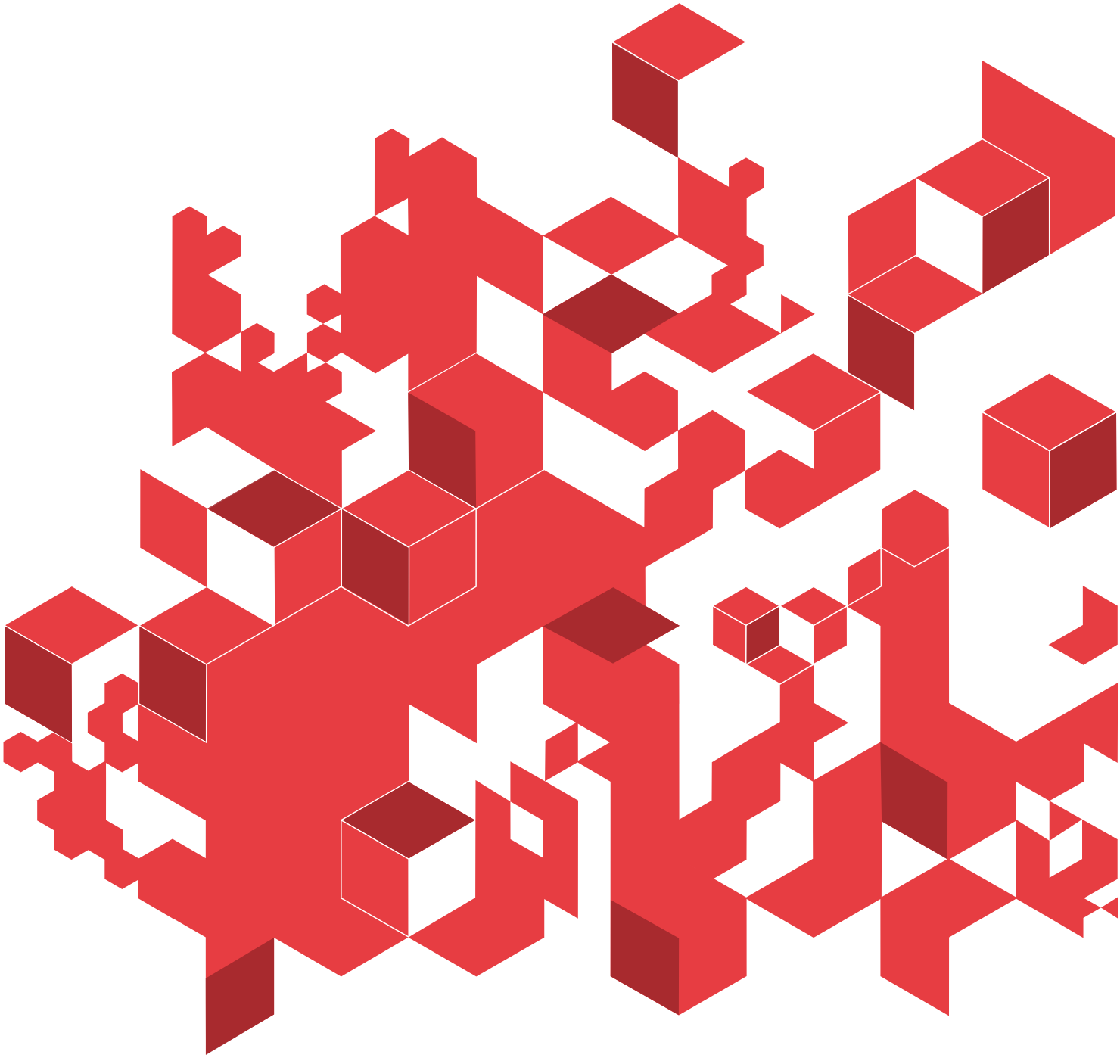
Planbim

# BIM STANDARD FOR PUBLIC PROJECTS

## Information Exchange between Appointing and Appointed Parties

Version 1.1



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**Page 21:** (1) "BS 1192:2007+A2:2016", (2) "ISO 19650"
**Page 69:** (1) "Project-Organization-Discipline-Zone-Level-Type of Document(*)-Description(*)-Status(*)-Revision(*)", (2) "Project-Status(*)-Revision(*), (3) "BS 1192:2007 +A2:2016"
**Page 70:** (1) "Result file: PR1-ABC-ARQ-Z1-01-MO-0001-Doors-C-A", (2) "BS 1192:2007+A2:2016"
**Page 73:** (1) Acronym for Audio and Acoustics, (2) Acronym for Air Extraction
**Page 90:** (1) TDI Table of BIM Use 12
**Page 147:** (1) Example acronyms on form 12
**Page 148:** (1) Example acronyms on form 13

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# BIM STANDARD FOR PUBLIC PROJECTS

## Information Exchange between Appointing and Appointed Parties

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## List of Acronyms

Note to the English version: Some of the acronyms in this list are in Spanish, while others have been translated to English according to the ISO and other international guides.

| | |
|---|---|
| **AECO:** | Architecture, Engineering, Construction and Operations |
| **AICE:** | Structural Civil Engineers Association (Asociación de Ingenieros Civiles Estructurales) |
| **AB:** | As-Built |
| **AOA:** | Association of Architecture Firms (Asociación de Oficinas de Arquitectura) |
| **BAS:** | Building Automation System |
| **BEP:** | BIM Execution Plan (Plan de Ejecución BIM o PEB) |
| **BCF** | BIM Collaboration Format |
| **BIM:** | Building Information Modeling |
| **CAPJ:** | Administrative Corporation of the Judiciary (Corporación Administrativa del Poder Judicial) |
| **CChC:** | Chilean Chamber of Construction (Cámara Chilena de la Construcción) |
| **CC:** | Construction Coordination (Coordinación de Construcción) |
| **CDE** | Common Data Environment |
| **CDT:** | Technological Development Corporation (Corporación Desarrollo Tecnológico) |
| **CM:** | Construction, Manufacturing and Assembly (Construcción, Manufactura y Montaje) |
| **CMMS:** | Computerized Maintenance Management System |
| **COBie:** | Construction Operations Building information exchange |
| **DA:** | Draft Design (Diseño de Anteproyecto) |
| **DB:** | Basic Design (Diseño Básico) |
| **DC:** | Concept Design (Diseño Conceptual) |
| **DD:** | Detail Design |
| **DGAC:** | General Civil Aviation Authority (Dirección General de Aeronáutica Civil) |
| **EIR:** | Exchange Information Requirement (Solicitud de Información o SDI) |
| **EAIM:** | Model Information Progress State (Estado de Avance de la Información de los Modelos) |
| **GIS:** | Geographic Information System |
| **GM:** | Asset Management and Maintenance (Gestión y Mantenimiento del Activo) |
| **IDM:** | Information Delivery Manual |
| **IFC:** | Industry Foundation Class |
| **IFD:** | International Framework for Dictionaries |
| **LOD:** | Level of Development (Nivel de Información o NDI) |
| **MDS:** | Ministry of Social Development |
| **MEI:** | BIM Basic Information Delivery Manual (Manual Básico de Entrega de Información) |
| **MINEDUC:** | Ministry of Education (Ministerio de Educación) |
| **MINSAL:** | Ministry of Health (Ministerio de Salud) |
| **MINVU:** | Ministry of Housing and Urban Development (Ministerio de Vivienda y Urbanismo) |
| **MOP:** | Ministry of Public Works (Ministerio de Obras Públicas) |
| **MVD:** | Model View Definition |
| **MTT:** | Ministry of Transportation and Telecommunications (Ministerio de Transporte y Telecomunicaciones) |
| **NDI:** | Level of Development, or LOD (Nivel de Información) |
| **PDI:** | Chilean Investigation Police (Policía de Investigaciones de Chile) |
| **PEB:** | BIM Execution Plan, or BEP (Plan de Ejecución BIM) |
| **PM:** | Commissioning (Puesta en Marcha) |
| **SDI:** | Exchange Information Requirement, or EIR (Solicitud de Información) |
| **TDI:** | Type of Information (Tipo de Información) |
| **TI:** | Information Technologies (Tecnologías de la Información) |

## Foreword

The *BIM Standard for Public Projects* was developed by Planbim from Corfo (Chilean Economic Development Agency) and published in June 2019.

The document was prepared by the Planbim team after surveying and studying international BIM regulations, standards and protocols, and studying information on national public projects. This work was formalized as a first draft, which was made available to a multi-sector committee, the BIM Standard Committee, that gathered between January and December 2018 to analyze and discuss its contents. Between January and March 2019, the committee-validated document was made available to the industry for its discussion through a public consultation. The observations made in that period were analyzed and reviewed by the same committee.

This *BIM Standard for Public Projects* was developed thanks to the funding of the Ministry of Economy, Development and Tourism; Ministry of Public Works; Ministry of Housing and Urban Development; and Corfo. **The translation and publication of the English and Portuguese versions of the standard was funded by the Inter-American Development Bank.**

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# 1

# Introduction to the Standard

# 1 Introduction to the Standard

## 1.1. AECO Industry in Chile

The Architecture, Engineering, Construction and Operations (AECO) industry in Chile represents a significant share of Chile's economy, as it contributes with 7.2% to its GDP[1] and 10.6% of its national employment (over 870,000 jobs[2]). However, despite its relevance, the sector shows low productivity. Two surveys from McKinsey[3] that compared Chile's labor productivity to that of the United States, measured by square meters built per man hour, show that productivity dropped from 55% in 2007 to 48% in 2011. The reasons stated for this low productivity in said studies included the low adoption of advanced management procedures, fragmentation of the stages and actors of the design, construction and operation processes, lack of standardization, low use of pre-manufactured materials and lack of training for workers

1 Banco Central, Memoria Anual, 2017
2 IALE Estudio de Identificación de Demanda de Capital Humano conCapacidades BIM en la Industria de la Construcción. Estudio, Santiago, 2017
3 McKinsey&Company, Productividad Laboral en Chile ¿Cómo estamos? Presentación IRADE, 28-11-2013


## 1.2 What is BIM?

BIM (Building Information Modeling) is a set of technologies, processes and standards enabling multiple stakeholders to collaboratively design, construct and operate a building or infrastructure in virtual space[4]. This is, on the one hand, technologies allow to generate and manage information using models throughout the life cycle of a project. On the other hand, the standard-based methodologies allow to share this information in a structured manner among involved actors, encouraging collaborative and interdisciplinary work and, thus, adding value to the industry processes. BIM challenges the traditional individual and fragmented way of working, proposing a collaborative work methodology. This methodology focuses on the generation of concise information in a project and the smooth exchange of information between the different actors throughout the project's life cycle.

## 1.3 What is Planbim?

Planbim was created in 2016, in order to increase the productivity and sustainability of the AECO industry by incorporating information and communication processes, methodologies and technologies, that encourage modernization throughout the life cycle of a project. This is a 10-year program proposed and promoted by Corfo within the Productivity and Sustainable Construction Strategic Program (Programa Estratégico de Productividad y Construcción Sostenible), Construye 2025. Since 2017, it is part of Corfo's Digital Transformation Committee. Planbim aims at reducing costs and timelines for the construction processes of public projects and making the operation of this infrastructure more efficient. In order to achieve this, one of Planbim's goals is using BIM methodology for the development and operation of public buildings and infrastructure by 2020.

BIM implementation process is being developed through coordinated and progressive work with different public institutions. This work began with a collaboration agreement signed by the following institutions:

- Ministry of Economy, Development and Tourism
- Ministry of Finance
- Ministry of Public Works
- Ministry of Housing and Urban Development
- Ministry of Social Development
- Ministry of Health
- Ministry of Education
- Ministry of Interior and Public Security
- Ministry of Transportation and Telecommunications
- Corfo
- Chilean Chamber of Construction
- Construction Institute
- Administrative Corporation of the Judiciary
- Codelco
- Civil Registration and Identification Service
- Chilean Police
- Chilean Investigation Police
- General Civil Aviation Authority

4 Based on the definition from BIM Dictionary, https://bimdictionary.com/en/building-information-modelling/1/

The work with these institutions is focused in the BIM implementation throughout their processes, the training of their teams, the generation of this BIM standard and the creation of standardized requirements for public construction and infrastructure projects (BIM Exchange Information Requirements.) This, in order to facilitate, among other things, the tendering processes for companies and to obtain accurate project information that allows for better tools in decision-making.

In addition to public institutions, Planbim works with the academic and private sectors, identifying and encouraging the need to integrate and update BIM contents in both training and study programs, and spreading the uses and benefits of these work methodologies. It is expected that these sectors respond to the public requirement, providing services, enabling technologies and training the workforce.

## 1.4 What is a standard?

**The International Organization for Standardization (ISO) states that a standard is:**

> A document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context[5].

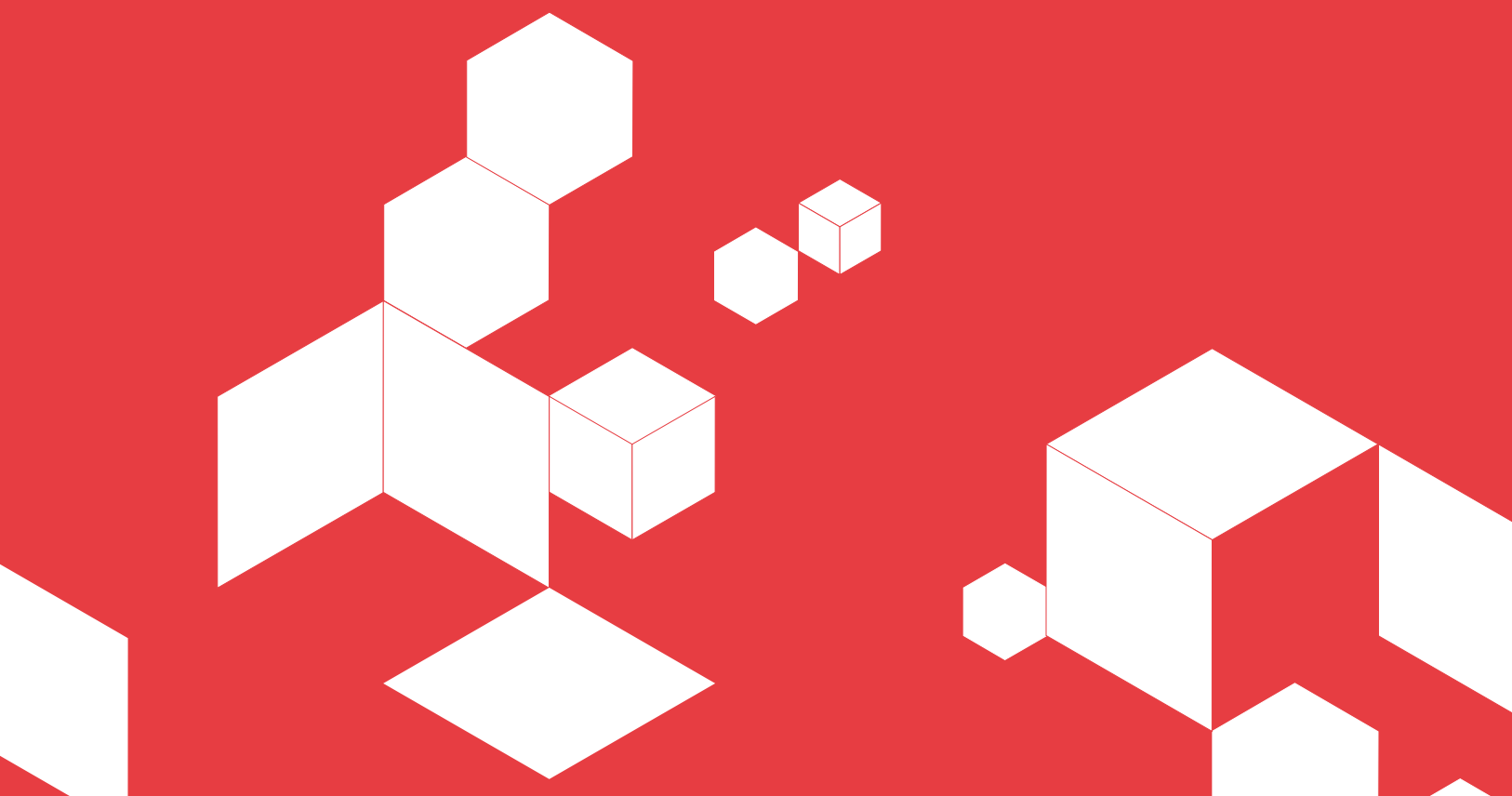
## 1.5 Why is the *BIM Standard for Public Projects* necessary?

The aim is to generate a consistent and transversal BIM requirement from the State. This is, that all public institutions that require BIM, do so in a standardized manner, known to all actors in the project, in order to facilitate the BIM implementation in both private and public institutions. On one hand, companies will be certain that the BIM requirements from different public institutions will always be clear and standardized, regardless the Appointing Party. This will allow BIM implementation within companies to be simpler, making their participation in public projects easier. On the other hand, the standard will help the public institutions requiring BIM, or intending to do so in the future, to begin their requirement from an existing common base.

5 ISO/IEC Guide 2 - Standardization and related activities - General Vocabulary, 2004.

# 2

# Objective and scope of the Standard



# 2

# Objective and scope of the Standard

## 2.1 Objective

This standard has been developed to ensure that the information related to public buildings and infrastructure projects is sufficient, consistent, of good quality and interoperable. This, together with other actions of the public and private sectors, aims at increasing the productivity and sustainability of the AECO industry.

## 2.2 Alignment with international standards

This standard is aligned with the minimum requirements for the exchange of BIM information, set in several international standards. It also includes more detail regarding how information should be delivered, through the definition of the Level of Development, Type of Information, BIM Uses, etc. All these definitions are based on international standards and conventions that are cross-referenced in each point.

### Table 01. Related international standards

The international standards used in this document are shown below:

| Type | Name | Standard | Description |
|---|---|---|---|
| Technology Base | IDM<br>Information Delivery Manual | ISO 29481-1: 2016<br>ISO 29481-2: 2012 | Describes processes |
| | IFC<br>Industry Foundation Classes | ISO 16739-1:2018 | Transports information/data |
| | BCF<br>BIM Collaboration Format | buildingSMART BCF | Enable collaboration |
| | IFD<br>International Framework for Dictionaries | ISO 12006-3: 2007<br>buildingSMART Data Dictionary | Define terms |
| | MVD<br>Model View Definition | buildingSMART MVD | Translates processes in technical requirements |
| | COBie<br>Construction Operations Building information exchange | BS 1192-4: 2014 | Transports information/data for operation |
| General | ISO BIM 1<br>Organization of information about construction works. Information management using building information modelling | ISO19650-1: 2018 | Describes BIM concepts and principles |
| | ISO BIM 2<br>Organization of information about construction works. Information management using building information modelling | ISO19650-2: 2018 | Describes asset delivery phase |
| Concept Base | Project Building Information Protocol Form | AIA Document G202-2013 | Defines five Levels of Development (LOD) |
| | Level of Development Specification | Level of Development Specification BIM Forum USA | Defines six Levels of Development (LOD) |
| | Project Execution Planning Guide version 2.1 | BIM Planning at Penn State | Defines 25 BIM Uses |
| | US Veterans Affairs Object/Element Matrix | VA BIM Guide | Defines Types of Information for each Entity |
| | BIM Basic Information Delivery Manual (IDM) | BIM Basic Information Delivery Manual -version 1.0 | Defines 12 steps to exchange information in a structured way |
| | Collaborative production of architectural, engineering and construction information - code of practice | BS 1192:2007+A2:2016 | Defines files and folders naming conventions |

*Developed by Planbim*

The table above shows three types of standards, which are described below.

**Technology base:** Seven documents and/or international formats that standardize processes, data and dictionaries were used as reference. These standards provide BIM software with a clear structure for the exchange of information with a global view of design, execution and operation of buildings and infrastructure. This allows for open work information flows, called openBIM.

**General:** The two international standards used include general recommendations on how to manage, exchange, record, control and organize the information used in the development of buildings and infrastructure by all the actors of a project. This provides a global framework that promotes internationalization, both in the exporting and importing, of related services.

**Concept Base:** Five international documents and / or protocols that establish the key concepts that allow the BIM Standard to define minimum requirements for the exchange of BIM information were taken as a reference, generating a common global language on BIM technical aspects.

## 2.3 Scope

This standard applies to public projects of varying complexity, regardless of their type or magnitude, throughout their life cycle.

Its main focus is the exchange of information between the Appointing Party and the Appointed Parties, be it Prospective Appointed Parties - during the tendering stage - or an Appointed Party - during the development of the project. The standard also deals with the flow between the Appointed Party and the companies rendering services for the development of the project through the BIM Execution Plan (4.6), as the Appointed Party must provide information regarding those in charge of the projects in this Plan, both within their own company and in other companies involved.

The *BIM Standard for Public Projects* includes conventions regarding geometric and non-geometric information that must be exchanged in a public project between the Appointing Party and the Appointed Parties. It also establishes, as a minimum requirement, the incorporation of the information established in the parameters of COBie (4.4.1) and the BIM Basic Information Delivery Manual, MEI (4.4.2) in BIM models.

The target audience of this document are the public institutions that regulate, tender and/or mandate projects to other institutions, such as private companies rendering services in this context.

Despite this standard being developed for public projects, it may be used as a reference for private projects, previously analyzing whether its contents correlate to the project's characteristics and objectives.

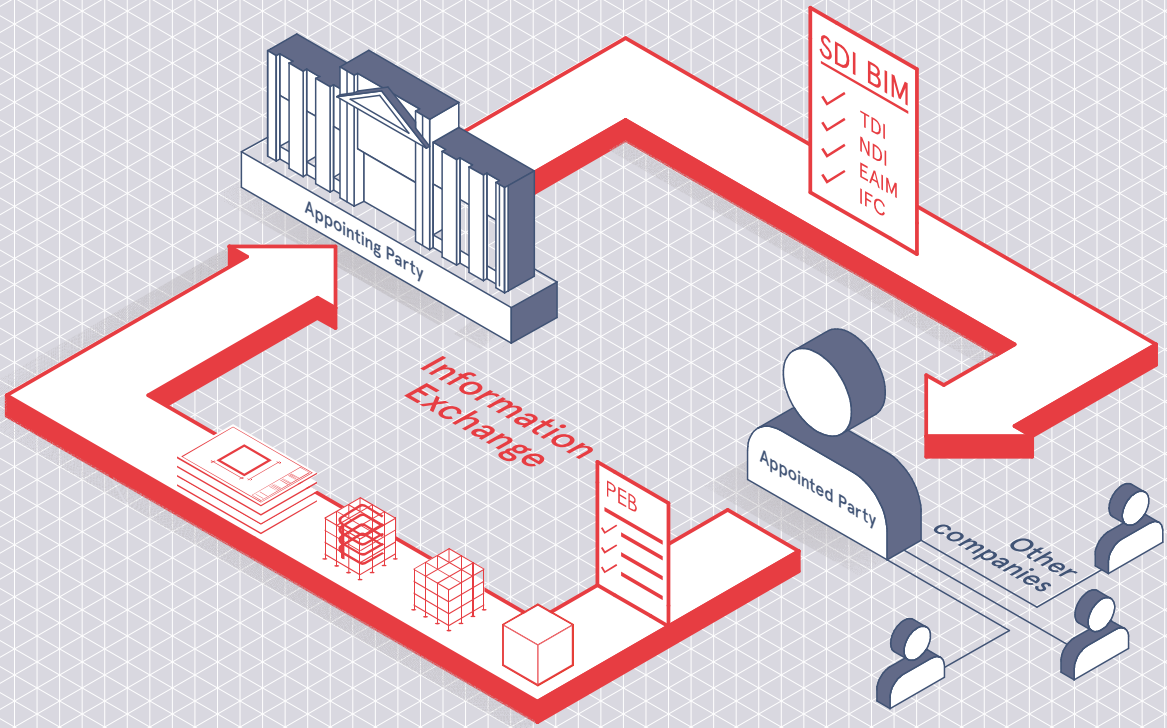



**Figure 1. Scope of the Standard**

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# 3

# Terms and definitions

# 3 Terms and Definitions

The following terms and definitions apply in the context of this standard:

> Note to the English version: Terms are organized according to their alphabetical order in the Spanish version of this document.

**3.1 Asset**
Building or infrastructure, after being built.

**3.2 Actor**
Organization, organizational unit or individual involved in one or more processes in the project's life cycle[6].

**3.3 As-built**
Record of the project as it has been actually built in the site, including all design changes during the development of works.

**3.4 Building Information Modeling (BIM)**
Set of technologies, processes and standards enabling multiple stakeholders to collaboratively design, construct and operate a building or infrastructure in virtual space[7].

**3.5 Life cycle**
Set of stages or phases a building or infrastructure goes through from its inception and definition of requirements to the end of its useful life[8].

**3.6 Client**
Actor responsible for initiating a project and/or approving deliveries[9].

6. Based on ISO19650-1:2018; 3.2.1, adapted
7. Based on Bilal Succar's definition, https://bimdictionary.com/en/building-information-modelling/1/, adapted
8. Based on ISO19650-1.2:2018; 3.2.10, adapted.
9. Based on ISO19650-1:2018; 3.2.5, adapted.

**3.7 COBie (Construction Operations Building information exchange)**
International standard that defines the prospects for information exchange throughout the life cycle of a building or infrastructure[10].

**3.8 Model Information Progress State (EAIM for its acronym in Spanish))**
Different consecutive degrees of development of the project information.

**3.9 Entity**
Virtual element representing a physical or abstract building object[11].

**3.10 Common Data Environment (CDE)**
Unique source of information for compiling, managing and disseminating documents and models for multidisciplinary teams through a standardized model. A CDE generally contains a document management system that simplifies the exchange of information between the actors of a project[12].

**3.11 BIM Deliverable**
Documents and information necessary for the creation of BIM models, as well as the products resulting from the use of BIM tools and workflows.

**3.12 Industry Foundation Classes (IFC)**
Expandable database structure representing building information for the exchange between different software for architecture, engineering and construction[13].

**3.13 Interoperability**
Ability of a product or system to work with other products or systems [...], either existing or future, with no restriction in access or implementation[14].

**3.14 BIM Basic Information Delivery Manual (MEI)**
Twelve-step guide to be applied to BIM models, allowing to share and exchange information in a structured manner during the whole life cycle of buildings and infrastructure, considering the use of openBIM standards[15].

**3.15 Federated BIM Model**
Model created from the information contained in separate files. This information may come from different actors[16].

**3.16 Integrated BIM Model**
Model comprising the information of different disciplines of the project, contained in a single database.

**3.17 Level of Development (LOD or NDI for its acronym in Spanish)**
Depth levels that the geometric and non-geometric information contained in the BIM model entities may have, according to the required Model Information Progress State.

10 BS 1192-4:2014
11 Based on Bilal Succar's definition, BIM Dictionary, adapted. https://bimdictionary.com/es/model-component/1/
12 Bilal Succar, https://bimdictionary.com/en/common-data-environment/1
13 Chuck Eastman and others. BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors, 2nd Edition.(2011), 114.
14 French speaking Libre Software Users' Association AFUL https://aful.org/gdt/interop
15 BIM Loket. https://www.bimloket.nl/BIMbasicIDM
16 Based on ISO 19650-1:2018 3.3.11 and 3.3.12, adapted.

**3.18 openBIM**
Universal approach for the design, execution and operation of buildings based on open standards and workflows. openBIM is an initiative from buildingSMART and several leading software vendors that use the open data model of the same organization[17].

**3.19 BIM Execution Plan (BEP o PEB for its acronym in Spanish)**
Document prepared by the Appointed Party defining how the aspects of information modelling and management will be developed[18].

**3.20 Appointed Party**
Actor providing information regarding works, goods or services[19].

Note: The Appointed Party may be a Prospective Appointed Party (presenting a technical and/or economic proposal in a tendering process) or an Appointed Party (already designated to develop a project).

**3.21 BIM Role**
Function performed in a given stage of the development and operation of a building or infrastructure project, based on BIM abilities that are added to non-BIM abilities.

**3.22 Appointing Party**
Actor receiving information on works, goods or services from the Appointed Party[20].

Note: In some cases the Appointing Party can also be the Client (3.6) of the project, while in others, the Appointing Party may act on behalf of the Client.

**3.23 BIM Exchange Information Requirement (BIM EIR or SDI BIM for its acronym in Spanish)**
Document defining why and how BIM will be used in a project. A BIM Exchange Information Requirement may have a different name, depending on the organization (e.g. BIM reference terms, administrative bases, etc.)

**3.24 Type of BIM Information (TDI for its acronym in Spanish)**
Data set the models may contain.

**3.25 BIM Use**
A method of applying Building Information Modeling during the life cycle of a building or infrastructure to achieve one or more specific objectives[21].

17 buildingSMART, https://www.buildingsmart.org/standards/technical-vision/
18 Based on ISO19650-2:2018; 3.1.3.1, adapted.
19 ISO19650-1:2018; 3.2.3.
20 ISO19650-1:2018; 3.2.4.
21 Ralph G. Kreider and John I. Messner. The uses of BIM: Classifying and Selecting BIM Uses, Version 0.9. (The Pennsylvania State University, 2013), 6.

# 4

# BIM information flows

# 4 BIM information flows

## 4.1 Incorporation of BIM to public projects

BIM is incorporated to the requirements of public projects in order to reduce the problems related to construction, referred to in 1.1. In this context, BIM does not modify the structure of the information flow within the project, but it is used to guarantee the sufficiency, consistency, quality and interoperability of the exchanged information during its development. This aims at supporting the process of compliance with projects' social rate of return and the efficiency in the use of State resources.

During the different stages of the public projects, one or more information exchanges occur between the Appointing and Appointed Parties. In order to define how this BIM information exchange will occur, the Appointing Party must generate a BIM Information Exchange Request and the Appointed Parties must answer through one or more BIM Execution Plans, among other documents (Figure 2).

The exchange of BIM models between Appointing and Appointed Parties must be carried using open formats, within an openBIM framework.

## 4.2 Interoperability

Interoperability is the "ability of a product or system to work with other products or systems [...], either existing or future, with no restriction in access or implementation[22].

In the case of this standard, interoperability is a key element, as it allows the State to:

- Maintain transparency and probity. The State should not request any specific brand of BIM software.
- Promote competition and the increase of technology solution suppliers..
- Integrate the information from BIM with that coming from other software, which may or be developed by public institutions.
- Guarantee the usability of data throughout the life cycle of the projects. The State needs organized information that can be used in the future for the operation and eventual remodeling of facilities. Therefore, it is key that the availability of the information does not depend on the availability of a specific software brand.

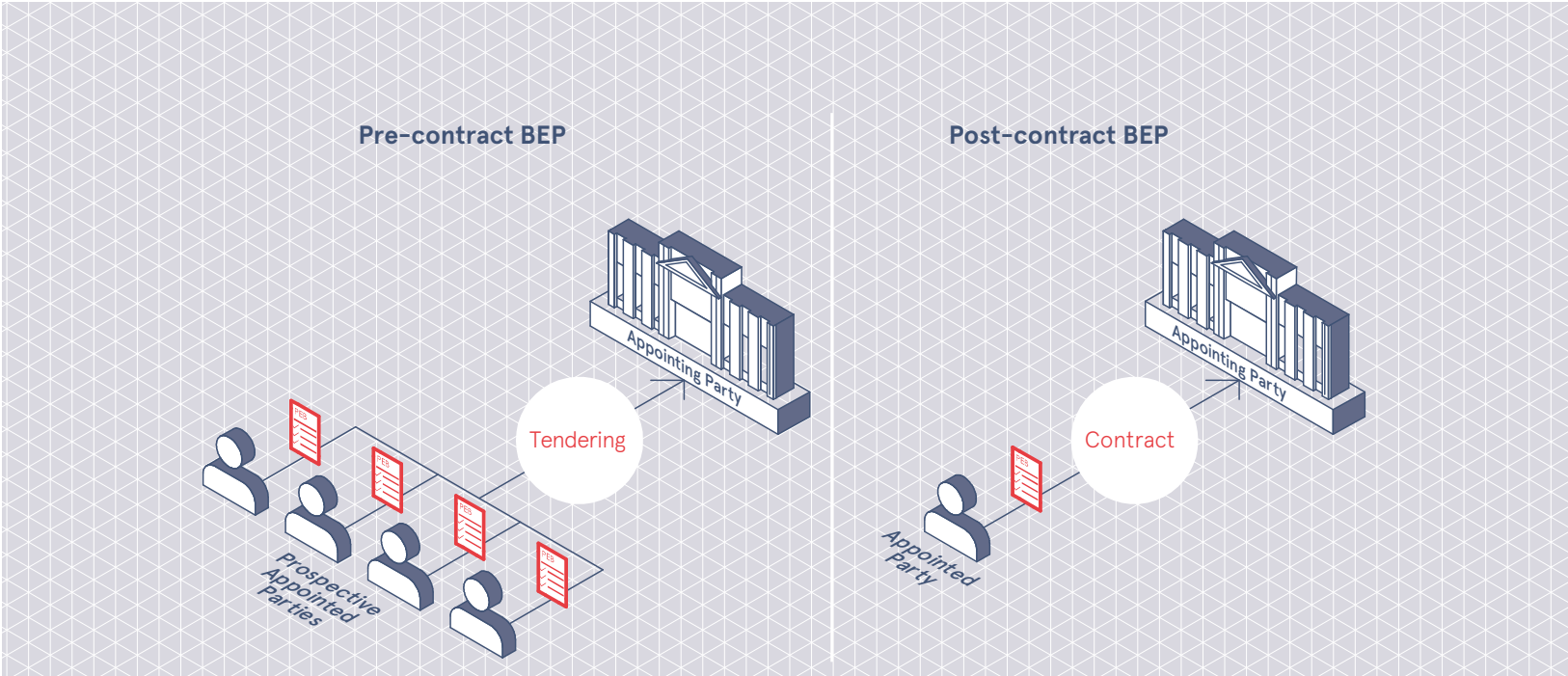



**Figure 2. BIM Execution Plan of Appointed and Prospective Appointed Parties**

*Developed by Planbim*

22.Francophone Association of Free Software Users AFUL https://aful.org/gdt/interop

## 4.3 Collaborative work

Collaborative work is the development of a building or infrastructure project where all actors involved are focused on attaining shared benefits from the tasks performed throughout the project's life cycle. It aims at a coordinated generation of information, regardless of the process or the type of contract.

To achieve collaborative work, it is necessary for the different actors in the project to generate information using standardized processes and established communication methods that ensure quality.

## 4.4 COBie and BIM Basic Information Delivery Manual (MEI)

### 4.4.1 COBie

COBie (Construction Operations Building information exchange) is an international standard developed in 2007 by the US Army Corps of Engineers.

This standard:

> Defines expectations for the exchange of information throughout the lifecycle of a Facility. The use of COBie ensures that information can be prepared and used without the need for knowledge of the sending and receiving applications or databases. It ensures that the information exchange can be reviewed and validated for compliance, continuity and completeness.[23]

In this standard, COBie parameters are the minimum dataset to be required by the Appointing Party (see Entities Information Matrix[24]). The COBie information exchange scheme allows to manage all necessary building or infrastructure data throughout its life cycle. These data may refer to facilities and sites, equipment lists, product datasheets, warranties, spare parts lists and maintenance programs, among others. The use of this scheme aims at improving the management of the operation and maintenance of public buildings and infrastructure.

### 4.4.2 BIM Basic Information Delivery Manual (MEI)[25]

This manual is a twelve-step guide to be used in BIM models. It allows to share and exchange information in a structured manner throughout the life cycle of buildings and infrastructure, considering the use of openBIM standards. This document was developed by a group of companies of the AECO sector in the Netherlands, together with BIM Loket and BuildingSMART Benelux[26], both non-profit organizations.

This manual allows to efficiently ensure the availability and potential reusability of BIM models' information, and it is used within the *BIM Standard for Public Projects* as part of the minimum data set to be requested by public institutions, in order to guarantee high-quality BIM deliverables.

For further information on the MEI, see Appendix III and Entity Information Matrix[27].

23 BS 1192-4:2014. Collaborative production of information - Part 4: Fulfilling employer's information exchange requirements using COBie – Code of practice (The British Standard Institution, 2014), 1.
24 https://planbim.cl/biblioteca/documentos/
25 CC BY-SA 4.0 license from BIM Loket. https://www.bimloket.nl/BIMbasicIDM
26 Belgium, Netherlands and Luxemburg
27 https://planbim.cl/biblioteca/documentos/

## 4.5 BIM Exchange Information Requirement (BIM EIR)

In this standard, the BIM Exchange Information Requirement, or BIM EIR, is understood as a document that defines why and for what BIM will be used in a project. The document must state in a formal and express manner the BIM deliverables and the information they must contain. This document is made by the Appointing Party and it must be delivered to the Prospective Appointed Parties, be them external (such as consultants and/or contractors in a tendering process) or internal teams in charge of certain project tasks.

The BIM Exchange Information Requirement may act as an addendum or appendix to a larger information requirement (tender terms and conditions, reference terms, calls for subsidies, etc.) and must require information according to this standard.

### 4.5.1 BIM Exchange Information Requirement structure

The minimum elements a BIM Exchange Information Requirement must contain are:

- General Objective and Specific Objectives (5.1)
- Required BIM Uses, Types of Information and Levels of Development (5.6 and 5.7)
- Deliverables (5.2)
- Collaboration Strategy (5.8)
- Model organization (5.9)

## 4.6 BIM Execution Plan (BEP)

The BIM Execution Plan (BEP) is a document that must be generated by each Appointed Party and that, based on the elements incorporated in BIM EIR (4.5.1), must focus on:

- Defining the modeling execution and project information management process
- Specifying the information exchange procedures, with their corresponding responsible people
- Establishing the technological infrastructure and competencies of the Appointed Party for the development of the information modeling in the project.

This facilitates the management of the project information delivery.

If a project begins with a tendering process, there must be two BEP, a Pre-contract BEP for the tendering stage, to be presented by all Prospective Appointed Parties, and a Post-contract BEP, to be developed by the Appointed Party that is awarded the tendering process (the Appointed Party). This second BEP must be updated, providing information on the Pre-contract BEP in higher detail.

If a project begins with a previously defined Appointed Party, this only needs to provide the Post-contract BEP.

Templates for the elaboration of these BEP are attached in Appendix IV and V of this standard.

### 4.6.1 Pre-contract BIM Execution Plan

The Pre-contract BEP must include, among other information, the following:

- Basic project information
- Objectives of the use of BIM in the project
- BIM Uses with the technological infrastructure and team skills to develop them
- Companies participating in the project and their corresponding responsible people
- General deliverables and their formats, according to the program of the project
- General collaboration strategy

### 4.6.2 Post-contract BIM Execution Plan

The Post-contract BEP must use the Pre-contract BEP as a basis, if available. The Post-contract BEP must be completed as the project progresses, to show its development and potential modifications. At the project completion, this document must include all changes made during its development.

The Post-contract BEP must provide detailed information regarding the following elements:

- Basic project information
- Objectives of the use of BIM in the project
- BIM Uses with the technological infrastructure and team skills to develop them
- Companies and individuals involved in the project and their BIM Roles
- Specific deliverables and their formats, according to the program of the project
- Collaboration strategy and platform
- Standards and conventions to be used regarding naming, classification, measuring units, coordinates, model structuring (defined levels, volumes, etc.), and others

# 5

# Components of the BIM Exchange Information Requirement and the BIM Execution Plan

# 5 Components of the BIM Exchange Information Requirement and the BIM Execution Plan

## 5.1 Objectives of the use of BIM

In order to correctly apply the BIM methodology in a project, the existence of clear and defined objectives for its use is a key element.

### 5.1.1 General objective

The general objective of the utilization of BIM will be the main goal set for the project in which this methodology will be used. Said objective does not refer to the institution's objective, but the project's particular goal. However, they may be the same in some cases. The general objective must be clear, concise, attainable within the defined deadlines using the available resources and be aimed at concrete results.

### 5.1.2 Specific objectives

Specific objectives of the utilization of BIM are the goals focused on measurable tasks that aim at solving the actual problems of the project. These goals may be multiple, and they must always be in line with the general objective of the BIM requirement of the project.

### 5.1.3 General and specific objectives of using BIM in the BIM EIR

The BIM Exchange Information Requirement must clearly state, in a separate manner, the general and specific objectives of the use of BIM in the project. BIM Deliverables (5.2) and BIM Uses (5.6) requested in the BIM EIR must match these objectives.

**The BIM EIR is a document that defines why and for what BIM will be used in a project. The BEP is a document elaborated by the Appointed Party that defines how the modelling and management of information will be carried out.**

**General objective example:**

The general objective of using BIM is to prevent critical errors or modifications of the approved timeline and budget.

**Specific objectives examples:**

- To obtain the quantities and costs of the project's components
- To ensure compliance with program requirements
- To facilitate collaboration and communication among all involved actors
- To prevent critical conflicts between the different project designs

### 5.1.4 General and specific objectives of using the BIM in BEP

Appointed Parties must state the BIM objectives of the project, set in the BIM EIR, in both Pre-contract and Post-contract BEP, correlating them with the BIM Uses to be applied for their fulfillment. For this purpose, forms in section B.1 are included in Pre-contract BEP and Post-contract BEP templates. These templates are attached in appendices IV and V of this standard.

## 5.2 BIM Deliverables

BIM Deliverables are any document and information necessary for the attainment of BIM models, as well as the products resulting from the use of BIM tools and workflows.

### 5.2.1 BIM Deliverables in the BIM EIR

The BIM Exchange Information Requirement must clearly establish BIM deliverables, stating, for each of them, a delivery format and medium.

**These deliverables must include, at the very least:**

- BIM Execution Plan: Pre-contract and/or Post-contract BEP, depending on the project's contract type (4.6)
- BIM Models: The specific models being required must be defined (5.3)
- Documents related to the models (5.4)

The BIM Exchange Information Requirement must define whether deliverables not specified in other reference terms of the same project will be added.

In order to specify and delimit the information to be exchanged through deliverables during the project, four concepts must be used in the requirement:

- BIM Uses (5.6)
- Model Information Progress States (5.5)
- Types of Information (TDI) (5.7.1)
- Levels of Development (LOD) (5.7.2)

### 5.2.2 BIM Deliverables in the BEP

Appointed Parties must mention the BIM Deliverables, in both Pre-contract and Post-contract BEP, determining the person in charge and a format for each, among other information. For this purpose, forms in section C are included in Pre-contract BEP and Post-contract BEP templates, together with the forms in Section E in the Post-contract BEP. These templates are attached in appendices IV and V of this standard.

## 5.3 BIM Models

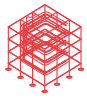
"A BIM model is an object-based, data-rich, 3D digital model generated by a project actor using a BIM software Tool"[28]. For the purposes of this standard, a BIM model may be developed and/or managed throughout any stage of the project's life cycle.

### 5.3.1 Types of models

There are different BIM models that may be generated by different actors throughout the life cycle of the project.

**Table 02.Types of BIM models**

Nine types of BIM models that may be developed for building or infrastructure projects are shown below:

| BIM model | Building | Infrastructure |
|---|---|---|
| Site |  |  |
| Volumetric |  |  |
| Architecture or Infrastructure Design |  |  |
| Structure |  |  |
| Mechanical Electrical Plumbing (MEP) |  |  |
| Coordination (**) |  |  |
| Construction (***) |  |  |
| As-Built |  |  |
| Operation |  |  |

(**): The coordination model must be developed through the consolidation of, at the very least, the models of architecture or design of infrastructure, structure, and MEP. This consolidation must be performed using federated or integrated models according to 5.8.2

(***): The construction model may consider the use of other types of models among the nine mentioned previously. This consolidation must be performed using federated or integrated models according to 5.8.2

*Developed by Planbim*

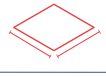
28 Bilal Succar, BIM Dictionary, https://bimdictionary.com/es/bimmodel/1/

### 5.3.2 BIM model entities

"A model entity is a virtual element representing a construction physical or abstract object, which may be parametrically driven, 2D or 3D"[29].

**Table 03. Minimum entities for each type of BIM model**

Some of the minimum entities required in each type of information model are mentioned in the table below. The IFC description of each entity can be found in ISO 16739-1:2018 and in the Entities Information Matrix document, available at Planbim's digital repository[30].

| BIM models | Entities | | Grids *(IfcGrid)* | Site *(IfcSite)* | Civil Elements *(IfcCivilElement)* | Geographic Elements *(IfcGeographicElement)* | Footings *(IfcFooting)* | Zones / Spaces *(IfcSpace- IfcZone)* | Columns *(IfcColumn)* | Beams *(IfcBeam)* |
|---|---|---|---|---|---|---|---|---|---|---|
| Site |  |  | | ● | * | * | * | ● | * | * |
| Volumetric |  |  | | ● | * | * | | ● | | |
| Architecture or Infrastructure Design |  |  | ● | ● | ● | ● | ● | ● | ● | ● |
| Structure |  |  | ● | ● | ● | | ● | | ● | ● |
| MEP |  |  | ● | ● | | | | ● | | |
| Coordination (**) |  |  | ● | ● | ● | ● | ● | ● | ● | ● |
| Construction (***) |  |  | ● | ● | ● | ● | ● | ● | ● | ● |
| As-Built |  |  | ● | ● | ● | ● | ● | ● | ● | ● |
| Operation |  |  | * | ● | ● | ● | | ● | ● | ● |

29.Bilal Succar, BIM Dictionary. https://bimdictionary.com/es/model-component/1/
30. https://planbim.cl/biblioteca/documentos/

● : Required element, according to type of model. ✱ : Suggested element, according to the type of model

(**): The coordination model must be developed using the consolidation of, at the very least, the models of architecture or design of infrastructure, structure, and MEP. This consolidation must be performed using federated or integrated models according to 5.8.2

(***): The construction model may consider the use of other types of models among the nine previously mentioned. This consolidation must be performed using federated or integrated models according to 5.8.2

| **Slabs** *(IfcSlab)* | **Walls** *(IfcWall)* | **Curtain Walls** *(IfcCurtainWall)* | **Windows** *(IfcWindow)* | **Doors** *(IfcDoor)* | **Roofs** *(IfcRoof)* | **Ceilings / Finishes** *(IfcCovering)* | **Conveying systems / Stairs / Ramps** *(IfcTransportElement - IfcStair - IfcRamp)* | **Equipment and Fixtures** *(IfcSanitaryTerminal-IfcMedicalDevice-IfcLamp)* | **Furniture** *(IfcFurniture-IfcSystemFurnitureElement)* | **Special Structures** *(IfcElementAssembly)* | **MEP Equipment and Boards** *(IfcEnergyConversionDevice - IfcDistributionControlElement)* | **MEP Distribution and Piping** *(IfcDistributionFlowElement)* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ✱ | ✱ | ✱ | | | ✱ | | | | | | | |
| | | | | | | | | | | | | |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | | |
| ● | ● | ✱ | | | ● | | ● | | | ● | | |
| | | | | | | | | ● | | | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ✱ | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

*Developed by Planbim, based on the US Veterans Affairs Object Element Matrix and the ISO 16739-1:2018*

### 5.3.3 BIM models in the BIM EIR

BIM EIR must clearly show which models of the nine in point 5.3.1 are required for the development of the project.

In order to ensure the usability of the BIM model information throughout the life cycle of a project, these must be delivered in a format that allows reusing information, even in a different software from the one in which it was originally created. Therefore, BIM EIR must require models in:

- IFC 2x3 format (minimum)
- LandXML31 format, when applicable
- Native format of the BIM authoring software

The BIM EIR must request that IFC files be exported using the Model View Definition (MVD) corresponding to the project delivery stage.

### 5.3.4 BIM models in the BEP

Appointed Parties must mention all models to be delivered, in both Pre-contract and Post-contract BEP, declaring the format and version used for each of them. For this purpose, forms in section C.1 and C.2 are included in Pre-contract BEP and Post-contract BEP templates. These templates are attached in appendices IV and V of this standard.

Appointed Parties must ensure that all information required in the BIM EIR has been exported to IFC files using the Model View Definition(s) (MVD) corresponding to the project delivery stage.

31 http://www.landxml.org/

## 5.4 Documents related to the BIM models

In this standard, *Documents related to BIM models* shall be understood either as the files that can be extracted directly from the BIM models in different formats, such as drawings, sheets, technical specifications, images, videos, etc., or documents supporting the project development and models, such as technical sheets, catalogues, point clouds, etc. (Figure 3).

### 5.4.1 Documents related to the BIM models in the BIM EIR

The BIM Exchange Information Requirement must clearly define the documents to be required.

### 5.4.2 Documents related to the BIM models in the BEP

Appointed Parties must mention all documents to be delivered, in both the Pre-contract and Post-contract BEP, declaring the format and version used in each of them. For this purpose, the forms in section C.3 are included in Pre-contract BEP and Post-contract BEP templates. These templates are attached in appendices IV and V of this standard.

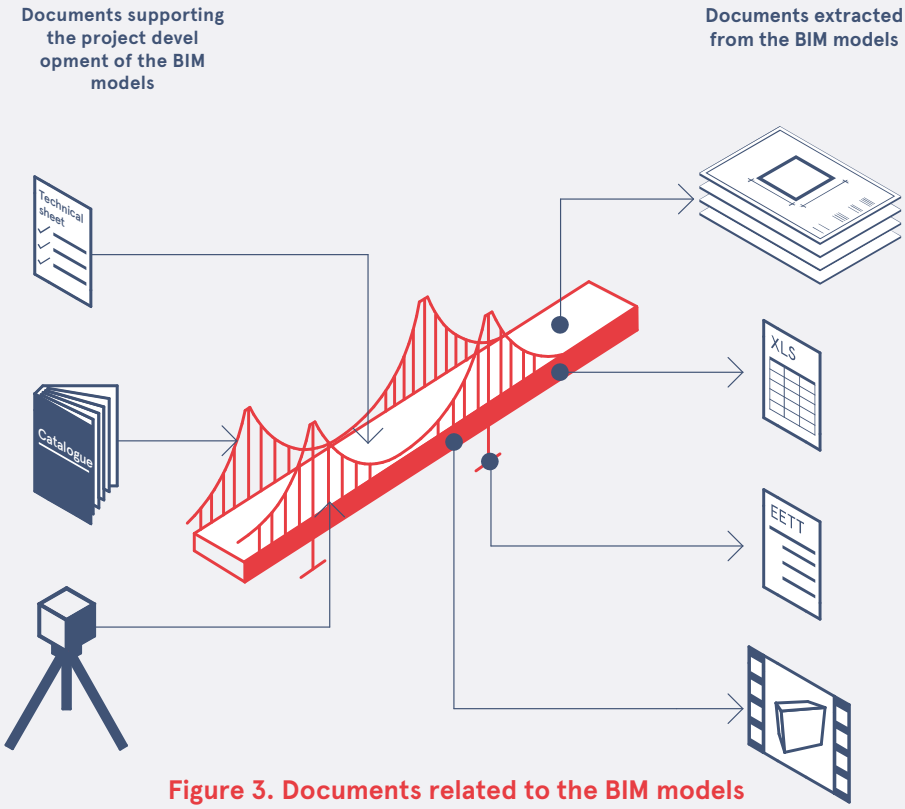



Figure 3. Documents related to the BIM models

*Developed by Planbim*

## 5.5 Model Information Progress States (EAIM)

The Model Information Progress States are the different consecutive phases of definition of data contained in the BIM models, and they are directly related to the progress of the project in time. In this standard, nine EAIM have been defined, one for the Planning stage, three for the Design stage, three for the Construction stage, and two for the Operation stage. They limit the Levels of Development (LOD) of deliverables. For more information on LOD, see 5.7.2..

### Table 04. Model Information Progress States

The table below shows the different Model Information Progress States:

| | | |
|---|---|---|
| Planning Information | **DC Concept Design** | Initial phase of the design process, in which the set of tasks needed to attain a solution to a problem are established according to the specifications, requirements and needs of the Appointing Party. |
| Design Information | **DA Draft Design** | Early phase of the design process, in which the general criteria of a project are established, considering the requirements and restrictions of the Appointing Party, such as code-related or legal. |
| | **DB Basic Design** | Phase in which the general criteria and specifications of the systems in the project are prepared. |
| | **DD Detail Design** | Phase in which specific documentation is elaborated for each project element, through a full description of the information necessary for their manufacturing and/or construction. |
| Construction Information | **CC Construction Coordination** | Phase in which the set of activities to be performed in a construction work is planned, sorting them as efficiently as possible, planning all actions for their execution. |
| | **CM Construction, Manufacturing and Assembly** | Phase of execution of the, on- and off-site, planned activities, beginning both manual and industrialized manufacturing tasks. |
| | **AB As-Built** | Phase in which the project is recorded as it has been actually built in the site, including all design changes occurred during the development of works. In this phase, construction information is delivered, finishing its contract. |
| Operation Information | **PM Commissioning** | Phase in which tasks for the asset handover to the client are performed, including the information regarding its use, such as warranties of installed equipment. This information is also useful for potential remodeling or extension projects. This phase includes asset operation testing. |
| | **GM Asset Management and Maintenance** | Phase in which maintenance tasks are performed, according to the asset service program, including the activities outlined in the handover strategy, the assessment after its occupation and the review of the project's performance. |

*Developed by Planbim*

*Note: The names of EAIMs may change according to the definitions of the Appointing Party.*

### 5.5.1 Model Information Progress States in the BIM EIR

The BIM Exchange Information Requirement must define the project deliveries, indicating, for each of them, the Progress States of Information in which the models need to be delivered. A State may have one or more deliveries.

The Model Information Progress States depend on the degree of development of the project. For instance, during Draft Design (DA) or Detail Design (DD) phases, the Construction Model or the Operation Model cannot be requested, as the information necessary for their development does not exist yet.

## Table 05. BIM models that may be required according to the Information Progress State

The types of BIM models that may be required on each EAIM are described below:

| EAIM | BIM model | Site | Volumetric | Architecture or Infrastructure Design | Structure | MEP | Coordination | Construction | As-Built | Operation |
|---|---|---|---|---|---|---|---|---|---|---|
| Planning Information | DC Concept Design | ● | ● | ● | ● | ● | | | | |
| Design Information | DA Draft Design | ● | ● | ● | ● | ● | ● | | | |
| | DB Basic Design | ● | ● | ● | ● | ● | ● | | | |
| | DD Detail Design | ● | ● | ● | ● | ● | ● | | | |
| Construction Information | CC Construction Coordination | | | | | | ● | ● | | |
| | CM Construction, Manufacturing and Assembly | | | | | | | ● | | |
| | AB As-Built | | | | | | | | ● | |
| Operation Information | PM Commissioning | | | | | | | | ● | ● |
| | GM Asset Management and Maintenance | | | | | | | | | ● |

*Developed by Planbim*

It is worth noting that a delivery may contain models in different Progress States. For instance, as shown in the figure below, in a first delivery, the BIM EIR could require only the architecture model in Draft Design State. Then, for the second delivery, that model could be required in Basic Design State, while the Structure model, that will be developed after architecture, could be delivered in Draft Design State. In the third delivery, the architecture and structure models could be in Basic Design State, however, the MEP models, which are developed in a later stage, could be in Draft Design State (Figure 4).

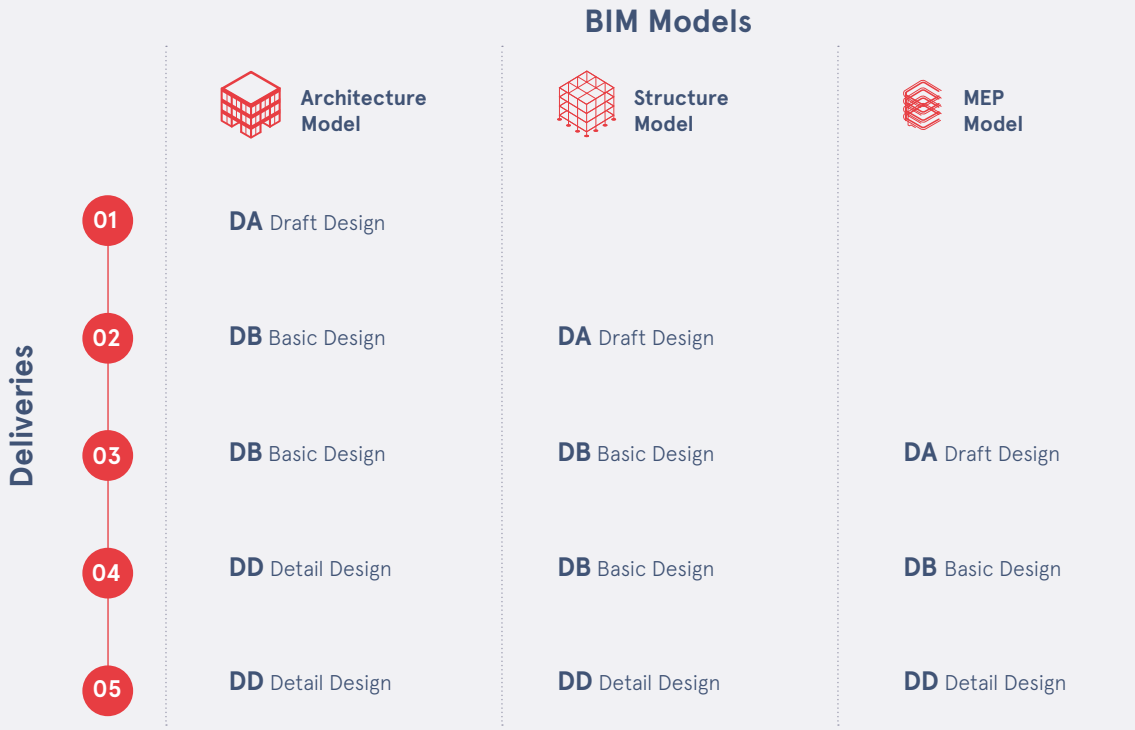



**Figure 4. Example of deliveries with models in different Information Progress States**

*Developed by Planbim*

### 5.5.2 Model Information Progress States in the BEP

The Appointed Parties must add information regarding, for instance, deliverables and formats for each Model Information Progress State, in both Pre-contract and Post-contract BEP. For this purpose, forms in section C.2 and C.3 are included in Pre-contract BEP and Post-contract BEP templates. These templates are attached in appendices IV and V of this standard.

## 5.6 BIM Uses

BIM Uses are "a method of applying Building Information Modeling during the life cycle of a building or infrastructure to achieve one or more specific objectives"[32]. They can be used to explain the different ways in which the stakeholders of the project may use BIM.

In an international context, there are different documents that define BIM Uses. The definitions included in this standard are based on the *Building Information Modeling Project Execution Planning Guide* of Penn State University, USA, which determines 25 BIM Uses.

BIM Uses are shown in the table below:

### Table 06. BIM Uses

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| 1. Existing conditions modeling | | | |
| 2. Cost and quantities estimation | | | |
| 3. Phase planning | | | |
| 4. Program compliance analysis | | | |
| 5. Site analysis | | | |
| 6. 3D Coordination | | | |
| | 7. Design authoring | | |
| | 8. Design review | | |
| | 9. Structural analysis | | |
| | 10. Lighting analysis | | |
| | 11. Energy analysis | | |
| | 12. Mechanical analysis | | |
| | 13. Other engineering analyses | | |
| | 14. Sustainability evaluation | | |
| | 15. Code validation | | |
| | | 16. Site utilization planning | |
| | | 17. Construction system design | |
| | | 18. Digital Fabrication | |
| | | 19. 3D control and planning | |
| | | 20. Record modeling | |
| | | | 21. Asset management |
| | | | 22. Building system analysis |
| | | | 23. Maintenance scheduling |
| | | | 24. Space management and tracking |
| | | | 25. Disaster planning |

*Based on the Project Execution Planning Guide version 2.1, May 2011*

32 Ralph G. Kreider and John I. Messner. The uses of BIM: Classifying and Selecting BIM Uses, Version 0.9. (The Pennsylvania State University, 2013), 6

### 5.6.1 Definition of BIM Uses

The 25 BIM Uses are defined below. For more information on the suggested resources, necessary competences, and Types of Information (TDI) applicable to each Use, see sheets in Appendix I.

**1. Existing conditions modeling:** Process for developing one or more BIM models considering the current conditions of a site and/or its facilities and/or a specific area in a building or infrastructure. This model may be developed in many different manners, for instance, from laser scanning or conventional topography techniques. Once the model is built, it can be used to obtain information, either for a new construction or for a remodeling and/or extension project.

**2. Cost and quantities estimation:** Process of using one or more BIM models to extract certain quantities of components and materials of the project and, based on this information, the cost of a project on its different stages. Its early development is more efficient. This allows to prevent potential additional costs and delays due to errors and/or modifications to the project.

**3. Phase planning:** Process of using one or more 4D models (3D + time) for planning the construction sequence of a project and/or the occupation stages of the remodeling or extension of a building or infrastructure.

**4. Program compliance analysis:** Process of using one or more BIM models for assessing whether the design complies in an efficient and precise manner with the areas included in the project requirements, considering established codes and regulations.

**5. Site analysis:** Process of using one or more BIM and/or GIS models for assessing the properties of an area and determining the best site and orientation of a future project.

**6. 3D Coordination:** Process of planning between the different disciplines prior to design, in order to avoid potential interferences. This BIM Use also includes the identification of interferences once the designs of the disciplines are developed using one or more BIM models.

**7. Design authoring:** Process of creating one or more BIM models of the different disciplines of a project. Design authoring is a key step for incorporating this information to a smart database, from which properties, quantities, costs, programing, etc., can be extracted.

**8. Design review:** Process of reviewing the possible responses to the project's requirements related to areas, spatial design, lighting, safety, comfort, acoustics, materiality, colors, etc., through the creation of one or more BIM models that may contain multiple design alternatives.

**9. Structural analysis:** Process of analysis for determining the behavior of a structural system through one or more BIM models, based on which the design is developed and adjusted, in order to create efficient structural systems that comply with regulations in force. This information will be used in the design and construction phases.

**10. Lighting analysis:** Process for determining the behavior of a lighting system through one or more BIM models. This may include artificial (internal and external) and natural (light and shade) lighting. Based on this analysis, the design is developed and adjusted in order to create efficient lighting systems. This analysis allows for simulations that may improve significantly the design and performance of lighting throughout its life cycle.

**11. Energy analysis:** Assessment process of a project through one or more BIM models, based on energy criteria, that may include materials, performance and/or processes. This energy assessment may be performed in all stages of the life cycle. However, it is more effective when performed during the design stage, to be later applied in the construction and operation stages.

**12. Mechanical analysis:** Process of analyzing and assessing the mechanical systems, based on the design specifications for the project systems through one or more BIM models.

**13. Other engineering analyses:** Process for determining the most adequate non-traditional engineering method, based on the design specifications, through one or more BIM models. The performance analysis and simulation tools may significantly improve the design of facilities and their energy consumption throughout their life cycle.

**14. Sustainability evaluation:** Process in which a project is evaluated based on sustainability criteria through one or more BIM models. This process applies to all stages of a project's life cycle, including planning, design, construction and operation. The application of sustainable criteria on a project on planning and early design phases improves the ability to impact the efficiency of the design and planning.

**15. Code validation:** Process of reviewing the compliance with codes and regulations that apply to the project through one or more BIM models.

**16. Site utilization planning:** Process in which one or more BIM models are used to plan, in a graphic manner, the activities related to existing, temporary and proposed elements of a project during its construction. This may include the cost of labor and materials, among others.

**17. Construction system design:** Process of design and analysis of the supplementary construction systems (for instance, temporary supports, glazing, etc.), in order to optimize their planning through one or more BIM models.

**18. Digital fabrication:** Process that uses information from one or more BIM models to facilitate the manufacturing of construction or assembly components. Some uses of digital fabrication can be appreciated, for instance, in the manufacturing of metal plates and structural steel, pipe cutting, creation of prototypes for design intent review, etc. The information of the models helps to guarantee precision, as well as waste reduction in the manufacturing phase.

**19. 3D control and planning:** Process of monitoring, analyzing, managing and optimizing construction through one or more BIM models. The aim is to guarantee that the construction is performed according to the technical specifications, regulations, safety and owner requirements, as well as backing up the payment status of the progress made in each partial delivery milestone.

**20. Record modeling:** Modeling process in which the physical conditions of all elements that are part of a building or infrastructure are exactly represented. The elements in these models contain all the information requested for these models, such as barcodes, serial numbers, warranties, maintenance history, among other.

**21. Asset management:** Process in which an organized management system is bidirectionally linked to an as-built BIM model that may consist of one or more BIM models to efficiently assist in the maintenance and operation of an asset. These BIM models contain information about the physical construction, systems, surroundings, and equipment that must be maintained, updated, and operated in an efficient and sustainable manner.

**22. Building system analysis:** Process in which one or more BIM models are used for the analysis of the performance of a building or infrastructure, according to the proposal of the original project designs. This includes how the different mechanical systems work and how much energy they use. Other possible analyses are the sun effect in facades, lighting and radiation analysis, airflow analysis, etc.

**23. Maintenance scheduling:** Process in which one or more BIM models are used to perform the functional maintenance of a building or infrastructure (walls, columns, floors, roofing, etc.) and its equipment (mechanical, electrical, plumbing, etc.) throughout its operation. A successful maintenance program can significantly improve the performance of an asset, reducing repairs and general costs.

**24. Space management and tracking:** Process of managing spaces and related resources in a building or infrastructure, through one or more BIM models that allow the management team to analyze the use of space and to plan possible changes. This is particularly useful when remodeling and expansion projects in spaces that are required to maintain their occupancy and operation.

**25. Disaster planning:** Process in which the critical information of the building or infrastructure is reviewed through one or more BIM models, in order to improve the response efficiency in the event of an emergency and minimize safety risks. The asset's dynamic information is provided by a BAS (Building Automation System), while its fixed information, such as floor drawings and equipment schematics, is in the BIM models. The BIM together with the BAS can clearly show where an emergency occurs inside the building, the possible routes to the area, and any other location at risk in the asset.

### 5.6.2 BIM Uses in the BIM EIR

The BIM Exchange Information Requirement must clearly define which BIM Uses out of the existing 25 are required. They must be in line with the objectives defined by the Appointing Party.

There is a correlation between the number of uses requested and the amount of resources needed to generate the models. Additionally, there are uses that are more resource-intensive than others. Therefore, it is important to determine which BIM Uses are necessary and ensure that, through them, the Appointed Party is able to achieve the objectives proposed in the BIM EIR.

### 5.6.3 BIM Uses in the BEP

Appointed Parties must state the BIM Uses that will be used to achieve the project's objectives, in both the Pre-contract and Post-contract BEP. Additionally, the competences and resources available to develop said Uses must be stated. For this purpose, forms in section B are included in Pre-contract BEP and Post-contract BEP templates. These templates are attached in appendices IV and V of this standard.

## 5.7 Types of Information and Levels of Development

In this standard, the concepts of Types of BIM Information (TDI) and Level of Development (LOD) are used to specify the datasets that model entities should contain and the degree of depth of said information. These concepts are explained in sections below.

### 5.7.1 Types of Information (TDI, for its Spanish acronym)

Types of Information, or TDI, are 15 datasets that may be contained in the model entities. These data are organized according to usability of the information throughout the life cycle of the project. These TDI are based on the *Object/Element Matrix* developed by the US Department of Veterans Affairs[33].

Types of Information are described below, identified from letter "A" to "O".

**TDI_A**
**General project information**
Basic ID information of the project, such as type of building or infrastructure, project name, address, spatial and program requirements, etc.


**TDI_B**
**Physical and geometric properties**
Information on the physical properties and features of entities such as width, length, height, area, volume, weight, etc.

**TDI_C**
**Geospatial and spatial location of entities**
Information regarding the spatial and geographical location of entities, such as latitude and longitude for the project's georeferencing, the name and number of floors, the name and number of spaces or areas, and other information required for the localization of entities.

**TDI_D**
**Manufacturer specific information requirements**
Specific information for the manufacturing and/or construction, such as type of element (wall, beam, door, etc.), materiality, name of components, if any, product identification, etc.

**TDI_E**
**Technical specifications**
Information regarding the specifications of the entity, such as transport weight, noise level, etc. In general, it applies to any industrially manufactured element, such as air equipment, furniture, etc.

**TDI_F**
**Cost estimation and requirements**
Basic information for the estimation of the total cost of the asset, such as reference unit cost, assembly base cost, transportation cost, etc.

33. U.S. Department of Veterans Affairs. The VA BIM Guide v1.0. Department of Veterans Affairs, 2010.

**TDI_G**
**Energy analysis requirements**
Information regarding the energy features of the entities, such as moisture requirements, U value, service consumption, low E glazing, etc.


**TDI_H**
**Sustainable standard**
Information on the sustainability conditions, lighting quality requirements, sustainable material specifications, recycled materials content, etc.

**TDI_I**
**Project environmental & site conditions**
Information regarding the site general and surrounding characteristics, such as seismic conditions, land use, hazard levels, etc.

**TDI_J**
**Program/space compliance or validation**
Key information for validation of compliance with the project's functional program, such as planned areas, glass area requirements, spatial volumetric, required services, etc.

**TDI_K**
**Code compliance/occupant safety requirements**
Information that allows to review the code compliance and safety requirements for the occupants of the project, such as firefighting requirements, ventilation requirements, width of entrances, use and occupancy loads, as well as transit safety, route geometric design, etc.

**TDI_L**
**Phases time sequencing & schedule requirements**
Information that allows to review phases, time sequences and scheduling of areas or parts of a project, such as considered phases, project milestone sorting, construction sequence, etc.

**TDI_M**
**Construction logistics & sequencing**
Key information for reviewing the construction logistics and sequence, such as material ID, facility ID, serial number of installed components, etc.

**TDI_N**
**Building commissioning requirements**
Key information to support the handover of the built asset, such as name of the companies involved in the project, contacts, discipline name, work areas, etc.

**TDI_O**
**Facilities/Asset management**
Information for the management of the asset, such as type of products, type of spare parts, relevant warranty dates, etc.

## Table 07. Types of Information per BIM Use

The table below shows each BIM Use, identifying the related Types of Information. For more information on the suggested resources, necessary competences and Types of Information applicable to each Use, see sheets in Appendix I.

| Types of Information (TDI) | BIM Uses | 1. Existing conditions modeling | 2. Cost and quantities estimation | 3. Phase planning | 4. Program compliance analysis | 5. Site analysis | 6. 3D Coordination | 7. Design authoring | 8. Design review |
|---|---|---|---|---|---|---|---|---|---|
| TDI_A General project information |  | ● | ● | ● | ● | ● | ● | ● | ● |
| TDI_B Physical and geometric properties |  | ● | ● | ● | ● | ● | ● | ● | ● |
| TDI_C Geospatial and spatial location of entities |  | ● | | ● | ● | ● | ● | ● | ● |
| TDI_D Manufacturer specific information requirements |  | | ● | ● | | | | ● | ● |
| TDI_E Technical specifications |  | | ● | ● | | | ● | ● | ● |
| TDI_F Cost estimation and requirements |  | | ● | | ● | | | | ● |
| TDI_G Energy analysis requirements |  | | | | ● | ● | | ● | ● |
| TDI_H Sustainable standard |  | | | | | | | ● | ● |
| TDI_I Project environmental & site conditions |  | ● | | ● | ● | ● | ● | ● | ● |
| TDI_J Program/space compliance or validation |  | | | | ● | ● | | ● | ● |
| TDI_K Code compliance/occupant safety requirements |  | ● | | | ● | ● | | ● | ● |
| TDI_L Phases time sequencing & schedule requirements |  | | ● | ● | | | ● | | * |
| TDI_M Construction logistics & sequencing |  | | ● | ● | | | ● | | |
| TDI_N Building commissioning requirements |  | | | | | | | | |
| TDI_O Facilities/Asset management |  | | ● | | | | | | |

● : TDI is considered for the indicated BIM Use

★ : TDI can be used in projects considering rehabilitation

| 9. Structural analysis | 10. Lighting analysis | 11. Energy analysis | 12. Mechanical analysis | 13. Other engineering Analyses | 14. Sustainability evaluation | 15. Code validation | 16. Site planning | 17. Construction system design | 18. Digital fabrication | 19. 3D control and planning | 20. Record modeling | 21. Facilities/Asset management | 22. System analysis | 23. Maintenance scheduling | 24. Space management and tracking | 25. Disaster planning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | | ● | ● | ● | | | ● | ● | ● | ● | ● | ● | ● | | |
| ● | ● | | ● | ● | ● | | ● | ● | ● | ● | ● | ● | ● | ● | | ● |
| | | | | | | | ● | | | ● | ● | | | ● | | ● |
| | ● | ● | | ● | ● | ● | | ● | | ● | ● | ● | ● | ● | ● | |
| | | ● | | ● | ● | ● | ● | ● | | ● | ● | ● | ● | ● | | |
| ● | ● | ● | ● | ● | ● | ● | ● | | | | ● | | ● | ● | | ● |
| | ● | ● | | ● | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | | | | | ● | | ● | ● | ● | ● | | | | | | |
| ● | | | ● | | | | ● | ● | ● | ● | ● | | | | | ● |
| | | | | | | | | | ● | | ● | ● | | ● | ● | |
| | | | | | | | | | | | ● | ● | ● | ● | ● | ● |

*Developed by Planbim, based on the Object/Element Matrix of the US Department of Veterans Affairs and the Project Execution Planning Guide version 2.1, May 2011.*

**TDI are 15 datasets that may be contained in the model entities. These data are organized according to usability of the information throughout the life cycle of the project.**

### 5.7.2 Levels of Development (LOD, or NDI for its acronym in Spanish)

Levels of Development or LOD are the depth degrees which geometric and non-geometric information contained in the BIM model entities may have, according to the required Model Information Progress State. This information may change and/or increase as the project progresses. LOD are directly related to the TDI.

Internationally, the term LOD is commonly used with different meanings and definitions in each country. For instance, in the UK, Level of Detail or Level of Definition are used, while in the US, the AIA definition, which means Level of Development, is used. This standard will use the term *Level of Development* (LOD) based on the standard developed by the American Institute of Architects (AIA)[34] and BIMForum USA[35].

This standard includes six different levels by which information of the different model entities may go through. Note that it is the entity information, and consequently the model information, that passes through different degrees, but not vice versa. This means that models are not defined according to a LOD, but the models contain several LOD, depending on the LOD of the entities they include (Figure 5).


**Figure 5. Simultaneity of different LOD of the entities in a BIM model**

*Developed by Planbim*

34 The American Institute of Architects. G202-2013 - Project Building Information Modeling Protocol Form. AIA, 2013
35 BIM Forum USA. Level of Development Specification. 2015.

## Table 08. Levels of Development

A description of each Level of Development is shown in the table below:

| Concept | | Description |
|---|---|---|
| LOD-1 | **Preliminary general information** | Preliminary information, that may be estimated, regarding the area, height, volume, location, and orientation of general elements. |
| LOD-2 | **Approximate basic information** | Basic information regarding size, shape, location, quantity, and orientation of general elements and systems, and their assembly. |
| LOD-3 | **Detailed information** | Detailed information regarding size, shape, location, quantity, and orientation, relevant for the elements assembly. |
| LOD-4 | **Detailed and coordinated information** | Detailed and coordinated information regarding size, shape, location, quantity, orientation, and interaction between construction systems and specific assembly elements. |
| LOD-5 | **Detailed information regarding manufacturing and assembly** | Detailed information regarding fabrication and assembly, considering size, location, quantity, orientation, and interaction of the elements. |
| LOD-6 | **Detailed information of built elements and their commissioning** | Detailed information regarding size, shape, location, quantity, orientation, and commissioning of built elements. |

*Developed by Planbim, based on G202-2013 - Project Building Information Modeling Protocol Form by AIA and the Level of Development Specification of BIMForum USA*

Some examples of geometric information of BIM entities are:

- Size
- Volume
- Shape
- Height
- Orientation

Some examples of non-geometric information of BIM entities are:

- System data
- Performance data
- Code compliance/occupant safety requirements
- Specifications
- Cost

For further details regarding geometric and non-geometric information of BIM entities, see the document Entities Information Matrix, available at Planbim's digital repository.[36]

36 https://planbim.cl/biblioteca/documentos/

### 5.7.2.1 Levels of Development per Types of Information

As some Types of Information may be required at different Levels of Development, depending on the project's objectives or its Model Information Progress State, the following table specifies the different Levels of Development that each Type of Information may reach.

For further details regarding the parameters to be shown for each TDI in the different LOD, see the document Entities Information Matrix, available at Planbim's digital repository.[37]

**Table 09. Levels of Development per Types of Information**

| Levels of Development \ Types of Information | TDI_A | TDI_B | TDI_C | TDI_D | TDI_E | TDI-F | TDI-G |
|---|---|---|---|---|---|---|---|
| LOD-1 | ● | ● | ● | N/A | N/A | ● | ● |
| LOD-2 | ● | ● | ● | ● | N/A | ● | ● |
| LOD-3 | ● | ● | ● | ● | ● | ● | ● |
| LOD-4 | ● | ● | ● | ● | ● | ● | ● |
| LOD-5 | ● | * | ● | ● | ● | ● | ● |
| LOD-6 | * | * | ● | ● | ● | ● | ● |

37 https://planbim.cl/biblioteca/documentos/

● : Generating information of this LOD is possible.
N/A : Generating information of this LOD is not applicable.
* : Information of the previous LOD is maintained.

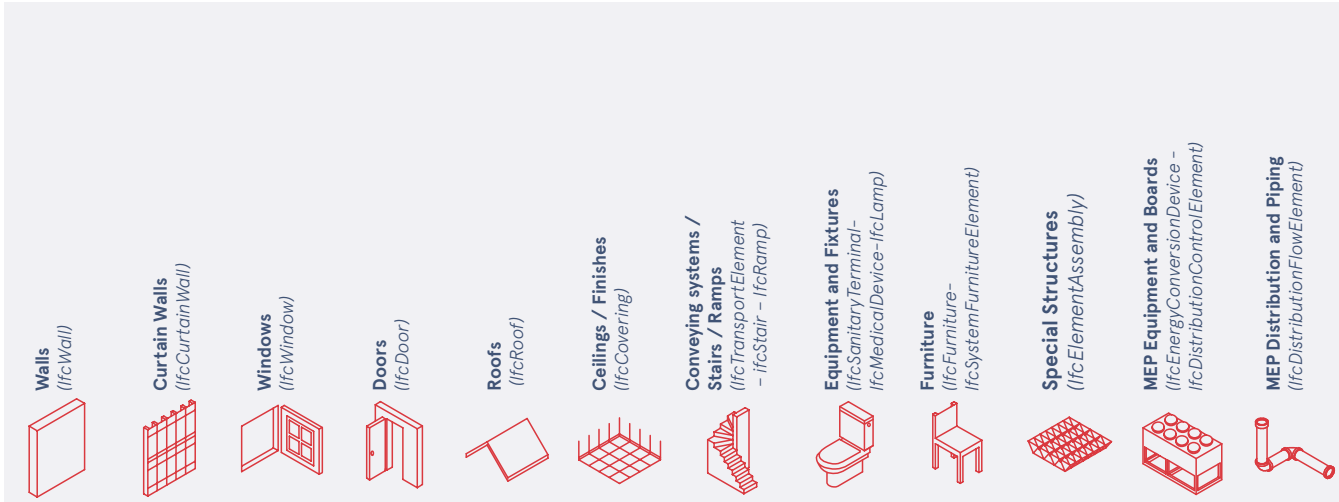
|  TDI_H |  TDI_I |  TDI_J |  TDI_K |  TDI_L |  TDI_M |  TDI_N |  TDI_O |
|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | N/A | ● | N/A |
| ● | * | ● | ● | ● | N/A | ● | N/A |
| ● | * | ● | ● | ● | ● | ● | N/A |
| ● | * | ● | * | ● | ● | ● | N/A |
| ● | * | ● | * | ● | ● | ● | ● |
| ● | * | ● | * | * | * | ● | ● |

*Developed by Planbim, based on G202-2013 - Project Building Information Modeling Protocol Form by AIA, the Level of Development Specification of BIMForum USA, and the Object/Element Matrix of the US Department of Veterans Affairs*

## Table 10. Levels of Development per Model Information Progress States

The table below shows the minimum Information Detail Levels that BIM entities may have at each Model Information Progress State.

| EAIM | | Entities: Grids (IfcGrid) | Site (IfcSite) | Civil Elements (IfcCivilElement) | Geographic Elements (IfcGeographicElement) | Footings (IfcFooting) | Zones / Spaces (IfcSpace-IfcZone) | Columns (IfcColumn) | Beams (IfcBeam) | Slabs (IfcSlab) |
|---|---|---|---|---|---|---|---|---|---|---|
| Planning Information | DC Concept Design | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 |
| Design Information | DA Draft Design | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 |
| | DB Basic Design | LOD-2 | LOD-2 | LOD-2 | LOD-1 | LOD-1 | LOD-2 | LOD-2 | LOD-2 | LOD-2 |
| | DD Detail Design | LOD-3 | LOD-2 | LOD-3 | LOD-2 | LOD-2 | LOD-3 | LOD-3 | LOD-3 | LOD-3 |
| Construction Information | CC Construction Coordination | LOD-3 | LOD-3 | LOD-4 | LOD-3 | LOD-3 | LOD-4 | LOD-3 | LOD-3 | LOD-4 |
| | CM Construction, Manufacturing and Assembly | LOD-3 | LOD-3 | LOD-5 | LOD-4 | LOD-4 | LOD-5 | LOD-4 | LOD-4 | LOD-4 |
| | AB As-Built | LOD-3 | LOD-3 | LOD-5 | LOD-4 | LOD-4 | LOD-5 | LOD-4 | LOD-4 | LOD-5 |
| Operation Information | PM Commissioning | LOD-3 | LOD-3 | LOD-5 | LOD-4 | LOD-4 | LOD-5 | LOD-4 | LOD-4 | LOD-5 |
| | GM Asset Management and Maintenance | LOD-3 | LOD-3 | LOD-6 | LOD-4 | LOD-4 | LOD-6 | LOD-4 | LOD-4 | LOD-5 |



| **Walls** *(IfcWall)* | **Curtain Walls** *(IfcCurtainWall)* | **Windows** *(IfcWindow)* | **Doors** *(IfcDoor)* | **Roofs** *(IfcRoof)* | **Ceilings / Finishes** *(IfcCovering)* | **Conveying systems / Stairs / Ramps** *(IfcTransportElement - IfcStair - IfcRamp)* | **Equipment and Fixtures** *(IfcSanitaryTerminal-IfcMedicalDevice-IfcLamp)* | **Furniture** *(IfcFurniture-IfcSystemFurnitureElement)* | **Special Structures** *(IfcElementAssembly)* | **MEP Equipment and Boards** *(IfcEnergyConversionDevice - IfcDistributionControlElement)* | **MEP Distribution and Piping** *(IfcDistributionFlowElement)* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 |
| LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 | LOD-1 |
| LOD-2 | LOD-2 | LOD-2 | LOD-2 | LOD-2 | LOD-2 | LOD-2 | LOD-2 | LOD-1 | LOD-1 | LOD-2 | LOD-2 |
| LOD-3 | LOD-3 | LOD-3 | LOD-3 | LOD-3 | LOD-3 | LOD-3 | LOD-3 | LOD-2 | LOD-2 | LOD-3 | LOD-3 |
| LOD-3 | LOD-3 | LOD-4 | LOD-4 | LOD-3 | LOD-4 | LOD-3 | LOD-4 | LOD-3 | LOD-3 | LOD-4 | LOD-4 |
| LOD-4 | LOD-4 | LOD-4 | LOD-4 | LOD-4 | LOD-4 | LOD-4 | LOD-5 | LOD-4 | LOD-4 | LOD-5 | LOD-5 |
| LOD-4 | LOD-5 | LOD-5 | LOD-5 | LOD-4 | LOD-5 | LOD-4 | LOD-5 | LOD-5 | LOD-5 | LOD-5 | LOD-5 |
| LOD-4 | LOD-5 | LOD-5 | LOD-5 | LOD-4 | LOD-5 | LOD-4 | LOD-6 | LOD-5 | LOD-5 | LOD-6 | LOD-6 |
| LOD-4 | LOD-6 | LOD-6 | LOD-6 | LOD-4 | LOD-5 | LOD-4 | LOD-6 | LOD-5 | LOD-5 | LOD-6 | LOD-6 |

*Developed by Planbim, based on G202-2013 - Project Building Information Modeling Protocol Form by AIA and Level of Development Specification of BIMForum USA*

### 5.7.3 Types of Information and Levels of Development in the BIM EIR

The BIM Exchange Information Requirement must define which Types of Information are required for the project, with their corresponding Levels of Development. As these levels depend on the Model Information Progress State, it must be guaranteed that the required LOD are always coherent with the progress status of the project. For instance, during Draft Design (DA) or Detail Design (DD), the information regarding warranty or maintenance dates cannot be requested, as the information does not exist yet.

### 5.7.4 Types of Information and Levels of Development in the BEP

As the Levels of Development are directly related to EAIMs (5.7.2.2), the Levels of Development are indirectly indicated in the BEP through the incorporation of EAIMs in each delivery. For this purpose, the form in section C.2 is included in Pre-contract BEP and Post-contract BEP templates. These templates are attached in appendices IV and V of this standard.

## 5.8 Collaboration strategy

Established and universally known methods for both the management and exchange of information are key for the correct development of the project. These methods must be supported by enabling platforms that facilitate communication and allow for information and decision-making traceability.

For this, a collaborative environment throughout the life cycle stages of the assets is necessary. It must allow the project actors to access the information to perform their functions, and it may be implemented in different manners, according to the maturity level of the Appointing and the Appointed Party. This environment is known as Common Data Environment (CDE).

### 5.8.1 Common Data Environment (CDE)

CDE allows for a unique source of information for compiling, managing and disseminating documents and models between the project actors, through a standardized process. A CDE generally contains a document management system that simplifies the exchange of information between the actors of a project[38]. It must also consider the information security and quality.

ISO 19650-1:2018 states that the information of a project may be in multiple locations, and the CDE allows for the workflow to be distributed in several computing systems or technology platforms.

Thus, CDE may consist of a platform or the addition of several systems that allow to collaborate, manage, record and trace the information transferred between the actors. The conditions these systems must consider are described below:

- **Collaboration platform:** It must allow the work with unified and centralized information, following a selected consolidation strategy (federated or integrated models), managing and backing up the BIM models securely.
- **Document management platform:** It must allow the control of the document and BIM model exchange processes, managing changes and tracking costs and timelines of the project.
- **Information and collaboration requirement format:** Comments, issues and reviews of BIM models must be made through formats that allow to record and track them. For this, BCF (BIM Collaboration Format) can be used, allowing, together with BIM IFC models, to communicate said information requirements through open formats, i.e., openBIM.

#### 5.8.1.1 Common Data Environment (CDE) status

ISO 19650 parts 1 and 2 standardize the CDE structure internationally, defining four statuses for the files hosted in the CDE:

- Work in progress
- Shared
- Published
- Archived

Data and information may exist in the four previous statuses, depending on their degree of development. The Archived status must be assigned to documents that have been replaced or deleted, in order to maintain the traceability of the development of information.

38 Based on Bilal Succar's definition, https://bimdictionary.com/en/common-data-environment/1/

### 5.8.2 Consolidation of BIM models

There are different ways to merge the model information generated by the different actors of the project. Accordingly, one of the following consolidation strategies, known and used throughout the development of the project, must be chosen:

- **Federated BIM Model:** Model created from the information contained in separate files. This information may come from different actors[39].
- **Integrated BIM Model:** Model consisting of the information of different disciplines of the project, contained in a single database.

### 5.8.3 Procedure for meetings

At the beginning of a project, the Appointed Party must meet the Appointing Party to:

- Confirm capabilities and resources availability regarding required BIM Uses
- Agree and validate information for the development of the Post-contract BEP

Additionally, to achieve a collaborative process throughout the development of the project, meetings must be scheduled for the activities that require to do so.

Clear objectives, participants, mode, and frequency of meetings must be previously defined.

### 5.8.4 Collaboration strategy in the BIM EIR

The BIM Exchange Information Requirement must set the conditions for the development of the collaborative work between the different actors throughout the project. It must cover, at least, aspects of:

- CDE
- Consolidation of BIM models
- Procedure for meetings

If the Appointing Party has no preference regarding one or more conditions, the BIM EIR must require the actors involved to agree and define them.

### 5.8.5 Collaboration strategy in the BEP

In the Post-contract BEP, the Appointed Party must state how the collaboration strategy will be addressed. If the BIM EIR does not specifically define any of these aspects, a proposal, which must be validated by the Appointing Party, must be made in the BEP. For this purpose, forms in section D in Pre-contract BEP and Post-contract BEP templates are included in the appendices IV and V of this standard.

39 Based on ISO 19650-1:2018 3.3.11 and 3.3.12, adapted.

## 5.9 Organization of BIM models

For a proper flow of information in the development of the project, it is necessary to share structured unambiguous information, and BIM models are an important part of said information. Having models that comply with minimum standardization requirements allows to guarantee the availability of the information more efficiently and to avoid time losses in the process.

The requirements for the organization of models in this standard focus on:

- Model structuring
- Naming and coding
- Classification systems

### 5.9.1 Structuring BIM models

Agreement between Appointing Party and Appointed Party regarding the following is fundamental for the development of models:

- Units to be used for the development of models
- Coordinates to be used for all models
- Model subdivision system, if necessary

### 5.9.2 Naming and coding

#### 5.9.2.1 General structure of naming

For a proper information exchange and communication between the actors of a project, the use of universally known and shared naming conventions is vital for elements, such as models, entities, and related documents.

#### 5.9.2.2 File and folder names

Files and folders must be named using the codes specified below. These codes must be linked using a hyphen (-).

The naming structure for the files must be the following:

*Project-Organization-Discipline-Zone-Level-Type of Document-Number-Description* ***(*)-Status(*)-Revision(*)***

Filename example analyzed in Table 11: **PR1-ABC-ARQ-Z1-01-MO-0001-Doors-C-A**

The naming structure for the folders must be the following:

*Project-Status(*)-Revision(*)*

Folder example analyzed in Table 11: **PR1-C-A**

The file and folder name fields, as well as descriptions incorporated in this standard, are based on BS

1192:2007+A2:2016.

*Note: (*) indicates an optional code.*

## Table 11. File and folder names

| Field | Description | Folder | File |
|---|---|---|---|
| **Project** | A unique project code must be defined at the beginning of the project, independent of and different from the internal number the organization may use. It is recommended that this code matches an existing contract code. The project code and any sub-project code must contain from two to six characters. | PR1 | PR1 |
| **Organization** | A unique code must be defined for the appointing party, and it must contain from three to six characters. | | ABC |
| **Discipline or system** | A unique code must be defined for each discipline or system in the project (Table 13). The code must contain three characters. | | ARQ |
| **Zone** | A unique code must be defined for the building or infrastructure zone to which the file belongs. It must contain one or two characters.<br>Note: If a file represents all zones of a building or infrastructure, the following code must be used:<br>· ZZ: All zones | | Z1 |
| **Level or location** | A unique code must be defined for each level for buildings and for each location for infrastructure.<br>This code must contain two characters.<br>· ZZ: Multiple levels<br>· XX: Not applicable level<br>· 01: First level<br>· 02: Second level, etc.<br>E1: Mezzanine above level 01<br>E2: Mezzanine above level 02, etc.<br>S1: First underground<br>S2: Second underground, etc. | | 01 |
| **Type of document** | A unique code must be defined for each type of document (Table 12). This code must contain two characters. | | MO |
| **Number (optional)** | If a file belongs to a series that is not distinguished by any of the previous fields, a correlative number must be used. This code must contain four digits. | | 0001 |
| **Description (optional)** | Descriptive text can be added to differentiate documents and it must be precise and concise. | | Doors |
| **Status (optional)** | Status identification and management codes in folders and files can follow the instructions stated in section Common Data Environment Status (5.8.1.1).<br>This code must contain one to three characters.<br>· T: Work in progress<br>· C: Shared<br>· P: Published<br>· A: Archived | C | C |
| **Revision (optional)** | Files and folders may show the revision version of the information they contain. This code must contain one or two characters and be assigned correlatively. | A | A |
| **Resulting folder: PR1-C-A** | | | |
| **Resulting file: PR1-ABC-ARQ-Z1-01-MO-0001-Doors-C-A** | | | |

*Developed by Planbim, based on BS 1192:2007+A2:2016.*

### 5.9.2.3 Type of document codes

Two-capital-letter codes for document identification are shown below. If the project includes a type of document not included in the following list, the Appointing Party must propose a two-letter code.

## Table 12. Document codes

Note to the English version: The document name in Spanish is presented in parentheses.
The acronyms in this table correspond to the original version in Spanish.

| Acronym | Documento |
|---|---|
| CO | Section (Corte) |
| CV | Vertical circulation with details (Circulaciones verticales con sus detalles) |
| DE | External detail (Detalle exterior) |
| DH | Wet area detail (Detalle zona húmeda) |
| DI | Interior detail (Detalle interiore) |
| DP | Plan view detail (Detalles de planta generale) |
| EL | Elevations, interior and exterior (Elevaciones) |
| ES | Detail Section (Escantillón) |
| ET | Technical specifications (Especificaciones técnicas) |
| GE | General aspects and notes on the project (Generalidades y notas generales respecto al Proyecto) |
| ME | Report - architectural, calculation, others (Memoria) |
| MO | Model (Modelo) |
| PC | Reflected ceiling plan (Planta de cielo) |
| PL | Plan view (Planta) |
| PM | Master plan (Plan maestro) |
| PO | Official program (Programa oficial) |
| PT | Budget (Presupuesto) |
| TP | Previous work - demolition, work on site, work installation, works (Trabajos previos) |

*Developed by Planbim*

#### 5.9.2.4 Codes and colors per discipline and/or system

A table with three-capital-letter codes for disciplines and systems most commonly found in projects is shown below, including colors for each of them.

If the project features a discipline or system that is not included in the following list, the Appointing Party must propose a three-capital-letter code, and a color not being used by other systems or disciplines.

## Table 13 – Codes and colors per discipline and/or system

Note to the English version: The acronyms in this table correspond to the original version in Spanish.

| Discipline | Acronym | Color | R | G | B |
|---|---|---|---|---|---|
| **Architecture** | **ARQ** | | | | |
| **Audio and Acoustics** | **AYA** | | | | |
| Audio | **AUD** | | 190 | 120 | 10 |
| Acoustics | **ACU** | | 230 | 230 | 30 |
| **Structural calculation** | **EST** | | 165 | 165 | 165 |
| **Fuel load** | **CCB** | | | | |
| Fuel networks | **RCB** | | 255 | 255 | 0 |
| Gas exhaust | **EDG** | | 255 | 215 | 0 |
| **Closed circuit TV** | **CTV** | | 230 | 160 | 0 |
| **Air conditioning** | **CLI** | | | | |
| Air injection | **INY** | | 230 | 30 | 100 |
| Air extraction | **EXA** | | 135 | 15 | 80 |
| Air return | **RET** | | 155 | 40 | 175 |
| Fresh air | **FRE** | | 215 | 0 | 250 |
| Coolant | **REF** | | 100 | 60 | 180 |
| Equipment | **EQU** | | 100 | 30 | 255 |
| Condensation duct | **CON** | | 80 | 110 | 255 |
| **Centralized control** | **CCT** | | 30 | 150 | 240 |
| **Electrical** | **ELE** | | | | |
| Power | **FRZ** | | 105 | 160 | 55 |
| Weak currents | **COD** | | 120 | 255 | 0 |
| Lights | **ALU** | | 205 | 220 | 55 |
| Voice and Data | **VOD** | | 200 | 255 | 0 |
| **Waste Extraction** | **BAS** | | 110 | 210 | 75 |
| **Lighting** | **ILU** | | 75 | 175 | 80 |
| **Civil works** | **OCV** | | 55 | 85 | 35 |
| **Fire protection** | **PCI** | | | | |
| Fire detection | **DET** | | 255 | 20 | 70 |
| Fire extinction | **EXT** | | 0 | 175 | 255 |
| Wet system | **RHU** | | 230 | 60 | 50 |
| Dry system | **RSE** | | 215 | 165 | 70 |
| **Radiocommunications** | **RAD** | | 0 | 230 | 255 |
| **Medical gas system** | **RGC** | | | | |
| Medical gas | **GCL** | | 100 | 255 | 220 |
| Compressed air system | **RAC** | | 0 | 150 | 135 |
| **Medical waste** | **RCL** | | 0 | 230 | 120 |
| **Plumbing** | **SAN** | | | | |
| Hot water | **ACA** | | 255 | 60 | 0 |
| Cold water | **AFR** | | 65 | 195 | 255 |
| Sewage waters | **ANE** | | 50 | 65 | 160 |
| Grey waters | **AGR** | | 125 | 30 | 160 |
| Treated waters | **ATR** | | 195 | 25 | 90 |
| Rain water | **ALL** | | 255 | 85 | 35 |
| Irrigation | **RIE** | | 120 | 85 | 70 |
| **Gas supply** | **GAS** | | 255 | 235 | 60 |
| **Technological surveillance** | **TVG** | | 115 | 115 | 115 |

*Developed by Planbim*

### 5.9.3 Classification systems

On an international scale, there are several classification systems for the AECO industry, such as Uniformat, OmniClass (US), Uniclass (UK), Building 90 (Finland) and Sfb and BSAB (Sweden). They are all based on ISO 12006-2:2015, that sets a framework for the organization of information on construction works.

Within the development of a project, a classification system must be selected to be used by all actors involved in the process.

### 5.9.4 Organization of BIM models in the BIM EIR

The BIM Exchange Information Requirement may define criteria to be used by all actors involved regarding the organization of models stated in 5.9.2, 5.2.2 and 5.9.3, related to:

- Structuring of models: units, coordinates, and model subdivision
- Naming and coding: file and folder names, codes and colors for disciplines and/or systems
- Classification systems: a system must be defined for the entire project

If the Appointing Party has no preference regarding one or more of these aspects, the BIM EIR must require the actors involved to define them by agreement.

### 5.9.5 Organization of BIM models in the BEP

In the Post-contract BEP, the Appointed Party must state how it will address the model organization. The Appointed Party must follow the instructions in BIM EIR regarding the structuring of models, naming, coding, and classification system. If the BIM EIR does not specifically define any of these aspects, a proposal, which must be validated by the Appointing Party, must be made in the BEP. For this purpose, forms in section E are included in the Post-contract BEP template in appendix V of this standard.


**The aim is that all public institutions that require BIM, do so in a standardized manner, known to all actors in the project.**

# Appendix I

## BIM Uses Datasheets

# Appendix I

## BIM Uses data sheets

Below you can find a datasheet describing each BIM Use, identifying suggested resources, competences required by the team and the Types of BIM Information related to those uses.

For further information on the capabilities related to each case, see Appendix II, BIM Roles Matrix.

## 1. Existing conditions modeling

Process for developing one or more BIM models considering the current conditions of a site and/or its facilities and/or a specific area in a building or infrastructure. This model may be developed in many different manners, for instance, from laser scanning or conventional topography techniques. Once the model is built, it can be used to obtain information, either for a new construction or for a remodeling and/or extension project.

**Suggested resources:**

- BIM modeling software
- Point cloud, laser exploring or photogrammetric manipulation software
- LIDAR or photogrammetric equipment
- Conventional photography equipment
- Hardware suitable for BIM model processing
- Necessary IT IT infrastructure

**Team with BIM abilities related to:**

- Additional tools, such as 3D laser scanner, drones, conventional surveying equipment, etc. **N-42***
- BIM model generation from information obtained with the additional tools: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, J-29, I-27***
- Information generated by the additional tools: **G-22, G-23, G-24, I-27***
- Levels of Development (LOD) required: **G-22, G-23, G-24***

**Experience or previous knowledge about:**

- N/A

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| ✓ | ✓ | ✓ | ✓ |

**Types of Information applicable to *Existing conditions modeling***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 2. Cost and quantities estimation

Process of using one or more BIM models to extract certain quantities of components and materials of the project and, based on this information, the cost of a project on its different stages. Its early development is more efficient. This allows to prevent potential additional costs and delays due to errors and/or modifications to the project.

**Suggested resources:**

- Cost estimation software based on BIM models
- BIM modeling software
- BIM models with LOD corresponding to the indicated EAIM
- Cost data (including classification system data)
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for cost estimation: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, K-31, K-33, I-27***

**Experience or previous knowledge about:**

- Project quantification and estimation
- Design and construction
- Applicable standards and codes
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

PLANNING ✓ — DESIGN ✓ — CONSTRUCTION ✓ — OPERATION ✓

**Types of Information applicable to *Cost and quantities estimation***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| ✓ **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| **TDI_K** Code compliance/ occupant safety requirements | ✓ **TDI_L** Phases time sequencing & schedule requirements | ✓ **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | ✓ **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 3. Phase planning

Process of using one or more 4D models (3D + time) for planning the construction sequence of a project and/or the occupation stages of the remodeling or extension of a building or infrastructure.

**Suggested resources:**

- BIM modeling software
- Planning software
- BIM software incorporating time (4D)
- BIM models with LOD corresponding to the stated EAIM
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for planning: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, K-31, K-32, I-27***
- BIM models incorporating time (4D): **F-18, F-19, F-20, F-21, I-27, K-31, K-32***
- Construction scheduling: **F-19, K-31, K-32***

**Experience or previous knowledge about:**

- N/A

**Project stages in which this BIM Use is applicable:**

PLANNING ✓ | DESIGN ✓ | CONSTRUCTION ✓ | OPERATION

**Types of Information applicable to *Phase planning***

- **TDI_A** General project information ✓
- **TDI_B** Physical and geometric properties ✓
- **TDI_C** Geospatial and spatial location of objects & elements ✓
- **TDI_D** Manufacturer specific information requirements ✓
- **TDI_E** Technical specifications ✓
- **TDI_F** Cost estimation and requirements
- **TDI_G** Energy analysis requirements
- **TDI_H** Sustainable standard
- **TDI_I** Project environmental & site conditions ✓
- **TDI_J** Program/space compliance or validation
- **TDI_K** Code compliance/ occupant safety requirements
- **TDI_L** Phases time sequencing & schedule requirements ✓
- **TDI_M** Construction logistics & sequencing ✓
- **TDI_N** Building commissioning requirements
- **TDI_O** Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

## 4. Program compliance analysis

Process of using one or more BIM models for assessing whether the design complies in an efficient and precise manner with the areas included in the project requirements, considering established codes and regulations.

**Suggested resources:**

- BIM modeling software
- BIM models with LOD corresponding to the indicated EAIM
- Project's spatial program data
- Regulations in force for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for the analysis of compliance with the project's spatial program: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***

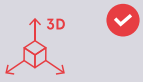
**Experience or previous knowledge about:**

- N/A

**Project stages in which this BIM Use is applicable:**


**Types of Information applicable to *Program compliance analysis***

**TDI_A**
General project information




**TDI_B**
Physical and geometric properties

**TDI_C**
Geospatial and spatial location of objects & elements



**TDI_D**
Manufacturer specific information requirements



**TDI_E**
Technical specifications

**TDI_F**
Cost estimation and requirements

**TDI_G**
Energy analysis requirements



**TDI_H**
Sustainable standard

**TDI_I**
Project environmental & site conditions

**TDI_J**
Program/space compliance or validation

**TDI_K**
Code compliance/ occupant safety requirements



**TDI_L**
Phases time sequencing & schedule requirements



**TDI_M**
Construction logistics & sequencing



**TDI_N**
Building commissioning requirements



**TDI_O**
Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

## 5. Site analysis

Process of using one or more BIM and/or GIS models for assessing the properties of an area and determining the best site and orientation of a future project.

**Suggested resources:**

- GIS software
- BIM modeling software
- BIM models with LOD corresponding to the indicated EAIM
- Site location data
- Regulations in force for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM and/or GIS models for site analysis: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27***

**Experience or previous knowledge about:**

- N/A

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| ✓ | ✓ | | |

**Types of Information applicable to *Site Analysis***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 6. 3D Coordination

Process of planning betweenthe different disciplines prior to design, in order to avoid potential interferences. This BIM Use also includes the identification of interferences once the designs of the disciplines are developed using one or more BIM models.

**Suggested resources:**

- BIM modeling software
- BIM model review software
- BIM models with LOD corresponding to the indicated EAIM
- Regulations in force for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***
- Review tools: **E-15, J-29, J-30***

**Experience or previous knowledge about:**

- Work team leadership
- Project coordination
- Design and construction
- Applicable standards and codes
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

PLANNING ✓ | DESIGN ✓ | CONSTRUCTION ✓ | OPERATION

**Types of Information applicable to *3D Coordination***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| **TDI_K** Code compliance/ occupant safety requirements | ✓ **TDI_L** Phases time sequencing & schedule requirements | ✓ **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 7. Design authoring

Process of creating one or more BIM models of the different disciplines of a project. Design authoring is a key step for incorporating this information to a smart database, from which properties, quantities, costs, programing, etc., can be extracted.

**Suggested resources:**

- BIM modeling software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28***

**Experience or previous knowledge about:**

- Design and construction
- Applicable standards and codes
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Design authoring***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 8. Design review

Process of reviewing the possible responses to the project's requirements related to areas, spatial design, lighting, safety, comfort, acoustics, materiality, colors, etc., through the creation of one or more BIM models that may contain multiple design alternatives.

**QSuggested resources:**

- BIM model review software
- BIM models with LOD corresponding to the indicated EAIM
- Collaborative and interdisciplinary review and validation space (virtual or physical)
- Regulations in force for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **D-13, F-18, F-19, F-20, F-21, I-27, I-28***

**Experience or previous knowledge about:**

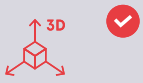
- Design and construction
- Applicable standards and codes
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

PLANNING | DESIGN | CONSTRUCTION | OPERATION

Types of Information applicable to *Design review*

**TDI_A**
General project information




**TDI_B**
Physical and geometric properties

**TDI_C**
Geospatial and spatial location of objects & elements

**TDI_D**
Manufacturer specific information requirements

**TDI_E**
Technical specifications

**TDI_F**
Cost estimation and requirements

**TDI_G**
Energy analysis requirements


**TDI_H**
Sustainable standard

**TDI_I**
Project environmental & site conditions

**TDI_J**
Program/space compliance or validation

**TDI_K**
Code compliance/ occupant safety requirements

**TDI_L**
Phases time sequencing & schedule requirements



**TDI_M**
Construction logistics & sequencing



**TDI_N**
Building commissioning requirements



**TDI_O**
Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*
(*) *: Optional for remodeling and/or expansion projects*

## 9. Structural analysis

Process of analysis for determining the behavior of a structural system through one or more BIM models, based on which the design is developed and adjusted, in order to create efficient structural systems that comply with regulations in force. This information will be used in the design and construction phases.

**Suggested resources:**

- BIM modeling software
- Structural engineering analysis tools and software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for structural analysis: **F-18, F-19, F-21, G-22, G-23, G-24, I-27, I-28***

**Experience or previous knowledge about:**

- Analytic modeling techniques
- Structural design
- Applicable standards and codes
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Structural analysis***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | ✓ **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 10. Lighting analysis

Process for determining the behavior of a lighting system through one or more BIM models. This may include artificial (internal and external) and natural (light and shade) lighting. Based on this analysis, the design is developed and adjusted in order to create efficient lighting systems. This analysis allows for simulations that may improve significantly the design and performance of lighting throughout its life cycle.

**Suggested resources:**

- BIM modeling software
- Lighting analysis tools and software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for lighting analysis: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28***

**Experience or previous knowledge about:**

- Lighting analysis

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Lighting analysis***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 11. Energy analysis

Assessment process of a project through one or more BIM models, based on energy criteria, that may include materials, performance and/or processes. This energy assessment may be performed in all stages of the life cycle. However, it is more effective when performed during the design stage, to be later applied in the construction and operation stages.

**Suggested resources:**

- Energy simulation and analysis software
- Design models with LOD corresponding to the indicated EAIM
- Detailed local meteorology data
- Standards and codes for each discipline
- National and/or local energy standards (e.g.: ASHRAE 90.1)
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28, M-40***
- Analysis tools: **I-27, I-28*, L-34**

**Experience or previous knowledge about:**

- Applicable standards and codes
- Design and construction
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Energy analysis***

| | | | | |
|---|---|---|---|---|
| ✓ | ✓ | ✓ | | |
| **TDI_A** General project information | **TDI_B** Physical and geometric properties | **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | **TDI_E** Technical specifications |
| | ✓ | ✓ | ✓ | ✓ |
| **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| ✓ | | | | |
| **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 12. Mechanical analysis

Process of analyzing and assessing the mechanical systems, based on the design specifications for the project systems through one or more BIM models.

**Suggested resources:**

- BIM modeling software
- Engineering analysis and calculation tools and software
- Design models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for mechanical analysis: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28***

**Experience or previous knowledge about:**

- Design and construction of mechanical systems
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Mechanical analysis***

**TDI_A**
General project information


**TDI_B**
Physical and geometric properties

**TDI_C**
Geospatial and spatial location of objects & elements

**TDI_D**
Manufacturer specific information requirements

**TDI_E**
Technical specifications



**TDI_F**
Cost estimation and requirements

**TDI_G**
Energy analysis requirements


**TDI_H**
Sustainable standard

**TDI_I**
Project environmental & site conditions



**TDI_J**
Program/space compliance or validation

**TDI_K**
Code compliance/ occupant safety requirements



**TDI_L**
Phases time sequencing & schedule requirements

**TDI_M**
Construction logistics & sequencing



**TDI_N**
Building commissioning requirements



**TDI_O**
Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

## 13. Other engineering analyses

Process for determining the most adequate non-traditional engineering method, based on the design specifications, through one or more BIM models. The performance analysis and simulation tools may significantly improve the design of facilities and their energy consumption throughout their life cycle.

**Suggested resources:**

- BIM modeling software
- Engineering analysis tools and software
- Design models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for engineering analysis: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28***

**Experience or previous knowledge about:**

- Specific engineering
- Design and construction
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Other engineering analyses***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 14. Sustainability evaluation

Process in which a project is evaluated based on sustainability criteria through one or more BIM models. This process applies to all stages of a project's life cycle, including planning, design, construction and operation. The application of sustainable criteria on a project on planning and early design phases improves the ability to impact the efficiency of the design and planning.

**Suggested resources:**

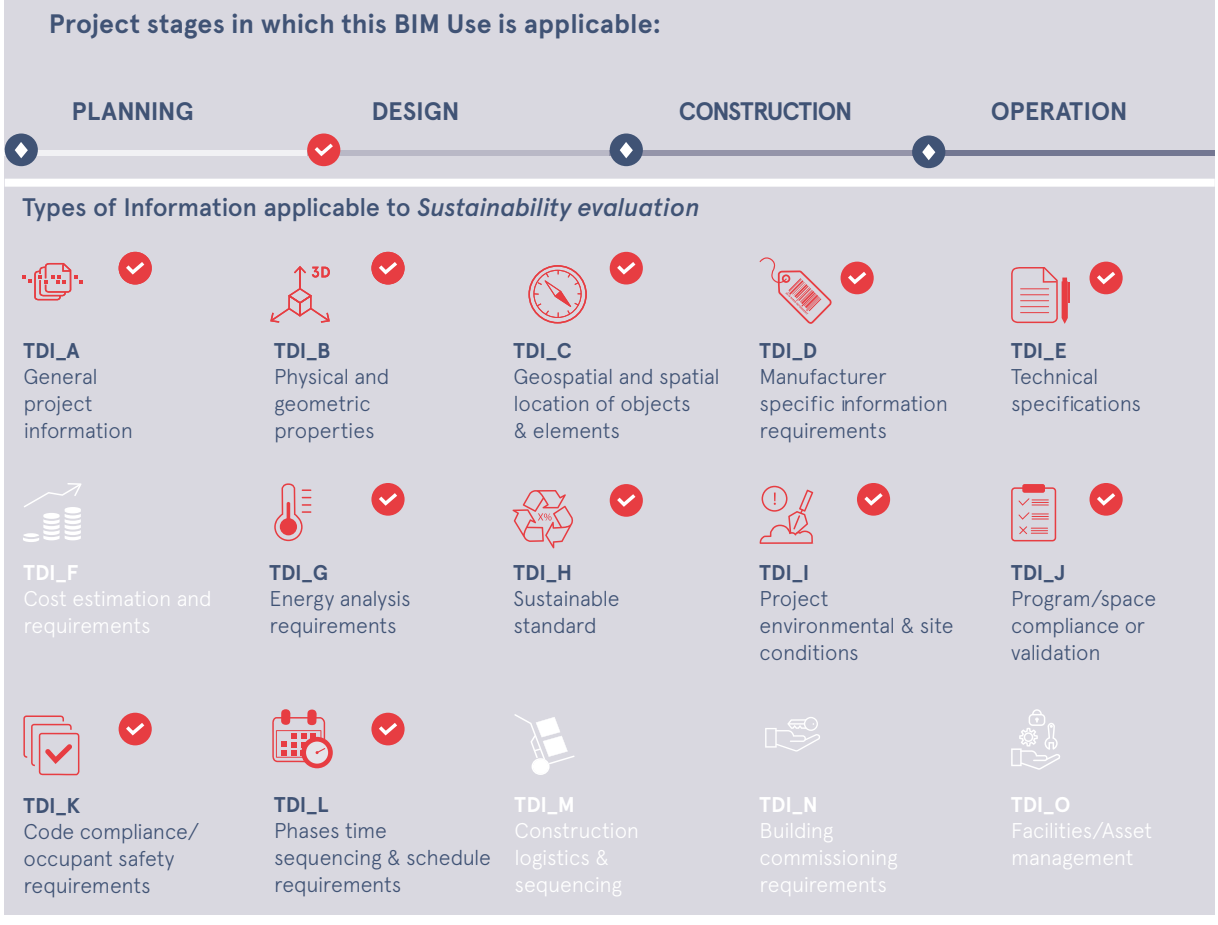
- BIM modeling software
- Sustainability criteria analysis software
- Design models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- Sustainability assessment BIM models: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28, L-34***

**Experience or previous knowledge about:**

- Applicable standards and codes
- Design and construction
- Construction means and methods




**: See abilities defined for BIM Roles in appendix II.*

*: BIM Use is optional for this stage.*

## 15. Code validation

Process of reviewing the compliance with codes and regulations that apply to the project through one or more BIM models.

**Suggested resources:**

- Rule-based BIM model review software
- Design models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, H-25, H-26, I-27, I-28, J-29, J-30***
- Review of code regulation: E-15, E-17, J-29*

**Experience or previous knowledge about:**

- Applicable codes

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | ✓ | | |

**Types of Information applicable to *Code validation***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 16. Site utilization planning

Process in which one or more BIM models are used to plan, in a graphic manner, the activities related to existing, temporary and proposed elements of a project during its construction. This may include the cost of labor and materials, among others.

**Suggested resources:**

- BIM integration software that incorporates time (4D)
- Planning software
- BIM models with LOD corresponding to the indicated EAIM
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***
- Planning and scheduling tools: **K-31, K-32, K33***

**Experience or previous knowledge about:**

- Coordination of construction resources
- Design and construction
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

**Types of Information applicable to *Site utilization planning***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| ✓ **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | ✓ **TDI_L** Phases time sequencing & schedule requirements | ✓ **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 17. Construction system design

Process of design and analysis of the supplementary construction systems (for instance, temporary supports, glassings, etc.), in order to optimize their planning through one or more BIM models.

**Suggested resources:**

- BIM modeling software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models for construction system design: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25,**
- **H-26, I-27, I-28***

**Experience or previous knowledge about:**

- Construction means and methods
- Adequate construction practices for each construction system

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

Types of Information applicable to *Construction system design*

**TDI_A**
General project information


**TDI_B**
Physical and geometric properties

**TDI_C**
Geospatial and spatial location of objects & elements

**TDI_D**
Manufacturer specific information requirements

**TDI_E**
Technical specifications



**TDI_F**
Cost estimation and requirements

**TDI_G**
Energy analysis requirements


**TDI_H**
Sustainable standard



**TDI_I**
Project environmental & site conditions

**TDI_J**
Program/space compliance or validation

**TDI_K**
Code compliance/ occupant safety requirements

**TDI_L**
Phases time sequencing & schedule requirements

**TDI_M**
Construction logistics & sequencing



**TDI_N**
Building commissioning requirements



**TDI_O**
Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

## 18. Digital fabrication

Process that uses information from one or more BIM models to facilitate the manufacturing of construction or assembly components. Some uses of digital fabrication can be appreciated, for instance, in the manufacturing of metal plates and structural steel, pipe cutting, creation of prototypes for design intent review, etc. The information of the models helps to guarantee precision, as well as waste reduction in the manufacturing phase.

**Suggested resources:**

- BIM modeling software
- BIM models with LOD corresponding to the indicated EAIM
- Data for fabrication machine
- Manufacturing equipment
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- Digital fabrication models: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, H-25, H-26, I-27, I-28***

**Experience or previous knowledge about:**

- Extraction of digital information for fabrication
- Fabrication of construction components using digital information
- Construction means and methods

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

**Types of Information applicable to *Digital fabrication***

**TDI_A**
General project information


**TDI_B**
Physical and geometric properties

**TDI_C**
Geospatial and spatial location of objects & elements

**TDI_D**
Manufacturer specific information requirements

**TDI_E**
Technical specifications



**TDI_F**
Cost estimation and requirements



**TDI_G**
Energy analysis requirements



**TDI_H**
Sustainable standard



**TDI_I**
Project environmental & site conditions

**TDI_J**
Program/space compliance or validation

**TDI_K**
Code compliance/ occupant safety requirements

**TDI_L**
Phases time sequencing & schedule requirements

**TDI_M**
Construction logistics & sequencing

**TDI_N**
Building commissioning requirements



**TDI_O**
Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

## 19. 3D control and planning

Process of monitoring, analyzing, managing and optimizing construction through one or more BIM models. The aim is to guarantee that the construction is performed according to the technical specifications, regulations, safety and owner requirements, as well as backing up the payment status of the progress made in each partial delivery milestone.

**Suggested resources:**

- Instruments for on-site digital measurement
- Site control BIM software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***
- Planning and control tools: **K-31, K-32, K33, I-27***

**Experience or previous knowledge about:**

- Design and construction
- Coordination of construction resources
- Construction means and methods
- Risk matrix
- Impact analysis (Time/Cost)

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

**Types of Information applicable to *3D control and planning***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| ✓ **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | ✓ **TDI_L** Phases time sequencing & schedule requirements | ✓ **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 20. Record modeling

Modeling process in which the physical conditions of all elements that are part of a building or infrastructure are exactly represented. The elements in these models contain all the information requested for these models, such as barcodes, serial numbers, warranties, maintenance history, among others.

**Suggested resources:**

- BIM modeling software
- BIM model manipulation software or tools
- Software that allows the access to information of already built project
- BIM models with LOD corresponding to the indicated EAIM
- Asset and/or equipment database (according to owner's capacity)
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***
- Authoring tools: **M-36, M-38***

**Experience or previous knowledge about:**

- Coordination of different the different actors of design, construction, and management of the asset

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | ✓ |

**Types of Information applicable to *Record modeling***

| | | | | |
|---|---|---|---|---|
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **TDI_A** General project information | **TDI_B** Physical and geometric properties | **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | **TDI_E** Technical specifications |
| ✓ | ✓ | ✓ | ✓ | ✓ |
| **TDI_F** Cost estimation and requirements | **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| ✓ | | ✓ | ✓ | ✓ |
| **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | **TDI_N** Building commissioning requirements | **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 21. Asset management

Process in which an organized management system is bidirectionally linked to an as-built BIM model that may consist of one or more BIM models to efficiently assist in the maintenance and operation of an asset. These BIM models contain information about the physical construction, systems, surroundings, and equipment that must be maintained, updated, and operated in an efficient and sustainable manner.

**Suggested resources:**

- Asset management software
- Building and facility recording system with a bidirectional link between the BIM model and the management software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27***
- Asset management tools: **M-35, M-36, M-37, M-38, M-39, M-40***

**Experience or previous knowledge about:**

- Asset financial management
- Construction and operation of a building or infrastructure (replacements, improvements, etc.)
- Building or infrastructure management
- Experience in energy efficiency

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

**Types of Information applicable to *Asset management***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | **TDI_I** Project environmental & site conditions | **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | ✓ **TDI_N** Building commissioning requirements | ✓ **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 22. Building system analysis

Process in which one or more BIM models are used for the analysis of the performance of a building or infrastructure, according to the proposal of the original project designs. This includes how the different mechanical systems work and how much energy they use. Other possible analyses are the sun effect in facades, lighting and radiation analysis, airflow analysis, etc.

**Suggested resources:**

- System analysis software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, I-27, I-28***
- Operation and maintenance tools: **M-35, M-36, M-37, M-38, M-39, M-40, M-41***

**Experience or previous knowledge about:**

- Building or infrastructure operation and maintenance
- Computerized Maintenance Management System (CMMS)

**Project stages in which this BIM Use is applicable:**

PLANNING | DESIGN | CONSTRUCTION | OPERATION

Types of Information applicable to *Building system analysis*

**TDI_A** General project information

**TDI_B** Physical and geometric properties

**TDI_C** Geospatial and spatial location of objects & elements

**TDI_D** Manufacturer specific information requirements

**TDI_E** Technical specifications

**TDI_F** Cost estimation and requirements

**TDI_G** Energy analysis requirements

**TDI_H** Sustainable standard

**TDI_I** Project environmental & site conditions

**TDI_J** Program/space compliance or validation

**TDI_K** Code compliance/ occupant safety requirements

**TDI_L** Phases time sequencing & schedule requirements

**TDI_M** Construction logistics & sequencing

**TDI_N** Building commissioning requirements

**TDI_O** Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

## 23. Maintenance scheduling

Process in which one or more BIM models are used to perform the functional maintenance of a building or infrastructure (walls, columns, floors, roofing, etc.) and its equipment (mechanical, electrical, plumbing, etc.) throughout its operation. A successful maintenance program can significantly improve the performance of an asset, reducing repairs and general costs.

**Suggested resources:**

- BIM model manipulation software or tools
- BIM models with LOD corresponding to the indicated EAIM
- Building automation tool linked to the as-built model
- Computerized Maintenance Management System (CMMS) linked to the as-built model
- User panel interface linked to the as-built model to provide information on the performance of the building or infrastructure
- Standards and codes for each discipline
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***
- Operation and maintenance tools: **M-35, M-36, M-37, M-38, M-39, M-40***

**Experience or previous knowledge about:**

- Building or infrastructure operation and maintenance
- Computerized Maintenance Management System (CMMS)

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

**Types of Information applicable to *Maintenance scheduling***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | ✓ **TDI_D** Manufacturer specific information requirements | ✓ **TDI_E** Technical specifications |
| ✓ **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | ✓ **TDI_H** Sustainable standard | ✓ **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **RBG]J** Phases time sequencing & schedule requirements | **RBG]K** Construction logistics & sequencing | ✓ **RBG]L** Building commissioning requirements | ✓ **RBG]M** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 24. Space management and tracking

Process of managing spaces and related resources in a building or infrastructure, through one or more BIM models that allow the management team to analyze the use of space and to plan possible changes. This is particularly useful when remodeling and expansion projects in spaces that are required to maintain their occupancy and operation.

**Suggested resources:**

- Asset recording system with a bidirectional link between the BIM model and management software
- Survey of the asset areas or zones
- Enterprise asset management software
- BIM models with LOD corresponding to the indicated EAIM
- Standards and regulations, as applicable
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models of the corresponding disciplines: **F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28***
- Space management and tracking tools: **M-35, M-36, M-37, M-38, M-39, M-40***

**Experience or previous knowledge about:**

- N/A

**Project stages in which this BIM Use is applicable:**

| PLANNING | DESIGN | CONSTRUCTION | OPERATION |
|---|---|---|---|
| | | ✓ | |

**Types of Information applicable to *Space management and tracking***

| | | | | |
|---|---|---|---|---|
| ✓ **TDI_A** General project information | ✓ **TDI_B** Physical and geometric properties | ✓ **TDI_C** Geospatial and spatial location of objects & elements | **TDI_D** Manufacturer specific information requirements | **TDI_E** Technical specifications |
| **TDI_F** Cost estimation and requirements | ✓ **TDI_G** Energy analysis requirements | **TDI_H** Sustainable standard | **TDI_I** Project environmental & site conditions | ✓ **TDI_J** Program/space compliance or validation |
| ✓ **TDI_K** Code compliance/ occupant safety requirements | **TDI_L** Phases time sequencing & schedule requirements | **TDI_M** Construction logistics & sequencing | ✓ **TDI_N** Building commissioning requirements | ✓ **TDI_O** Facilities/Asset management |

**: See abilities defined for BIM Roles in appendix II.*

## 25. Disaster planning

Process in which the critical information of the building or infrastructure is reviewed through one or more BIM models, in order to improve the response efficiency in the event of an emergency and minimize safety risks. The asset's dynamic information is provided by a BAS (Building Automation System), while its fixed information, such as floor drawings and equipment schematics, is in the BIM models. The BIM together with the BAS can clearly show where an emergency occurs inside the building, the possible routes to the area, and any other location at risk in the asset.

**Suggested resources:**

- As-built BIM model and entities review software
- Building Automation System (BAS) linked to the as-built BIM model
- Computerized Maintenance Management System (CMMS) linked to the as-built model
- Standards and regulations, as applicable
- Hardware suitable for BIM model processing
- Necessary IT infrastructure

**Team with BIM abilities related to:**

- BIM models: F-18, F-19, F-20, F-21, G-22, G-23, G-24, I-27, I-28*
- Disaster planning tools: L-34, M-35, M-36, M-37, M-38, M-39, M-40, M-41*

**Experience or previous knowledge about:**

- N/A

**Project stages in which this BIM Use is applicable:**

PLANNING — DESIGN — CONSTRUCTION — OPERATION

**Types of Information applicable to *Disaster planning***

- **TDI_A** General project information
- **TDI_B** Physical and geometric properties
- **TDI_C** Geospatial and spatial location of objects & elements
- **TDI_D** Manufacturer specific information requirements
- **TDI_E** Technical specifications
- **TDI_F** Cost estimation and requirements
- **TDI_G** Energy analysis requirements
- **TDI_H** Sustainable standard
- **TDI_I** Project environmental & site conditions
- **TDI_J** Program/space compliance or validation
- **TDI_K** Code compliance/ occupant safety requirements
- **TDI_L** Phases time sequencing & schedule requirements
- **TDI_M** Construction logistics & sequencing
- **TDI_N** Building commissioning requirements
- **TDI_O** Facilities/Asset management

**: See abilities defined for BIM Roles in appendix II.*

*: BIM Use is optional for this stage.*

# Appendix II

## BIM Roles Matrix

# Appendix II

# BIM Roles Matrix

## 1. Context of the definition of BIM Roles and responsibilities

One of the structural gaps recognized by Planbim through the *Study of the current situation of BIM human capital formation in Chile* [40] is that the AECO industry in Chile, during 2016, did not have an explicit and commonly agreed BIM Role definition that facilitated the adoption of this methodology. This definition is necessary, as the use of BIM methodology requires the incorporation of new abilities to organizations. Thus, in 2017, four multi-sector working sessions were conducted to generate a role definition that was later included, in November of that year, in the document *BIM Roles Matrix*.

In this matrix, five roles were defined and named according to the BIM responsibilities that each of them assumes, with forty-two BIM abilities required by said roles throughout the project's life cycle.

40 PMG. Diagnóstico de la situación actual de formación de capital humano de BIM en Chile. Study by PMG for CORFO, 2016

## 2. What is a BIM Role?

A BIM Role is a function performed in any stage of the planning, design, construction and/or operation of a building or infrastructure project, based on BIM abilities that are added to non-BIM abilities.

- A role is **NOT** a position
- BIM roles **DO NOT** define a new discipline
- Roles may be performed by people already part of a team if they are trained for that purpose
- One person **CAN** perform more than one role
- A role **CAN** be performed by several people
- Roles define BIM abilities that are added to the competences of each discipline
- Assuming a role implies responsibilities for certain actions

## 3. What do BIM Roles define?

At the beginning of a project incorporating BIM methodology, the BIM Uses required for fulfilling the proposed objectives must be selected. These BIM Uses must be developed by people with specific abilities for their execution and with defined responsibilities regarding project information. These abilities and responsibilities are defined in the BIM Roles, and are linked to each Use through the BIM Use Datasheets, included in Appendix I of this standard.

## 4. Why is defining BIM Roles necessary for the Industry?

The definition of BIM Roles allows to:

- Agree a common language between the industry actors that enables and simplifies collaborative work
- Differentiate the responsibilities that each actor in a project assumes and explicitly define the required BIM abilities for a BIM Role
- Encourage the learning of BIM methodology and new technologies for the management of project information, promoting the training of current and future workforce
- Guide academic institutions in the update of their study programs, ensuring they are consistent with the needs of the 4.0 industry
- Guide companies and organizations in the diagnosis of BIM abilities currently installed in their work teams, and also simplify the characterization of training gaps, in order to develop a training plan adjusted to their requirements

## 5. How to use the BIM Roles Matrix?

The Matrix has seven columns and forty-two rows:

- The first column describes the fourteen topic areas of BIM methodology, covering the entire life cycle of a project and allowing the grouping of abilities
- The second column explains the 42 BIM abilities
- Each cell between the third and seventh columns incorporates one or more verbs that describe the function of each of the 5 BIM Roles for each of the 42 BIM abilities

In order to use the BIM Roles Matrix, a BIM Role and ability must be cross-checked. For this, it is necessary to:

A. Select the BIM Role column to be analyzed

B. Identify the row corresponding to the BIM ability and topic

C. Cross-check the BIM ability and the defined verb for the selected Role, placing the specific verb that assumes said role before the description of the corresponding BIM ability. For instance, for the BIM Review Role and the ability No. 17 of the Matrix, the phrase will be the following:

The person who assumes the BIM Review Role must be capable of ***Applying*** **standards and instruments previously set for the industry or developed internally for multidisciplinary and collaborative work.** (Figure 6)

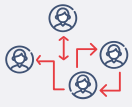
| BIM abilities | BIM Direction | BIM Review | BIM Modeling | BIM Coordination | BIM Management |
|---|---|---|---|---|---|
| **E. 17** *Applying* standards and instruments previously set for the industry or developed internally for multidisciplinary and collaborative work. | Understanding | Applying | Applying | Applying | Developing / Implementing |

**Figure 6. Example of the definition of BIM ability per Role**

## 6. Actions, responsibilities and previous experience for each BIM Role

In the table below, each of the BIM Roles is defined, according to their BIM-related actions and responsibilities, and suggested previous experience.

**Roles Table 01. Actions, responsibilities and previous experience for each BIM Role**

| BIM Roles | Actions | Experience or previous knowledge |
|---|---|---|
|  **BIM Review** | Visualizing and verifying the information (geometry and data) of the models developed in BIM, according to the project's life cycle stage (idea, design, construction and operation). | Knowledge on the technical and regulatory objectives of the project type, discipline, and stage to be reviewed. Competencies in any of the following responsibilities: inspection, validation, auditing, control, development and/or execution based on the information obtained from a project. |
|  **BIM Modeling** | Developing BIM models of projects according to the selected discipline, using the different types of representation and extraction of technical documentation. Mastering the exchange of information in different formats. Modeling elements, adding or updating the required information. Using and creating new entities. | Knowledge and competencies regarding the technical and regulatory objectives per project type, discipline, and stage to be modeled. |
|  **BIM Coordination** | Developing the integration process and information flow between the different actors according to the project stage. Validating and integrating models from different disciplines, anticipating conflicts, and providing solutions. Communicating with specialists to compile information and ensure the proper modeling of the design. Organizing coordination sessions between disciplines. Configurating the modeling environment to develop deliveries according to the BEP specifications. Maintaining the model(s) updated and light. Those in this role are the main contact point between modelers. | Knowledge and competencies regarding project development, technical and regulatory objectives per project type, discipline, and stage to be coordinated. Team leadership. |
|  **BIM Management** | Leading the planning, development and management of human and technological resources for the implementation and updating of the BIM methodology, either in an organization, a project, or the management of an asset. Defining the modeling environment, the standards to be used, the models to be created, how they will correlate, how the model information will be organized and classified, the configuration of the IT infrastructure, and the communication protocols. Defining a schedule for deliveries and organizing BIM team meetings. Those in this role are the contact point for project manager(s) and several coordinators. | Competencies in any of the following responsibilities: standardization and optimization of technological processes, project planning and management, and asset operation and maintenance. Team leadership. |
|  **BIM Direction** | Leading and encouraging the BIM implementation in an organization, according to strategic needs and decision-making related to projects and investments, according to the stages of the project's life cycle (idea, design, construction and operation). | Experience in project and/or organization strategic management. Leadership. |

*Developed by Planbim*

## 7. BIM Roles Matrix

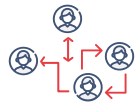
The table below details the specific abilities of each role.

### Roles Table 02. BIM Roles Matrix

| Topics | | BIM abilities |
|---|---|---|
| **A** **Fundamental pillars of the National BIM Mandate for 2020 in the international context.** | 1 | The characteristics and deficit of the traditional production model of the current AECO industry on a national and international scale versus the BIM production model. |
| | 2 | The fundamental pillars of BIM methodology related to: strategy, processes and standards, technologies, and human capital. |
| | 3 | The opportunities in productivity, competitiveness, sustainability, and innovation brought by the implementation of BIM methodology. |
| **B** **BIM methodology focused on collaborative work throughout the entire life cycle of a project.** | 4 | BIM as a collaborative work methodology throughout the entire life cycle, considering the operation and maintenance requirements of a project since its beginning. |
| | 5 | The benefits brought by BIM in terms of cost and time saving, and productivity, considering the limitations and risks of its implementation. |
| | 6 | The challenges and changes brought by implementing a BIM culture and the responsibilities of each sector: public, private, and academic. |
| **C** **BIM implementation strategies and organizational change management.** | 7 | The challenges and changes brought by implementing BIM in an organization (collaborative work, information flow, etc.) |
| | 8 | The BIM Roles and their characterization and responsibilities, that must be integrated to the human capital of an organization. |
| | 9 | The requirements regarding: redesign of methodologies, processes and standards, technologies and interoperability enablement, and training, among others. |
| | 10 | The legal and commercial effects for the organization. |
| | 11 | The challenges for the adoption of BIM in an organization, such as creating conditions for success, showing medium- and long-term achievements, defining a baseline and KPIs, among others. |
| | 12 | The organizational change for BIM implementation, according to the maturity and role of the organization in the production chain. |

| BIM Direction | BIM Review | BIM Modeling | BIM Coordination | BIM Management |
|---|---|---|---|---|
| Understanding / Communicating | Understanding | Understanding | Understanding | Understanding / Communicating |
| Understanding / Communicating | Understanding | Understanding | Understanding | Understanding / Communicating |
| Understanding / Communicating / Promoting | Understanding | Understanding | Understanding | Understanding / Communicating / Promoting |
| Understanding / Planning/ Communicating | Understanding | Understanding | Understanding | Understanding / Communicating / Promoting |
| Understanding / Planning/ Communicating | Understanding | Understanding | Understanding | Understanding / Planning/ Communicating |
| Understanding / Communicating / Promoting | Not applicable | Not applicable | Not applicable | Understanding / Communicating |
| Understanding / Planning/ Communicating | Not applicable | Not applicable | Understanding | Understanding |
| Understanding | Understanding | Understanding | Understanding | Planning / Implementing |
| Validating / Planning | Not applicable | Not applicable | Not applicable | Planning / Implementing |
| Validating / Communicating / Promoting | Not applicable | Not applicable | Not applicable | Understanding |
| Validating / Communicating / Promoting | Not applicable | Not applicable | Not applicable | Planning / Implementing |
| Validating / Communicating / Promoting | Not applicable | Not applicable | Understanding | Planning / Implementing |

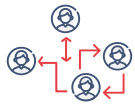
| Topics | BIM abilities | |
|---|---|---|
| **D**<br>**Communication strategy according to the BIM Exchange Information Requirement (BIM EIR) and the BIM Execution Plan (BEP) to coordinate collaborative work** | 13 | A collaborative work system between the actors of a project, based on communication and security protocols, query, control, review, validation, and feedback of information. |
| | 14 | The information flow defined by the BIM Exchange Information Requirement (BIM EIR) and the BIM Execution Plan (BEP). |
| **E**<br>**Regulatory framework and standards for collaborative and coordinated work.** | 15 | The regulatory framework for the development of BIM projects. |
| | 16 | The contract framework between the participants in a project developed in BIM, related to a life cycle phase. |
| | 17 | The standards and instruments previously set for the industry, or developed internally, for collaborative and multidisciplinary work. |
| **F**<br>**Visualization and review of structured and updated information of a project, according to the workflow and deliverables.** | 18 | The representation of the geometric information of a BIM project through: planimetry, 3D visualizations, renders, animations, etc. |
| | 19 | The representation of the non-geometric information of a BIM project through: reports, datasheets, tables, labels, data tables, etc. |
| | 20 | The different formats and visualization interfaces of project information in mobile devices. |
| | 21 | Project spreadsheets and data export and import in different formats such as: Excel, DWG, DWF, etc. |
| **G**<br>**Design and development of a building or infrastructure based on digital and parametric models.** | 22 | The geometric information of a BIM model, according to Type of Information (TDI), Level of Development (LOD), and BIM Deliverables that are required in each stage, and according to each discipline (topography, architecture, MEP, structure, etc.) |
| | 23 | The non-geometric information of a BIM model, according to Type of Information (TDI), Level of Development (LOD), and BIM Deliverables that are required in each stage and according to each discipline (topography, architecture, MEP, structure, etc.) |
| | 24 | Preset BIM entities that facilitate the standardization and interoperability of projects. |

| |  BIM Direction |  BIM Review |  BIM Modeling |  BIM Coordination |  BIM Management |
|---|---|---|---|---|---|
| | Validating / Communicating / Promoting | Applying / Validating | Applying | Applying / Validating | Planning / Implementing |
| | Understanding | Validating | Applying | Applying | Developing / Implementing |
| | Understanding | Applying / Validating | Applying | Applying / Validating | Validating |
| | Understanding | Applying | Not applicable | Understanding | Understanding / Applying |
| | Understanding | Applying | Applying | Applying | Developing / Implementing |
| | Not applicable | Using / Validating | Developing | Developing | Validating |
| | Not applicable | Using / Validating | Developing | Developing | Validating |
| | Using | Using | Using | Using | Planning / Implementing |
| | Not applicable | Understanding | Developing | Using / Developing | Planning / Implementing |
| | Not applicable | Using / Validating | Developing | Developing | Planning / Validating |
| | Not applicable | Using / Validating | Developing | Developing | Planning / Validating |
| | Not applicable | Understanding | Developing / Applying | Developing / Applying | Validating |

| Topics | BIM abilities | |
|---|---|---|
| **H** **Programming and customization of interfaces.** | 25 | The customization of the BIM software interface through predetermined configurations and templates. |
| | 26 | Task and function automatization in the BIM software used. |
| **I** **Import and export of project models with parametric data through interoperability protocols.** | 27 | The export and import of information between interoperable BIM systems through formats such as: IFC, LandXML, GIS, BCF, COBie, SQL, etc. |
| | 28 | The communication management and information exchange systems/ platforms (Common Data Environments - CDE). |
| **J** **Coordination and integration of information from different disciplines of a project, in order to foresee conflicts and interferences.** | 29 | The coordination of different BIM models of a project to avoid and/or detect possible issues, collisions, or conflicts. |
| | 30 | Reports on coordination, detected interferences and collisions, and/or possible solutions. |
| **K** **Planning of construction according to costs, timelines and scheduling of the works.** | 31 | Information of the model, arranged according to its stages (previous and subsequent activities) allowing for coordination to be consistent with site orders and production processes during construction. |
| | 32 | A project timeline estimation , using BIM planning, organizing, scheduling, and site control tools for construction. |
| | 33 | A project cost estimation using BIM tools for increasing budget precision through: price tables, cost assessment, contract verification, and quantity takeoff for construction. |
| **L** **Optimization and early simulation of operation and maintenance of a project throughout its life cycle.** | 34 | Sustainable analysis and energy performance for the optimization of a project through BIM tools. |

| BIM Direction | BIM Review | BIM Modeling | BIM Coordination | BIM Management |
|---|---|---|---|---|
| Not applicable | Using | Using | Using / Planning | Planning / Developing / Implementing |
| Not applicable | Using | Using | Using / Planning | Planning / Developing / Implementing |
| Not applicable | Using | Developing | Using / Developing | Planning / Implementing |
| Understanding | Using | Using | Using | Planning / Developing / Implementing |
| Not applicable | Validating | Not applicable | Developing | Planning / Validating |
| Not applicable | Validating / Developing | Not applicable | Developing | Planning / Validating |
| Not applicable | Not applicable | Developing | Developing | Planning / Validating |
| Communicating / Promoting | Applying / Validating | Understanding | Using / Developing | Planning / Validating |
| Communicating / Promoting | Applying / Validating | Understanding | Using / Developing | Planning / Validating |
| Communicating / Promoting | Validating | Using | Using / Developing | Planning / Validating |

| Topics | | BIM abilities |
|---|---|---|
| **M**<br>**Operation and maintenance of an infrastructure or building asset until its decommissioning.** | **35** | Information necessary to monitor the behavior and maintenance of an asset. |
| | **36** | As-built information necessary for the management, maintenance, and operation of an asset. |
| | **37** | Data to calculate, track and report use, time, and cost indicators for the asset's operation. (e.g., design performance, adjustment to code and standards, information of manufacturers and appointed parties, replacement cost, exchange and maintenance periods, etc.). |
| | **38** | The update of entities, data, and processes in BIM models, e.g., parts, equipment and systems, registering their history, thus, allowing traceability. |
| | **39** | The tracking and monitoring of data in a planned and periodic manner for adequate asset operation and logistic control. |
| | **40** | Information for the consumption and saving strategy throughout the life cycle, and the technical maintenance and optimization plan. |
| | **41** | Disaster planning information, and preparation in case of evacuation or other emergencies. |
| **N**<br>**Implications of the information Era and the value of continuous update and education.** | **42** | Ongoing training of human capital in the organization regarding the industry's technological advances. |

| |  BIM Direction |  BIM Review |  BIM Modeling |  BIM Coordination |  BIM Management |
|---|---|---|---|---|---|
| | Not applicable | Validating | Developing | Using / Developing | Planning / Validating |
| | Not applicable | Validating | Developing | Planning | Planning / Validating |
| | Not applicable | Validating | Developing | Using / Developing | Planning / Validating |
| | Not applicable | Validating | Developing | Using / Developing | Planning / Validating |
| | Communicating / Promoting | Validating | Developing | Using / Developing | Planning / Implementing |
| | Not applicable | Validating | Developing | Using / Developing | Planning / Validating |
| | Not applicable | Validating | Developing | Using / Developing | Planning / Validating |
| | Communicating / Promoting | Understanding | Understanding | Understanding | Planning / Implementing |

*Developed by Planbim*

# Appendix III

## BIM Basic Information Delivery Manual (MEI)

This manual[41] is a twelve-step guide to be used in BIM models. It allows to share and exchange information in a structured manner throughout the life cycle of buildings and infrastructure, considering the use of openBIM standards. This document was developed by a group of companies of the AECO sector in the Netherlands, together with BIM Loket and BuildingSMART Benelux, both non-profit organizations

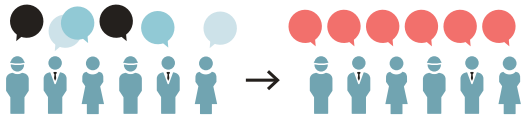
This manual allows to efficiently ensure the availability and potential reusability of BIM models' information, and it is used within the *BIM Standard for Public Projects* as part of the minimum dataset to be requested by public institutions, in order to guarantee high-quality BIM deliverables

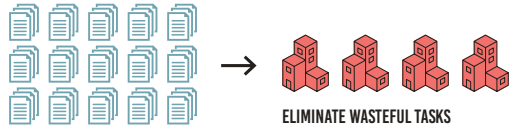
41 BIM Loket. https://www.bimloket.nl/BIMbasicIDM

# BIM BASIC INFORMATION DELIVERY MANUAL (IDM)

## 1. WHY ARE WE SHARING THIS INFORMATION UNAMBIGUOUSLY?

In order to secure and reuse information more efficiently and effectively.




## 2. HOW ARE WE GOING TO SHARE THIS INFORMATION UNAMBIGUOUSLY?

Knowledge and practical experiences have shown that there is a significant common denominator.
We are not developing something new, but rather using existing structures, based on openBIM IFC.

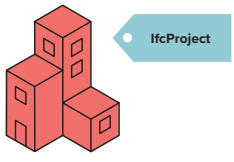

## 3. WHICH STRUCTURE WILL WE USE?

The agreements listed below help ensure that every involved party will always be able to find and supply the right information in the right place.

### Checklist basic information delivery manual

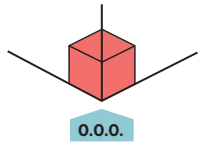
#### 3.1 FILE NAME

- ✔ Ensure that uniform and consistent naming is used for (discipline) models within the project.
  **example:** <Building>_<Discipline>_<Component>



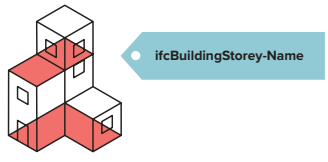

#### 3.2 LOCAL POSITION AND ORIENTATION

- ✔ The local position of the building is coordinated and close to the origin.
  **tip:** use a physical object as point of origin, positioned at 0.0.0., and also export this to IFC.




#### 3.3 BUILDING STOREYS AND NAMING

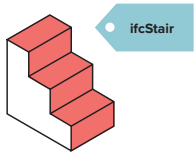
- ✔ Name Building Storeys only as ifcBuildingStorey-Name.
- ✔ Allocate all objects to the correct level.
- ✔ Within a project, ensure that all involved parties consistently use exactly the same naming, that can be numerically sorted with a textual description.
  **example 1:** 00 ground floor
  **example 2:** 01 first floor



### 3.4 CORRECT USE OF ENTITIES

- ✔ Use the most appropriate type of BIM entity, both in the source application and the IFC entity.

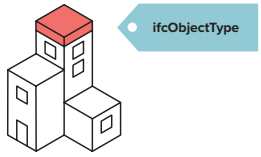
**example:** slab = ifcSlab, wall = ifcWall, beam = ifcBeam, column = ifcColumn, stair = ifcStair, door = ifcDoor etc.




### 3.5 STRUCTURE AND NAMING

- ✔ Consistently structure and name objects.
- ✔ Correctly enter the object TYPE (ifcType, ifcObjectType or ifcObjectTypeOverride).
- ✔ Where applicable, also correctly enter the Name (ifcName or NameOverride).

**example:** roof insulation, type: glass fibre




### 3.6 CLASSIFICATION SYSTEM

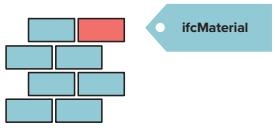
- ✔ Apply the existing classification system used in the relevant country. In the Netherlands this is the NL-SfB.
- ✔ Allocate to each object a four-digit NL-SfB variant element code.

**example:** 22.11


### 3.7 OBJECTS WITH CORRECT MATERIALIZATION

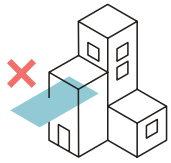
- ✔ Allocate objects with a material description (ifcMaterial).

**example:** limestone




### 3.8 DUPLICATES AND INTERSECTIONS

- ✔ There are no duplicates or intersections permitted. Make sure this is checked in IFC.



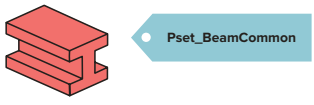
### LEARNING TO SPEAK THE SAME LANGUAGE IS SOMETHING WE DO TOGETHER.

When naming objects, consider whether the name meets the following criteria. Double-check this, and know what information you are sharing.

- ✔ Significant
- ✔ Understandable
- ✔ Logical
- ✔ Insightful
- ✔ Consistent
- ✔ Recognizable

## 4. HOW CAN WE SECURE OTHER/FUTURE OBJECT INFORMATION?

Object information is secured in the correct properties and property sets as defined in IFC.



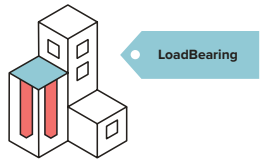

**example:** for beams, the properties FireRating, LoadBearing and IsExternal are part of the Pset_BeamCommon.

**ifc Property Sets**

- Pset##Common; LoadBearing
- Pset##Common; IsExternal
- Pset##Common; FireRating
- ....

### 4.1 LOADBEARING

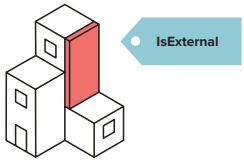
- ✔ Allocate objects, when applicable, with the property LoadBearing [True/False].




### 4.2 IS EXTERNAL

- ✔ Allocate objects, when applicable, with the property IsExternal [True/False]

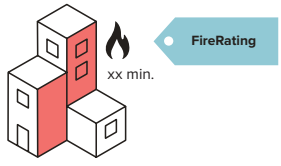
**tip:** both inner and outer faces of the façade have the property IsExternalTrue.




### 4.3 FIRERATING

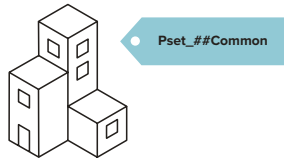
- ✔ Allocate objects, when applicable, with the property FireRating.

**example:** Apply the existing standard used in the relevant country.




### 4.4 PROJECT SPECIFIC

- ✔ Define which IFC properties you are using for each specific project.



# Appendix IV

## Pre-contract BEP Template

# Appendix IV

# Pre-contract BEP Template

A template for the generation of the Pre-contract BIM Execution Plan is shown below. It must be completed by Prospective Appointed Parties within the deliveries required in the BIM Exchange Information Requirement. The digital version of this template is available at Planbim's digital repository[42].

42 https://planbim.cl/biblioteca/documentos/

# Pre-contract BIM Execution Plan

## Project information

| | |
|---|---|
| Appointing Party: | |
| Name of the project: | |
| Location of the project: | |
| Type of contract: | |
| Description of the project: | |
| Contract number: | |
| Project number: | |

No. of document:

Date:

Revision:

State:

## Document control sheet

| Revision | Status | Page | Amendment | Date | By |
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# Introduction

In the Pre-contract BIM Execution Plan (Pre-contract BEP), the Prospective Appointed Parties must show their strategy for the use of BIM for the project, as well as the abilities and competencies of their company and their supply chain, in order to comply with the Appointing Party's information requirements indicated in the BIM Exchange Information Requirement (BIM EIR).

The information provided through the BEP must comply with what is stated in the *BIM Standard for Public Projects*: *Information Exchange between Appointing and Appointed Parties.*

# A. Participating companies

Indicate the companies that will be participating in the project.

## Form 01 Pre-contract BEP. Participating Companies

| Company | Discipline | Code | Name of person in charge |
|---|---|---|---|
| *E.g.: Architop* | *E.g.: Architecture Project* | *E.g.: ARQ* | *E.g.: Juan Muñoz* |
| *E.g.: Gerenciatop* | *E.g.: Management* | *E.g.: GER* | *E.g.: Alejandra Pérez* |
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## Declaration of the Prospective Appointed Party

The information provided in this BIM Execution Plan by the Prospective Appointed Party has been agreed by the representatives of the project team above, who are authorized by their companies to validate this document and its use within the project.

# B. BIM Objectives and Uses

## B.1 Objectives of the use of BIM in the project

State the general and specific objectives listed in the BIM Exchange Information Requirement and add the BIM Uses related to each objective. For more information, see 5.1 of the *BIM Standard for Public Projects*.

### Form 02 Pre-contract BEP. General objective of the use of BIM in the project

| General objective |
|---|
| *E.g.: The objective of the use of BIM is to prevent critical errors or modifications on the approved schedule and budget.* |

### Form 03 Pre-contract BEP. Specific objectives of the use of BIM in the project

| Specific objectives | Related BIM Uses |
|---|---|
| *E.g.: To obtain the quantities and costs of the project's components* | *E.g.: Cost and quantities estimation.* |
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## B.2 BIM Uses (Pre-contract BEP)

Indicate, for each BIM Use, the company and main Role in said company of the person who will be in charge of its development. For more information, see 5.6 of the *BIM Standard for Public Projects*.

### Form 04 Pre-contract BEP. BIM Uses

| BIM Use | Company | BIM Role |
|---|---|---|
| *E.g.: Existing conditions modeling* | *E.g.: MasterTop* | *E.g.: BIM Management* |
| *E.g.: Design Authoring* | *E.g.: Arquitop* | *E.g.: BIM Management* |
| | | |
| | | |

## B.3 Resources, abilities, and previous experience for each required BIM Use

Indicate, for each BIM Use requested in the BIM EIR, the resources that will be used to achieve them. For this, the equipment resource forms, created for each BIM Use, must be used. These can be found in the BEP templates, available at Planbim's digital repository.[43] The way the Appointed Party complies with the resources, abilities, and previous experience for each BIM Use, referred to in the BIM Uses Datasheets in Appendix I, must be explained in these forms.

43 https://planbim.cl/biblioteca/documentos/

# C. BIM deliverables and their formats

## C.1 Requested BIM models and their formats (Pre-contract BEP)

State, for each BIM model, the **discipline** to which it corresponds, the formats that will be used for its development and exchange between appointed parties, who will develop it, and who will be in charge of its quality control. For more information, see 5.3 of *BIM Standard for Public Projects*.

### Form 05 Pre-contract BEP. Requested BIM models and their formats

| BIM models | Discipline | Model author | Responsible | Native format |
|---|---|---|---|---|
| *E.g.: Volumetric* | *E.g.: Architecture Project* | *E.g.: ARQ* | *E.g.: ARQ* | *E.g.: PLN* |
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## C.2 Model Information Progress State of BIM Models per delivery

State, for each model, the corresponding EAIM for delivery according to the BIM EIR. For more information, see 5.5 of the *BIM Standard for Public Projects.*

### Form 06 Pre-contract BEP. EAIM for each delivery

| **Project:**<br>*(Insert project name)*<br>*(Insert date)* | **Delivery 01** | **Delivery 02** | **Delivery 03** | **Delivery 04** | **Delivery 05** | **Delivery 06** | **Delivery "N"** |
|---|---|---|---|---|---|---|---|
| **BIM models** | **EAIM** | **EAIM** | **EAIM** | **EAIM** | **EAIM** | **EAIM** | **EAIM** |
| **Site** | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | |
| **Volumetric** | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | |
| **Architecture** | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | *E.g.: DD Detail Design* | *E.g.: DD Detail Design* | |
| **Structure** | | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | *E.g.: DD Detail Design* | |
| **Mechanical Electrical and Plumbing (MEP)** | | | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | |
| **Coordination** | | | | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | |
| **Construction** | | | | | | | |
| **As-built** | | | | | | | |
| **Operation** | | | | | | | |

## C.3 Requested documents and their formats (Pre-contract BEP)

Indicate, for each delivery, the date and the Information Progress States of the Models corresponding to each requested deliverable. For more information, see 5.4 of the *BIM Standard for Public Projects*.

### Form 07 Pre-contract BEP. Requested documents and their formats

| Delivery | Date | Model Information Progress States (EAIM) | Deliverable |
|---|---|---|---|
| *E.g.: Stage 01* | *E.g.: 02-03-2018* | *E.g.: Draft Design* | *E.g.: Master plans* |
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# D. Collaboration strategy

## D.1 Common Data Environment (CDE)

Specify if the CDE consists of one or multiple technology platforms, which platforms these are, and the formats that will be used for the information and collaboration requirements. For more information, see 5.8.1 of the *BIM Standard for Public Projects*.

### Form 08 Pre-contract BEP. Common Data Environment

**The CDE to be used consists of a single platform**

| Yes ☐ | No ☐ |
|---|---|

**Platforms and formats of the Common Data Environment**

| | |
|---|---|
| Common Data Environment (CDE): | *E.g.: CDE MASTER* |
| Collaboration platform: | *E.g.: BIMCollab* |
| Document management platform: | *E.g.: G-Drive* |
| Information and collaboration requirements format: | *E.g.: BCF files* |

## D.2 Consolidation of BIM models

Specify the consolidation strategy to be used. For more information, see 5.8.2 of the *BIM Standard for Public Projects*.

### Form 09 Pre-contract BEP. Generation of BIM model

| Strategy | YES | NO |
|---|---|---|
| Federated BIM model | *E.g.: X* | |
| Integrated BIM model | | |

# Appendix V

## Post-contract BEP Template

# Appendix V

# Post-contract BEP Template

A template for the generation of the Post-contract BIM Execution Plan is shown below. It must be completed by the Appointed Party within the deliveries required in the BIM Exchange Information Requirement. The digital version of this template is available at Planbim's digital repository[44].

44 https://planbim.cl/biblioteca/documentos/

# Post-contract BIM Execution Plan

## Project information

| |
|---|
| Appointing Party: |
| Name of the project: |
| Location of the project: |
| Type of contract: |
| Description of the project: |
| Contract number: |
| Project number: |

**No. of document:**

**Date:**

**Revision:**

**State:**

## Document control sheet

| Revision | Status | Page | Amendment | Date | By |
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# Introduction

In the Post-contract BIM Execution Plan (Post-contract BEP), the Appointed Party must show its strategy for the use of BIM for the project, as well as the abilities and competencies of its company and its supply chain, in order to comply with the Appointing Party's information requirements indicated in the BIM Exchange Information Requirement (BIM EIR).

The information provided through the Post-contract BEP must comply with what is stated in the *BIM Standard for Public Projects: Information Exchange between Appointing and Appointed Parties.*

# A. Participating companies

Indicate the companies that will be participating in the project.

## Form 01 Post-contract BEP. Participating companies

| Company | Discipline | Code | Name of person in charge |
|---|---|---|---|
| *E.g.: Architop* | *E.g.: Architecture Project* | *E.g.: ARQ* | *E.g.: Juan Muñoz* |
| *E.g.: Gerenciatop* | *E.g.: Management* | *E.g.: GER* | *E.g.: Alejandra Pérez* |
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### Declaration of the Appointed Party

The information delivered in this BIM Execution Plan by the Appointed Party has been agreed by the representatives of the project team above, who are authorized by their companies to validate this document and its use within the project.

# B. BIM Objectives and Uses

## B.1 Objectives of the use of BIM in the project

State the general and specific objectives listed in the BIM Exchange Information Requirement and add the BIM Uses related to each objective. For more information, see 5.1 of the *BIM Standard for Public Projects*.

### Form 02 Post-contract BEP. General objective of the use of BIM in the project

| General objective |
|---|
| *E.g.: The objective of the use of BIM is to prevent critical errors or modifications on the approved schedule and budget.* |

### Form 03 Post-contract BEP. Specific objectives of the use of BIM in the project

| Specific objectives | Related BIM Uses |
|---|---|
| *E.g.: To prevent critical conflicts between the different project disciplines* | *E.g.: 3D Coordination* |
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## B.2 BIM Uses (Post-contract BEP)

Specify the main contact points of each organization participating in the project related to each BIM Use. Include the email of each contact, as well as the role developed within the company. More people can be added further in the document. For more information, see 5.6 of the *BIM Standard for Public Projects*.

### Form 04 Post-contract BEP. BIM Uses

| BIM Use | Company | BIM Role | Person in charge | Discipline | Activity /Profession | Email |
|---|---|---|---|---|---|---|
| *E.g.: Existing conditions modeling* | *E.g.: MasterTop* | *E.g.: BIM Management* | *E.g.: Juan López* | *TOP* | *Land Surveyor* | *juanlopez @mail.com* |
| *E.g.: Design Authoring* | *E.g.: Arquitop* | *E.g.: BIM Management* | *E.g.: Esteban Torres* | *ARQ* | *Architect* | *estebantorres @email.com* |
| | | | | | | |
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## B.3 Resources, abilities, and previous experience for each required BIM Use

Indicate, for each BIM Use requested in the BIM EIR, the resources that will be used to achieve them. For this, the equipment resource forms, created for each BIM Use, must be used. These can be found in the BEP templates, available at Planbim's digital repository.[45] The way the Appointed Party complies with the resources, abilities, and previous experience for each BIM Use, referred to in the BIM Uses Datasheets in Appendix I1, must be explained in these forms.

45 https://planbim.cl/biblioteca/documentos/

# C. BIM deliverables and their formats

## C.1 Requested BIM models and their formats (Post-contract BEP)

State, for each BIM model, the discipline to which it corresponds, the formats that will be used for its development and exchange between Appointed Parties, who will develop it, and who will be in charge of its quality control. For more information, see 5.3 of the *BIM Standard for Public Projects*.

### Form 05 Post-contract BEP. Requested BIM models and their formats

| BIM models | Discipline | Model Author | Responsible | Native format | Exchange format for the supply chain | Quality control reponsible |
|---|---|---|---|---|---|---|
| *E.g.: Volumetric* | *E.g.: Architecture Project* | *E.g.: ARQ* | *E.g.: ARQ* | *E.g.: PLN* | *E.g.: IFC / MVD Coordination view 2.0* | *E.g.: GER* |
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## C.2 Model Information Progress States of BIM models per delivery

Indicate, for each model, the corresponding EAIM for delivery according to the BIM EIR. For more information, see 5.5 of the *BIM Standard for Public Projects*.

### Form 06 Post-contract BEP. EAIM for each delivery

| **Project:**<br>*(Insert project name)*<br>*(Insert date)* | **Delivery 01** | **Delivery 02** | **Delivery 03** | **Delivery 04** | **Delivery 05** | **Delivery 06** | **Delivery "N"** |
|---|---|---|---|---|---|---|---|
| **BIM models** | **EAIM** | **EAIM** | **EAIM** | **EAIM** | **EAIM** | **EAIM** | **EAIM** |
| **Site** | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | |
| **Volumetric** | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | |
| **Architecture** | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | *E.g.: DD Detail Design* | *E.g.: DD Detail Design* | |
| **Structure** | | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | *E.g.: DD Detail Design* | |
| **Mechanical Electrical and Plumbing (MEP)** | | | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | *E.g.: DB Basic Design* | |
| **Coordination** | | | | *E.g.: DC Concept Design* | *E.g.: DA Draft Design* | *E.g.: DB Basic Design* | |
| **Construction** | | | | | | | |
| **As-built** | | | | | | | |
| **Operation** | | | | | | | |

## C.3 Requested documents and their formats (Post-contract BEP)

Indicate, for each delivery, the date and Information Progress State of the Models corresponding to each requested deliverable with their format, version, and whether it will be directly extracted from a model or not. The last part does not apply to deliverables that are models. For more information, see 5.4 of the *BIM Standard for Public Projects*.

### Form 07 Post-contract BEP. Requested documents and their formats

| Delivery | Date | Model Information Progress State (EAIM) | Deliverable | Format | | | From model |
|---|---|---|---|---|---|---|---|
| | | | | Native | Version | Delivery | |
| *E.g.: Stage 01* | *E.g.: 02-03-2018* | *E.g.: Draft Design* | *E.g.: Master planimetrics* | *E.g.: RVT* | *E.g.: 2015* | *E.g.: PDF* | *E.g.: Yes* |
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# D. Collaboration strategy

## D.1 Common Data Environment (CDE)

Specify if the CDE consists of one or multiple technology platforms, which platforms these are, and the formats that will be used for the information and collaboration requirements. For more information, see 5.8.1 of the *BIM Standard for Public Projects*.

### Form 08 Post-contract BEP. Common Data Environment

| The CDE to be used consists of a single platform | |
|---|---|
| Yes ☐ | No ☐ |

| Platforms and formats of the Common Data Environment | |
|---|---|
| Common Data Environment (CDE): | *E.g.: CDE MASTER* |
| Collaboration platform: | *E.g.: BIMCollab* |
| Document management platform: | *E.g.: G-Drive* |
| Information and collaboration requirement format: | *E.g.: BCF files* |

## D.2 Consolidation of BIM models

Specify the consolidation strategy to be used. For more information, see 5.8.2 of the *BIM Standard for Public Projects*.

### Form 09 Post-contract BEP. Generation of BIM models

| Strategy | YES | NO |
|---|---|---|
| Federated BIM model | *E.g.: X* | |
| Integrated BIM model | | |

## D.3 Procedure for meetings (only Post-contract BEP)

State the main work and coordination meetings to be held throughout the project and their participants. For more information, see 5.8.3 of the *BIM Standard for Public Projects*.

### Form 10 Post-contract BEP. Procedure for meetings

| Type of meeting | Project stage | Participating disciplines | Frequency of meetings* | Number of meetings | Location | Modality | Type of backup |
|---|---|---|---|---|---|---|---|
| *E.g.: BIM requirement beginning* | *E.g.: Design* | *E.g.:<br>· ARQ<br>· CAL* | *15 days* | *5* | *Client's main office* | *In person* | *Minute* |
| *E.g.: BEP review* | *E.g.: Design* | *E.g.:<br>· ARQ<br>· CAL<br>· ELE<br>· CLI* | *45 days* | *not defined* | *Project coordinator's main office* | *In person* | *Minute* |
| *E.g.: Design coordination* | *E.g.: Design* | *E.g.:<br>· ARQ<br>· CAL<br>· ELE<br>· CLI* | *15 days* | *8* | *Project coordinator's main office* | *In person and video conference* | *Minute and video recording* |
| *E.g.: Any other BIM meeting with multiple parties* | *All* | *All* | *30 days* | *not defined* | *According to availability* | *Video conference* | *Minute and video recording* |

(*) The number and frequency of meetings may change according to the project's dynamics.

# E. Organization of BIM models

## E.1 BIM model structuring (only Post-contract BEP)

State the structure that BIM models will have in the project. For more information, see 5.9.1 of the *BIM Standard for Public Projects*.

### Form 11 Post-contract BEP. BIM model structuring

| Units to be used for the development of BIM models | Coordinates to be used for all BIM models |
|---|---|
| *E.g.: Meters with three (3) decimals* | *E.g.: Local coordinates 0, 0, 0 of the software must be used. These coordinates must be linked to the intersection point of axis A and 1. In addition, each model must incorporate an entity (IfcBuildingElementProxy) related to those coordinates.* |

**Model subdivision system, if necessary**

| BIM model | By Building | By Floor | By Zones | By Area | By Discipline |
|---|---|---|---|---|---|
| *E.g.: Site* | | | | | X |
| *E.g.: Volumetric* | | X | X | | |
| *E.g.: Architecture* | X | X | | | |
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## E.2 BIM model filename (only Post-contract BEP)

Indicate the structure to be used for the model filenames. For more information, see 5.9.2 of the *BIM Standard for Public Projects*.

**Project-Organization-Discipline-Zone-Level-Type of Document-Number- Description (*)-Status(*)-Revision(*).xyz**

Example: PR1-ABC-ARQ-Z1-01-MO-0001-Doors-C-A.xyz

*Note: xyz refers to the extension of the format of the file*

### Form 12 Post-contract BEP. BIM model filename

| BIM model | Name |
|---|---|
| *E.g.: Site* | *E.g.: PR1-ABC-TOP-ZZ-ZZ-MO-0001-Levels-C-A.xyz* |
| *E.g.: Architecture* | *E.g.: PR1-ABC-ARQ-ZZ-ZZ-MO-0001-Doors-C-A.xyz* |
| | |
| | |

## E.3 Codes and colors by disciplines and/or systems (only Post-contract BEP)

Name the colors to be used for the different disciplines and/or model entities. For more information, see 5.9.2.4 of the *BIM Standard for Public Projects*.

### Form 13 Post-contract BEP. Codes and colors by disciplines and/or systems

| Discipline | Acronym | Color | R | G | B |
|---|---|---|---|---|---|
| *E.g.: Architecture* | *E.g.: ARQ* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Audio and Acoustics* | *E.g.: AYA* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Structural Calculus* | *E.g.: EST* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Fuel Load* | *E.g.: CCB* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Fuel Network* | *E.g.: RCB* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Gas exhaust* | *E.g.: EDG* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Closed Circuit TV* | *E.g.: CTV* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Air Conditioning* | *E.g.: CLI* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Air Injection* | *E.g.: INY* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Air Extraction* | *E.g.: EXA* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Air Return* | *E.g.: RET* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Fresh Air* | *E.g.: FRE* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Coolant* | *E.g.: REF* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Equipment* | *E.g.: EQU* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| *E.g.: Condensation Duct* | *E.g.: CON* | | *E.g.: 255* | *E.g.: 255* | *E.g.: 255* |
| | | | | | |

## E.4 Classification system (only Post-contract BEP)

Name the classification system to be used in the BIM models of the project. For more information, see 5.9.3 of the *BIM Standard for Public Projects*.

### Form 14 Post-contract BEP. Classification system

**Classification system to be used**

*E.g.: The classification system to be used is Omniclass*

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