Digititalisation of the construction planning in Poland

Construction investment management in BIM methodology – BIM document templates

Report

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Attachments

Nr	Document title	Language	
		PL	EN
[1]	BIM Lexicon	X	
[2]	Overview of the Exchange Information Requirements (EIR) Template	X	
[3]	Exchange Information Requirements (EIR) Template	X	X
[4]	Overview of the BIM Execution Plan (BEP) Template	X	
[5]	BIM Execution Plan (BEP) Template	X	X
[6]	Model production and delivery table. Template, overview, example	X	X
[7]	BIM Attachment to the Agreement	X	X
[8]	Stakeholders consultation report - questions and answers	X	

Notes

Contents **MARKED IN COLOR** means the provisions which the reader should pay special attention to because the proper interpretation of the presented contents is required to understand the assumptions discussed in the document.

This document is a part of the studies prepared under the project "Digitization of the construction planning in Poland" (hereinafter "Project"), implemented with the financial and substantive support of the European Union under the European Commission program for supporting structural reforms (DG Reform). The Project Beneficiary is the Ministry of Development.

The following documents were prepared as part of the project deliverable:

- ***"Management of the construction investment in the BIM methodology – BIM document templates"*** – a document describing the adopted assumptions and the most important information necessary for the correct interpretation of the template provisions;
- „***BIM Lexicon***" – a glossary of BIM-related terms used in BIM document templates;
- ***"Overview of the Exchange Information Requirements (EIR) Template"*** – a document containing an overview of the content presented in the "Exchange Information Requirements (EIR) Template" and guidelines for completing it;
- ***"Exchange Information Requirements (EIR) Template"*** – a template of the "Exchange Information Requirements (EIR)" containing universal[1] provisions of that document;
- ***"Overview of the BIM Execution Plan (BEP) Template"*** – a document containing an overview of the content presented in the "BIM Execution (BEP) Template" and guidelines for its completion;
- ***"BIM Execution Plan (BEP) Template" – a template of the "BIM Execution Plan (BEP)"*** containing universal[1] provisions of that document;
- ***"Model production and delivery table. Template, overview, example"*** – the template of the "Model production and delivery table" with an overview and an example
- ***"BIM Attachment to the Agreement"*** – template of the BIM attachment to construction works contracts regulating selected issues related to the application of BIM.

ALL OF THE ABOVE LISTED DOCUMENTS SHOULD BE READ TOGETHER.

[1] The term "universal" should be understood as meaning that the proposed provisions should apply to most PROJECTS. Their use depends on the specific PROJECT and should always be analyzed by the template user.

1 Introduction

1 Introduction

1.1 Introduction

As part of the project task for the development of BIM document templates, the main document of which is this study, two types of studies have been developed:

- **BIM DOCUMENT TEMPLATES** whose main goal is to support the implementation of public pilot projects in residential construction using the BIM methodology. At the same time, the task of the project team is to develop universal document templates for the public and private construction sector;
- The documents constituting **THE OVERVIEW OF THE AFOREMENTIONED TEMPLATES** containing comments and recommendations aimed at facilitation for the representatives of the construction market of the use of those documents in the implementation of the aforementioned projects.

These documents were subject to consultation with representatives of the construction industry as part of the survey. The results of the survey are presented in chapter 4.1 of this document and during the meeting with Project Stakeholders, which took place in July 2020.

Template users should bear in mind the meaning of the used terms related to “PROJECT” and “REQUIREMENTS”, which are indicated in Table 1. Concepts related to BIM are presented in the BIM Lexicon which constitutes Attachment no. 1 to this study.

Table 1. The most important terms used in this study

No.	Term	Meaning	Comments
1	PROJECT	An investment task, in particular a pilot project (PP) for the implementation of which BIM documents developed under the "Project" will be used.	This term is used in the content of BIM document templates and instructions for those studies.
2	Project	Task entitled "Digitization of the construction planning in Poland", implemented with financial and technical support of the European Union under the European Commission’s programme for the support of structural reforms, whose beneficiary is the Ministry of Development.	-
3	Pilot Project (PP)	Task/tasks implemented in accordance with the assumptions adopted under the Project for the implementation of investments using BIM in Poland, with the application of BIM document templates. The task of Pilot Projects is to verify the effectiveness of the project delivery formula and to validate the BIM document templates.	This Project does not include the implementation of Pilot Projects and possible corrections of BIM document templates resulting from their implementation.
4	BIM Documents	Studies setting out the principles for using BIM as part of the implementation of an investment.	In relation to the results of the Project, BIM documents mean attachments to this study.
5	BIM Document Templates	A set of BIM document templates developed as part of the Project, constituting attachments 1-7 to this study.	These documents, after being supplemented by the relevant entities involved in the PROJECT implementation, constitute attachments to the contract concluded for this purpose. Their place in the implementation process is presented in Figure 3.
6	REQUIREMENTS	A set of exchange information requirements developed for the PROJECT, in particular the "Exchange Information Requirements (EIR)" developed on the basis of the "Exchange Information Requirements (EIR) Template".	This term is used in the content of BIM document templates and instructions for those studies.

Table 1. The most important terms used in this study

No.	Term	Meaning	Comments
7	TEAM	A team of people cooperating with each other to implement the PROJECT, consisting of representatives of the contracting authority, the contractor and - if necessary - its subcontractors.	This term is used in the content of BIM document templates and instructions for those studies.
8	Contracting Authority	The entity defining the REQUIREMENTS.	The ISO19650 standard indicates that both the investor (appointing party) and the lead / general contractor (lead appointed party) may act as the "contracting authority" - in relation to their subcontractors. British documents used the term "employer" before the introduction of ISO19650.
9	Contractor	The Entity implementing the "PROJECT".	-

Users of BIM Document Templates should also understand that the documents should be treated as a proposal for the layout of documents and their minimum content which will allow for the proper implementation of the investment with the BIM requirement. It should always be borne in mind that the overriding purpose of development of the BIM Document Templates is to support the user in the implementation of investments with the BIM requirement and **EACH TIME, THE PRESENTED DOCUMENTS SHOULD BE ADAPTED TO THE IMPLEMENTED PROJECT**.

1.2 MacroBIM

The MacroBIM[2] stage is a part of the asset procurement process, which includes the delivery of a concept (design and implementation) with the proposed indicative total cost of the investment.

MacroBIM is the first stage of the procurement procedure and is not significantly different from traditional procurement processes. The largest difference is the greatest emphasis placed on preparing the investment in such a way as to ensure its economic security.

MacroBIM consists of the following steps:

- announcement of the procedure, defining the client's needs and requirements;
- conducting the pre-qualification procedure in order to select the number of participants (tenderers) specified by the contracting authority, who are invited to submit preliminary offers covering the concept of investment implementation with its financial evaluation;
- if the initial offers differ significantly from the budget, the contracting authority cancels the procedure;
- the conduct of negotiations between the contracting authority and participants regarding initial offers or offers submitted during negotiations, which include Target Cost negotiations (see below);
- invitation to submit and submission of final offers;
- The MacroBIM stage ends with providing the contracting authority with a conceptual solution (described later in this chapter) specifying the Target Cost;
- The contracting authority assesses both the substantive quality of the schematic concept and its economic value. The selected solution (offer) with the set Target Cost serves as the basis for carrying out the delivery stage (design and implementation).

THE TARGET COST[3] should be the starting point for any investment carried out in the BIM methodology and the basic economic criterion of the project. From the possible base of design solutions for the pre-design (conceptual) stage, only those will be selected and evaluated which remain after being qualified based on the two criteria

[2] The definition is included in the document entitled "BIM Lexicon".

[3] The definition is included in the document entitled "BIM Lexicon".

applied to their juxtaposition: the minimum quality of the design solution and the maximum Target Cost assumed in the evaluation process. The idea of the Target Cost is shown in Figure 1.

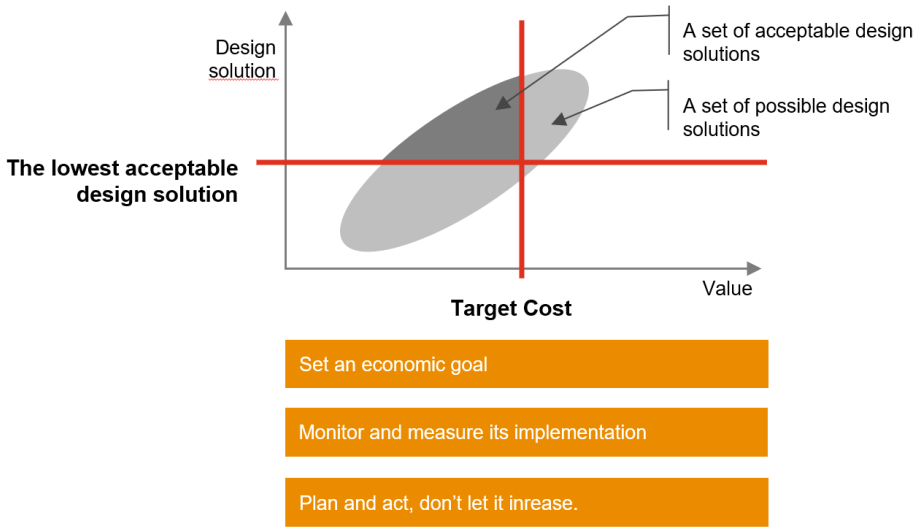


Figure 1: Diagram of extrapolation of the Target Cost based on the available design solutions

Source: own translation based on [1]

The concept evaluation assumes indicative calculations for m2 gross/net function, m3 cubic capacity, unit calculations, other calculations possible to be obtained from 3D models (without any definitions of building partitions or openings) and combination of groups of functions (without division into individual room allocation). An example of a conceptual model (volumes and areas of grouped functions) for the purposes of evaluating indicative investment costs in the MacroBIM stage is presented in Figure 2.

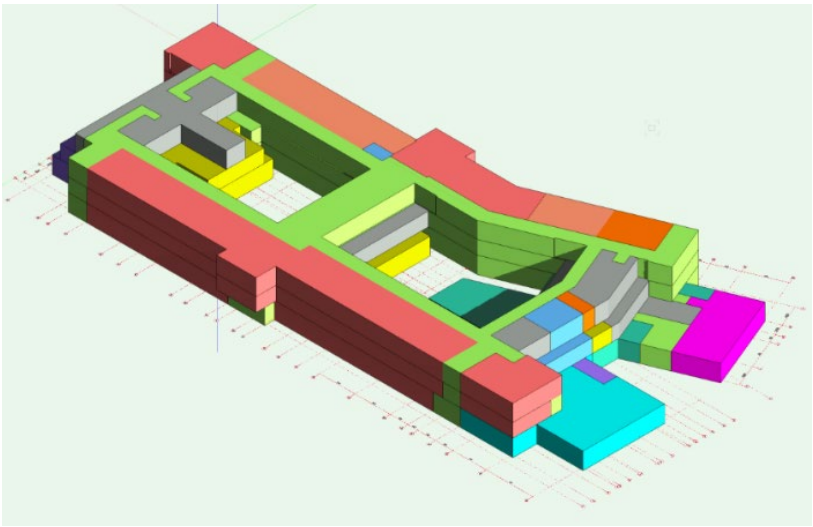


Figure 2: Example of maximum model accuracy for delivery in the MacroBIM stage

Source: own 3D study. 2D concept: architectural office of Jan Gorgul, Łódź

For a Target Cost proposal to be feasible, it must include not only the design, but also executive, organizational and exploitation solutions for the construction site. Therefore, the concept of each of the tenderers should be developed in the form of cooperation between the maximum possible number of all significant entities which will be involved in the implementation of the construction investment, both at the design and implementation stage, including future users, in a form similar to multilateral contracts for the integrated design, and implementation and exploitation stage of a relevant investment (e.g. a Joint Venture[4]).

[4] The definition is included in the document entitled "BIM Lexicon".

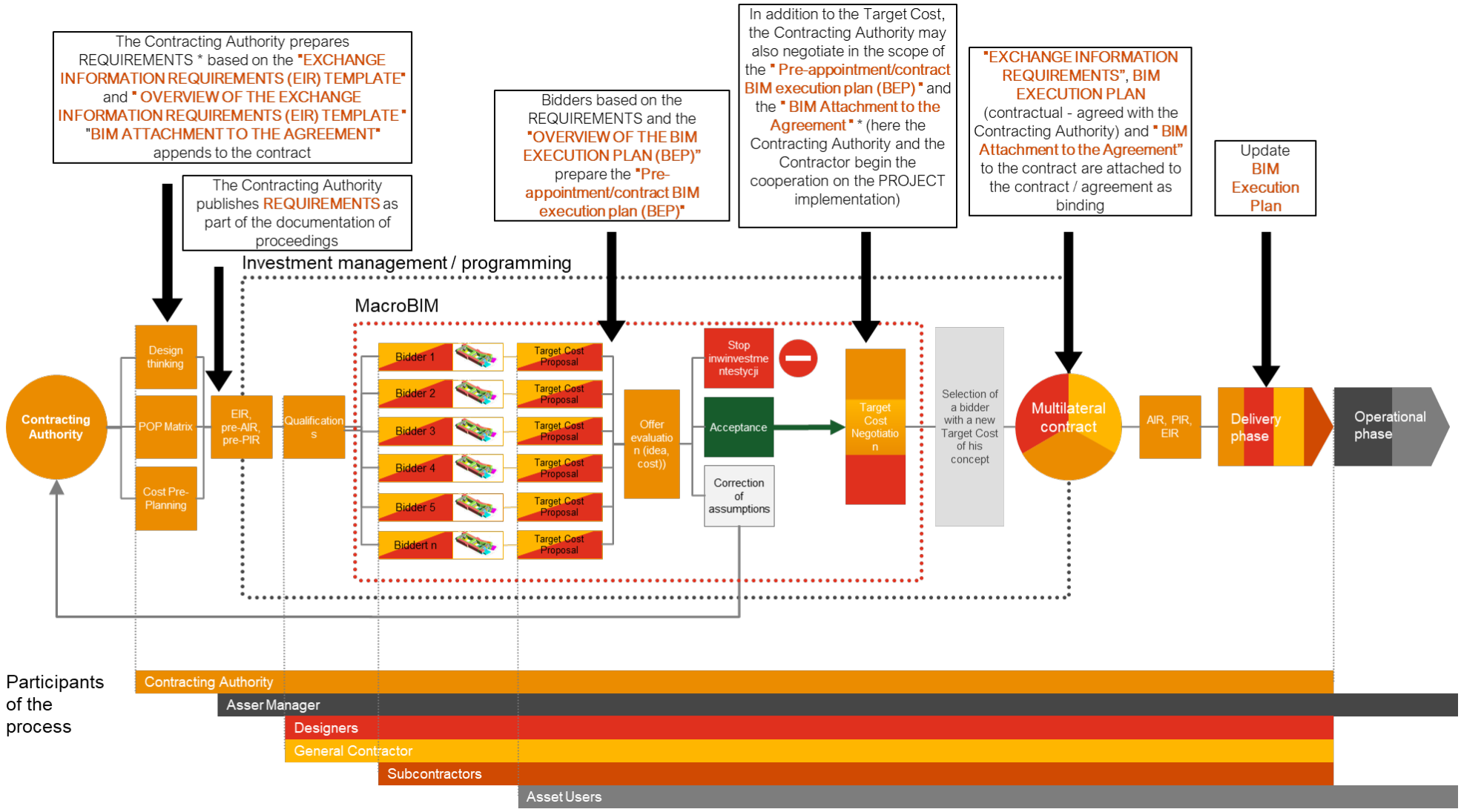
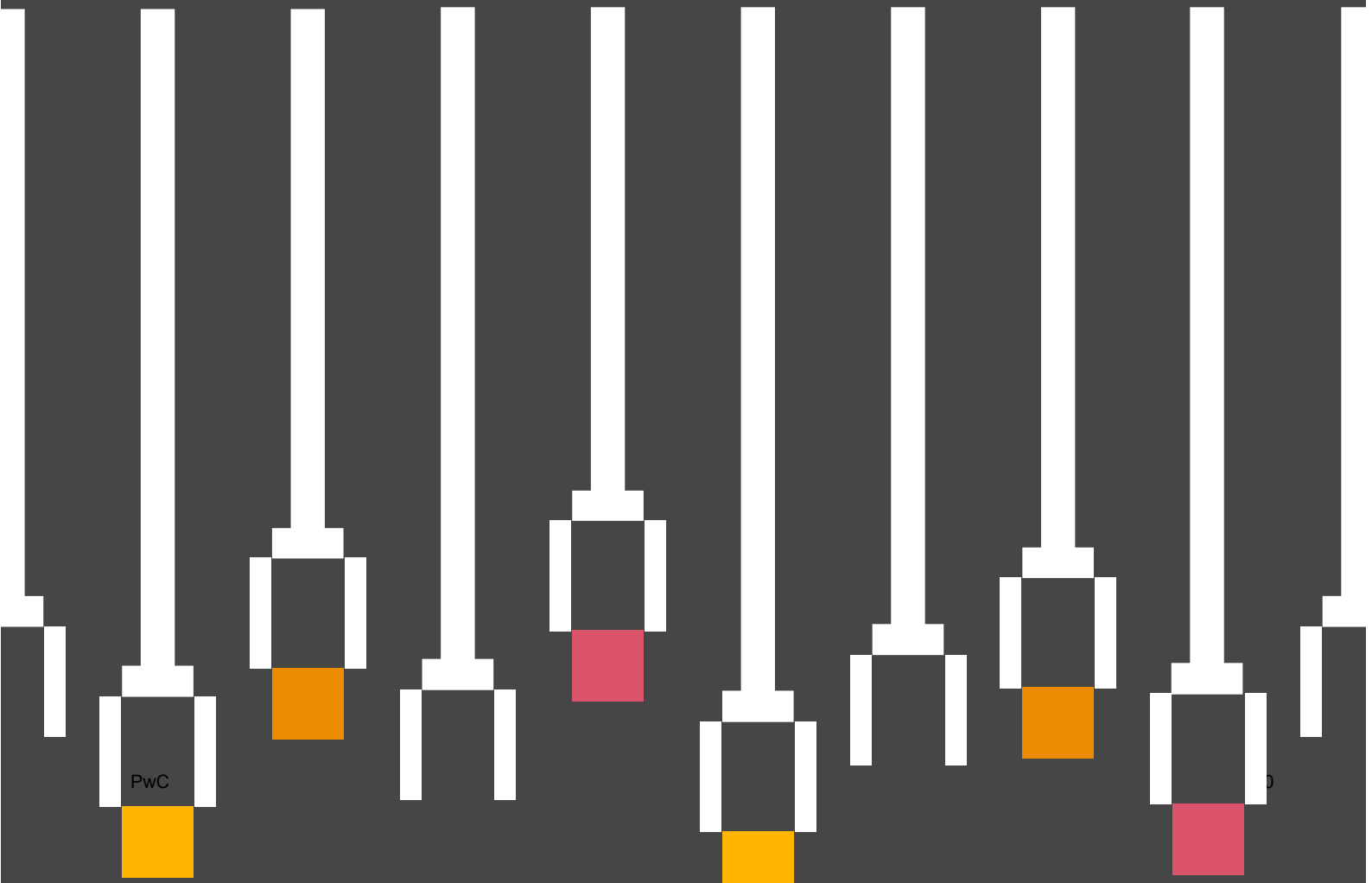


Figure 3. Illustration of the investment process using the MacroBIM stage - the location of the BIM document templates

Source: own study

2

BIM Document Templates



2 BIM Document Templates

2.1 Purpose of the BIM Document Templates

The main goal of the development of the BIM Document Templates is to support the residential construction sector in the implementation of this type of investments using BIM, in particular as part of Pilot Projects. It is also possible to use materials developed under the Project for the implementation of other types of building investments, but **IT SHOULD BE BORNE IN MIND THAT SOME OF THE INDICATIONS OR RECOMMENDATIONS COVERED BY THE TEMPLATES MAY NOT APPLY**.

The recipients of the BIM Document Templates, based on the assumption of the Project, are mainly:

- Public contracting authorities implementing residential projects;
- Contractors (designers and contractors of works) undertaking to participate in the implementation of such tasks;
- Their subcontractors;

But also:

- Private contracting authorities implementing residential projects;
- Contracting authorities carrying out other investments in the field of building construction;
- Contractors (designers and contractors of works) undertaking to participate in the implementation of such tasks;
- Their subcontractors.

BIM document templates developed as part of the Project can serve as a basis for the development of similar documents for infrastructure investments. However, their adaptation may require more than is the case in building construction, because they differ from building construction in many respects. Most of the differences result from the specifics of implementation of linear investments, but it is possible to use the same or similar mechanisms as in the case of building construction, the mechanisms indicated in the BIM document templates developed as part of the Project.

When using BIM Document Templates, it should be borne in mind that their use should be preceded by a detailed analysis of the scope of a given PROJECT - the developed **BIM DOCUMENT TEMPLATES DO NOT CONSTITUTE DOCUMENTS READY TO BE USED IN INVESTMENTS**.

The role of the entities using the BIM Document Templates is their proper incorporation in the documentation of the proceedings, i.e. ensuring that they become binding on the Parties during the implementation of the PROJECT. To this end, it is recommended to use the provisions of the " BIM Attachment to the Agreement ". It is also recommended that the contractor, when entering contracts with its subcontractors, also incorporates them. The parties may also use provisions not included in the " BIM Attachment to the Agreement " if this is justified by the needs of the PROJECT.

THE USER OF THE BIM DOCUMENT TEMPLATES SHOULD BEAR IN MIND THAT THE BIM DOCUMENTATION OF THE PROJECT (UNDERSTOOD AS ALL THE DOCUMENTS REGULATING THE ISSUES CONNECTED WITH THE USE OF BIM IN ITS IMPLEMENTATION) SHOULD BE ALWAYS CONSIDERED AS A WHOLE.

2.2 The scope of the BIM Document Templates

Based on the scope of the Project, documents and templates were developed whose scope is presented in Table 2. **THESE TEMPLATES SHOULD BE TREATED AS PROPOSALS WHICH MAY BECOME A STANDARD TO BE APPLIED IN THE CONSTRUCTION INDUSTRY IN POLAND.**

Table 2. The scope and content of BIM document templates developed as part of the Project

Attachment number	Title of the template	Description of the content	Comments
1	BIM Lexicon	Concepts, terms and acronyms used in BIM document templates developed as part of the Project. These terms should be treated as proposals which are not but may become a standard to be applied in the construction industry in Poland.	The meaning of these terms should be treated as a suggestion and always adapted to the PROJECT.
2	Overview of the Exchange Information Requirements (EIR) Template	Presentation of the recommended minimum content of individual chapters of the template, also containing suggestions and recommendations regarding actions or methods of conduct undertaken under the PROJECT.	-
3	Exchange Information Requirements (EIR) Template	This is a study to be completed by the contracting authority (investor, its representative or contractor planning to present Exchange Information Requirements (EIR) to its subcontractors).	Exchange Information Requirements should be incorporated in the documentation of the procedure - as an attachment to the description of the subject matter of the contract.
4	Overview of the BIM Execution Plan (BEP) Template	Presentation of the recommended minimum content of individual chapters of the template, also containing suggestions and recommendations regarding actions or methods of conduct undertaken under the PROJECT.	-
5	BIM Execution Plan (BEP) Template	This is a study to be completed by the contractor (as a proposal to meet the contracting authority's requirements). The content of the document should be agreed, i.e. it should contain provisions developed between the parties to the proceedings by way of cooperation	It is recommended to include the template in the documentation of the procedure as an attachment to the description of the subject of the contract in order to standardize the studies submitted by contractors as part of their offers. It is required to adapt the document to the content and scope of the "BIM Execution Plan" developed on the basis of the " Overview of the BIM Execution Plan (BEP) Template " and the " Exchange Information Requirements (EIR) Template " to ensure consistency in terms of structure and content for both documents. Based on the offer document, a BIM Execution Plan will be agreed as part of negotiations with the Contractor. It is recommended to include it in the contract concluded as a result of the completed tender procedure.
6	Model production and delivery table. Template, overview, example	A template of a table covering the types of models produced as part of the PROJECT implementation, their content, and responsibility for their delivery in terms of investment stages.	-
7	BIM Attachment to the Agreement	Recommended contractual provisions to be included by the Parties in the content of the contract concluded as a result of the completed tender procedure.	The provisions contained in the document should be incorporated in the model contract concluded between the contracting authority and the contractor. The contractor should incorporate them in the contract concluded with its subcontractors.

Recommendations should not be treated as a full, closed list and each PROJECT implemented based on the BIM document templates should be analysed individually.

2.3 Form of the templates

The BIM document templates prepared as part of this Project have been developed at a fairly high level of generality to ensure that they can be applied to the widest possible group of PROJECTS. The user should take into account the intended use of the templates, which are specified in chapter 2.1 of this document.

Being aware that it is not the lack of a template that is the greatest obstacle for the industry, but the answer to the question: "how to fill it?", in the "Overview of the BIM Requirements Template" and "Overview of the Building Information Modelling Plan (BEP) Template" a number of issues were presented, indicating the recommended paths to be considered in the **CONTEXT OF A GIVEN PROJECT**. These comments form a set of tips - a guide on how the template user should complete it.

A user of templates should also pay attention to the fact that they should be treated as a proposal for the layout of documents and their minimum content which will allow for the proper implementation of the investment with the BIM requirement.

When analysing the content of the BIM document templates, one should keep in mind the importance of concepts related to this methodology which were presented in the study entitled BIM Lexicon.

The content of the BIM Document Templates written in black font is an example of the entries which may appear in the document. This content should be completed by the contracting authority, indicating additional provisions related to the PROJECT, so that they constitute an exhaustive description of its requirements. The numbering of the requirements has been introduced in order to indicate relations between entries.

The content in orange font is an additional overview of the issue and examples which are aimed to better illustrate the discussed content.

The text written against a grey background indicates the parts of the template which should be completed by the template user. To facilitate this task, BIM document templates contain suggestions for these entries, which should not, however, be considered as a closed list.

Before issuing (publishing) a document, it is necessary to remove all elements which constitute merely a help for the template user, as specified above.

2.4 ISO standard and the content of BIM documents

Since the ISO 19650 series of standards is currently the only international document describing the principles of using BIM in construction projects, it is recommended to follow its provisions. It should be borne in mind that the comprehensive implementation of the provisions of the standard in individual countries may not be possible, as they differ in the legal and economic background in which its provisions should be embedded.

In order to help industry representatives to make reference between the presented BIM Document Templates and the provisions of ISO 19650, a list of comments and recommendations in this regard is presented below (see: Table 3).

Table 3. Application of the recommendations of the PN-EN ISO 19650 series standards in BIM documents

No.	Issue	Comments
1	**General**	
1.1	Terms and definitions	The lack of Polish equivalents of terms regarding BIM used in the standard and other studies means that the vocabulary and terminology used in Polish proceedings are not uniform - it is recommended to develop a common glossary of terms, i.e. considering: • Terms included in the "BIM Lexicon" (Attachment 1 to this study), • Additional terms and acronyms that will be used in Polish BIM documents. Translations of the terms contained in the ISO 19650 series of standards (it is recommended that this task be undertaken by the relevant Technical Committee of the Polish Committee for Standardization).
1.2	Introduction - the idea of cooperation	The idea of cooperation, which was highlighted in the introduction to the series of standards and repeatedly emphasized in its content, should be the overriding idea in the case of implementing investments with the use of BIM. Actions taken to implement BIM in Poland should result in displacing antagonistic relations between participants in investment processes and rewarding cooperation. The lean methods proposed in the templates (mainly in chapter 1.3 „Overview of the Exchange Information Requirements (EIR) Template ") fit into the approach recommended in the standard. The other documents also indicate the need to cooperate for the implementation of the PROJECT.
1.3	The role of information requirements	The rules set out in ISO 19650, which refer to information requirements, are similar to the requirements contained in Polish regulations, in particular in the Public Procurement Law[5] Act. The information requirements should be provided to the contractor and they should constitute a set of basic PROJECT principles, as indicated in Table 2 contained in this document. Information requirements should also be specified adequately to the subject of the PROJECT, i.e. they should be proportionate and appropriate to the scale and complexity of the PROJECT which is the subject of the contract, as indicated in the introduction and chapter 1.4 „ Overview of the Exchange Information Requirements (EIR) Template ".
1.4	„BIM compliant with ISO 19650”6	The term "BIM compliant with ISO 19650" should be related to the level of BIM maturity that has not yet been achieved in Poland, because there is no adequately developed, complete and well-established legal and normative system, which is required to achieve the expected from "ISO-compliant BIM 19650 "results. Recommendations for the development of additional documents supporting the achievement of the "BIM compliant with ISO 19650" level are provided in chapters 4.3 and 4.4 this document.
2	**Remarks on the main issues of PN-EN ISO 19650-1**	
2.1	The role of OIR, AIR, AIM, PIR and EIR	Due to the scope of the Project, issues related to the operational phase (AIR and AIM) were only indicated in the BIM Documents. In Chapter I.C "Overview of the Exchange Information Requirements (EIR) Template", the links between the OIR, AIR, PIR and EIR indicated in the standard were presented. The definitions of the above-mentioned studies and their the basic content are presented in the document "Discussion of PN-EN ISO 19650 series standards with focus the possibility of their application within the framework of digitalization of Polish construction industry". It should be noted that setting requirements for the delivery of the AIM document are not contrary to Polish regulations. However, it is worth ensuring that AIR is included in the "Exchange Information Requirements (EIR)" or attaching to a Description of the Subject of the Contract a separate study containing the requirements for AIM. This will allow them to be properly documented in the procurement documentation. The scope of the EIR is presented in the "Overview of the Exchange Information Requirements (EIR) Template " and the "Exchange Information Requirements (EIR) Template". Recommended provisions regarding the anchoring of information models in the documentation of the procedure are presented in the " BIM Attachment to the Agreement" (Annex 7 to this study).

[5] *Ustawa z dnia 11 września 2019 r. Prawo zamówień publicznych (Dz. U. poz. 2019 r. poz. 1843*

[6] Ang. „BIM according to the ISO 19650 series”.

Table 3. Application of the recommendations of the PN-EN ISO 19650 series standards in BIM documents

No.	Issue	Comments
2.2	The information delivery cycle (planning, delivery and verification)	Since the production, delivery and verification of data are key elements of an effective BIM process, these issues run through all BIM documents developed as part of the Project. In particular, the need for adequate planning of information delivery was identified. In particular, the need for appropriate planning of information provision was indicated. It is recommended to use the methods indicated in chapter 2.2.3 of " Overview of the BIM Execution Plan (BEP) Template " to define the procurement schedule. It is also recommended to describe the implementation products (in the form of models) using the model production and delivery table, the template and overview of which is provided in annex no 6 to this document. Recommendations related to the verification of the data provided are presented in chapters 2.4 and 3.3.2 of „Overviews”[7].
2.3	Roles in the process - general requirements	The division of roles in the process should be adapted to the PROJECT requirements. However, considering the large discrepancy, both in the nomenclature and in the scope of responsibilities of the "new" roles (members) of the team implementing the investment – in chapters 2.3 „Overviews” there are general recommendations regarding the division of roles and responsibilities. The recommendations consider the provisions of the "Roadmap for the implementation of BIM methodology in public procurement". In addition, the " Exchange Information Requirements (EIR) Overview" includes a responsibility matrix (proposal) that is recommended to be included in the BIM Execution Plan.
2.4	Federation strategy	The federation strategy described in the standards of the ISO 19650 series corresponds, in assumptions, to the standard division of labor in project teams that takes place in Poland. The only difference in relation to projects implemented in a "traditional" way (i.e. without the use of BIM) is the form of these studies. Issues related to the federation strategy are discussed in chapters 2.2.1 of "Overviews". Additionally, the "BIM Execution Plan Template" contains the basic principles of creating BIM models that are recommended for use.
2.5	Level of information need[8]	The recommended approach to the concept of "level of information need" and the method of defining these requirements is presented in chapter2.2.2 „Exchange Information Requirements (EIR) Overview”.
2.6	Collaboration in the CDE environment	According to the standards of the PN-EN ISO 19650 series, the guidelines for the CDE are one of the most important in the process of investment implementation with the BIM requirement. Provisions regarding these requirements, due to the broad aspect of issues that should be considered, are included in the following chapters of " Exchange Information Requirements (EIR) Overview ", respectively: • with reference to the basic principles of work and recommendations contained in standards - in chapter 2.2.4 • with reference to the selection of the solution in terms of the impact on the PROJECT implementation and technical requirements - in chapter 3.1.1, • with reference to the work safety at CDE - in chapter 2.5. It should be noted that it is recommended that the contracting authority deliver CDE, even though the most frequently chosen solution by contracting authority is requiring the contractor to deliver CDE.
3	**Remarks on the main issues of PN-EN ISO 19650-2**	
3.1	Organization of the information delivery process - general scheme	The scheme of organization of the information management process presented in PN-EN ISO 19650-2 (Figure 3) is possible to be implemented in Polish legal conditions. However, the chosen formula for the order fulfillment will affect the amount of activity. For the formula recommended in this document ("design and build"), it will be the same as that presented in the standard. In the case of other formulas (e.g. "design", "build"), certain elements of the scheme will have to be repeated due to the occurrence of additional tender procedure.

[7] "Overviews" should be understood as " Overview of the Exchange Information Requirements (EIR) Template " and " Overview of the BIM Execution Plan (BEP) Template ".

[8] Eng. level of information need – The definition is included in the document entitled "BIM Lexicon".

Table 3. Application of the recommendations of the PN-EN ISO 19650 series standards in BIM documents

No.	Issue	Comments
3.2	Identification of needs	The issues related to the preparation of the procedure, indicated in the standard, are typical to be undertaken by the contracting authority planning the implementation of the investment. The contracting authority must indicate, as in Polish practice, persons performing functions related to project management (and information provided during the project implementation) as well as specify information requirements. The last scope includes the development of a series of guidelines, called Exchange Information Requirements (it is recommended to use the " Exchange Information Requirements Template Overview" and the " Exchange Information Requirements Template" itself). These documents include guidance on, inter alia, information production methods and procedures (chapter 2.2.1) and the PROJECT information standard (chapter 2.2.2). The rules that regulate the legal issues that should be considered in the case of Polish investments using BIM are included in the " BIM Attachment to the Agreement "
3.3	Invitation to tender	As in the traditional approach to investment implementation, the contracting authority, in accordance with the standard, should define the terms of participation in the procedure and tender evaluation criteria (in the Polish Public Procurement Law, these are elements of the Specification of Order Terms). BIM documents developed under this Project do not contain guidelines in this regard. It is recommended to develop them as part of the next steps of BIM implementation in Polish public procurement, as indicated in chapter 4.4 of this document.
3.4	Tender preparation and submission, signing the contract	The main difference between the implementation of the investment in a traditional way (without BIM) and the method recommended by the standard is the inclusion of a study that constitutes the Pre-appointment/contract building information modelling execution plan. As its provisions should be agreed, it is recommended to use the procurement procedures that will enable such activities. They have been indicated in chapter 3.3 of this study. The implementation of one of the above-mentioned procurement procedures will allow to include in the contract (as binding documents, applicable to the PROJECT) documents that are the sum of the BIM Requirements and the contractor's capabilities. It is recommended to include in the contract the provisions of the " BIM Attachment to the Agreement ", constituting Annex 7 to this document.
3.5	Mobilization	The mobilization stage occurs in Polish projects, but it is mainly associated with contracts for the implementation of works. Regardless of the scope of the contract (design, build, design and build), due to the need to verify the adopted technological and organizational solutions, it is recommended to include this stage in the investment implementation schedule. in chapter 2.1 " Exchange Information Requirements Template Overview " and chapter 2.1 " BIM Execution Plan Template Overview", the advantages of this approach and recommended actions to be performed are indicated
3.6	Collaborative production of information and model delivery information	As part of the production of information, emphasis should be put on the correct (i.e. in accordance with the Exchange Information Requirements set for the PROJECT and the agreed BIM Execution Plan) implementation of the subject of the contract. The basic principles of cooperation and providing information are the provisions of the "Overviews". Additional recommendations for the production and verification of information are provided in section 2.2 of this table.
3.7	Completion of the project delivery phase	The closing of the PROJECT (if the contracting authority did not provide CDE for its implementation) should be accompanied by the delivery of an archive of data exchanged by CDE. As this is not a recommended solution, and the way of delivering the archive depends on the individual needs of the customer, this issue was only mentioned in the study " Exchange Information Requirements (EIR) Overview " (see chapter 2.5).

3

Recommendations for the PROJECTS, including PP, implemented with the use of the BIM documents.

3 Recommendations for the PROJECTS, including PP, implemented with the use of the BIM document templates

The following items contain recommendations for Pilot Projects in residential construction implemented using the BIM document templates developed as part of the Project. It is also possible to use them to implement other investments, but in each case the following assumptions should be borne in mind.

3.1 General recommendations

According to the comments contained in the introduction to the PN-EN ISO 19650-1 standard, **IT IS RECOMMENDED TO BASE THE WHOLE IMPLEMENTATION ON THE COOPERATION OF ENTITIES INVOLVED IN THE EXECUTION OF THE PROJECT**[9]. The adoption of such an approach facilitates the equalization of competences (knowledge and skills) between the Parties and the achievement of the expected results [2].

3.2 Formula for investment implementation

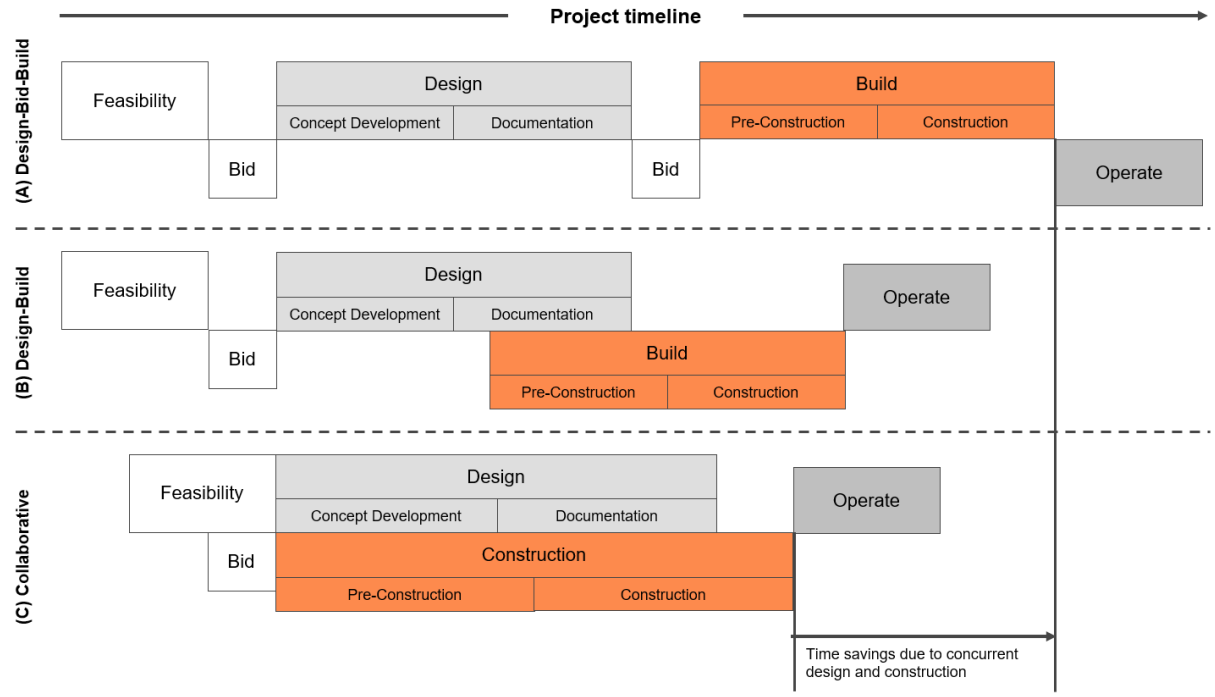
In the implementation of PROJECTS with the use of BIM, it is recommended to apply the **"DESIGN AND BUILD" FORMULA**. The following arguments support this recommendation:

- This formula will allow the most complete application of the recommendations contained in the PN-EN ISO 19650 [2], [3] standard;
- The greatest challenge during the implementation of the investment covered by the Exchange Information Requirement (EIR) is the "transition" between the design and implementation stage, because in the case of the most-commonly used procedure ("design" and "build" separately) the contractor (and thus its possibilities, capabilities and resources) is not known at the design stage. However, its experience and impact on the accepted design solutions can be invaluable. Thanks to the early involvement of the contractor into the project team implementing the PROJECT, many design changes may be avoided, and the adopted technological, logistic and economic solutions may be optimized;
- When using the "design" and "build" formulas, the contracting authority's requirements must be defined in such a way as to enable the contractor to use the products developed during the design stage as widely as possible (to minimize overproduction associated with the re-development of the same scopes of work), and, on the other hand, ensure the achievement of the contracting authority's objectives related to the various stages of the PROJECT implementation. This task, therefore, requires special attention of the contracting authority and a better knowledge of the issues related to BIM, because it enforces a broad analysis of the available solutions and conditions, including legal conditions, and skillful connection of information requirements and competences of individual entities involved in the implementation of the Task10;
- The "design and build" formula allows the contracting authority to apply greater generality of the requirements, which promotes cooperation with the contractor when developing the most favorable cooperation methods for the PROJECT between the Parties implementing the PROJECT (this approach forms the basis of BIM);
- From the investment implementation formulas used in Poland, "design and build" is the closest to the recommended assumptions for BIM, i.e. the implementation of investments based on multilateral contracts

[9] The entities involved in the implementation of the PROJECT should be understood as entities involved in the implementation of the investment process, in particular: the contracting authority, designers, contractors and its subcontractors.

[10] Therefore, the contracting party must, *inter alia*, take into account a possibility of data exchange between the designer and the contractor (whose resources are not known at the time of publication of the REQUIREMENTS for the design stage), analyse in detail the duties and scopes of responsibility of the designer and contractor, for instance with regard to responsibility for information models, etc

(e.g. in accordance with IPD[11] rules), based on full cooperation and allowing for the involvement of all parties, at the earliest possible stage of the PROJECT implementation.



A. The traditional single-stage involves the completion of each phase prior to the start of the next phase, often involving a different organization performing each phase in a non-integrative process

B. The design-build process involves an overlap of development phases leading to a shortened overall schedule and requires integration between designers and builders

C. A collaborative process involves participation by all key participants as early in the process as possible and ongoing collaboration

Figure 4. Comparison of investment implementation charts

Source: own transtaltion based [4]

3.3 Procurement procedure mode

In the most used procurement procedure modes (i.e. open tendering and restricted tendering), there is no element of negotiation that would allow the implementation of:

- MacroBIM phase, in particular - negotiations of the Target Cost;
- Activities recommended by the PN-EN ISO 19650-2 standard, in particular – agreeing even before signing the contract the provisions of the BIM Execution Plan and the mobilization plan.

Due to the above, it is not recommended to use these modes. As indicated in the „Road map for the implementation of the BIM methodology in public procurement": " Taking into account the legal solutions foreseen in the new PPL act, the conducting of the procedure with the use of MacroBIM seems possible with the application of the negotiation procedure with announcing (152-168 Pzp)[12]. The negotiation procedure may be used for the orders covering the building works, supplies or services covering project or innovative solutions as well as in case of orders which due to its their nature, complexity degree or due to the risk connected with the building works, supplies or services may not be granted in another procedure. It is clear from the above that the use of BIM, as including innovative (compared to traditional) solutions - both organizational and technological - fits perfectly into

[11] The definition is included in the document entitled "BIM Lexicon".

[12] Other modes e.g. competitive dialogue also may be applied here, whereas the phase MacroBIM itself would have to be subject to the modifications resulting from the very procedure of the competitive dialogue.

the conditions set by the legislator for the negotiation with announcement mode. To proceed with investments with the use of BIM, including Pilot Projects, the negotiation with announcement mode is recommended.

3.4 Organization of the investment process

Although the pre-delivery stage of the investment is not typically carried out in Poland using BIM, it is recommended to include it in the implementation of Pilot Projects and other investment projects. Information obtained in this stage is invaluable if rational and effective spending of funds is one of the priorities. Especially for contracting authorities representing public institutions, this should be of great importance because public expenditure should be made: in a purposeful and economical manner, in accordance with the principles of: obtaining the best effects from given expenditures, optimal selection of methods and measures to achieve the assumed purposes[13]. Similarly, the provisions of the Public Procurement Law [5] emphasize the quality and economic efficiency of awarding contracts. According to Art. 17 above, procurement contracts should be awarded in such a way as to ensure the best quality of supplies, services and construction works, and to obtain the best contract results (social, environmental and economic) in relation to the expenditure incurred.

THE APPLICATION OF MACROBIM PROVIDES FOR THE ENSURING OF REALISTIC COST ESTIMATION BEFORE THE COMMENCEMENT OF THE INVESTMENT, AND IN SPECIAL CASES (WHEN THE TARGET COST PROPOSED BY THE BIDDERS IN THE MACROBIM PHASE MUCH EXCEEDS THE CONTRACTING AUTHORITY'S INVESTMENT CAPABILITY NOT GIVING A CHANCE FOR ITS SIGNIFICANT REDUCTION DURING NEGOTIATIONS)- CANCELLATION OF IMPLEMENTATION OF THE INVESTMENT.

The MacroBIM stage assume that the entity which has developed the concept which best meets the investor's requirements - if the investment is continued (i.e. it does not turn out to be unprofitable) - will continue works as part of the delivery stage (design and implementation of works). There should therefore be no significant risks associated with the requirements for the PROJECT between the MacroBIM stage and the subsequent stages. It should be borne in mind that in the subsequent stages of the PROJECT, they will, however, require significant clarification (in the MacroBIM stage it is not justified to specify detailed requirements for further stages, as they may not occur - it would therefore be unreasonable to develop them).

Therefore, BIM documents developed as part of the Project should be supplemented in accordance with the information presented in Table 4 below.

Table 4. PROJECT implementation phases - general comments

No.	Stage	Main steps related to the implementation of the requirements contained in the BIM documents	Comments
1	Pre-delivery (Preparation of the investment)	• Securing the budget for the MacroBIM phase; • Defining the basic requirements for the PROJECT, including OIR [14]; • Development of EIR for the PROJECT MacroBIM stage.	Due to the scope of studies carried out in the MacroBIM stage (point 2), it is recommended to develop the following information requirements: • For the MacroBIM stage - to the precise degree; • For the design and implementation phase - to a high degree of generality (it should be borne in mind that if the investment is not continued, the expenditure incurred to develop the requirements for further stages will be economically unjustified).
2	Procurement procedure (MacroBIM)	• Prequalification[15] of the entities applying for the contract; • Cooperation with entities developing the functional and utility concept;	It is recommended to apply the prequalification for the following reasons: • Reducing the number of entities involved in the work at the MacroBIM stage (i.e. at the tender

[13] The above-mentioned principles are contained in Art. 44 sec. 3 of the Act of 27 August 2009 on Public Finance. Source: [6]

[14] The definition is included in the document entitled "BIM Lexicon".

[15] Pre-qualification is a process aimed at ensuring that entities joining the procedure meet certain conditions - ensuring proper performance of the contract - and that the number of potential contractors will not exceed a certain number.

Table 4. PROJECT implementation phases - general comments

No.	Stage	Main steps related to the implementation of the requirements contained in the BIM documents	Comments
		• Confrontation of the obtained data with the assumptions and possibilities of the contracting authority - making a decision on further investment procedure; • Specifying or developing detailed requirements for the PROJECT.	stage); • Limitation of contractors' claims related to the need to develop materials qualifying for "design" materials at the tender stage. The entity that developed the concept that best meets the investor's requirements - if the investment is proceeded - will continue to work in the capital phase. Therefore, between the MacroBIM phase and the next phase, there should be no significant risks related to the requirements specified for the PROJECT, but they require significant clarification – therefore a close cooperation of the Parties is recommended.
3	Delivery[16] (design)	• In preparation for the design stage, based on the requirements for the PROJECT, a BEP will be developed, constituting its implementation document. This document should be developed in close cooperation between the contracting authority and the contractor (designer and general contractor); • The BEP does not have to include the works implementation stage, but it is recommended that it contains those assumptions which may have a significant impact on the design process; • The preparatory stage should be completed with verification of the procedures adopted for the PROJECT, i.e. the so-called mobilization stage.	It is recommended that contractors (designers and contractors of building works) cooperate fully at the design stage. The participation of the contractor will provide for: • Avoidance of overproduction associated with the re-development of design resulting from the introduction of optimization only at the stage of works implementation; • Adaptation of the developed studies to the reality of the construction. Due to the requirements of the construction law (the need to apply for a construction permit for - (*pol.* Pozwolenie na Budowę - PnB) at least one data drop can be distinguished. Separating the conceptual stage (with results in the form of an architectural or multi-branch design) is also a common practice. However, this is not necessary if the contracting authority takes an active part in the process from the very beginning. The amendment to the Construction Law also introduces the obligation to develop a technical design. Because it must be developed before the commencement of the works, it can be the second data drop, after the data drop related to the Construction Permit.
4	Delivery (implementation of works)	• As part of the preparation for the works implementation stage, the BEP developed at the design stage should be supplemented with the issues related to the use of the developed materials; • Prior to the commencement of work, the procedures adopted for the PROJECT (mobilization stage) should be verified; • If facility management is planned using the data developed with the application of BIM, preparation for this stage should also include an agreement regarding the scope and content of AIM[17].	It is recommended that the designer be responsible for information models throughout the design and implementation of works. Due to an increased number of entities involved in the PROJECT at the stage of works implementation, attention should be paid to the effectiveness of the management and communication processes. It should be noted that the contractor's liability also covers the initial stage of the operation (due to the provision of services under the warranty obligations and in connection with the warranty period). To ensure that all obligations related to the update of information are properly fulfilled, at this stage of

[16] The investment phase, in which the financial resources are mobilized for its implementation. It includes the stage of design and implementation of works, i.e. providing the asset.

[17] The definition is contained in the “BIM Lexicon”.

Table 4. PROJECT implementation phases - general comments

No.	Stage	Main steps related to the implementation of the requirements contained in the BIM documents	Comments
			work, it is also necessary to involve a designer who will act as a supervisor of the PROJECT's information model.
4	Operational[18] (exploatation)	Not applicable	Due to the scope of the Project, this stage has not been covered by this study, and therefore it is not discussed in the BIM document templates. However, it should be noted that during the operational stage, due to the associated costs, it is worth considering the implementation of the appropriate information management procedures.

As can be seen, in the use of the BIM methodology, the greatest emphasis on proper organization of the PROJECT implementation process is placed on the first stages of the investment implementation (investment preparation and conduct of the procurement procedure). Decisions taken at that time have an impact on the entire process of providing the asset and, in a sense, define it.

3.5 Summary of assumptions for PROJECTS, including PPs implemented based on BIM document templates

BIM document templates listed in chapter 2.2 of this study have been developed assuming that the PROJECT will be implemented:

- with the full cooperation of the Parties;
- in the “design and build” formula;
- considering the MacroBIM stage;
- without considering the operational stage.

A user who wants to apply the BIM Document Templates using different assumptions than those specified above, should analyse the provisions contained in them, taking into account the comments contained in the instructions for individual studies.

[18] The operational phase covers the operation phase of the facility up to its demolition.

4 Verification of BIM documents

4 Verification of BIM documents

4.1 Consultation with Project Stakeholders – survey

Consultations with Project stakeholders were aimed at gathering opinions on the content of the developed BIM documents. The consultations were conducted in the form of a survey, the results of which were summarized during a meeting with stakeholders.

The purpose of the survey was to obtain the opinion of representatives of the construction industry regarding the proposed BIM document templates. Due to the possibility of identifying potential correlations between the responses and obtaining an opinion in terms of all developed documents the results of only those surveys which have been completed, i.e. 68, have been subject to analysis. A total of 174 people took part in the survey.

Most respondents took 5 to 30 minutes to complete the entire survey. Most of the people who dropped out of the study quit within the first 5 minutes (68%).

The survey was divided into three parts:

- Profile of the respondent – containing questions about the respondent;
- General questions – regarding the scope and form of the templates;
- Detailed questions addressing the subject of each of the documents submitted for consultation separately.

The survey was structured in such a way that only respondents who declared a minimum basic scope of knowledge in the field of BIM, i.e. 47 people, answered detailed questions concerning the provisions contained in the BIM document templates. Such a procedure allowed to focus on the most substantive comments and proposals (often supported by many years of professional experience declared by the survey participants). The changes and additions proposed by the stakeholders were considered in accordance with the scope presented in Annex 8 to this document.

The following types of charts were used in the study:

- Circular – for single-choice questions,
- Bar – for multiple-choice questions (the percentage of respondents - unless otherwise stated - was indicated in relation to the total number of respondents to whom a given question was addressed).

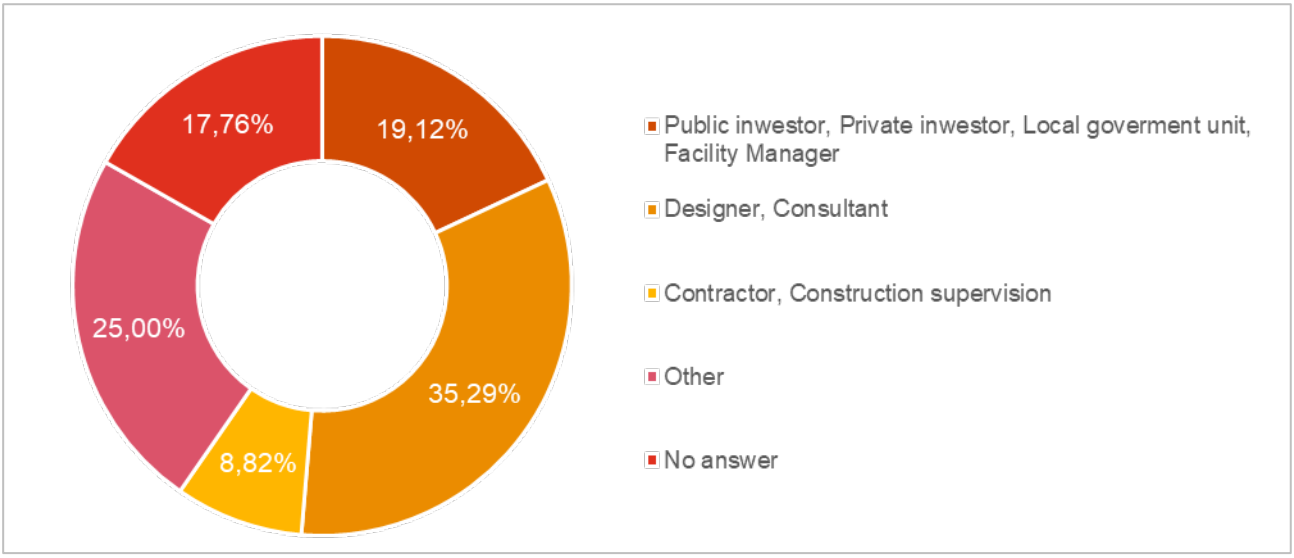
4.1.1. Profile of respondents

The first part of the survey contained general questions, which were intended to provide basic information about the respondents, relevant for:

- Limiting comments from people who declared no or low knowledge of BIM as unrepresentative for further analysis;
- Possibility to determine links between the answers and belonging to a specific group of respondents.

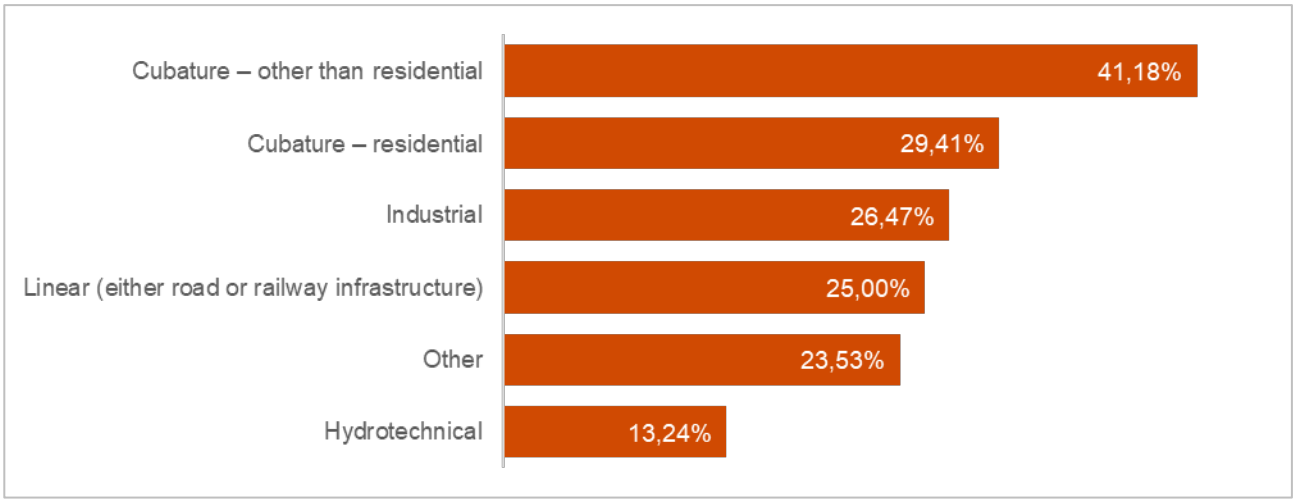
The structure of respondents was shaped as shown in the chart below. The "Other" profile includes, among other: lawyers, software suppliers or surveyors.

Chart 1. Business profile of the respondents



Approximately 71% of respondents indicated cubature construction as their main business activity (or one of the main ones). The answer "Other" was given, among others, by representatives of the geotechnical and energy industry, software suppliers and healthcare professionals.

Chart 2. Profile of respondents – types of construction



Approximately **66% OF RESPONDENTS DECLARED, THAT THEY IMPLEMENT PROJECTS WITH THE USE OF BIM**. About 15% use BIM mainly for visualization purposes (concept presentation, virtual walks, etc.). Slightly over 22% indicated that although they communicate with other participants in the investment process based on 2D drawings, BIM models are indeed made in their organization. Every fourth respondent communicates with the use of a 3D model. Only about 4% of respondents use BIM for advanced analyzes.

Approx. 87% of respondents who declared the implementation of projects using BIM participated in more than 1 such project, and every third (about 36%) in more than 5 (70% of them represent designers or consultants).

Chart 3. Declared level of BIM use

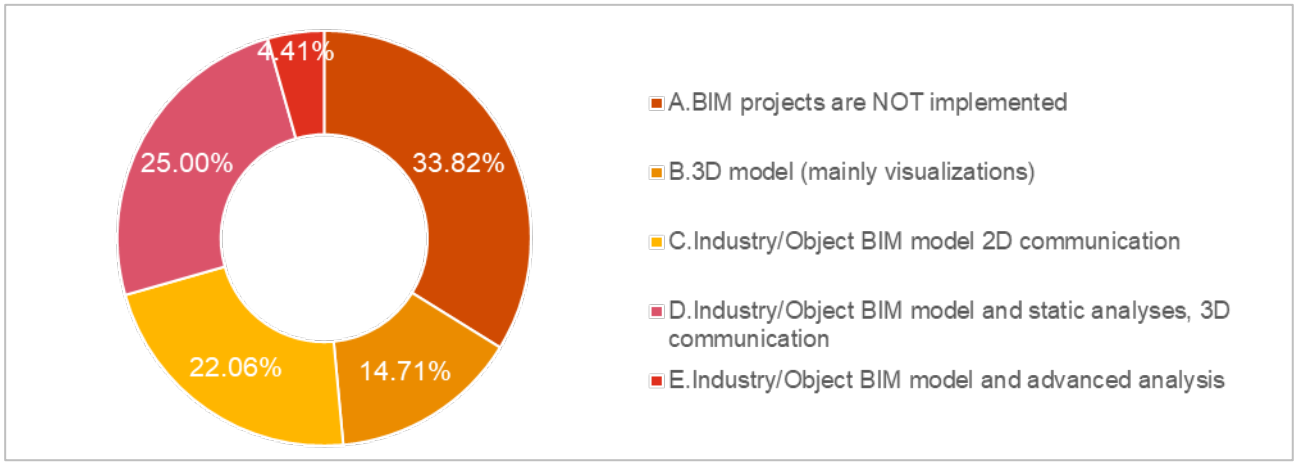
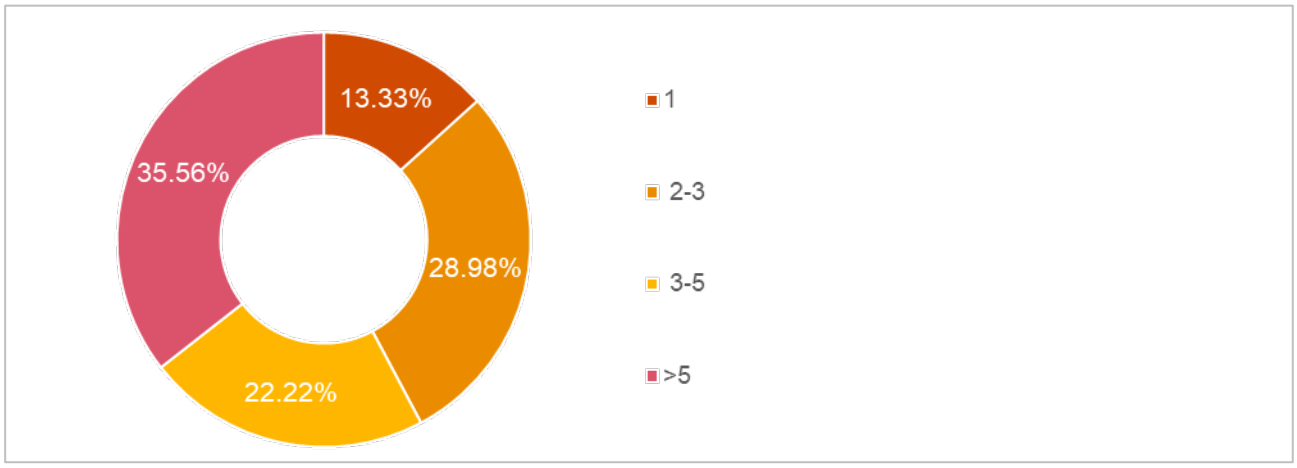
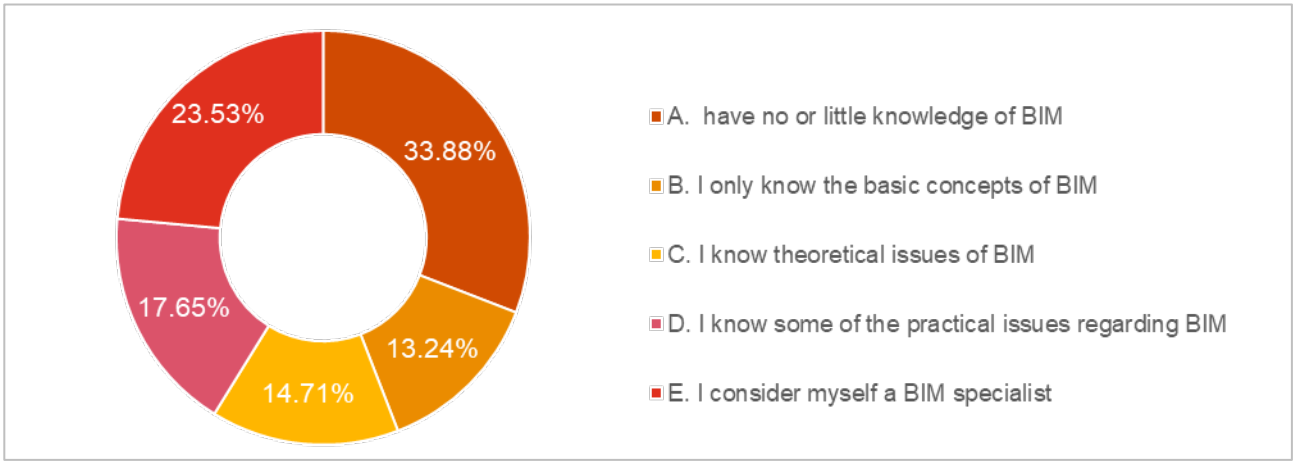


Chart 4. Declared number of completed projects using BIM



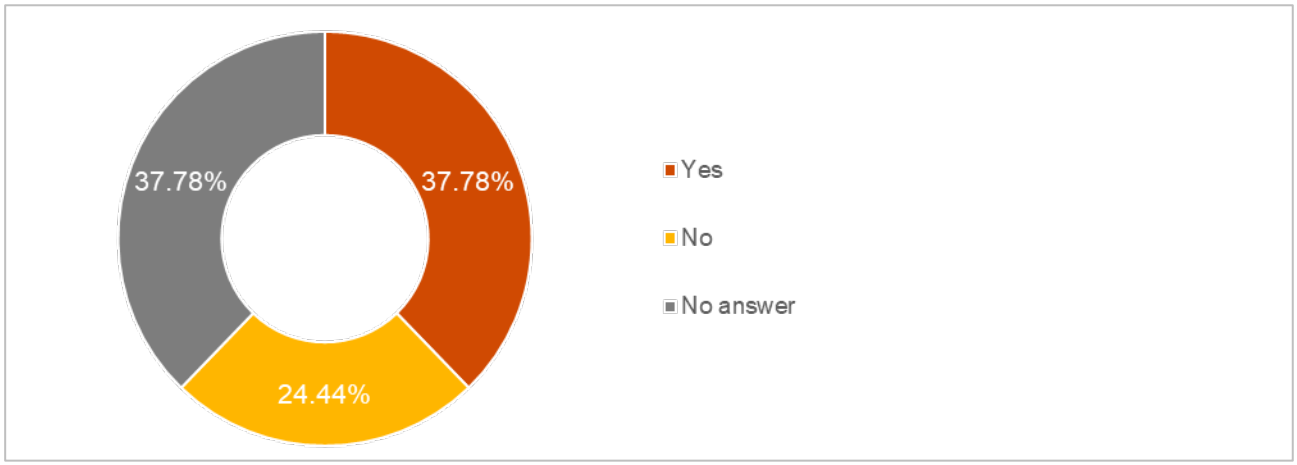
Respondents defined their level of knowledge at a different level. Almost every third respondent (31%) did not have knowledge of BIM or described it as negligible. The remaining respondents (about 69%) declared they knew at least basic concepts of BIM.

Chart 5. Declared level of knowledge about BIM



Almost 38% of respondents who indicated that they implement projects using BIM participated in the development of the " Exchange Information Requirements " (EIR) or the "BIM Execution Plan" (BEP). Almost every 4th respondent did not answer this question.

Chart 6. Declared participation in the development of the EIR or BEP



4.1.2. Answers to general questions

The respondents were divided in terms of their answers to the question whether the presented set of documents was complete. 43% of the respondents stated that they did not have an opinion on this subject. Every third respondent indicated that the system is complete (32%), and every fourth said that it was not (25%). The respondents indicated deficiencies in the field of:

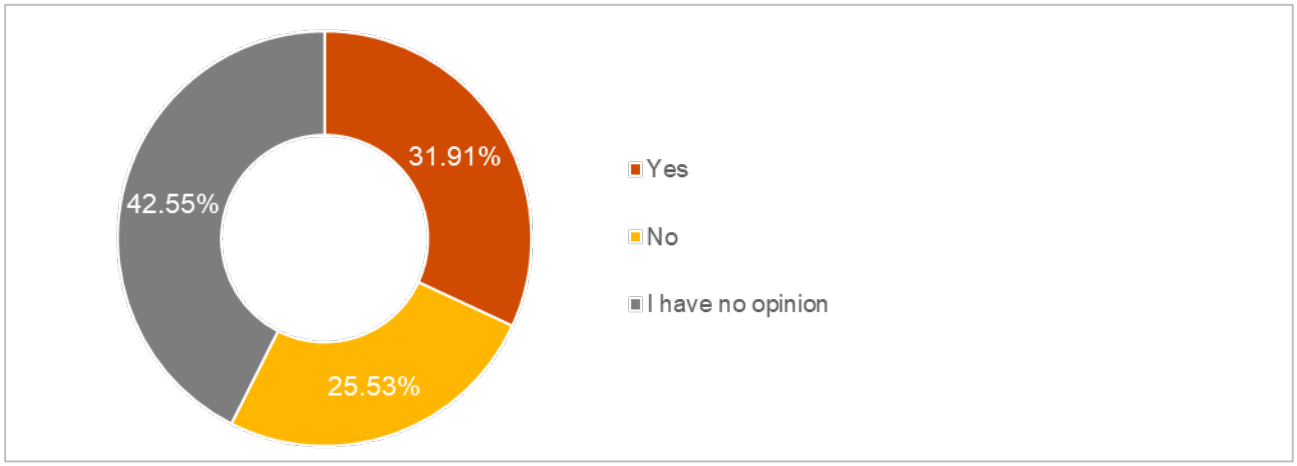
- Classification of building elements;
- Information on the operational stage;
- LOD and LOI tables[19];
- Model contracts for design work[20], qualification evaluation forms.

The respondents also paid attention to the need to ensure compliance with the PN-EN ISO 19650 series of standards.

[19] The definition is included in the document entitled "BIM Lexicon". The position of the authors in this regard is presented in Annex 8 to this document.

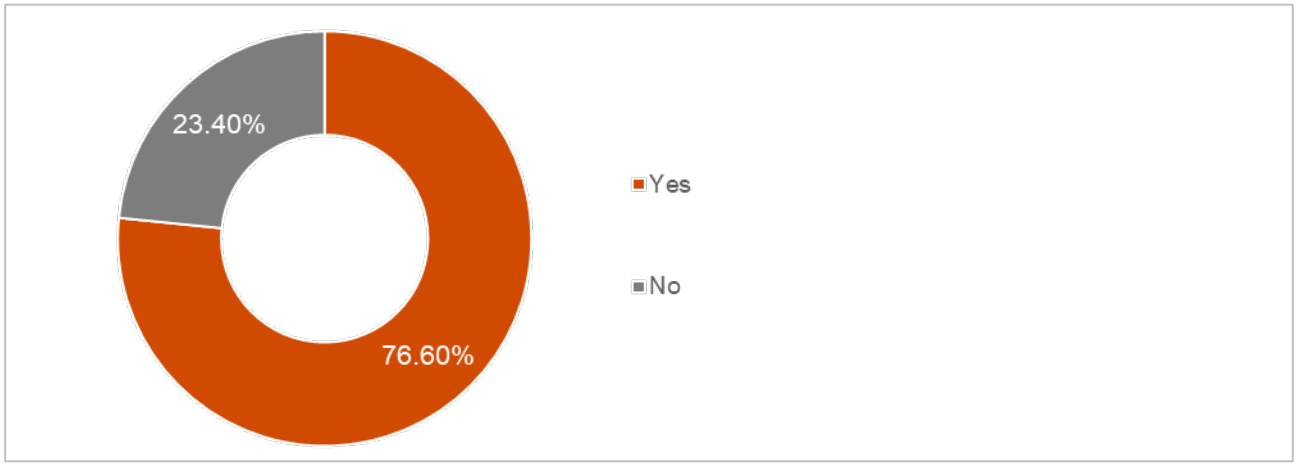
[20] The position of the authors in this regard is presented in Annex 8 to this document.

Chart 7. Is the BIM document system complete?



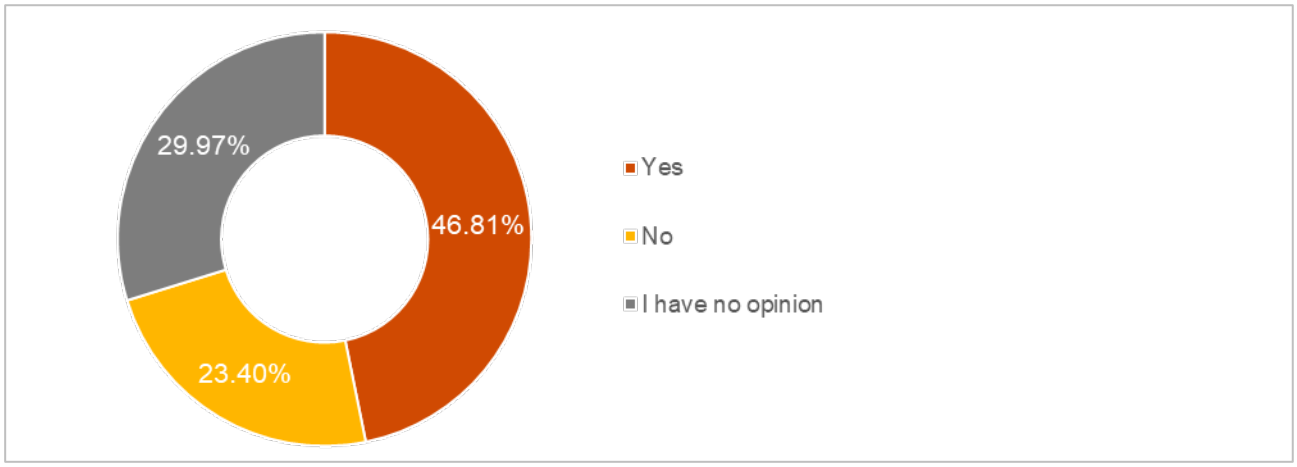
The document system proposed as part of the study was developed so that each BIM document contains a part describing the content of the template and its description. Over three quarters of the respondents (77%) found that such a layout of documents is legible and understandable.

Chart 8. Is the form of BIM document templates clear and understandable?



Almost half of the respondents (47%) stated that BIM documents deal with the most important issues related to BIM. Every fourth person (23%) indicated that the templates should be completed. In addition to general comments, the respondents indicated, inter alia, the expected additions to the content of the Exchange Information Requirements (EIR) template (e.g. regarding CDE, description of roles in the implementation of the investment process, trainings, naming conventions).

Chart 9. Do the templates represent the most important aspects of BIM?

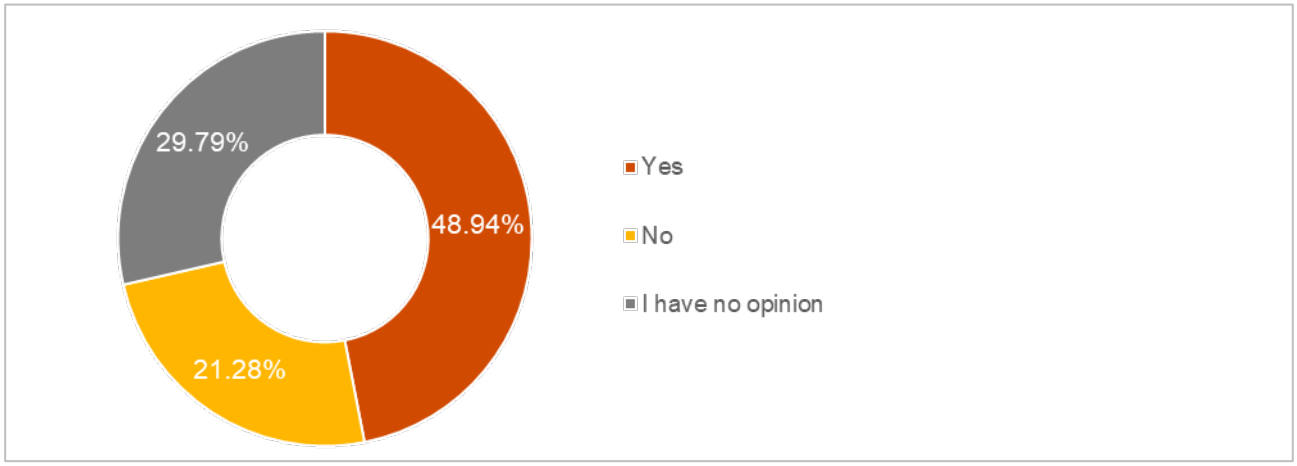


4.1.3. Answers to specific questions

BIM Lexicon

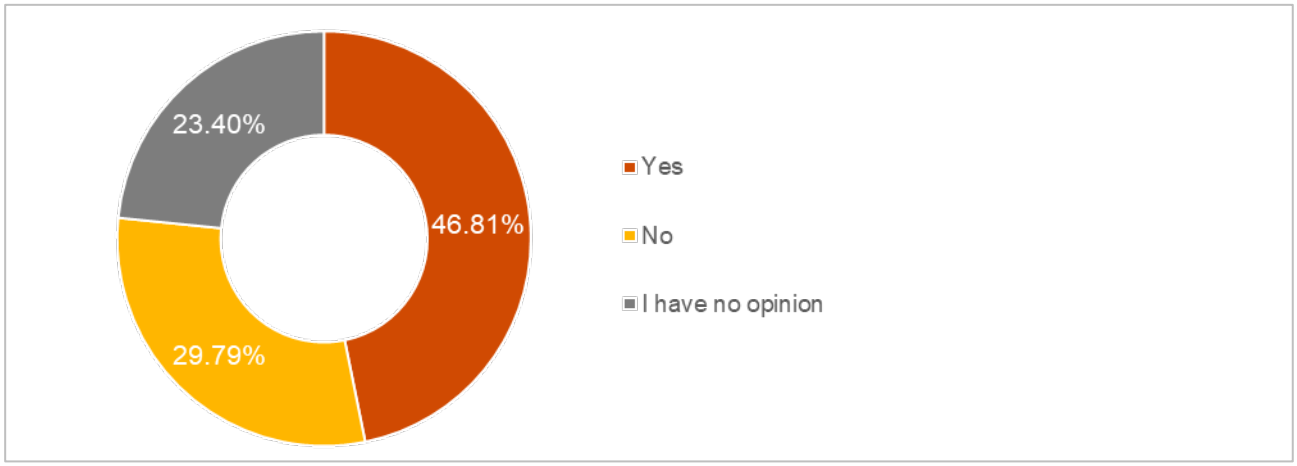
The list of terms used in the documents, indicated in the content of the "BIM Lexicon" for half (49%) of respondents, is enough to understand the content of the templates

Chart 10. Is the list of terms in the BIM Lexicon enough to understand the content of the templates?



Almost every third respondent (30%) indicated that the terms contained in the "BIM Lexicon" are not sufficiently explained. According to the respondents, the "BIM Lexicon" requires, first, the development or reformulation of definitions (their content is not understandable) and the indication of examples. In addition, the respondents indicated the need to translate the definitions contained in the series of PN-EN ISO 19650 standards.

Chart 11. Are the terms in the BIM Lexicon sufficiently explained?

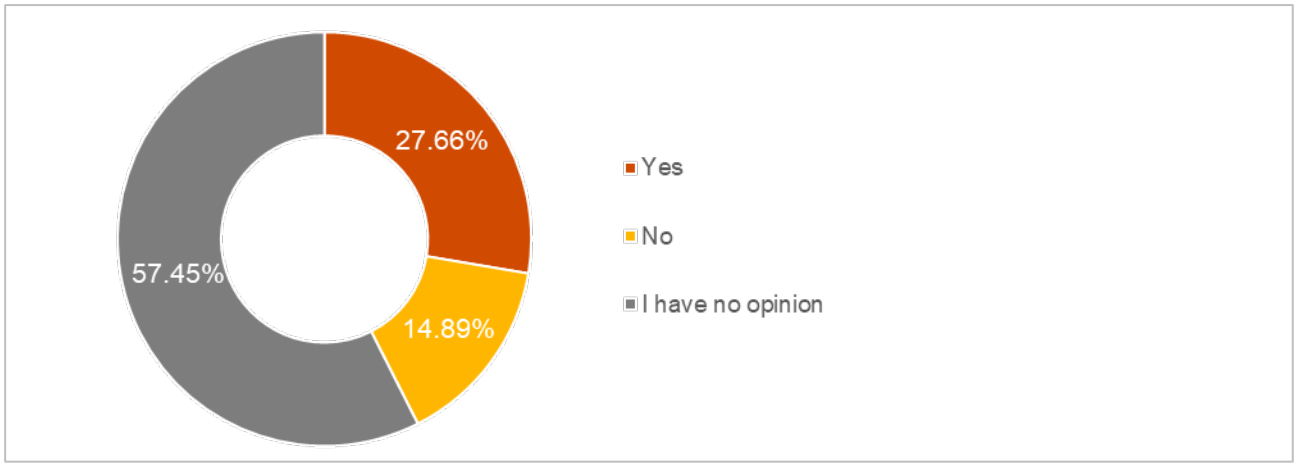


Exchange Information Requirements (EIR)

Opinions on whether the contracting authority will be able to prepare the Exchange Information Requirements (EIR) on its own based on the template and its discussions were distributed equally.

More than a third of the respondents (36%) stated that the contracting authority would not be able to independently develop Exchange Information Requirements (EIR) based on the provided template and discuss it. According to the respondents - mostly represented by contractors - the scope of BIM is so wide that the contracting authority, despite having a template and discussion, will need external support. The reasons for this may be seen in the lack of appropriate competences on the part of the contracting authorities. It should be noted, however, that the representatives of the contracting authorities were less skeptical - half of them could not clearly indicate whether they would be able to develop BIM requirements on the basis of the provided documents, and every third respondent representing this group indicated that the contracting authority would cope with this task

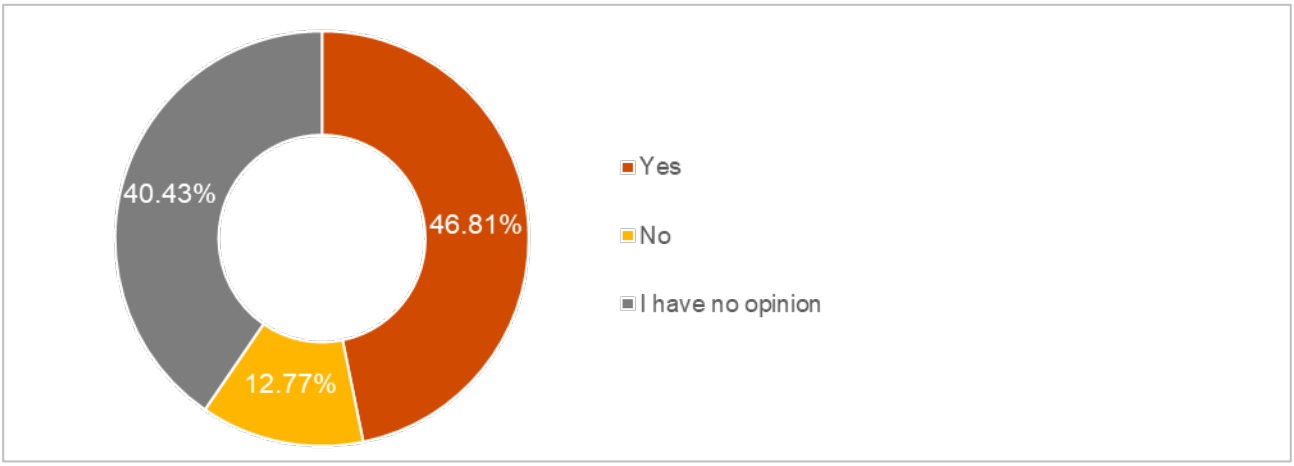
Chart 12. Will the contracting authority be able to independently develop the Exchange Information Requirements based on the provided documents?



BIM Execution Plan (BEP)

The respondents gave a slightly better rating to the BIM Execution Plan template along with its overview. Almost half of the respondents believe that the project team will be able to develop a BIM Execution Plan using the template and overview of the BIM Execution Plan. Respondents who had a different opinion indicated that it is necessary to have experience in implementing projects using BIM. In their opinion, model documents adapted to the specifics of various projects (investment types and sizes) could also be useful.

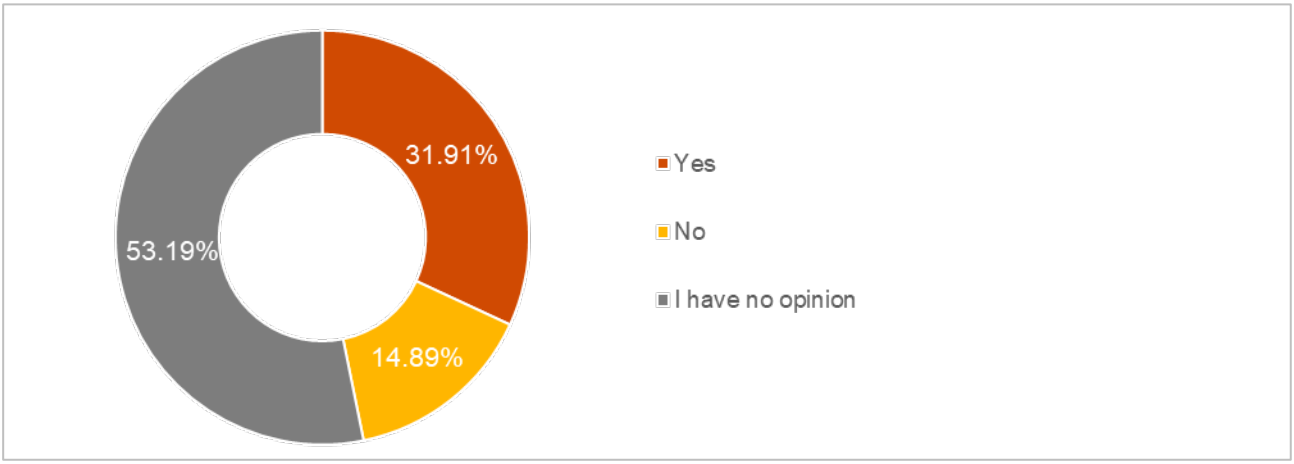
Chart 13. Are the BIM Execution Plan template and its overview detailed enough for the project team to develop a BIM Execution Plan based on them?



Model production and delivery table.

Model production and delivery table is a document that seems to be the least understandable to stakeholders. More than half of the respondents have no opinion on this document. The respondents who unequivocally stated that the table is not sufficiently understandable indicated that it was not necessary to describe the classification codes for model elements and to introduce additional model divisions.

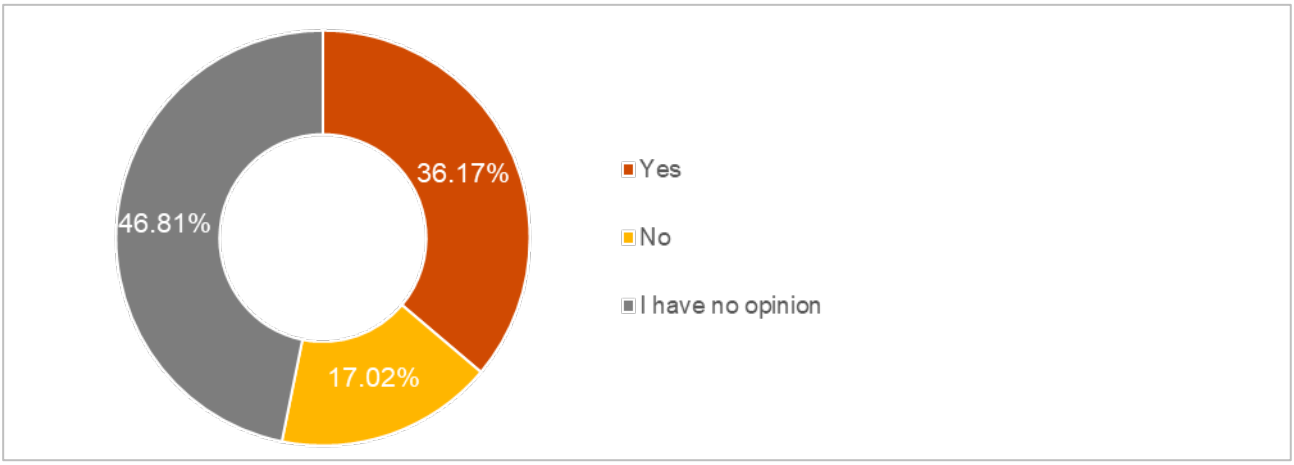
Chart 14. Is the overview of the Model production and delivery table sufficient?



BIM Attachment to the Agreement

Every sixth respondent (17%) believes that the provisions of the document are not sufficient. The respondents pointed to the need for clarification or changes in the provisions concerning copyright and a more detailed approach to the provisions concerning CDE.

Chart 15. Do the provisions of the BIM Attachment to the Agreement cover the most important issues in relation to BIM, which are not regulated in standard construction agreements?



4.2 Consultation with the Project Stakeholders - meeting

As part of the project, on July 24, 2020, a meeting summarizing consultation with Project Stakeholders was organized. The meeting was held in the form of a videoconference. Over 40 people from over 30 institutions and companies participated in the meeting.

The presentation, which was the first part of the meeting, was divided into 3 parts:

- Introduction, during which the stakeholders were presented with the objective and meeting agenda;
- Presentation of MacroBIM with reference to the legal aspects of the implementation of this phase for investment processing, in accordance with applicable law;
- Presentation of the survey results (see chapter 4.1).

The second part of the meeting was devoted to discussion with Stakeholders. They raised the following issues:

- Compliance of the nomenclature and definitions with the Public Procurement Law;
- Confirmation of the placement of the MacroBIM procedure in the public procurement procedure;
- Compliance, in principle that each investment using BIM should be preceded by consultations / dialogue between the contracting authority and the contractor;
- The transfer of economic copyrights to the contracting authority should take place not earlier than after the contractor has been remunerated for the project;
- It was confirmed that under the Act on Copyright and Related Rights, personal copyrights are inalienable;
- Discussion on the guidelines for LOD (LOG as defined in the "BIM Lexicon") and LOI;
- The necessity to prepare clauses for contracts according to FIDIC was reported. It was declared to include the above-mentioned action in the recommendations. The need to develop document templates for the facility use stage was reported. It was declared to include the above-mentioned action in the recommendations;
- The need to develop BIM templates for linear investments was reported. It was declared to include the above-mentioned action in the recommendations;
- The role of the designer in the project and the change of approach to cooperation were discussed.

Conclusions from the meeting:

- The proposed form and system of working with BIM documents are clear and understandable, both for survey respondents and meeting participants;
- BIM templates will be reviewed for nomenclature compliance with the Public Procurement Law and, if necessary, corrected accordingly;

- The provisions related to copyright and their transfer to the contracting authority will be completed / detailed;
- The document will include recommendations regarding the need to develop, in the next steps of the BIM implementation process in Poland, contracts according to FIDIC and BIM documents for the operation phase;
- The authors of the study will consider the possibility of introducing recommendations regarding the minimum levels of LOD (LOG as defined in the "BIM Lexicon") and LOI for BIM documentation into BIM documents, in order to standardize the requirements of contracting authorities towards contractors;
- Both substantive (technical) and soft training, changing the way of working within the PROJECT (soft issues) are necessary

4.3 Key success factors

The implementation of BIM is a long-term process that requires continuous improvement (e.g. due to dynamically changing economic, social, legal, environmental and technical background etc.). Therefore, all solutions, before they become a standard, should be checked in practical application and - if such a need is identified - supplemented or corrected.

VERIFICATION OF DOCUMENTS SHOULD BE CONDUCTED ON MANY INVESTMENTS (it is recommended to collect results from at least a dozen implementations, in particular from Pilot Projects) in order to obtain the most complete picture that will allow to verify in practice the adjustment of their content to the possibilities of the Polish market.

Due to the invaluable advantages of the **LESSON LEARNT APPROACH**[21] z it is recommended to use it regardless of the type of entity for which the investment is carried out (public or private).

Therefore, it is recommended to complete the table below, at least at the end of each stage of the PROJECT implementation. These tables should be completed by all members of the Core Group[22] , and the conclusions should be discussed at a joint meeting to exchange experiences.

Table 5. Lesson learnt – sheet proposal

No.	Suggested questions	Conclusions in terms of the PROJECT implementation stage		
		MacroBIM	Designing	Execution of works
1	In your opinion, were the requirements set sufficient?			
2	Could the change of requirements bring a better effect for the PROJECT?			
3	Which element of the BIM process was the greatest challenge for you? Why?			
4	Which elements of the implemented process brought you the greatest profits? Replace them.			
5	Which actions taken by you brought the greatest benefit to other participants of the investment process? Replace them.			

[21] To put it simply, the lesson learnt approach is based on the analysis of completed tasks, drawing conclusions from them and their implementation into subsequent tasks.

[22] The Core Group is composed of representatives of the main participants in the investment process: the contracting authority, industry designers and the contractor of construction works. It is a decision-making group, jointly responsible for the risks and rebates of the process. See also: "BIM Lexicon".

Table 5. Lesson learnt – sheet proposal

No.	Suggested questions	Conclusions in terms of the PROJECT implementation stage		
		MacroBIM	Designing	Execution of works
6	What preparatory activities would improve your work and the work of your team			
7	What preparatory activities would help reduce the "greatest challenges" identified in point 3?			
8	Which element of the implemented process, in your opinion, was redundant or requires organizational changes? (including the adopted assumptions) What is your proposal for changes?			
9	Other comments			

CONCLUSIONS FROM PUBLIC INVESTMENTS SHOULD BE PUBLISHED on a dedicated internet platform[23], to facilitate the exchange of experiences between industry representatives. It is also recommended to develop **GOOD PRACTICE** handbooks, which will support the construction market in developing BIM documents and facilitate the selection of the best solutions.

During further work on BIM Document Templates, it is recommended to prepare additional studies that will contain **EXAMPLES OF SUPPLEMENTS TO BIM DOCUMENTS**, which would contain model provisions adapted to various types of investments - both in terms of type (e.g. for linear and cubature construction) and the size of the implemented PROJECT. Such a need was also reported by Project stakeholders during consultations.

4.4 Supplement to the standard of BIM documents – next steps

BIM document templates attached to this study are the first step that should be taken by representatives of the construction industry to enable efficient implementation of investments using BIM in Poland.

Additional recommendations for industry representatives and the Steering Committee (responsible for the efficient BIM implementation in Poland, in accordance with the assumptions contained in the "Roadmap for the implementation of the BIM methodology in public procurement") are presented below in relation to the types of studies recommended for preparation. The goal is to achieve full BIM integration in the processing of construction investments.

Table 6. Comments and recommendations regarding supplements to the BIM document system

No.	Scope	Comments and recommendations
1	**Standards**	
1.1	Complete and detailed naming system for construction investments	The system, used independently of the PROJECT, will allow participants of the construction process to find themselves faster in the documentation received. It is recommended to develop it as a national annex to the PN-EN ISO 19650-2 standard, like the British version of the standard (BS-EN ISO 19650-2).
1.2	Classification	Classification of building elements is a necessary element of a coherent and integrated system for structuring construction data throughout the entire life cycle of an asset, from project programming (MacroBIM phases), through

[23] It is recommended to use the BIM Platform for this purpose. The concept of a BIM Platform was described in the study "IT platform for BIM – report with recommendations".

Table 6. Comments and recommendations regarding supplements to the BIM document system

No.	Scope	Comments and recommendations
		concept, design, execution, to the preparation of resource data for operation (see also point 1.4 in this table). The development of the classification will also allow the creation of Digital Supply Chains (DSC).
1.3	Standards for GIS[24] and their incorporation into the standards system for BIM	Project stakeholders indicated that GIS data should be considered when developing BIM standards (especially in the field of BIM document templates). This task may bring real effects, in particular in relation to the planning phase, in which these data are used, e.g. in the implementation of line investments or as part of pre-design works.
1.4	BIM documents for the operational phase	During consultations, the Project stakeholders indicated the need to develop documents covering the operational phase. It is a necessary step in order to create a full system of BIM standards for the implementation of construction investments throughout their entire life cycle.
2	**Contracts and agreements**	
2.1	Model provisions of contracts, joint venture contracts	The development of model contractual provisions and agreements will be conducive to building good practices, as well as eliminating antagonistic practices in terms of the division of competences and responsibilities. It will also shorten the process of preparing the documentation of the proceedings. It is not recommended to develop separate contracts for design work. This action may be conducive to further consolidating the division of the information provision process.
2.2	Model provisions for construction contracts based on FIDIC[25]	Currently, it is possible to proceed with the investment using the FIDIC contract conditions and BIM, but the model set of clauses, including BIM, would avoid discrepancies and gaps in the provisions of the contract. It will also ensure the proper handling of investments with the use of BIM, respecting the principles of cooperation and shared responsibility
3	**Specification of Order Terms**	
3.1	Model provisions regarding the conditions for participation in the procurement procedure	Model conditions for participation in the procedure should be developed in such a way as to ensure effective execution of projects with the use of BIM. Such studies should not, however, release the contracting authorities from the obligation to adjust the conditions of participation in the procedure to the PROJECT implemented by the contracting authorities.
3.2	Model provisions concerning offer evaluation criteria other than price or cost	Model sets of bid evaluation criteria for BIM will help contracting authorities to prepare documentation of the procedure, in particular in the context of the recommendations contained in the "Roadmap for the implementation of the BIM methodology in public procurement"[26] related to the introduction of mandatory non-price criteria for the use of BIM in public tenders The development of the indicated documents will also allow to increase the quality of PROJECTS, while reducing the risk related to unjustified increase in offer prices. It does not release contracting authorities from the necessity to analyze the needs of the PROJECT being implemented and the appropriate selection of tender evaluation criteria.
3.3	Description of the roles of participants in investment processes and their scope of responsibility	If it does not result from the model provisions of contracts and contracts, it is recommended to develop the minimum and suggested competences of individual BIM roles (or assign them to roles existing in Polish construction practice).

[24] Eng. geographic information system – an information system for collecting, processing and analyzing geographic data.

[25] Fr. Federation Internationale des Ingenieurs-Conseils – has developed unified procedures for the implementation of construction investments.

[26] Document developed under this Project, developed in order to outline the basis for the development of a detailed strategy for BIM implementation in Poland

Table 6. Comments and recommendations regarding supplements to the BIM document system

No.	Scope	Comments and recommendations
		It is also necessary to standardize the names of the roles and to develop appropriate scopes of responsibility for these roles, which will be used in the implementation of typical construction investments.
4	**Other**	
4.1	Other recommendations included in the "Roadmap for the implementation of the BIM methodology in public procurement"	-

All documents that will be developed as part of the next steps of BIM implementation in Poland should be **COORDINATED** (in accordance with the generally accepted implementation strategy) and **MUTELY CONSISTENT** in order to create a fully-fledged organizational system for the processing of construction investments in Poland.

Bibliography

[1] Haahtela Group. Lean Construction Institute. Provider Number H561, *Lean Design Forum P2SL/AIA/LCI 2016 Day One. P2SLDF20161,* 2016.

[2] *PN-EN ISO 19650-1:2019 Organizacja i digitalizacja informacji o budynkach i budowlach, w tym modelowanie informacji o budynku (BIM). Zarządzanie informacjami za pomocą modelowania informacji o budynku. Część 1: Koncepcje i zasady.*

[3] *PN-EN ISO 19650-1:2019 Organizacja i digitalizacja informacji o budynkach i budowlach, w tym modelowanie informacji o budynku (BIM). Zarządzanie informacjami za pomocą modelowania informacji o budynku. Część 2: Realizacja projektu.*

[4] C. Eastman, *BIM Handbook - a guide to building information modeling,* John Wiley & Sons, 2008, p. 116.

[5] *Ustawa z dnia 11 września 2019 r. Prawo zamówień publicznych (Dz. U. z 2019 r. poz. 2019 ze zm.).*

[6] *Ustawa z dnia 27 sierpnia 2009 r. o finansach publicznych (Dz.U. z 2009 r. Nr 157, poz. 1240).*

Digitalisation of the construction planning in Poland

Construction investment management in BIM methodology – BIM documents templates

Overview of Employers Information Requirements and BIM Execution Plan

August 2020

pwc

European Commission

MINISTERSTWO ROZWOJU

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Notes

This document is a part of the studies prepared under the project "Digitization of the construction planning in Poland" (hereinafter "Project"), implemented with the financial and substantive support of the European Union under the European Commission program for supporting structural reforms (DG Reform). The Project Beneficiary is the Ministry of Development.

The following documents were prepared as part of the project deliverable:

- ***"Management of the construction investment in the BIM methodology – BIM document templates"*** – a document describing the adopted assumptions and the most important information necessary for the correct interpretation of the template provisions;
- „***BIM Lexicon***" – a glossary of BIM-related terms used in BIM document templates;
- ***"Overview of the Exchange Information Requirements (EIR) Template"*** – a document containing an overview of the content presented in the "Exchange Information Requirements (EIR) Template" and guidelines for completing it;

- ***"Exchange Information Requirements (EIR) Template"*** – a template of the "Exchange Information Requirements (EIR)" containing universal[1] provisions of that document;
- ***"Overview of the BIM Execution Plan (BEP) Template"*** – a document containing an overview of the content presented in the "BIM Execution (BEP) Template" and guidelines for its completion;
- ***"BIM Execution Plan (BEP) Template" – a template of the "BIM Execution Plan (BEP)"*** containing universal* provisions of that document;
- ***"Model production and delivery table. Template, overview, example"*** – the template of the "Model production and delivery table" with an overview and an example
- ***"BIM Attachment to the Agreement"*** – template of the BIM attachment to construction works contracts regulating selected issues related to the application of BIM.

ALL OF THE ABOVE LISTED DOCUMENTS SHOULD BE READ TOGETHER.

The definitions contained in this document are to be understood as indicated in the "BIM Lexicon". Additionally:

- The project should be understood as a task entitled "Digitization of the construction planning in Poland", implemented with financial and technical support from the European Union as part of the European Commission program in the field of supporting structural reforms, the Beneficiary of which is the Ministry of Development;
- PROJECT should be understood as an investment project, in particular a Pilot Project (PP), for the implementation of which BIM documents created as part of the Project will be used;
- REQUIREMENTS should be understood as a set of BIM Requirements developed for the PROJECT, in particular those developed on the basis of the "Employer's Information Requirements";
- A TEAM should be understood as a team of people cooperating with each other in order to implement the PROJECT, consisting of representatives of the contracting authority, the contractor and - if necessary - its subcontractors.

[1] The term "universal" should be understood as meaning that these provisions should apply to most PROJECTS. Their use results from a specific PROJECT and should always be analyzed by the user of the template.

I

Overview of Employer's Information Requirements Template

I. Overview of Employer's Information Requirements Template

I.A. Purpose of the Overview of the „Exchange Information Requirements Template"

The purpose of the document is to facilitate the contracting authority to develop BIM requirements for a PROJECT, in particular for Pilot Projects. The manual contains general remarks dealing with the issues of individual chapters of the "Exchange Information Requirements (EIR) Template", indicating also some solutions, which, however, should not be treated as a closed list

I.B. Purpose of the „Exchange Information Requirements (EIR)"

The purpose of developing "Exchange Information Requirements" is to formulate and present the requirements of the PROJECT being implemented by the contracting authority. These requirements are divided into three groups:

- Technical requirements - concerning the software used, data exchange formats, accuracy etc.;
- Organizational requirements - concerning the method of implementing the processes necessary for the proper implementation of the investment, responsibility of team members, applicable norms, standards, etc.;
- Qualification Requirements - regarding PROJECT objectives and the associated minimum BIM competencies and how to evaluate them.

When formulating the requirements in the above-mentioned scopes, the contracting authority indicates the guidelines for the PROJECT implementation - its framework (boundary conditions), goals and the desired methods of their implementation or the requirements for them.

Development of this document, since its provisions affect the implementation of the entire investment process, is a complex and demanding task. Therefore, entities with less experience or knowledge (and those who do not have the required competences in their resources) should consider using the assistance of external entities specializing in advisory in this area (consultants) when implementing it.

It should be remembered that in order to be able to effectively use the PROJECT results, one should take care of appropriately qualified personnel, whose task will be:

- At the implementation stage - verification and acceptance of PROJECT outcomes;
- At the operational stage - maintenance of the facility using the obtained products and keeping the data up to date.

It is recommended to build competences within the contracting authority's own resources.

I.C. Content of the Overview of the „Exchange Information Requirements (EIR) Template"

Table 1 contains a list of the issues covered in the "Exchange Information Requirements (EIR) Template" along with information on the relationships between the provisions of individual chapters, as well as additional information that should be taken into account by the user of the template, the assumptions of which for the PROJECT are different from those presented in Chapter 3 of the document entitled "Construction investment management in the BIM methodology - BIM document templates".

Indication of links between individual chapters of the "Exchange Information Requirements (EIR) Template" should be treated as additional guidelines for the contracting authority - the content of the REQUIREMENTS should always be considered as a whole in relation to the PROJECT, taking into account the details of the PIR

(which defines, among others, the types of data to be provided, implementation of this task and other individual requirements of the contracting authority in relation to the PROJECT) and the OIR (which may affect the PIR requirements), in accordance with the diagram below.

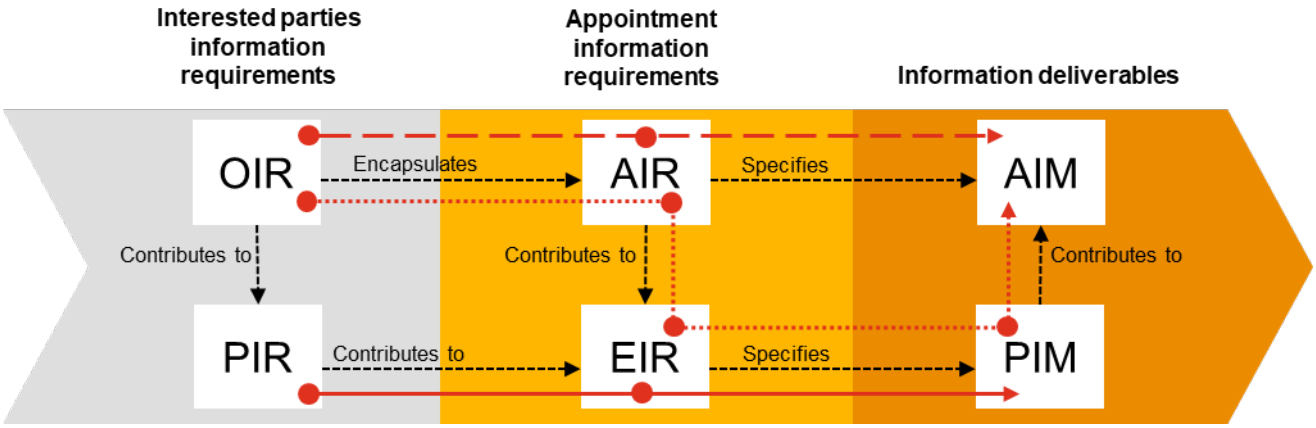

Figure 1. Diagram of dependencies between requirements and related products.
In the figure above, "Contains" means "Provides and specifies input data", "Contributes" means "Influences", "Specifies" means "Specifies the context, structure and method of implementation", "Procurement information requirements" refer to the PROJECT that is the subject of the procurement. The arrows indicate the PROJECT implementation scenarios described below
Source: own study based on [1]

The above graphic also shows the "paths" that should be analyzed when delivering the selected PROJECT implementation scenario in accordance with PN-EN ISO 19650:

- Scenario No. 1 (solid line): PROJECT implementation without considering resource management issues: PIR-EIR-PIM;
- Scenario 2 (dashed line): resource management without considering the PROJECT implementation: OIR-AIR-AIM;
- Scenario No. 3 (dotted line): combined PROJECT delivery and resource management: OIR-AIR-EIR-PIM-AIM and PIR-EIR-PIM-AIM

Table 1. The content of the individual chapters of "Employer's Information Requirements Template Overview", the reference between them and with other client's documents

Chapter	Content	Reference to other chapters of REQUIREMENTS	Reference to other documents
1	**GENERAL INFORMATION**		
1.1	Summary of basic data about the PROJECT	**Chapter 2.1** - the adopted procedure and the subject of the procedure may affect the need to separate additional stages during the implementation (e.g. the implementation of the procedure in the "design" and "build" formula requires at least two procedures - for the selection of a designer and contractor). **Chapter 2.2.1** - the scope of the PROJECT (the subject of the contract) affects the scope of the data required for delivery **Chapter 2.2.4** - the adopted formula for the PROJECT[2] implementation affects the manner of cooperation between the TEAM members **Chapter 2.3** - the scope of responsibility to be distributed among the TEAM members depends on the formula of its implementation **Chapter 2.6** - the way the PROJECT is organized affects the risks associated with its implementation **Chapter 3.1.3** - the scope of the PROJECT may define the areas that should be supported with additional tools **Chapter 3.3.1** - basic information on geolocation results from the location of the investment	• Other documents of the procurement procedure[3]
1.2	Reference to the nomenclature used in the document, including list of abbreviations used	The nomenclature used should be consistent throughout the document and other documents of the procedure	• „BIM Lexicon" • Other documents of the procedure
1.3	PROJECT objectives specified by the contracting authority, influencing the manner of project delivery and conditioning its course	**Chapter 1.4** - PROJECT objectives and associated BIM[4] applications may indicate the scope of the norms, standards and regulations to be applied during implementation **Chapter 2.2** - PROJECT objectives affect the scope of data required to provide data and level of accuracy **Chapter 2.6** - PROJECT objectives may affect for the risks associated with their implementation	-

[2] The formula for the PROJECT implementation should be understood as the way of organizing the investment implementation process, e.g. "design", "design and build", "build".

[3] The term "other documents of the procurement procedure" should be understood as the Specification of the terms of the contract (*pol*. SWZ), Description of the subject of the contract (*pol.* OPZ), the contract and other attachments developed as part of the investment preparation.

[4] Refer „BIM Lexicon" for the definition of the term.

Table 1. The content of the individual chapters of "Employer's Information Requirements Template Overview", the reference between them and with other client's documents

Chapter	Content	Reference to other chapters of REQUIREMENTS	Reference to other documents
		Chapter 3.2.2 - objectives may define requirements in the scope of units used in the PROJECT **Chapter 3.3.2** - PROJECT objectives may affect the required scope of coordination	
1.4	List of norms, standards and regulations, the application of which is required by the contracting authority	See note to: **Chapter 1.3** **Chapter 2.2.2** - if the necessity to use classification has been indicated, specify the norm or standard required to be applied	• ISO 19650 series of standards • Other standards indicated in the REQUIREMENTS • Other standards of the contracting authority (if available) • Legal acts and standards regarding the standard of development that can be implemented using BIM[5]
2	**ORGANISATIONAL REQUIREMENTS**		
2.1	Division of the PROJECT into stages and phases	See note to: **Chapter 1.1** **Chapter 2.2.2** – for individual milestones, the required ranges of data that must be provided by the contractor as part of the PROJECT implementation should be indicated **Chapter 2.2.3** – The division into phases and stages defined for the PROJECT is the starting point for the development of requirements for the data provided by the contractor	• Other documents of the procedure, in particular the deadlines specified in the contract
2.2	Requirements for the PROJECT information standard and methods and procedures for creating information	See note to: **Chapter 1.3** **Chapter 2.1** – the division into phases and stages defined for the PROJECT defines data dumps for which requirements should be defined in terms of the scope and accuracy of the information provided	• Acts and standards regarding the standard of development that can be implemented using BIM
2.2.1	The scope of information packages required to develop and general guidelines for their creation and structure	As for chapter 2.2 and additionally: See note to: **Chapter 1.1**	• BIM[6] technical manual (if in the possession of the contracting authority) • Legal acts and norms related to the standard

[5] In particular, the Construction Law Act, the Ordinance on the detailed scope and form of the construction design, the Ordinance on the technical conditions to be met by buildings and their location

[6] Refer „BIM Lexicon" for the definition of the term

Table 1. The content of the individual chapters of "Employer's Information Requirements Template Overview", the reference between them and with other client's documents

Chapter	Content	Reference to other chapters of REQUIREMENTS	Reference to other documents
		Chapter 3.1.2 – the division into information packages and their scope may affect the requirements for the software **Chapter 3.2.1** – the division of the information model should take into account the ranges of data provided in various formats	• National standards[7]
2.2.2	PROJECT information standard, including nomenclature, classification and scope of information requirements	As for chapter 2.2 and additionally: See: **Chapter 1.4** **Chapter 3.1.3** – the use of other tools may require additional data to be included to the information models that will be supported by them **Chapter 3.2.2** – accuracies affect the required scope of information	• Standard of nomenclature • LOG / LOI standard or other describing the required content of information models - if it is used to describe the REQUIREMENTS
2.2.3	PROJECT providing data, including a schedule	As for chapter 2.2 and additionally: See note to: **Chapter 2.1**	• The Contracting Authority may include a template of the master data delivery plan in the documentation
2.2.4	Requirements for the organization of cooperation with the use of CDE[8]	As for chapter 2.2 and additionally: See note to: **Chapter 1.1** **Chapter 2.3** – the responsibility matrix should include tasks resulting from the adopted way of organizing work in CDE **Chapter 2.4** – project delivery control procedures should be reflected in the organization of work in CDE **Chapter 3.1.1** – the CDE specification affects the way in which cooperation is organized	-
2.3	Requirements for the allocation of responsibilities among the members of the TEAM	See note to: **Chapter 1.1** See note to: **Chapter 2.2.4** **Chapter 2.6** – appropriate allocation of responsibility may contribute to the mitigation or elimination of risks	Other procedural documents, in particular: • Requirements for the contractor's key personnel should result from the responsibilities assigned to them • The contract contains the basic obligations of the contractor and the contracting authority - they should be included in the matrix

[7] Currently (July 2020) there are no national standards.

[8] Refer „BIM Lexicon" for the definition of the term

Table 1. The content of the individual chapters of "Employer's Information Requirements Template Overview", the reference between them and with other client's documents

Chapter	Content	Reference to other chapters of REQUIREMENTS	Reference to other documents
2.4	Requirements for the procedures to ensure the expected level of quality	See note to: **Chapter 2.2.4** **Chapter 3.1.1** – the requirements for CDEs should be defined in such a way that implementation control procedures can be carried out **Chapter 3.1.2** – requirements for PROJECT implementation control procedures may define software requirements **Chapter 3.1.3** – additional tools may support PROJECT implementation control procedures **Chapter 3.3.2** – spatial coordination is a fundamental element of quality control	• If the contracting authority has templates of reports that are required to be delivered, they should be made available
2.5	Safety requirements: digital, physical and health and safety	See note to: **Chapter 1.1** **Chapter 2.6** – safety issues should be included in the risk register **Chapter 3.1.1** – security considerations should be included in the requirements for CDEs **Chapter 3.1.2** – care should be taken to maintain appropriate security procedures for the information generated	• Other procedural requirements
2.6	Requirements for risk management	See note to: **Chapter 1.3** See note to: **Chapter 2.3** See note to: **Chapter 2.5** **Chapter 2.7** – if raising competences may be conducive to minimizing the risk, it is worth considering including this scope in the training requirements **Chapter 3.1** – the use of appropriate tools may help to reduce risks	• PROJECT risk register (if it is kept as a result of the requirements of the description of the subject of the contract) • Contract provisions may generate additional risks
2.7	Requirements for the training provided as part of the PROJECT	See note to: **Chapter 2.6**	-
2.8	Requirements for the BIM Plan	The scope of the BEP should include the answer to all scopes for which the contracting authority has defined the requirements and those resulting from the adopted method of PROJECT implementation	• „BIM Execution Plan Template"
3	**TECHNICAL REQUIREMENTS**		
3.1	Requirements for the software used in the PROJECT	**Chapter 2.4** – the tools used should support the PROJECT implementation control procedures, but the procedures may also require the use of additional tools	Restrictions resulting from the Public Procurement Law (if the Contracting Authority

Table 1. The content of the individual chapters of "Employer's Information Requirements Template Overview", the reference between them and with other client's documents

Chapter	Content	Reference to other chapters of REQUIREMENTS	Reference to other documents
		Chapter 2.5 – regardless of the type of tools used, appropriate procedures related to data security should be applied See note to: **Chapter 2.6** **Chapter 3.2** – the software used may have limitations / requirements for the data supported	is from the public sector)[9]
3.1.1	Requirements for CDE	As indicated for chapter 3.1 and additionally: See note to: **Chapter 2.2.4**	-
3.1.2	Software requirements for model production, management, etc.	As indicated for chapter 3.1 and additionally: See note to: **Chapter 2.2.1** **Chapter 3.3.2** – proper coordination may require the use of dedicated software	-
3.1.3	Requirements for other tools not directly related to the production of information or its verification	As indicated for chapter 3.1 and additionally: See note to: **Chapter 1.1** **Chapter 2.2.2** – the use of other tools may require that additional data to be supported by the information models are included **Chapter 3.3.1** – the additional software used may need to bind the information model to a global frame of reference	-
3.2	Technical information on the required data formats and their coordination	See note to: **Chapter 3.1** **Chapter 3.1.2** – when specifying technical requirements, the software capabilities should be considered **Chapter 3.1.3** – data formats may define requirements for additional software and vice versa	-
3.2.1	Requirements for the data formats provided	As indicated for chapter 3.2 and additionally: See note to: **Chapter 2.2.1**	-
3.2.2	Requirements for units used in the PROJECT	As indicated for chapter 3.2 and additionally: See note to: **Chapter 1.3** See note to: **Chapter 2.2.2**	• Legal acts and standards regarding the standard of documents that can be implemented using BIM methodology

[9] Act of September 11, 2019 - Public Procurement Law (Journal of Laws of 2019, item 2019, as amended) [2]

Table 1. The content of the individual chapters of "Employer's Information Requirements Template Overview", the reference between them and with other client's documents

Chapter	Content	Reference to other chapters of REQUIREMENTS	Reference to other documents
3.3	PROJECT coordination requirements	**Chapter 2.4** – the coordination requirements affect the quality control procedures **Chapter 3.1.2** – coordination may require the use of dedicated software **Chapter 3.1.3** – coordination requirements can affect the need for additional software	-
3.3.1	Information of the Contracting Authority and requirements regarding the coordinate systems used for the PROJECT	As indicated for chapter 3.3 and additionally: See note to: **Chapter 1.1** **Chapter 3.3.2** – determining the coordinate systems is required for the proper coordination of the PROJECT	-
3.3.2	Requirements for spatial coordination of information models	As indicated for chapter 3.3 and additionally: See note to: **Chapter 1.3** See note to: **Chapter 2.4** See note to: **Chapter 3.3.1**	-

II

Overview of BIM Execution Plan Template

II. Overview of BIM Execution Plan Template

II.A. Purpose of the Overview of „BIM Execution Plan (BEP) Template”

The document aims to facilitate, among others:

- The Contracting Authority to develop a template for a "BIM Execution Plan" that will be adapted to the REQUIREMENTS developed on the basis of the "Exchange Information Requirements Template" and the "Overview of the BIM Execution Plan Template";
- The Contractor to develop the "BIM Execution Plan" by drawing attention to the provisions essential for the implementation of the PROJECT using BIM;
- The Contracting Authority and the contractor to understand the scope of the BIM Execution Plan.

This document is intended for entities involved in the implementation of Pilot Projects, but also for representatives of the construction sector implementing PROJECTS using BIM.

The overview of the "BIM Execution Plan Template" contains general notes dealing with the issues of individual chapters of the "BIM Execution Plan Template", indicating also some solutions, which, however, should not be treated as a closed list.

II.B. Purpose of the „BIM Execution Plan (BEP)”

The purpose of developing a "BIM Execution Plan" is to present the agreed method of PROJECT implementation. This document is prepared by the contractor, but the participation of the contracting authority in its creation is required, inter alia, for the following reasons:

- Verification of the correctness of the solutions proposed by the contractor in relation to the REQUIREMENTS;
- Assessment of the fulfillment of the PROJECT objectives specified by the contracting authority;
- Analysis of the impact of the REQUIREMENTS on the PROJECT implementation;
- Agree on the provisions, i.e. adjusting them to the capabilities and expectations of all TEAM members.

Joint development of the provisions of the "BIM Execution Plan" also fosters building an atmosphere of understanding and mutual exchange of knowledge and experience, which favors the development of BIM in the industry.

Entities with less experience or knowledge (and those who do not have resources with the required competences) may use external entities specializing in advising in this area (consultants).

II.C. Content of the „BIM Execution Plan (BEP) Template”

When developing a "BIM Execution Plan", the user should bear in mind the relationship between the individual chapters of the "Exchange Information Requirements", which are indicated in the document "Overview of Exchange Information Requirements Template" and the assumptions for the PROJECT presented in Chapter 3 of the document entitled "Construction investment management in the BIM methodology - BIM document templates”.

When developing the "BIM Execution Plan", it is not necessary to use the "BIM Execution Plan Template", unless it results from the client's requirements. However, maintaining the indicated structure will allow the contracting authority to more easily assess compliance with the REQUIREMENTS developed based on the "Exchange Information Requirements Template" and “Overview of the Exchange Information Requirements Template". The Contractor may also extend the "BIM Execution Plan" developed based on this template, if it results from the needs of the PROJECT or the working methods used by the TEAM.

When developing a "BIM Execution Plan", read the notes in "Overview of the Exchange Information Requirements Template" and treat both documents as a consistent source of information.

Any examples contained in this manual marked in orange should be treated as an illustration of how to complete the template - not as recommendations for the use of the indicated methods, procedures or records.

Bibliography

[1] Information management according to BS EN ISO 19650. Guidance Part 1: Concepts, UK BIM Framework, 2019

[2] Kancelaria Sejmu, „Ustawa z dnia 11 września 2019 r. Prawo zamówień publicznych," Warszawa, 2019

Digitalisation of the construction planning in Poland

Construction investment management in BIM methodology – BIM documents templates

Exchange Information Requirements Template

August 2020

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Notes

This document is a part of the studies prepared under the project "Digitization of the construction planning in Poland" (hereinafter "Project"), implemented with the financial and substantive support of the European Union under the European Commission program for supporting structural reforms (DG Reform). The Project Beneficiary is the Ministry of Development.

The following documents were prepared as part of the project deliverable:

- ***"Construction investment management in the BIM methodology – BIM document templates"*** – a document describing the adopted assumptions and the most important information necessary for the correct interpretation of the template provisions);
- „***BIM Lexicon***" – a glossary of BIM-related terms used in BIM document templates;
- ***"Overview of the Exchange Information Requirements (EIR) Template"*** – a document containing an overview of the content presented in the "Exchange Information Requirements (EIR) Template" and guidelines for completing it (this document);
- ***"Exchange Information Requirements (EIR) Template"*** – a template of the "Exchange Information Requirements (EIR)" containing universal[1] provisions of that document; (**PRESENT DOCUMENT**);
- ***"Overview of the BIM Execution Plan (BEP) Template"*** – a document containing an overview of the content presented in the "BIM Execution Plan (BEP) Template" and guidelines for its completion;
- ***"BIM Execution Plan (BEP) Template" – a template of the "BIM Execution Plan (BEP)"*** containing universal[1] provisions of that document;
- ***"Model production and delivery table. Template, overview, example"*** – the template of the "Model production and delivery table" with an overview and an example;
- ***"BIM Attachment to the Agreement"*** – template of the BIM attachment to construction works contracts regulating selected issues related to the application of BIM.

ALL OF THE ABOVE LISTED DOCUMENTS SHOULD BE READ TOGETHER.

The definitions contained in this document are to be understood as indicated in the "BIM Lexicon". Additionally:

- The project should be understood as a task entitled "Digitization of the construction planning in Poland", implemented with financial support from the European Union as part of the European Commission program in the field of supporting structural reforms, the Beneficiary of which is the Ministry of Development;
- PROJECT should be understood as an investment task, in particular a Pilot Project (PP), for the implementation of which BIM documents created as part of the Project will be used;
- REQUIREMENTS should be understood as a set of Exchange Information Requirements developed for the PROJECT, in particular those developed on the basis of the "Exchange Information Requirements Template";
- A TEAM should be understood as a team of people cooperating with each other in order to implement the PROJECT, consisting of representatives of the Contracting Authority, the Contractor and - if necessary - its subcontractors.

Whenever the terms " must", " should", " shall", or similar are used in a document, they shall be regarded as identical and interpreted as an obligation of the Contractor.

Whenever the word "must be agreed" is used in the document, it means the need to obtain the approval of the Contracting Authority about the implementation of the described requirement and place this information in the BIM Execution Plan.

It is the Contracting Authority's responsibility to adapt the template to the needs of its PROJECT. The Contracting Authority is responsible for the content of the requirements contained in the document prepared based on the template.

[1] The term "universal" should be understood as meaning that these provisions should apply to most PROJECTS. Their use results from a specific PROJECT and should always be analyzed by the user of the template.

Exchange Information Requirements Template

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1 General information

1.1 PROJECT description

Table 1. PROJECT description

No.	Range	Information about the Project
1	**Contracting Authority**	Name Address Website E-mail Fax number Mobile phone number
2	**Investment**	Investment name Investment address
3	**Procedure number**	Procedure number
4	**Proceeding**	Limited tender / open tender / competition / other procedure specified in the PPL Act[2]
5	**Type of order**	☐ Services ☐ Works ☐ Deliveries
6	**Investment description**	Provide a short description of the investment, including: the subject of the contract, main stages, scope of work, etc.
7	**Date of publication of the notice**	For procedures financed from public funds, the date of publication of the notice should be specified, understood as the beginning of the time limits specified in the PPL Act. [2]
8	**Documentation of the procedure**	The location of the procedure documentation should be indicated (link to the procedure page, information necessary to log in to the Contracting Authority's purchasing platform, etc.)
...		

1.2 Terms and definitions

[1] The terms used in the REQUIREMENTS related to BIM should be understood as indicated in the "BIM Lexicon".

[2] The Contractor may / may not, as part of the development of the BIM Plan, propose changes or additions to the "BIM Lexicon provided with the REQUIREMENTS".

[3] Other requirements of the Contracting Authority in the scope of this chapter.

1.3 Objectives of the PROJECT

[4] As part of the PROJECT implementation, it is planned to achieve the goals presented in Table 2.

[5] The Contracting Authority indicated in Table 2 the methods that should be used by the Contractor in the implementation of the Project. The Contractor may/shall not propose alternative methods of achieving the indicated objectives under the "BIM Plan".

[2] Act of September 11, 2019 - Public Procurement Law (Journal of Laws of 2019, item 1843)

Table 2. Goals for the PROJECT and ways to achieve them

No.	Target	Way of implementation	Detailed requirements	Condition for achieving the goal
1				
2				
3				
…				

[6] Other requirements of the Contracting Authority in the scope of this chapter.

1.4 Norms, standards and regulations binding for the PROJECT

[7] The PROJECT will apply the standards and regulations presented in Table 3.

Table 3. Norms, standards and regulations binding for the PROJECT

No.	Document	Scope of application	Attachment number
1			
2			
3			
…			

[8] Other requirements of the Contracting Authority in the scope of this chapter.

2 Organizational requirements

2.1 Phases and stages of investment implementation

[9] As part of the PROJECT implementation, milestones are listed, which, along with the expected results, are indicated in the table below.

Table 4. General schedule of the PROJECT implementation

No.	Stage		Milestone number	The expected result
	Start date	End date		
1				
2				
3				
…				

[10] Products delivered under each of the milestones are specified in the chapters 2.2.1 and 2.2.2.

[11] The Contractor is obliged to agree with the Contracting Authority a detailed plan - PROJECT schedule, including the data delivery plan referred to in chapter 2.2.3 Provision of data.

[12] A mobilization phase is required before starting work on the PROJECT implementation.

[13] Completion of the mobilization stage depends on the fulfillment of the following assumptions:

a. Conducting all training necessary for the proper implementation of the PROJECT. Their scope is presented in section 2.7;

b. Tests of the ICT infrastructure were successful, ie it was confirmed that it meets the adopted assumptions;

c. The Contractor's supply chain ability to achieve the PROJECT objectives was confirmed;

d. BIM Plan approved.

[14] Other requirements of the Contracting Authority in the scope of this chapter.

2.2 Information management

2.2.1. Information creation method and procedure

[15] The Contracting Authority requires the delivery of the following information models in accordance with the standard indicated below.

Table 5. Standard for the delivery of information models

No.	Information model	Standard[1]
1	To be completed by the Contracting Authority	To be completed by the Contracting Authority
2	To be completed by the Contracting Authority	To be completed by the Contracting Authority
3	To be completed by the Contracting Authority	To be completed by the Contracting Authority
…		

[1] The type of development should be indicated: 2D, 3D, BIM, other (if appropriate)

[16] The technical documentation corresponding to the range of information models to be made as BIM models has to be sourced directly from the model. It is allowed to supplement the documentation in the non-modeled scope.

[17] The breakdown into information models is the main way to break down into information packets. The Contracting Authority allows / does not allow the change of the indicated division by the Contractor as part of the development of the "BIM Execution Plan".

[18] The Contractor in the "BIM Execution Plan" should define responsibilities for the production and delivery of each of the indicated information packages.

[19] The Contracting Authority requires spatial coordination of the information models developed as part of the TASK, in accordance with the requirements set out in chapter 3.3 Coordination.

[20] Other requirements of the Contracting Authority in the scope of this chapter.

2.2.2. PROJECT information standard

[21] The Contracting Authority requires the use of the structure of catalogs and folders presented in the appendix provided by the awarding entity / developed by the Contractor and agreed with the Contracting Authority.

[22] The Contracting Authority requires the use of the file naming convention presented in the appendix provided by the awarding entity / developed by the Contractor and agreed with the Contracting Authority.

[23] The Contracting Authority requires the use of the file naming convention presented in the appendix provided by the awarding entity / developed by the Contractor and agreed with the Contracting Authority.

[24] The Contracting Authority allows/does not allow changes in the adopted convention of designations.

[25] The following classifications are required to be used in the implementation of the PROJECT:

a. The name of the classification (1), the rules for its application are specified in the Annex number, reference to the content of the Exchange Information Requirements, etc.;

b. The name of the classification (2), the rules for its application are specified in the Annex number, reference to the content of the Exchange Information Requirements, etc.;

c. The name of the classification (n), the rules for its application are specified in the Annex number, reference to the content of the Exchange Information Requirements, etc.

[26] Other requirements of the Contracting Authority in the scope of this chapter.

2.2.3. Provision of data

[27] In the milestones set out in chapter 2.1 Phases and stages of investment implementation, the Contracting Authority requires the provision of data indicated in Table 6.

Table 6. Data provided in milestones

No.	Scope of data provided	Milestone				Notes
		1	2	3	n	
1		☐	☐	☐	☐	
2		☐	☐	☐	☐	
3		☐	☐	☐	☐	
…	…	☐	☐	☐	☐	

[28] The Contracting Authority requires cyclical provision of data indicated in Table 7. The indicated frequency may / may not be the subject of arrangements between the Contracting Authority and the Contractor.

Table 7. Cyclical data delivery

No.	Scope of data provided	Data delivery frequency	Notes
1			
2			
3			
…	…		

[29] The Contractor shall, in consultation with the Contracting Authority, develop a data delivery plan to be attached to the "BIM Execution Plan". The Contractor may / may not develop a data delivery plan in a form other than that presented in the "BIM Execution Plan Template".

[30] The Contracting Authority requires the development of a model production and delivery table as part of the "BIM Execution Plan", containing at least information about the models created, their content and accuracy. The Contractor may / may not provide this information in a form other than that presented in the "BIM Execution Plan Template"".

[31] The data provision plan will be reviewed and updated on a regular basis, e.g. periodically, at milestones, on specified dates (if known at the time the requirements are communicated to the Contractor).

[32] Other requirements of the Contracting Authority in the scope of this chapter.

2.2.4. CDE – work rules

[33] The primary means of information exchange and communication within the PROJECT is CDE.

[34] It is allowed to use other (conventional) methods of communication, e.g. e-mail, telephone, written form, provided that the results of the arrangements are made available to CDE.

[35] At least the following procedures should be followed in a CDE:

a. Procedure [1];

b. Procedure [2];

c. Procedure [n].

[36] The diagrams of procedures specified in requirement [35] will be prepared by the Contractor / specified in the appendix provided by the Contracting Authority.

[37] Other requirements of the Contracting Authority in the scope of this chapter.

2.3 Responsibilities of team members

[38] The Contractor will propose in the "BIM Execution Plan" assigning the roles and responsibilities of the TEAM members for the tasks indicated in the REQUIREMENTS, in particular in Table 8.

[39] The list of tasks presented in Table 8 should be completed by the Contractor in such a way as to take into account the agreed way of PROJECT implementation..

Table 8. Roles and responsibilities of the PROJECT team members - requirements

No.	Task	Role			
		[Role 1]	[Role 2]	[Role n]	…
1					
2					
3					
…					

The liability markings used::
[…] –…
[…] – …
[…] – …

[40] Other requirements of the Contracting Authority in the scope of this chapter.

2.4 Execution control

2.4.1. Quality assurance and control procedures

[41] "Reconciliation" means obtaining the approval of the Contracting Authority with regard to a given scope. Acceptance of the solution does not release the Contractor from responsibility for the correctness of the solutions adopted and their potential effects having a negative impact on the implementation of the PROJECT.

[42] The Contracting Authority requires active participation in the PROJECT implementation of the key personnel indicated in the procedure documentation.

[43] As part of the performance control, the Contracting Authority requires the Contractor to undertake the following activities, as described in these REQUIREMENTS:

a. Perform quality control procedures for reported work results;

b. Reporting on the results of the implemented implementation control procedures;

c. Organization of meetings;

d. Other activities indicated by the Contracting Authority and described further in REQUIREMENTS.

[44] The quality control procedures to be performed by the Contractor include in particular those indicated in Table 9.

Table 9. Requirements for quality control procedures

No.	Procedure	Frequency of implementation	Detailed requirements	Expected results
1				
2				
3				
…				

In the [Detailed requirements] and [Expected results] columns, the Contracting Authority should indicate the reference to specific provisions, specifying the rules for carrying out the indicated procedure.

[45] As part of the PROJECT implementation, the Contractor will verify the clashes at least to the extent presented in Table 10.

Table 10. Requirements for collision verification

	[Package 1]	[Package 2]	[Package 3]	[Package n]
[Package 1]	☐	☐	☐	☐
[Package 2]	☐	☐	☐	☐
[Package 3]	☐	☐	☐	☐
[Package n]	☐	☐	☐	☒

[46] The Contractor will indicate in the "BIM Plan" the tool that he will use to implement the collision verification procedure and describe the manner of implementing this procedure.

[47] Quality control procedures should be carried out in two stages:

a. Prior to data delivery - internally in the Contractor's team;

b. In the Contracting Authority’s team - after providing the data verified by the Contractor.

[48] The Contractor is responsible for providing data that meet the quality levels agreed in the "BIM Execution Plan".

[49] The collision verification should be confirmed by the preparation of an appropriate report, the template of which will be attached by the Contractor to the "BIM Plan”.

[50] Other requirements of the Contracting Authority in the scope of this chapter.

2.4.2. Meetings

[51] The Contracting Authority requires the Contractor to organize the meetings indicated in Table 11.

Table 11. Requirements for meetings

No.	Phase	Type of meeting	Objective	Frequency	Form	Participants
1						
2						
3						
…						

[52] The Contractor, as part of the "BIM Execution Plan" arrangements, may propose additional meetings.

[53] Other requirements of the Contracting Authority in the scope of this chapter.

2.4.3. Reporting

[54] The Contracting Authority requires reporting in the scope indicated in Table 12.

Table 12. Reporting requirements

No.	Phase	Type of study	Required content	Delivery frequency / times	Draws up
1					
2					
3					
...					

[55] Binding, i.e. reports / protocols / notes approved by the TEAM should be placed in CDE.

[56] Approval of studies indicated in Table 12 should be performed according to the following procedure:

a. Approval procedure - step [1];

b. Approval procedure - step [2];

c. Approval procedure - step [n].

[57] Other requirements of the Contracting Authority in the scope of this chapter.

2.5 Security

[58] The Contracting Authority requires the appointment of a person / within its team of a person responsible for CDE security management.

[59] The PROJECT requires compliance with the information security policy developed by the Contracting Authority / agreed with the Contracting Authority.

[60] Other requirements of the Contracting Authority in the scope of this chapter.

2.6 Risk management

[61] The Contracting Authority requires the development of a risk register for the PROJECT, which will be implemented under the implementation:

a. Conducted on an ongoing basis;

b. Supplemented when new risks are identified;

c. Periodically analyzed to ensure control over the impact of identified risks on the PROJECT implementation;

d. Updated on an ongoing basis in CDE.

[62] Other requirements of the Contracting Authority in the scope of this chapter.

2.7 Trainings

[63] The Contractor's task is to assign suitably qualified personnel to the PROJECT implementation. Any training, if required, will be organized by the Contractor at his own expense, considering the PROJECT implementation dates.

[64] The Contracting Authority / Contractor - depending on the scenario referred to in section 3.1.1, will organize training in the use of CDE.

[65] The Contracting Authority requires the Contractor to conduct the following trainings:

a. Training [1];

b. Training [2];

c. Training [n].

[66] Detailed training requirements are presented below.

Table 13. Training requirements to be completed by the Contracting Authority

No.	Scope of information	Description of the requirements
1	Subject	
2	Entity responsible	
3	Form	
4	Duration	
5	Number of participants	
6	Technical facilities	
7	Location	
8	Date	

The table should be repeated an appropriate number of times - depending on the number of training sessions.

[67] Other requirements of the Contracting Authority in the scope of this chapter.

2.8 „BIM Execution Plan”

[68] The Contractor is obliged to develop a "BIM Execution Plan" and agree it with the Contracting Authority as part of the mobilization / negotiation stage - depending on the selected form of the procedure.

[69] The Contracting Authority requires / does not require the use of the "BIM Execution Plan Template" provided with the documentation of the procedure.

[70] The Contracting Authority has the right to request the Contractor to make additions and explanations regarding the content of the "BIM Execution Plan”.

[71] The approval of the "BIM Execution Plan" must be confirmed by an appropriate protocol.

[72] The Contracting Authority allows for changes to the content of the agreed "BIM Execution Plan" in the situations specified in the Agreement.

[73] Other requirements of the Contracting Authority in the scope of this chapter.

3 Technical requirements

3.1 Software

3.1.1. CDE

[74] As part of the PROJECT implementation, the CDE function will be a solution provided by the Contracting Authority / Contractor.

[75] The Contracting Authority / Contractor / third party is responsible for data security in CDE - in accordance with the CDE delivery scenario adopted for the PROJECT.

[76] Other requirements of the Contracting Authority in the scope of this chapter.

3.1.2. Model production and management tools

[77] In order to develop information models, the Contractor should use the software indicated in Table 14.

Table 14. Requirements for the modeling software and the scope of its use

No.	Type of study	Software requirements	Scope of application[1]
1			
2			
3			
…			

[1] Contracting Authority should indicate the scope of information packages that it requires to be delivered in a specific format. In order to define this requirement, reference may be made to the information presented in Table 15.

[78] As part of the PROJECT, the Contractor is obliged to use BIM software that meets the following requirements:

a. Requirement [1];
b. Requirement [2];
c. Requirement [n].

[79] The scope of the documentation of information packets to be developed as BIM models is indicated in Table 5.

[80] It is not recommended to change the version or software during the PROJECT implementation. If such a change is necessary, the procedure specified in the requirement should be followed [81].

[81] Performing the software update (version change, installation of plugins, overlays, etc.) requires the following procedure:

a. Informing the TEAM members about the intention to update;
b. Obtaining approval for updating;
c. Backing up existing data;
d. Software update;
e. Data validation after updating;
f. Verification of the correctness of the other PROJECT procedures.

[82] Other requirements of the Contracting Authority in the scope of this chapter.

3.1.3. Other tools

[83] As part of the PROJECT implementation, the Contractor is obliged to use software, type of software [1] that meets the following requirements:

a. Requirement [1];
b. Requirement [2];
c. Requirement [n].

The above requirements should be specified for each software, the use of which is required by the Contracting Authority (i.e. duplicate the content of the requirement [83]).

[84] Other requirements of the Contracting Authority in the scope of this chapter.

3.2 Data

3.2.1. Data formats

[85] The Contracting Authority requires the data to be provided in the formats presented in Table 15.

Table 15. Required data formats

No.	Type of study	Data storage and sharing formats		
		[Format 1]	[Format 2]	[Format n]
1		☐	☐	☐
2		☐	☐	☐
3		☐	☐	☐
…		☐	☐	☐

[86] The Contractor may also provide data in formats other than those indicated in Table 15 after prior agreement with Contracting Authority

[87] Information on the data formats used in the implementation of the PROJECT will be provided by the Contractor in the "BIM Plan".

[88] Other requirements of the Contracting Authority in the scope of this chapter.

3.2.2. Units

[89] In the studies provided as part of the PROJECT implementation, the Contractor will use the units indicated in Table 16.

Table 16. Required data formats

No.	Measure	Unit		Accurancy
		Name	Shortcut	
1				
2				
3				
…				

[90] Other requirements of the Contracting Authority in the scope of this chapter.

3.3 Coordination

3.3.1. Geolocation

[91] The Contractor is obliged to embed the information models in the GUW[3] created by:

a. Plane rectangular coordinate system, e.g. PL-2000, PL-1992, PL-UTM, PL-LAEA, PL-LCC / or geodetic reference system, e.g. PL-ETRF2000, PL-ETRF89;

b. Altitude system to be completed by the Contracting Authority, e.g. PL-EVRF2007-NH.

[92] The coordinates and reference data for the UCS[4] agreed for the PROJECT, the Contractor will indicate in the BIM Plan.

[93] Once agreed, the coordinate systems should not be changed during the PROJECT implementation.

[94] Other requirements of the Contracting Authority in the scope of this chapter.

[3] The concept was described in the "BIM Lexicon".

[4] The concept was described in the "BIM Lexicon".

3.3.2. Spatial coordination

[95] The Contracting Authority requires providing spatially coordinated coordination models. By this it should be understood that the principles indicated in chapter 2.4.1. have been met.

[96] The Contracting Authority requires verification of the conflict in the scope indicated in Table 17.

Table 17. Requirements for collision verification

	[Package 1]	**[Package 2]**	**[Package 3]**	**…**
[Package 1]				…
[Package 2]				…
[Package 3]				…
…	…	…	…	…

[97] Other requirements of the Contracting Authority in the scope of this chapter.

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BIM Execution Plan Template

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Notes

This document is a part of the studies prepared under the project "Digitization of the construction planning in Poland" (hereinafter "Project"), implemented with the financial and substantive support of the European Union under the European Commission program for supporting structural reforms (DG Reform). The Project Beneficiary is the Ministry of Development.

The following documents were prepared as part of the project deliverable:

- ***"Management of the construction investment in the BIM methodology – BIM document templates"*** – a document describing the adopted assumptions and the most important information necessary for the correct interpretation of the template provisions);
- „***BIM Lexicon***" – a glossary of BIM-related terms used in BIM document templates;
- ***"Overview of the Exchange Information Requirements (EIR) Template"*** – a document containing an overview of the content presented in the "Exchange Information Requirements (EIR) Template" and guidelines for completing it;
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- ***"Model production and delivery table. Template, overview, example"*** – the template of the "Model production and delivery table" with an overview and an example
- ***"BIM Attachment to the Agreement"*** – template of the BIM attachment to construction works contracts regulating selected issues related to the application of BIM.

ALL OF THE ABOVE LISTED DOCUMENTS SHOULD BE READ TOGETHER.

The definitions contained in this document are to be understood as indicated in the "BIM Lexicon". Additionally:

- The project should be understood as a task entitled "Digitization of the construction planning in Poland", implemented with financial and technical support from the European Union as part of the European Commission program in the field of supporting structural reforms, the Beneficiary of which is the Ministry of Development;
- PROJECT should be understood as an investment task, in particular a Pilot Project (PP), for the implementation of which BIM documents created as part of the Project will be used;
- REQUIREMENTS should be understood as a set of BIM Requirements developed for the PROJECT, in particular those developed on the basis of the "BIM Requirements Template";
- A TEAM should be understood as a team of people cooperating with each other in order to implement the PROJECT, consisting of representatives of the contracting authority, the contractor and - if necessary - its subcontractors.

[1] The term "universal" should be understood as meaning that these provisions should apply to most PROJECTS. Their use results from a specific PROJECT and should always be analyzed by the user of the template.

BIM Execution Plan Template

PwC

1 General information

1.1 PROJECT description

Table 1. Basic information about the project

No.	Scope	Data
1	**Contracting authority**	Name Address Website address E-mail address Fax number Mobile phone number
2	**Investment**	Investment name Investment address
3	**Procedure number**	Procedure number
4	**Procedure**	Procedure
5	**Type of order**	☐ Services ☐ Works ☐ Deliveries
6	**Investment description**	Brief description of the investment including: the subject of the contract, main stages, scope of work, results of the MacroBIM phase, etc..
…	…	

[1] Other agreed BIM Execution Plan provisions within the scope of this chapter.

1.2 Terms and definitions

[2] As part of the PROJECT implementation in the field of BIM, the meaning of the terms was adopted, which is presented in the reference to the appropriate appendix to the BIM Execution Plan.

[3] Other agreed BIM Execution Plan provisions within the scope of this chapter.

1.3 Objectives of the PROJECT

[4] For the PROJECT, the implementation and the method of achieving the objectives are indicated in Table 2

Table 2. Goals for the PROJECT and ways to achieve them

No.	Goal	Way of implementation	Detailed description	Condition for achieving the goal
1				
2				
3				
…				

[5] Details on how to achieve the individual BIM objectives of the PROJECT are provided below.

Table 3. Implementation of the PROJECT goal no. 1

No.	Information	Description	Notes
1	The purpose of the PROJECT		
2	The method of achieving project goal		
3	Necessary procedure to achieve the project goal		
4	The frequency of the above-mentioned procedure		
5	Input data (required to perform the above-mentioned procedure)		
6	Output data (result of the above-mentioned procedure)		
7	Result		

The above table should be repeated several times appropriate for the PROJECT.

[6] Other agreed BIM Execution Plan provisions within the scope of this chapter.

1.4 Norms, standards and regulations binding for the PROJECT

[7] As part of the PROJECT implementation, the norms, standards and guidelines indicated in Table 4 were applied.

Table 4. Norms, standards and regulations adopted for use within the PROJECT

No.	Document	Scope of application	Attachment No.
1			
2			
3			
…			

[8] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2 Implementation of organisational requirements

2.1 Phases and stages of project implementation

[9] As part of the PROJECT implementation, milestones are listed, which, along with the expected results, are indicated in the table below.

Table 5. General schedule of the PROJECT implementation

No.	Stage	Start date	End date	Milestone number	The expected result
1					
2					
3					
…					

[10] Products delivered under each milestone are defined in Chapter 2.2.3.

[11] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.2 Information management

2.2.1 Information production method and procedure

Federation strategy

[12] The division into information packages used in the PROJECT is shown in Figure 1.

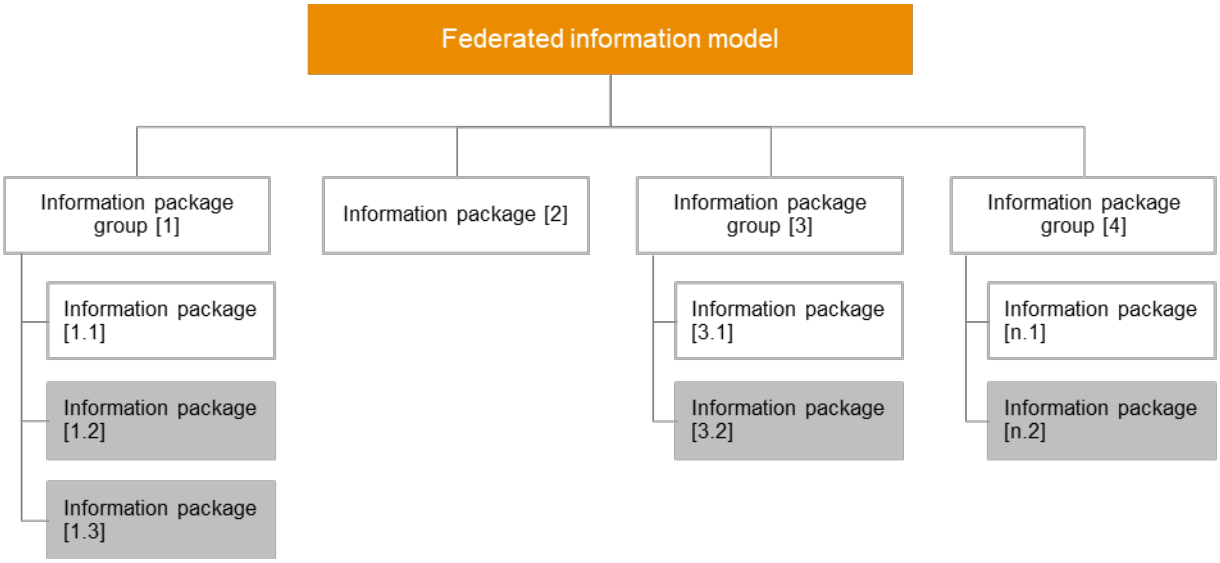

Figure 1. The division into information packages used in the PROJECT.
Legend: White background - package delivered as a BIM model; gray background - package delivered as 2D CAD.

[13] The content of individual information packages is presented in the model production and delivery table, which is attached as an attachment number to the BIM Execution Plan.

The template of the model production and delivery table with an overview and an example is attached as Appendix 6.

[14] The table also contains information on responsibility for information production and package marking.

[15] The symbols used are presented in chapter 2.2.2 of the Information Standard.

[16] Other agreed BIM Execution Plan provisions within the scope of this chapter.

Basic principles of developing information models

[17] All information models will be provided under the PROJECT implementation:

a. Maintain a consistent starting point (coordinates are specified in the chapter 3.3.1 Geolocation);

b. Oriented towards north.

[18] BIM models developed as part of the PROJECT will:

a. Keep a consistent structure with regard to the story of the object, and each component will be assigned to one story (in case the component will include more than one - to the lowest, on which it appears);

b. Maintain the agreed level of accuracy for the relevant phase and information package, both in terms of geometry and information content.

[19] BIM model components that have different properties specified in the requirements will be separate instances.

[20] The components of the BIM models will be correctly classified.

[21] Each component of the model will have properties resulting from the requirements specified in this document.

[22] BIM and 3D model objects will have a correct (in terms of geometric requirements) three-dimensional representation.

[23] The elements of the model will be named in accordance with the established convention indicated in the Annex no. reference to the Annex to the BIM Execution Plan.

The general principles of modeling are described, inter alia, in the study "Guideline for the implementation of BIM Execution Plans (BEP) and Exchange Information Requirements (EIR) on European level based on EN ISO 19650-1 and -2" published by the British Standard Institution in 2020. It is recommended to use them adequately to the PROJECT requirements.

[24] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.2.2 PROJECT information standard

Notation convention

[25] The convention of notations used in the PROJECT implementation is presented in Annex No. a reference to the appropriate annex to the BIM Execution Plan.

[26] Where a need for an extension, amendment or revision of a convention has been identified, the following procedure will apply:

a. Inform the person indicated in Table 9 about the need to make a correction in the applicable designation convention;

b. Development of a correction proposal in the adopted convention;

c. Analysis of changes resulting from the introduced adjustments;

d. Presenting to all TEAM members a proposed correction in the adopted convention;

e. Agree on corrections;

f. Approval of the corrections, changes or additions;

g. Publish a revision of the BIM Execution Plan to CDE and notify every one of the changes.

[27] Other agreed BIM Execution Plan provisions within the scope of this chapter.

Classifications

[28] Agreed provisions of the BIM Execution Plan within the scope of this chapter.

Level of information need (LOG/LOI)

[29] The levels of accuracy of individual elements of the models implemented as part of the PROJECT are indicated in the model production and delivery table, which is attached as Annex number to the BIM Execution Plan.

[30] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.2.3 Data provision

Table 6. Data provided in milestones

No.	Scope of data provided	Milestone				Notes
		1	2	3	n	
1		☐	☐	☐	☐	
2		☐	☐	☐	☐	
3		☐	☐	☐	☐	
…	…	☐	☐	☐	☐	

Table 7. Cyclical data delivery

No.	Scope of data provided	Data delivery frequency	Notes
1			
2			
3			
…	…		

[31] The data provision plan will be reviewed and updated with frequency, e.g. periodically, milestones, deadlines etc. - depending on the arrangements.

[32] The model production and delivery table constitute Annex no. reference to the Annex to the BIM Execution Plan.

[33] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.2.4 CDE – work rules

[34] CDE is the primary means of information exchange and communication within the PROJECT.

[35] It is allowed to use other (conventional) methods of communication, e.g. e-mail, telephone, written form, provided that the results of the arrangements are made available to CDE.

[36] At least the following procedures will be implemented at CDE:

a. Procedure [1];

b. Procedure [2];

c. Procedure [n].

[37] Diagrams for the implementation of the above procedures constitute attachments no. scope of attachments to the BIM Execution Plan.

[38] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.3 Responsibilities of team members

[39] A TEAM was assigned to implement the PROJECT, which is presented in Table 8.

Table 8. The PROJECT implementation TEAM

No.	Role	Data				
		Subject	Surname	Name	E-mail	Phone
1						
2						
3						
…						

[40] Responsibilities of individual members of the TEAM are presented in Table 9.

Table 9. Roles and responsibilities of the PROJECT team members

No.	Task	Role			
		Role 1	Role 2	Role n	…
1					
2					
3					
…					

Used markings:
[…] – …;
[…] – …;
[…] – ….

[41] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.4 Implementation control

[42] The following methods of implementation control will be used under the PROJECT:

a. Method of monitoring implementation [1];
b. Method of monitoring implementation [2];
c. Method of monitoring implementation [n].

As part of the BIM Execution Plan, describe in detail the implementation control methods used, providing the information indicated in the "Overview of the BIM Execution Plan Template".

[43] The following rules will be applied during work at CDE:

a. Principle [1] of working at CDE;
b. Principle [2] of working at CDE;
c. Principle [n] of working at CDE.

[44] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.5 Security

2.5.1 Digital security

[45] The person performing the CDE security management function is indicated in Table 9.

[46] The security policies adopted for the PROJECT were attached to the BIM Execution Plan (attachment number) / included in CDE.

[47] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.6 Risk management

[48] Under the management, the following activities will be undertaken:

a. Agreed action [1] to be taken by the TEAM;
b. Agreed action [2] to be taken by the TEAM;
c. Agreed action [3] to be taken by the TEAM.

Table 10. PROJECT risk register

No.	Risk	Impact on the PROJECT implementation[1]	Propability of occurence[2]	Risk mitigation methods
1				
2				
3				
…				

Legend:
[1] High/medium/low
[2] High/medium/low

[49] Other agreed BIM Execution Plan provisions within the scope of this chapter.

2.7 Trainings

2.7.1 Scope of training

[50] As part of the mobilization phase, the trainings indicated in the table below will be implemented.

Table 11. Information on trainings carried out as part of the mobilization stage

No.	Scope of training	Form	Duration	Term	Notes
1					
2					
3					
…					

[51] Other agreed BIM Execution Plan provisions within the scope of this chapter.

3 Implementation of technical requirements

3.1 Software

3.1.1 CDE

[52] The PROJECT will use a tool to be completed by the TEAM.

[53] The rules of working at CDE are described in chapter 2.4.

[54] Other agreed BIM Execution Plan provisions within the scope of this chapter.

3.1.2 Tools used for model production and management

Table 12. Software used within the PROJECT

No.	Type of software	Scope of application	The software used		
			Name	Version	Output formats
1					
2					
3					
…					

[55] Performing the software update (version change, installation of add-ons or patches, etc.) will be performed using the following procedure:

a. Obtain the consent of the person indicated in Table 9;

b. Back up existing data;

c. Verify the correctness of data after updating.

[56] Other agreed BIM Execution Plan provisions within the scope of this chapter.

3.1.3 Other tools

[57] Agreed provisions of the BIM Execution Plan within the scope of this chapter.

3.2 Data

3.2.1 Data formats

Table 13. Data formats used in the PROJECT

No.	Type of study	Data storage and sharing formats			
		Format [1]	Format [2]	Format [3]	…
1		☐	☐	☐	☐
2		☐	☐	☐	☐
3		☒	☐	☐	☐
…		☐	☐	☐	☐

[58] Other agreed BIM Execution Plan provisions within the scope of this chapter.

3.2.2 Units

Table 14. Data formats used in the PROJECT

No.	Measure	Unit		Accuracy
		Name	Shortcut	
1				
2				
3				
…				

[59] Other agreed BIM Execution Plan provisions within the scope of this chapter.

3.3 Coordination

3.3.1 Geolocation

[60] Global coordinate system data was determined using the:

a. Plane rectangular coordinate system, e.g. PL-2000, PL-1992, PL-UTM, PL-LAEA, PL-LCC / or geodetic reference system, e.g. PL-ETRF2000, PL -ETRF89;

b. Altitude system designation of the altitude system.

Table 15. PROJECT coordinate systems

No.	Coordinates	Reference system	
		Local	Global
1	Longitude		
2	Latitude		
3	Altitude		
4	North direction		

[61] Other agreed BIM Execution Plan provisions within the scope of this chapter.

3.3.2 Spatial coordination

[62] The software used for verification is indicated in chapter 3.1.2.

[63] As part of the PROJECT, the verifications indicated in Table 16.

Table 16. Collision verification - scope

No.	Type of coordination	Scope	Frequency
1			
2			
3			
…			

[64] The designations used are indicated in Table 17.

Table 17. Collision marking matrix

	[Range 1]	[Range 2]	[Range n]
[Range 1]			
[Range 2]			
[Range n]			

[65] As part of the PROJECT, the following procedure was adopted with regard to the detected collisions:

Table 18. Collision verification - an exemplary procedure

Verified ranges		Collision description	Action required
[Range 1]	[Range 2]		

[66] Other agreed BIM Execution Plan provisions within the scope of this chapter.

Digititalisation of the construction planning in Poland

Construction investment management in BIM methodology – BIM document templates

Model production and delivery table. Template, overview, example

August 2020

pwc

European Commission

MINISTERSTWO ROZWOJU

INTRODUCTION

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- **"BIM Attachment to the Agreement"** – template of the BIM attachment to construction works contracts regulating selected issues related to the application of BIM.

All of the above listed documents should be read together.

NOTES

This study consists of the following sheets::

INFO - this sheet, containing information about the Project and other BIM documents developed as part of its implementation,
MPDT. Template - containing a model production and delivery table template,
MPDT. Example - containing a fragment of the exemplary model production and delivery table,
MPDT. Overview - containing information on how to complete the model production and delivery table.

*The term "universal" should be understood as meaning that the proposed provisions should apply to most PROJECTS. Their use depends on the specific PROJECT and should always be analyzed by the template user.

Bibliography:

1. www.thenbs.com/knowledge/what-is-uniclass-2015 [access: July 2020]
2. Saleeb N., Marzouk M., Atteya U, *A comparative suitability study between classification systems for BIM in heritage* , International journal of sustainable development and planning, WIT Press, Canada, 2018

MODEL PRODUCTION AND DELIVERY TABLE. Template

							Stage														
							Data drop														
Information package		Model element	Classifiaction					LOG	LOI	RES	Date	LOG	LOI	RES	Date	LOG	LOI	RES	Date
Code	Name		Table	Group	Subgroup	Section	Object				[YYMMDD]				[YYMMDD]				[YYMMDD]

LEGEND:
LOG - as indicated in [BIM Lexicon]
LOI - as indicated in [BIM Lexicon]
RES - entity responsible for delivering a scope of works (designations according to the standard of communication)

MODEL PRODUCTION AND DELIVERY TABLE. Example

								Stage												
								Data drop												
Information package		Model element	Classification					LOG	LOI	RES	Date	LOG	LOI	RES	Date	LOG	LOI	RES	Date
Code	Name		Table	Group	Subgroup	Section	Object				[YYMMDD]				[YYMMDD]				[YYMMDD]
ARC	Architecture										210716								
		Wall	Ss	25	13	50	51	4	2	AR									
		Wooden window	Pr	30	59	98	96	3	3	AR									
		Aluminium window	Pr	30	59	98	2	3	3	AR									
		…																	
ARM	Small architecture										210716								
Scope of the model production and delivery task table		Bench	Pr	40	50	12	07	2	1	AR									
		Trash can	Pr	40	50	7	75	2	2	IS									
		…																	
IEN	Low voltage electrical installations										210716								
		Lighting fixture	Pr	70	70	48	62	2	2	IE									
		Cable ladder	Pr	65	70	11	14	1	2	IE									

LEGEND:
LOG - as indicated in [BIM Lexicon]
LOI - as indicated in [BIM Lexicon]
RES - entity responsible for delivering a scope of works (designations according to the standard of communication)

MODEL PRODUCTION AND DELIVERY TABLE. Overview

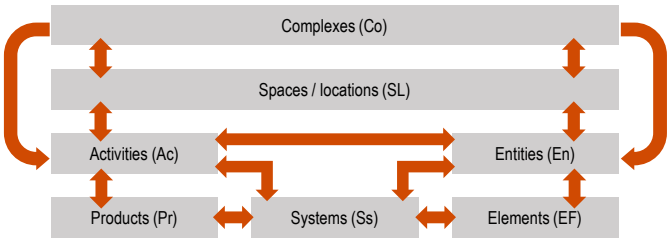
No.	Column	The scope of information	Primary source of information
1	[A]	Information package description code. The codes may be the same	Nomenclature standard for a PROJECT (PROJECT information standard)
2	[B]	Code name (this column is not mandatory, but may be useful if the coding convention is not persisted in the TEAM)	Nomenclature standard for a PROJECT (PROJECT information standard)
3	[C]	Types of components of an information package - their scope depends on the PROJECT (e.g. it results from its scope)	1.Scope of the PROJECT (description of the subject of the contract)
			2. REQUIREMENTS for the content of the information model
4	[D] – [H]	Components of the classification code for an element, according to the adopted scheme *	Classification requirements: subsection 2.2.2. of the REQUIREMENTS
5	[I], [M], [Q] …	Indication of the level of geometric accuracy of the element to be used in the design phase for the development of a building permit design	1. Subchapter 2.2 REQUIREMENTS (PROJECT information standard and the method and procedure for information creation)
			2. PROJECT objectives
			3. Phases and stages of project implementation
6	[J], [N], [R] …	Indication of the level of non-geometric accuracy of the element to be used in the design phase for the development of a building permit design	1. Subchapter 2.2 REQUIREMENTS (PROJECT information standard and the method and procedure for creating information)
			2. PROJECT objectives
			3. Phases and stages of project implementation
7	[K], [O], [S] …	The entity responsible for providing an information model. Designation (code) in accordance with the PROJECT naming code	1. Responsibilities of the TEAM members
			2. Standard of nomenclature for a PROJECT (PROJECT information standard)
			3. Phases and stages of project implementation
8	[L], [P], [T] …	Date of delivery of the of the information model	Phases and stages of project implementation

* In the above example, the markings in accordance with the Uniclass 2015 (British) classification are indicated. Different classifications may include different field names, as well as accuracy and associations. The Uniclass classification consists of:

- 12 tables:
  - Ac - activities - defines activities related to the design, construction, use or management of a building complex, facility or space
  - Co - complexes - describes the project in general terms, e.g. university campus with lecture, administrative, sports buildings, dormitories
  - EF - elements / functions - describes the main elements of the object (e.g. floors, walls, foundations) or the functions they fulfill (e.g. transport)
  - En - instances / entities / units - describes separate objects within the complexes, e.g. a lecture building
  - FI - form of information - describes the type of study, e.g. 3D model, photo, list
  - PM - project management - describes the elements / activities related to facility management in its life cycle
  - Pr - products - describes the elements of objects
  - Ro - role - describes the entities involved in the implementation of the investment
  - SL - spaces / locations - describes the purpose of a space in the facility, e.g. kitchen, toilet, office space, library
  - Ss - systems - describes groups of products, e.g. roof system, services
  - TE - tools and equipment - describes items of equipment, e.g. ladders, water heater
  - Zz - describes elements of 2D drawings, e.g. drawing frame, dimension, line
- Groups
- Subgroups
- Sections
- Object

} describe individual elements / objects / roles / functions etc. at an increasingly higher level of detail, while maintaining inheritance

The relationships between individual tables are presented in the graphic below [2].



Digitalisation of the construction planning in Poland

Construction investment management in BIM methodology – BIM document templates

BIM Attachment to the Agreement

August 2020

pwc

European Commission

MINISTERSTWO ROZWOJU

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Notes

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- ***"BIM Attachment to the Agreement"*** – template of the BIM attachment to construction works contracts regulating selected issues related to the application of BIM (**PRESENT DOCUMENT**);

ALL OF THE ABOVE LISTED DOCUMENTS SHOULD BE READ TOGETHER.

THE CLAUSES PROPOSED IN THE DOCUMENT **ARE OF EXEMPLARY NATURE** and non-exhaustive. Before including these provisions of the BIM Annex to the Agreement **IT IS NECESSARY EACH TIME TO ADJUST THE PRESENTED PROVISIONS TO THE INDIVIDUAL EXCHANGE INFORMATION REQUIREMENTS AND THE SUBJECT OF SPECIFIC INVESTMENT**.

IT IS RECOMMENDED TO INCLUDE THE CLAUSES, BOTH TO THE AGREEMENT CONCLUDED BETWEEN THE CONTRACTING AUTHORITY AND THE CONTRACTOR, AND TO THE AGREEMENT CONCLUDED BETWEEN THE CONTRACTOR AND SUB-CONTRACTORS.

One should bear in mind that the purpose for issuing the clauses is not the intervention in the manner of placing the legal relations between the parties taking part in the delivery of the of the investment with the use of BIM, but paying attention of the parties to the key legal aspects, which should be taken into account, joining the PROJECT.

The text written in orange font constitutes additional information which should not be included to the Agreement with the text of the attachment.

[1] The term "universal" should be understood as meaning that these provisions should apply to most PROJECTS. Their use results from a specific PROJECT and should always be analyzed by the user of the template.

BIM Attachment to the Agreement

PwC

1 General provisions

[1] This BIM attachment constitutes and integral part of the Agreement.

[2] In case of any differences or non-conformities in text of the provisions of the Agreement and the BIM attachment to the Agreement, the provisions of the Agreement are binding.

[3] Unless the Agreement states otherwise, for interpretation, the provisions placed on the list below have priority:

a. Agreement;
b. BIM Attachment to the Agreement;
c. Other attachments to the Agreement.

[4] Unless the Agreement states otherwise, in the BIM Attachment to the Agreement, one should understand the definitions as provided:

a. Information model – as the set of structurised and non-structurised information packages;
b. BIM Execution Plan – as the agreed document defining the method of delivery of the Exchange Information Requirements;
c. Exchange Information Requirements – document defining the information requirements towards the subject of the Agreement;
d. CDE – as the agreed source of digital information for the projected or existing, used for collecting, managing and dissemination of the information packages connected therewith in the process managed;
e. Information package – as a fixed set of the information possible to restore from the hierarchy level of storing the files, system or applications;
f. Asset – as the facilities which have the potential or actual value for the organisation, in particular a building object.

[5] The Contractor is responsible for the contents of the information models and correctness of the solutions presented therein.

[6] Information models constitute integral part of the project documentation and their transferring is conditions by making the final handover.

2 Rights and obligations of the parties

[7] The parties undertake for full cooperation and seek due diligence within all tasks necessary for the realization of the subject of the Agreement.

[8] The parties undertake to apply all provisions contained in the agreed BIM Execution Plan.

[9] The Contractor undertakes to assign appropriately qualified personnel for the performance of the Agreement and to exercise due diligence in meeting the Exchange Information Requirements.

[10] The Contractor states that he will perform the subject of the order with due diligence and in accordance with the Exchange Information Requirements.

[11] The entity making available CDE, defined in the specification of the conditions of the order:

a. bears liability for assuring availability and safety of data and information available and processed in CDE, in particular the protection against loss, damage or deformation of data in CDE and against access of unauthorized persons;

b. undertakes to grant the access to CDE for all persons indicated in the terms of reference or in BIM Execution Plan, with reservation adequate for the function held, agreed level of rights for the duration of the Agreement.

[12] The Parties do not bear liability for any non-conformity of digital data delivered in accordance with the specification of terms of reference and the provisions of the BIM Execution Plan and caused after delivery of the data to CDE.

[13] In case of justified doubt of the Contracting Authority towards correctness of performing the order, in particular the case of stating the non-conformity of data presented in the technical documentation and in the BIM model corresponding thereto, he may demand to have the evidence presented confirming correctness of the contract execution and if the evidence turns out insufficient – take steps defined in the Agreement.

[14] The Contractor not less frequently than in milestones defined in the terms of reference shall make the review of the BIM Execution Plan and – in case of stating such necessity – made proper updates in Agreement with the Contracting Authority. The introduced updates may not change the subject of the Agreement.

[15] Unless the Agreement states otherwise, the updating of the provisions of the BIM Execution Plan in the scope of: [scopes are of exemplary nature – the Contracting Authority should adjust them to the needs of the project realized]

a. Division of information model on information packages,

b. Convention of markings, referred to in chapter 2.2.2 of the BIM Execution Plan,

c. Model delivery and production table,

d. Persons from the staff indicated in chapter 2.3 of the BIM Execution Plan, if the change took place in accordance with the provisions of the Agreement,

e. Contact data of the persons from the staff indicated in chapter 2.3 of the BIM Plan,

f. Transfer of liability for the realization of the task connected with the realization of the Agreement onto another member of the same team (team of the Contractor and the team of the Contracting Authority),

g. The procedures implemented in CDE, if they do not affect the necessity to change CDE or extended its functionality,

h. Risk register,

i. Updating applied software to the newer version,

j. Obvious writing corrections,

does not constitute the change of the subject of the Agreement and the Contractor are not entitled to the right to change the remuneration and the dates defined in the Agreement.

3 Copyrights

[16] Information models and all documents developed on their basis constitute the works within the meaning of the Act of 4 February 1994 on copyrights and derivative rights and shall be subject to the provisions of the act.

[17] The Contractor states that he possesses property rights not encumbered with the rights of third persons and free from defects to the works used during the execution of the Agreement or obtains them until transfer of these works to the Contracting Authority.

[18] The Contractor upon obtaining the whole or part of the remuneration [to be specified in the main Agreement] within the frames of the realization of the Agreement shall transfer onto the Contracting Authority without limitations as to the time and territory and number of copies:

a. property copyrights to the works collected by the Contracting Authority and

b. right to perform the derivative rights covering the preparation, disposal and using and permitting to perform the derivative rights to prepare studies and processing of the works and disposal and usage of the studies of the processing of the work collected by the Contracting Authority.

The above provision should be specified or re-edited by the Contracting Authority depending on the established remuneration formula in the Agreement.

[19] The Contractor allows for the Contracting Authority to perform the personal rights to the works created during the execution of the order and undertakes to withhold from performing the personal copyrights of the creator, excluding: [the rights are of exemplary nature – the Contracting Authority should adjust them to the needs of the project realized]

a. Authorship of the work;

b. Marking the work with his surname or pseudonym;

c. Presenting the work on Internet;

d. Use of the work for didactic purposes,

whereas, the Contractor undertakes not to disclose the data covered with protection based on other provisions of the Agreement.

[20] The Contractor shall pass onto the Contracting Authority the rights referred to in [18] and allows for the Contracting Authority to perform rights, referred to in [19] in the following fields of exploitation: [fields of exploitation are of exemplary nature – the Contracting Authority should adjust them to the needs of the project]

a. Record the work in any media, including digital e.g. CD, DVD, pen drive, hard disc;

b. Multiply the work with any technique, including digital with the use of any media;

c. Introduce the work into the computer memory and computer networks, multimedia and communication, including to the Internet;

d. Make the work available to other entities cooperating with the Contracting Authority in the scope of managing the assets erected or installed based on the work;

e. Using the work for one's own purposes or third persons and making the work available to other entities cooperating with the Contracting Authority, especially in the use, reconstruction, extension, refurbishment or disassembly of the assets erected or installed based on the work;

f. Publicly make available, record, or present including in promotional, information and advertising materials, also via Internet.

[21] The Contracting Authority at the same time with acquiring the property copyrights to the works acquires the property to all copies, on which they were maintained.

[22] The Contracting Authority is entitled to, and the Contractor expresses the consent for transferring property copyrights acquired by the Contracting Authority onto third persons.

[23] The authorisation covering the performance of personal copyrights of the Contractor and the obligation of not performing personal copyrights granted both to the Contracting Authority and other entities using the work of the Contractor with the consent of the Contracting Authority.

4 Licenses

[24] In case of the work covered with the license the Contractor upon obtaining the whole or part of remuneration [to be specified in the main Agreement] within the execution of the Agreement provides the Contracting Authority with the non-exclusive license for using the work, with the right to grant the sub-license in the following fields of exploitation: [fields of exploitation are of exemplary nature – the Contracting Authority should adjust them to the needs of the project]

a. Maintain the work in any media, including digital e.g. CD, DVD, pen drive, hard disc;

b. Multiply the work with any technique, including digital with the use of any media;

c. Introduce the work into the computer memory and computer networks, multimedia and communication, including to the Internet

d. Introduce corrections or modifications covered with the license necessary for the proper usage, erecting, extending, repairing or disassembly of the assets erected on the basis of the work.

The provision above should be specified or re-edited by the Contracting Authority depending on the remuneration formula established in the Agreement.

[25] The Contracting Authority declares that it has a license to use the works that will be made available to the Contractor in order to perform the contract.

[26] The Contracting Authority upon transferring to the Contractor the work covered with license shall provide the Contractor with the non-exclusive license for using the works made available by the Contracting Authority for the execution of the subject of the Agreement in the following fields of exploitation: [fields of exploitation are of exemplary nature – the Contracting Authority should adjust them to the needs of the project]

a. Maintain the work in any media, including digital e.g. CD, DVD, pen drive, hard disc,

b. Multiply the work with any technique, including digital with the use of any media;

c. Introduce the work into the computer memory and computer networks, multimedia and communication, including to the Internet

d. Introduce necessary corrections or modifications for the proper execution of the work covered with license.

[27] The Contracting Authority grants to the Contractor the right to grant the sub-licenses to his subcontractors in the fields of exploitation defined in [26].

5 Data bases

[28] The Contractor within the remuneration shall provide the Contracting Authority with the consent for collection and secondary usage of the data bases developed as part of the Agreement, in particular for introducing significant changes to the data bases, as to the quality or quantity including its completion, change or removal its part, excluding public display.

[29] The Contractor within the remuneration shall provide the Contracting Authority with the consent for making available the data bases developed as part of the Agreement to third parties cooperating with the Contracting Authority in the scope of usage, reconstruction, extension, refurbishment or disassembly of the assets erected or installed on the basis of the data bases and grants them the consent for introducing significant changes in the data bases as to the quality and quantity including supplementing it, change or removal of its part, excluding its public display.

[30] The Contractor is not responsible for changes to the content of the database provided under the Agreement, introduced by third parties to whom the Contracting Authority has granted consent for the re-use of the database developed under the Agreement.

Bibliography

[1] *Building Information Modelling (BIM) Protocol Second Edition. Standard Protocol For Use In Projects Using Building Information Models,* Construction Industry Council, 2018.

[2] *Act of 4 February 1994 on copyrights and derivative rights, (J. of L. 1994 No 24 it. 83).*

[3] A. Croft, M. Winfield i S. Lewis, *Information protocol to support BS EN ISO 19650-2 the delivery phase of assets,* UK BIM Framework, Construction Industry Council, 2020.

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