework for object-oriented information*

ISO 19650 (all parts), *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling*

ISO 29481-1, *Building information models — Information delivery manual — Part 1: Methodology and format*

ISO 29481-3, *Building information models — Information delivery manual — Part 3: Data schema and code*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6707-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

— IEC Electropedia: available at https://www.electropedia.org/

3.1 Terms related to knowledge resources

3.1.1
framework
structure of processes and specifications designed to support the accomplishment of a specific task

Note 1 to entry: A framework for a specification is analogous to a schema for an information container.

[SOURCE: ISO/IEEE 11073-10201:2020, modified — Note 1 to entry added.]

3.1.2
building information modelling implementation specification
BIM implementation specification
technical specification that aids authors and implementers in achieving their intended results through the use of *BIM* (3.1.5)

EXAMPLE Guide, guideline, manual, handbook.

Note 1 to entry: BIM implementation specifications are instantiations of a *framework* (3.1.1) schema.

Note 2 to entry: BIM implementation specifications can include BIM execution plans, definitions of style and content of deliverables such as types of drawing or schedule, and rules for preparing deliverables such as information container naming conventions.

3.1.3
information delivery manual
IDM
documentation which captures the business process and gives detailed specifications of the information that a user fulfilling a particular role would need to provide at a particular point within a project

Note 1 to entry: This can be referred to as an "information delivery specification (IDS)".

[SOURCE: ISO 29481-1:2016, 3.10]

3.1.4
information model
set of structured and unstructured information containers

[SOURCE: ISO 19650-1:2018, 3.3.8]

3.1.5
building information modelling
BIM
use of a shared digital representation of an asset to facilitate design, construction and operation processes to form a reliable basis for decisions

Note 1 to entry: The acronym BIM also stands for “building information model” as a shared digital representation of the physical and functional characteristics of any construction works.

[SOURCE: ISO 29481-1:2016, 3.2, modified — “asset” has replaced “built object”, and “(including buildings, bridges, roads, process plants, etc.)” has been deleted from the definition. ‘“building information model” as a’ has replaced “the” in Note 1 to entry.]

3.2 Terms related to requirements management

3.2.1
constraint
objective (3.2.4) or *metric* (3.2.2) that can be evaluated to true, false or unknown

Note 1 to entry: Based on specification of IfcConstraint in ISO 16739-1.

3.2.2
metric
limiting value or boundary condition that can be applied to or tested against a descriptive resource

Note 1 to entry: Based on specification of IfcMetric in ISO 16739-1.

Note 2 to entry: A building information model is an example of a descriptive resource.

3.2.3
clause
part of a specification document which contains one or more *objectives* (3.2.4)

Note 1 to entry: See 6.1.

3.2.4
objective
constraint (3.2.1) that is decidable by examination of its constituent *objectives* (3.2.4) and *metrics* (3.2.2)

Note 1 to entry: Based on specification of IfcObjective in ISO 16739-1.

3.2.5
requirement, application, selection, exception
RASE
method for structuring knowledge by distinguishing requirements, applicability, selections and exceptions

Note 1 to entry: See 6.4 and Reference [16].

4 Purpose and background

4.1 Role of the framework

The objectives of the framework are as follows:

a) Create a common approach for BIM implementation specifications by:

   1) aiding the development of clear and repeatable processes;

   2) allowing international, national, institutional and project/enterprise BIM implementation specifications to be prepared according to a common framework.

b) Make BIM implementation specifications manageable by:

   1) encouraging completeness of BIM implementation specifications by providing a common structure for outcomes, controls and inputs;

   2) encouraging the provision of reasoned explanations for demanded performance;

   3) enabling extensibility of BIM implementation specifications;

   4) supporting the comparing and merging of BIM implementation specifications.

c) Make BIM implementation specifications able to be tested by:

   1) encouraging the testing of BIM implementation specifications against this document;

   2) supporting the testing of outcomes against BIM implementation specifications;

   3) encouraging the use of formal arrangements which refer to BIM implementation specifications.

4.2 Intention of BIM implementation specifications

BIM implementation specifications may be used for a variety of purposes, including to:

a) establish the desired outcomes and define appropriate quality;

b) identify appropriate management effort and tools;

c) identify necessary effort and resourcing;

d) achieve and maintain a common understanding within national and project/programme contexts.

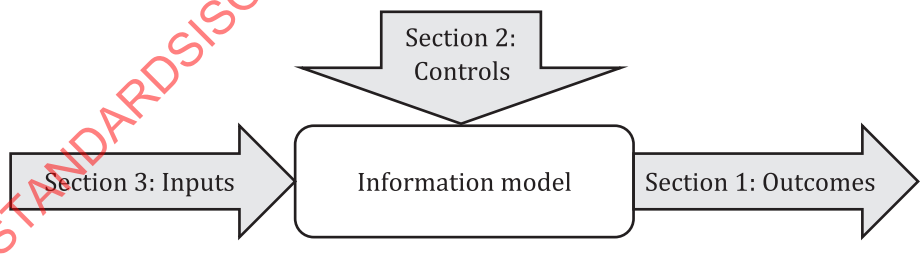
BIM implementation specifications may additionally cover the presentational conventions for application in the generation of outputs such as drawings and documents. This content may be carried forward from national and project drawing and document production standards.

4.3 Overview of framework sections

Authors and implementers should be able to easily navigate and understand any BIM implementation specification that results from implementation of this document. The enterprise is supported when the objectives for applying BIM (Framework Section 1: Outcomes, see 6.2.1) are reviewed and approved at the executive level. Information management (Framework Section 2: Controls, see 6.2.2) is supported by reviewing and implementing the management policies needed. Since these policies are keyed into the overall objectives, the dialogue between the manager and the executive is supported. Delivery teams can review and implement the input requirements (Framework Section 3: Inputs, see 6.2.3) as this defines what they shall do. These requirements are keyed into the management policies so that the dialogue between the delivery teams and management is supported. The three sections are illustrated in Figure 1.

The style and content are intended to ensure that the requirements within the BIM implementation specification are directly measurable either by human inspection or by automated checking.

A BIM implementation specification may be provided at an overall facility project or programme level, but may also be provided more specifically for individual sub-processes within those overall objectives. These individual sub-processes may be arranged in series and in parallel. The IDM methodology (see ISO 29481-1) shall be used to document, review and specify new processes. The outcomes of the review of new processes should then be documented in a BIM implementation specification, adhering to this document.



NOTE Based on the ISO/IEC/IEEE 31320-1:2012 IDEF0.

Figure 1 — Interaction of framework sections

4.4 Implementation

International, regional and national standards bodies, as well as other sponsored standardization authors and other project and consortia organizations responsible for facility projects or programmes may mandate the framework and BIM implementation specifications produced according to it. They may also author their requirements using this document. Requirement documents authored by those organizations may be converted to this document for use by organizations.

BIM implementation specifications are used internally within an organization as corporate technical specifications to manage information management within the delivery or operational phase.

The hierarchy of requirement sources authoring to this document affecting the execution and checking of its specifications is illustrated in Figure 2.

NOTE In some contexts national or regional standards can take precedence over international standards.

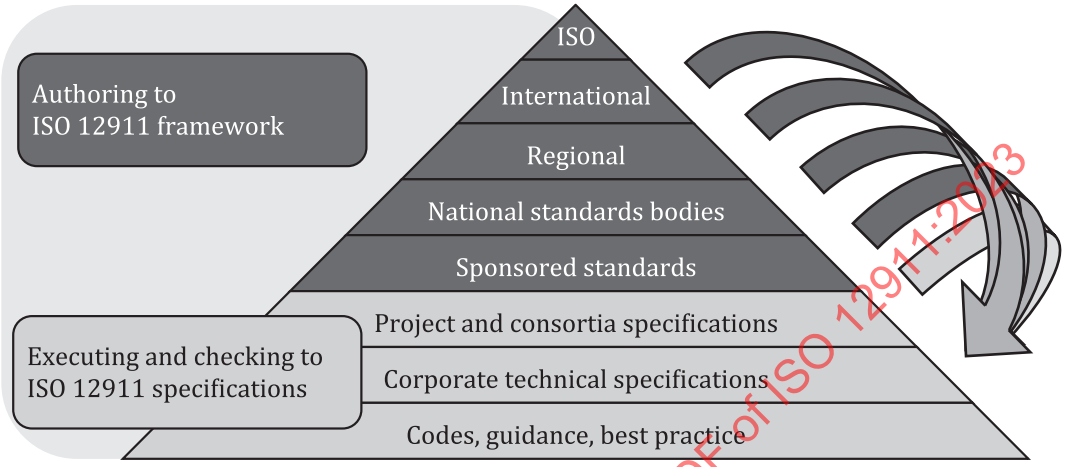


Figure 2 — Sources of and target for BIM implementation specifications

4.5 Conformity

Conformity testing to the BIM implementation specification shall be achieved by inspection or by the application of automatic compliance checking of information models and other information containers.

All units of information shall satisfy all objectives, by showing that each is either not applicable, is not selected, is excepted or is as required. Clause 6 and Table 2 give more detail on the logical implementation.

NOTE Units of information include objects, properties and relations.

4.6 Implications of nonconformity

Failing to conform to this document can impact on usability and coordination of BIM implementation specifications, leading to contractual and practical ambiguities.

Nonconformity with a BIM implementation specification can hinder testing and so impact the quality and efficiency of project/facility outcomes.

5 Relationship to other standards

5.1 Review

BIM implementation specifications shall be authored to support the internal commissioning and implementation of information management. It can be used in combination with other standards (refer to Table 1). New processes shall be analysed using ISO 29481-1 (IDM) and shall be incorporated within the ISO 19650 series process or other processes described in 5.2. Individual use cases or the overall delivery shall be defined and implemented using this document so as to support systematic checking using ISO 29481-3.

Table 1 — Approximate alignment of this document with other International Standards

Level of responsibility	Process development	Information management process	Use-case planning	Checking
	ISO 29481-1 Information delivery manual	The ISO 19650 series Information management	This document Implementation specifications	ISO 29481-3 IDS/mvdXML
Executive	Scope	Detailed responsibility matrix	Section 1: Outcomes	Package
Management	Business rules	Asset or project information standard, production methods and procedures (internal)	Section 2: Controls	Classification and naming policies
Implementation	Functional parts	Level of information need (internal) (see ISO 7817[1)])	Section 3: Inputs	Entities, relationships, shape and properties
		See 5.2 a) for non-BIM and 5.2 b) for standalone BIM projects		

5.2 Use

BIM implementation specifications shall be applied to the internal implementation of information management. In addition:

a) Projects and operational programmes that are not using BIM shall conform to this document with appropriate quality assurance (QA) and quality control (QC) measures.

b) Standalone projects and operational programmes, where only documentation is shared or published, should conform to ISO 9001 for QA and QC and ISO 21500 and ISO 55000 for its purposes.

c) Collaborative projects and operational programmes shall additionally follow the ISO 19650 series where BIM implementation specifications serve as the internal implementation plan or project or asset methods and procedures. ISO 19650-4 provides the information quality criteria for information exchanges.

NOTE Modelling and data technology can follow ISO 29481-1, ISO 23387, ISO 23386 and the ISO 21597 series.

5.3 Development of new outcomes

Where new outcomes are envisaged, ISO 29481-1 should be applied, and the outcome mapped to a BIM implementation specification. Refer to Table 1.

NOTE The inputs into the IDM process include a detailed process map for the desired outcome, highlighting the interfaces between parties and documenting the information requirements, generating a new Framework Section 1: Outcomes. Business rules that constrain the expected data can be documented, generating new clauses in Framework Section 2: Controls. Functional parts document the specific inputs, generating new clauses in Framework Section 3: Inputs.

5.4 Specialized application areas

The implications of International Standards from specialized application areas, where applicable, shall be inserted into the developed BIM implementation specification by domain experts.

EXAMPLE ISO 15686-4.

1) Under preparation. Stage at the time of publication: ISO/DIS 7817:2022.

5.5 Classification structures and language usage

BIM implementation specifications shall use classification systems conforming to ISO 12006-2 and terminology resources conforming to ISO 12006-3 where applicable to achieve the best possible degree of human and automated testability of the expectations.

5.6 Automation

BIM implementation specifications shall be written using simple sentences and avoiding compound metrics, to anticipate being mapped to formal rule schemas.

NOTE 1 Relevant rule schemas include:

a) ISO 10303-14: EXPRESS-X where information is held against an EXPRESS schema;

b) ISO 29481-3: buildingSMART mvdXML/IDS;

c) Schematron for information held against an XML schema;

d) SHACL for information held against an rdf/OWL schema;

e) DataLex: a text-based rule schema.

NOTE 2 Clause B.4 shows an example clause in Table B.15 mapped to two formal rule schemas.

6 Framework

6.1 Overview

Each BIM implementation specification shall be applied to the generation and management of any information model to support both the implementation strategy and checking of the outcomes. The BIM implementation specification shall support both the QA and QC processes, by explicitly specifying outcomes, controls and inputs necessary in terms of each clause's scope as RASE.

The overall structure of the framework shall be maintained.

The BIM implementation specification shall have:

a) three sections, relating to the desired outcomes, controls and inputs;

b) each section divided into clauses;

c) the sort ordering of the clauses maintained

NOTE The structure of the framework makes certain that there is consistency and compatibility between specification documents. This ensures that each clause can be developed, approved and implemented at the appropriate level of management and responsibility, and ensures that similar clauses can be easily located and reviewed.

6.2 Framework sections

6.2.1 Framework Section 1: Outcomes

The outcomes section shall specify the desired result(s).

Each outcomes clause shall specify

a) its applicability to a type of information container;

b) any selection of variants of the type of information container;

c) any otherwise included information containers that are excepted;

d) the outcomes(s) required.

NOTE 1 These can be generic outcomes, specific outputs or information containers. These outcomes can be chosen as part of the strategic planning for information management using BIM. See Table A.1 for example outcomes, and Clauses B.2.2 and B.3.2 for example usage.

NOTE The outcomes can be obtained from the ISO 29481-1 IDM process and exchange requirements or from the ISO 19650 series exchange information requirements.

6.2.2 Framework Section 2: Controls

The controls section shall specify the constraints on the development and delivery of the desired results and associated QA and QC criteria.

Each control clause shall specify:

a) the applicability to sets of information within the information container;

b) any selection of sets of information within the information container;

c) any otherwise included sets of information within the information container that are excepted;

d) the controls(s) required.

NOTE 1 These can include classification and naming rules and expected entities and relationships. These controls form the information management standards, methods and procedures. See Table A.2 for example controls, and Clauses B.2.3 and B.3.3 for example usage.

NOTE 2 The content can be obtained from the ISO 29481-1 IDM validation and business rules or the ISO 19650 series information standard, production methods and procedures.

6.2.3 Framework Section 3: Input

The input section shall specify the sets of information within information required to achieve the results selected in Section 1: Outcomes and the managerial processes required by Section 2: Controls.

Each input clause shall specify:

a) the applicability to sets of information within the information container;

b) any selection of variants of the sets of information within the information container;

c) any otherwise included sets of information within the information container that are excepted;

d) the unit(s) of information required.

NOTE 1 These can include specific properties. These inputs constitute the practical implementation of information management using authoring and mapping tools. See Table A.3 for example inputs, and Clauses B.2.4 and B.3.4 for example usage.

NOTE 2 The content can be obtained from the ISO 29481-1 IDM functional parts and concepts, deliverables or the ISO 7817 level of information need specifications defining the units of information necessary for the desired results.

6.3 Extensions

The integrity of the framework, as defined in 6.1, shall be maintained when the specification document is:

a) expanded by the insertion of additional clauses;

b) trimmed (filleted) to suppress clauses not relevant to specific implementation;

c) merged with other BIM implementation specifications to create a single integrated BIM implementation specification.

6.4 Clause structure

6.4.1 Overall

Clauses shall be written to express the normative objective by the clear expression of RASE.

Each clause shall have a title, the normative body and may conclude with informative notes.

6.4.2 Title

Every clause shall have as its title an objective which summarizes the intention. The title should also include a coding to control its ordering within the specification and on merging multiple specifications (see Annex A).

NOTE 1 A clearly stated objective can imply the benefit of conformity and the impact of nonconformity.

NOTE 2 An objective can be "quantity reporting for costing", "classification to a specific convention" or "the documentation of zones".

International clauses shall be entitled "Common... " and their coding given the suffix "A".

Nationally and regionally mandated policies including those provided by associations and professions, shall be entitled "National... " and their coding given the suffix "B".

Project- and facility-specific implementations shall be entitled "Specific..." and their coding given the suffix "C". This may include a specification provided with specific applications and implementation conventions, including owners or corporate policies.

NOTE 3 These suffixes are intended to ensure the expectations can be sorted correctly.

Table 2 summarizes the sections that follow the clause title. Any notes can be provided after these.

Table 2 — Breakdown of objectives into RASE

RASE	Logic	Scope	Spoken	Content
Applicability/ies[a]	not and	narrowing	Each...	— metric 1 — ...
Selections[a]	not or	broadening	Including...	— metric 1 — metric 2 — ...
Exception(s)[a]	or	excluding	Excepting...	— metric 1 — ...
Requirement(s)[a]	and	checking	Shall...	— metric 1 — ...

[a] See 6.4.3 to 6.4.6. The order of the RASE elements is not significant.

6.4.3 Applicability

Every clause shall identify the scope of its application. This shall be one or more metrics, which progressively narrow the scope relevant to the objective.

NOTE An applicability can be "published models", "fabric systems" or "layering of physical entities". All the example clauses in Annex B use at least one applicability. The example in Table B.14 uses two to narrow the scope (from all information containers) to drawings and then down to schematics.

6.4.4 Selection

A clause can identify the scope of selections. This should be two or more metrics, which collectively widen the scope relevant to the objective.

NOTE Selections can be "fabric" and "mechanical, electrical and plumbing", "a classification code" and "another classification code" or "classification assignment" and "property assignment". Tables B.4 and B.15 use selections to broaden the scope.

6.4.5 Exception

A clause may identify the exceptions to the scope. This should be one or more alternative metrics, each of which eliminate the scope as not relevant to the objective.

NOTE An exception can be "secondary accessories", "entities classified to [a classification code]" or "annotation". Tables B.4 and B.15 provide examples of exceptions.

6.4.6 Requirement

Every clause shall identify at least one requirement (or definition) constraint. There shall be one or more other constraints that define the scope.

NOTE A requirement can be "consistency of shape and measurement", "provision of 3D shape" or "recording the measured volume". All the example clauses in Annex B use at least one requirement. Example Table B.17 has four distinct requirements.

Definitions shall identify extensions to the information content using a definitive metric containing an "is defined as" comparator.

NOTE 1 Unlike other requirements, definitions cannot be not satisfied but can create new information.

NOTE 2 A definition of "fabric" can create a named grouping of wall, slab, door and window objects for use in other metrics, even if no such grouping exists in the information container. Tables B.2, B.12 and B.13 are definitions.

6.4.7 Complex metrics

A complex or compound metric shall be expressed as a complete subsidiary clause.

NOTE This makes the framework recursive, allowing any complexity to be documented and checked for compliance.

EXAMPLE A complex exception can be expressed using its own applicability and requirement: "Every entity shall have its weight recorded except spaces which are required to have their perimeter recorded." Table B.4 uses a complex exception.

6.4.8 Notes

Any notes shall explain but not modify the normative content of a clause.

Annex A
(informative)

Clause ordering

Tables A.1, A.2 and A.3 provide a recommended framework structure for use if there is no existing national, project/programme or organizational structure available. Each can be thinned or expanded, while conforming to Clause 6. A specific BIM implementation specification can need only a small number of clauses, sorted as indicated in these tables.

Table A.1 provides a list of possible desired outcomes including agreed purposes and use cases that may be obtained from the application of information management.

Table A.2 provides a list possible management approaches and supportive activities.

Table A.3 provides a list of possible inputs and productive effort

Table A.1 — Clause ordering for Framework Section 1: Outcomes

Topic	Ordering
Outcome: purposes and use cases	1
States	1.1
Compliance and legal outcomes	1.1.1
Certification	1.1.2
Process outcomes and evidence	1.1.3
Outputs	1.2
Drawing	1.2.1
Diagram	1.2.2
Image	1.2.3
List	1.2.4
Model	1.2.5
Text	1.2.6
Video/audio	1.2.7
Message/notification	1.2.8
Analysis and simulation	1.3
Functional	1.3.1
Operational	1.3.2
Cost and time	1.3.3
Structural outputs	1.4
Static load case	1.4.1
Dynamic load case	1.4.2
Environmental outputs	1.5
Energy use	1.5.1
Resource use	1.5.2
Other environmental impact	1.5.3
Social, economic and political outputs	1.6
Health	1.6.1

Table A.1 *(continued)*

Topic	Ordering
Well-being	1.6.2
Community	1.6.3
Integration with other processes	1.7
Approval process	1.7.1
Procurement process	1.7.2
Operational process	1.7.3

Table A.2 — Clause ordering for Framework Section 2: Controls

Topic	Ordering
Controls: management approaches and support activities	2
Facility and project life cycle stages/phases	2.1
Conformity	2.2
File conformity	2.2.1
Schema conformity	2.2.2
Data quality and business rule compliance	2.2.3
Criteria	2.3
Common data environment (CDE) and other metadata rules	2.3.1
Continuity between deliverables	2.3.2
Communication conventions such as dates and units	2.3.3
Consistency of space and property allocation	2.3.4
Completeness	2.4
Semantic completeness	2.4.1
Property completeness	2.4.2
Shape and positioning completeness	2.4.3
Classification	2.4.4
Change management	2.5
User competence	2.5.1
Access rights and filters	2.5.2
Issues and risks	2.5.3
Revisioning, versioning and differencing	2.5.4
Status	2.5.5
Workflow	2.6
Planning	2.6.1
Coordination	2.6.2
Review	2.6.3
Approval	2.6.4
Authorization	2.6.5
Acceptance	2.6.6
As-delivered/as-built	2.6.7
Interoperability: exchange management	2.7
Export and filtering	2.7.1
Transformation	2.7.2
Import and merging	2.7.3
Relationship to documentation	2.8

Table A.2 *(continued)*

Topic	Ordering
Legal and contracts	2.8.1
Design documents	2.8.2

Table A.3 — Clause ordering for Framework Section 3: Inputs

Topic	Ordering
Inputs: the production activity required	3
Objects	3.1
Elements	3.1.1
Spatial structure	3.1.2
Processes	3.1.3
Resources	3.1.4
Analysis factors	3.1.5
Properties	3.2
Identification	3.2.1
Grouping	3.2.2
Representation	3.2.3
Other properties	3.2.4
Relationships	3.3
Aggregation/decomposition	3.3.1
Adjacency and sequencing	3.3.2
Assignment of physical to spatial: containment and bounding	3.3.3
Assignment of process to physical: effects and change	3.3.4

Annex B
(informative)

BIM implementation specification examples

B.1 General

This annex uses the framework structure to show how BIM implementation specification can be organized for systematic checking and review. This approach is most relevant where quality management procedures and applications are in use. The division of the objective content into applicability, selection, exceptions and requirements and definitions is described in 6.4. Notes on each clause follow the normative content, as described in 6.4.7.

B.2 Fabric quantity report (example)

B.2.1 General

This example shows a combination of general (international), national and specific requirements for the outcomes, controls and inputs necessary to generate a quantity report for fabric systems. Together, these tables define the rules for generating the quantity report.

The requirements shown for the generic and national outcomes (see Tables B.1 and B.2) are further detailed in the controls in Table B.3, which gives the rules for geometric measurement, and Table B.5, which identifies the classification of work sections for grouping elements to be measured. The definition of which fabric systems are to be measured is detailed in Table B.4. Tables B.6 to B.10 describe the different inputs that are needed to support the quantity reporting process. These are an agreed naming convention for elements (shown in Tables B.6 and B.7), rules for grouping elements by type and construction (shown in Tables B.8 and B.9) and rules for grouping by classification codes (shown in Table B.10).

B.2.2 Framework Section 1: Outcomes

To obtain a fabric quantity report, the expectations in Tables B.1 to B.10 shall be met.

Table B.1 — Common quantity report

Section	Description	Ordering
Objective	To obtain fabric take off information	1.3.3.A
Applicability	Components in specific fabric systems	
Selection	All	
Exceptions	None	
Requirements	a) Level of information need shall be specified for common geometric measurements b) Identification of elements shall be to a common naming convention c) Grouping of elements shall be by type and construction	
Notes	This sets out the desired outcome and refers to later clauses for detail	

Table B.2 — National quantity take off

Section	Description	Ordering
Objective	Information on nationally endorsed quantity reporting	1.3.3.B
Applicability	Quantity report/observations	
Selection	All	
Exceptions	None	
Requirements	Grouping of elements shall be by their national classification of work sections	
Notes	This sets out the need for a national level management convention to control the groupings of the output	

B.2.3 Framework Section 2: Controls

Table B.3 — Common geometric measurements

Section	Description	Ordering
Objective	Common geometric measurements	2.4.2.A
Applicability	a) All objects b) With a physical representation c) After deductions for any openings, rebates, chases and addition for features	
Selection	All	
Exceptions	a) Spaces and zones b) Notional openings	
Requirements	a) Net volume b) Net surface area	
Notes	This sets out the policy on deductions affecting area and volume measures	

Table B.4 — Specific fabric systems

Section	Description	Ordering
Objective	Specific fabric systems	2.4.1.C
Applicability	Defined systems	
Selection	a) Substructure b) Structural columns beams c) Structural and non-structural floors, slabs and roofs d) Stairs, ramps and shafts e) Envelope with doors and windows f) Internal divisions and doors g) Fitted furniture and sanitary fittings	

Table B.4 *(continued)*

Section	Description		Ordering
Exceptions	**Section**	**Description**	
	Objective	To exclude implied openings	
	Applicability	Virtual opening elements	
	Selection	All	
	Exceptions	None	
	Requirement	Having a filling element	
	Notes	This ensures that only virtual opening elements without door or window content are measured.	
Definition	Common grouping as “fabric systems”		
Notes	This sets out scope of “fabric systems” as a definition		

Table B.5 — National classification of work sections

Section	Description	Ordering
Objective	National classification of work sections	2.4.4.B
Applicability	All objects representing work	
Selection	a) New objects b) Renovated and remodelled objects c) Deleted and demolished objects	
Exceptions	Objects providing context rather than work	
Requirements	Common grouping by classification should be according to [a classification system]	
Notes	This sets out the desired classification method	

B.2.4 Framework Section 3: Inputs

Table B.6 — Common Naming of elements

Section	Description	Ordering
Objective	Common naming of elements	3.2.1.A
Applicability	All objects representing instances of work or assets	
Selection	a) New objects b) Renovated and remodelled objects c) Deleted and demolished objects	
Exceptions	Objects providing context	
Requirements	a) Names shall be readable b) Names shall be unique within the project/facility	
Notes	This sets out requirement for consistent naming of in-contract entities	

Table B.7 — Specific naming policy

Section	Description	Ordering
Objective	Specific naming of elements	3.2.1.C
Applicability	All objects representing instances of work or assets	

Table B.7 *(continued)*

Section	Description	Ordering
Selection	a) New objects b) Renovated and remodelled objects c) Deleted and demolished objects	
Exceptions	Objects providing context	
Requirements	a) Names shall include their object type b) Names shall include a serial sequential three-digit number (e.g. 001)	
Notes	This sets out the specific naming policy to be used. Note that this example can be automated or checked systematically. This clause can refer to or implement ISO 4157-1.	

Table B.8 — Common grouping by type and construction

Section	Description	Ordering
Objective	Common grouping by type and construction	3.2.2.A
Applicability	All objects representing work or assets	
Selection	a) New objects b) Renovated and remodelled objects c) Deleted and demolished objects	
Exceptions	None	
Requirements	Grouping shall be associated by a single named object	
Notes	This sets out that entities shall have a specifying type or material associated	

Table B.9 — National grouping by type and construction

Section	Description	Ordering
Objective	National grouping by type and construction	3.2.2.B
Applicability	Fabric elements	
Selection	a) Walls b) Slabs c) Roofs	
Exceptions	Specialist work	
Requirements	Grouping by [a classification table]	
Notes	This sets out that the specifying types shall be classified	

Table B.10 — Common grouping by classification

Section	Description	Ordering
Objective	Common grouping by classification	3.2.3.A
Applicability	All objects	
Selection	All	
Exceptions	None	

Table B.10 *(continued)*

Section	Description	Ordering
Requirements	a) All elements shall be classified using one or more classification systems b) Only one value per system shall be used c) The code of the classification entry shall be available d) The description of the classification entry shall be available	
Notes	This sets out the required input of classification codes	

B.3 Schematic drawing (example)

B.3.1 General

This BIM implementation specification covers the production of developed design schematic drawings.

This example shows a combination of general (international), national and specific requirements for the outcomes, controls and inputs necessary for the production of developed design schematic drawings. Together, these tables define the rules for generating the production of developed design schematic drawings.

The requirements shown for the generic and national outcomes (see Table B.11) are further detailed in the controls in Tables B.12 and B.13, which define the components to be included, and Tables B.14 and B.15, which give the conventions expected. Tables B.16 and B.17 describe the naming and properties to be included.

To develop design schematic drawings, the expectations in Tables B.11 to B.17 shall be met.

B.3.2 Framework Section 1: Outcomes

Table B.11 — Common developed design schematic drawings

Section	Description	Ordering
Objective	To obtain developed design schematic drawings	1.2.1.A
Applicability	Systems	
Selection	a) Mechanical systems b) Electrical systems c) Plumbing and public health systems	
Exceptions	Fire detection and alarm systems	
Requirements	a) Engineering components definition b) Performance components definition	
Notes	This sets out the desired outcome	

B.3.3 Framework Section 2: Controls

Table B.12 — Common definition of engineering component

Section	Description	Ordering
Objective	To define engineering components	2.4.1.A
Applicability	Systems	