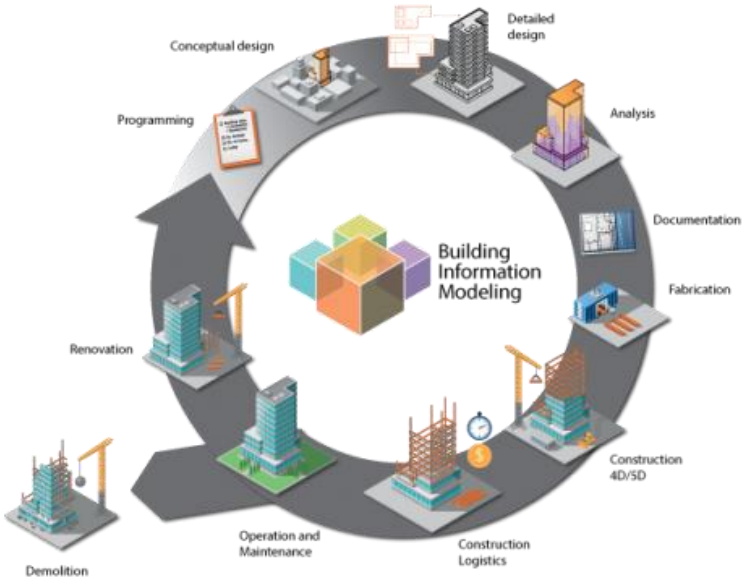
Task O2/A1.3

POLISH REGULATIONS REGARDING BIM TECHNOLOGIES IN CONSTRUCTION SECTOR

1. Introduction

BIM (Building Information Modeling) – „It is an intelligent 3D model-based process that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure" (Autodesk). BIM is some kind of technology which is used to generate and use data about the building. It is design, construction and operation during the full cycle of operation. This system allows all interested investment participants to have access to the same information, at the same time, through the interoperability of technology platforms. The main assumptions of BIM are presented in the figure below.



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Designing structures for many years has undergone various improvements, primarily through the development of tools and software. This is due to the development of digitization and technology. Improving computing equipment allows you to increase the accuracy of calculations and present results in a transparent and understandable way for recipients. With time, when it turned out that the consumers were getting better and more, as well as more and more demanding architectural visions, tools were created that could more easily visualize architectural thoughts and present them to customers. Originally, the aim was to create drawings more quickly and to operate them more easily. Everything was heading towards a change involving the creation of virtual models in 3D. The transition from presenting the project in 2D to 3D is considered a breakthrough because it was the beginning of creating software that not only allows for more precise presentation of ideas but also is the basis for a better understanding of industries and all participants in the construction process.

The core and main goal of BIM technology is the communication between the participants of the investment process and better understanding of the general design idea. The project at BIM introduces support in the form of various programs or reports facilitating and accelerating this interpretation as well as collecting and exchanging data by collaborating designers.

Architects as well as other participants of the investment process working on the 3D model are able to check virtually all the technical aspects of the planned implementation virtually before the heavy equipment starts work.
The greatest advantage of Building Information Modeling is the ease of making any changes. The virtual model in the computer is open to changes in various positions. It is easy to rotate the model, select any element and its correction. Any changes to the 2D documentation are extremely complicated, because you have to make sure that the change is made on each plan and cross-section so that the drawings are consistent with each other. Using BIM technology, due to the fact that each member of the investment and construction process is involved from the beginning, rather than one after the other, it is easy to make any changes with the certainty that the created project is consistent with each other.

2. POLISH regulation regarding BIM technologies in construction sector

One of the driving forces influencing initial changes in Polish legal regulations related to BIM is Directive of the European Parliament and of the Council 2014/24 / EU of 26 February 2014 on public procurement, repealing Directive 2004/18 / EC. In accordance with the provisions of this document the following element should be mentioned:

Article 22 Paragraph 4: 'With regard to public works contracts and design contests, Member States may require the use of specific electronic tools, such as electronic data modeling tools for construction data or the like. In such cases, contracting authorities must offer alternative means of access in accordance with paragraph 5 until such tools become publicly available within the meaning of paragraph the first sentence of the first subparagraph of paragraph 1. '

Article 90 Paragraph 1: 'Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by 18 April 2016. They shall forthwith communicate to the Commission the text of those provisions.'

The above statements were introduced to the Parliament Act of 22 June 2016 amending the Act - Public Procurement Law and certain other acts. - In accordance with Art. 1. In the Act of 29 January 2004 - Public Procurement Law (Journal of Laws of 2015, item 2164 and of 2016, item 831 and 996), as follows:

- Chapter 2a. Communication between the customer and contractors.

- Article 10e. In the case of works contracts or competitions, the contracting authority may require the use of electronic data modeling tools for construction data or similar tools. In this case, the contracting authority provides access to these tools in accordance with Article 10d until such tools become publicly available. "

- Art. 18. "In public procurement proceedings initiated and not completed before 18 October 2018, and in the case of proceedings conducted by the central contracting authority, before 18 April 2017: 3. in the case of works contracts or contests, the contracting authority may require the use of electronic data modelling tools for construction data or similar tools, if such tools are publicly available or the contracting authority provides alternative means of access to such tools; "

The following initiatives help Poland to form proper strategy of BIM implementation:

A) Cluster of Information Technology in Construction (BIM Klaster) is a network of cooperative relations, which was established on 02.04.2012, at the initiative of several companies from the Małopolska province. At present, BIM Klaster functions as an officially registered Association associating pro-innovative and highly specialized small and medium enterprises operating in the construction and ICT industries as well as public institutions from the business and scientific environment supporting entrepreneurship and innovation of the economy in Poland. Our main goal is to combine the potential and competences of companies and other entities that allow the implementation of any construction projects in the latest ICT technologies. The added value of a construction cluster is to inspire activities aimed at the full use of BIM technology in the entire investment process, from concept through execution to commissioning use, and even throughout the life cycle of the building.

B) BIM for Polish Construction. The Association brings together natural persons, organizational units without legal personality and legal persons interested in promoting and developing the application of BIM technology in Poland in the area of design, cost estimation, scheduling and implementation of public investments. Unit established in 2014.

C) The European Certification Center BIM (ECCBIM) Foundation is a platform that connects various environments interested in the effective implementation of BIM technology in our country as a tool significantly increasing the efficiency of public and private investments. A non-profit organization whose main purpose is to promote good practices, guarantee high quality of BIM services provided by Polish design and implementation companies, and to indicate to investors how to obtain maximum financial results from BIM.

D) V4 BIM Task Group is an international social initiative created in response to the provisions of the PEiR Directive 2014/24 / EU of 26/02/2014, it concentrates expert groups operating in the field of BIM technology. The activities of V4 BIM Task Group are focused on supporting the implementation of BIM technology in public procurement. The Group operates under an agreement between Polish institutions: SARP and PZITB as well as major engineering organizations of the Visegrad Group Countries

E) The systematization of works related to the implementation of BIM in Poland can be facilitated by the work of the Polish Committee for Standardization (PKN), which gradually circulates BIM-related standards. These include standards shown in the table Polish / English language tables at the next pages,

BIM related Polish standards:

	
PN-EN ISO 19650-1:2019-02 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. Dokument przedstawia wstępną ideę i zasady zarządzania informacjami odpowiadającymi stadium dojrzałości określanym jako „modelowanie informacji o budynku (BIM) zgodnie z ISO 19650”.	PN-EN ISO 19650-1:2019-02 Organization and digitization of building and building information, including building information modelling (BIM) - Information management through building information modelling - Part 1: Concepts and principles. The document presents the initial idea and principles of information management corresponding to the stage of maturity referred to as "building information modelling (BIM) in accordance with ISO 19650".
PN-EN ISO 19650-2:2019-01 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 Niniejszy dokument określa wymagania dla zarządzania informacją w formie procesu zarządzania, w kontekście realizacji projektu i j wymiany informacji w jej ramach, przy zastosowaniu BIM.	PN-EN ISO 19650-2: 2019-01 Organization and digitization of information on buildings and structures, including building information modelling (BIM) - Information management through building information modelling - Part 2: Project implementation This document defines the requirements for information management in the form of a management process in the context of project implementation and its exchange of information, using BIM.
PN-ISO 12006-2:2005 Budownictwo - Organizacja informacji związanej z robotami budowlanymi - Część 2: Schemat klasyfikacji informacji Określono schemat i zestaw zalecanych tytułów tablic bez precyzowania ich zawartości.	PN-ISO 12006-2: 2005 Construction - Organisation of information related to construction works - Part 2: Information classification scheme The scheme and set of recommended table titles were specified without specifying their content.

PN-EN ISO 12006-3:2016-12 Budownictwo - Organizacja informacji o obiekcie budowlanym - Część 3: Schemat danych obiektowo-zorientowanych Norma określa model informacji niezależnej od języka, która może być wykorzystywana do opracowywania słowników do przechowywania lub dostarczania danych na temat obiektu budowlanego.	PN-EN ISO 12006-3: 2016-12 Construction - Organization of object information - Part 3: Object-oriented data flowchart The standard specifies a language-independent information model that can be used to develop dictionaries for storing or providing data on a building.
PN-EN ISO 16739:2016-12 Industry Foundation Classes (IFC) do wymiany danych w budownictwie i zarządzania obiektami Niniejsza Norma Międzynarodowa określa schemat koncepcyjny danych i format pliku wymiany danych dla technologii BIM (modelowaniu informacji o obiekcie budowlanym).	PN-EN ISO 16739: 2016-12 Industry Foundation Classes (IFC) for data exchange in construction and facility management This International Standard specifies the conceptual data schema and the data exchange file format for BIM technology (modelling information about a building object).
PN-EN ISO 16757-1:2019-07 Struktury danych do elektronicznych katalogów wyrobów dla systemów instalacyjnych budynku -Część 1: Koncepcje, architektura i model Podstawowym celem ISO 16757 jest dostarczanie struktur danych do elektronicznych katalogów wyrobów, aby automatycznie przesyłać dane o wyrobach budowlanych do modeli aplikacji systemów instalacji budynku.	PN-EN ISO 16757-1: 2019-07 Data structures for electronic product catalogues for building installation systems - Part 1: Concepts, architecture and model The primary goal of ISO 16757 is to provide data structures for electronic product catalogues to automatically send data on construction products to building application system models.
PN-EN ISO 16757-2:2019-07 Struktury danych do elektronicznych katalogów wyrobów dla systemów instalacyjnych budynku - Część 2: Geometria Norma opisuje modelowanie geometrii wyrobów do systemów instalacji budynku.	PN-EN ISO 16757-2: 2019-07 Data structures for electronic product catalogues for building installation systems - Part 2: Geometry The standard describes modelling of product geometry for building installation systems.

PN-EN ISO 29481-1:2017-11 Modele informacji o budynku, podręcznik dostarczania danych -Część 1: Metodologia i format Norma określa metodologię, która łączy działania podejmowanie w procesie budowy obiektów (budowlanych) ze specyfikacją informacji wymaganych przez te procesy, i sposób tworzenia informacji niezbędnych w całym cyklu życia obiektu budowlanego.	PN-EN ISO 29481-1: 2017-11 Building information models, data delivery manual - Part 1: Methodology and format The standard defines a methodology that combines actions taken in the construction process of (construction) facilities with the specification of information required by these processes, and way of creating information necessary throughout the life cycle of the building.
PN-EN ISO 29481-2:2016-12 Modele informacji o budynku -- Podręcznik dostarczania danych -- Część 2: Schemat współdziałania Norma określa metodologię i formę określania „działań koordynacyjnych” pomiędzy wykonawcami zaangażowanymi w wykonanie projektu budowlanego na wszystkich etapach jego realizacji.	PN-EN ISO 29481-2: 2016-12 Building information models - Data delivery manual - Part 2: Interoperability scheme The standard specifies the methodology and form of determining "coordination activities" between contractors involved in the execution of the construction project at all stages of its implementation.
PN-EN 15804+A1:2014-04 Zrównoważoność obiektów budowlanych -- Deklaracje środowiskowe wyrobu -- Podstawowe zasady kategoryzacji wyrobów budowlanych W niniejszej Normie Europejskiej podano podstawowe zasady kategoryzacji wyrobów (PCR) do deklaracji środowiskowych III typu dla każdego wyrobu i usługi budowlanej.	PN-EN 15804 + A1: 2014-04 Sustainability of construction objects - Environmental product declarations - Basic rules for the categorization of construction products This European Standard provides the basic principles of product categorization (PCR) for type III environmental declarations for each product and construction service.
PN-EN 15942:2012 Zrównoważone obiekty budowlane -- Środowiskowe deklaracje wyrobu -- Format komunikatu: biznes-biznes Stosuje się do wszystkich wyrobów budowlanych, procesów i usług. Zdefiniowano i opisano format komunikatu dotyczącego informacji.	PN-EN 15942: 2012 Sustainable construction works - Environmental product declarations - Message format: business-to-business Applies to all construction products, processes and services. The format of the information message has been defined and described.
PN-EN ISO 13567-1:2017-11 Dokumentacja techniczna wyrobu -- Organizacja i nazewnictwo warstw w programach CAD -- Część 1: Zasady ogólne Dokument ustala ogólne zasady struktury warstw w plikach CAD. Warstwy umożliwiają kontrolę przejrzystości oraz zarządzania i przekazywania danych pliku CAD. Nazwy warstw służą do prezentacji ich struktury.	PN-EN ISO 13567-1: 2017-11 Product technical documentation - Organization and naming of layers in CAD programs - Part 1: General principles The document sets out the general principles of layer structure in CAD files. Layers allow you to control transparency as well as manage and transfer CAD data. Layer names are used to present their structure.

PN-EN ISO 13567-2:2017-12 Dokumentacja techniczna wyrobu -- Organizacja i nazewnictwo warstw w programach CAD -- Część 2: Pojęcia, format oraz kody stosowane w dokumentacji budowlanej Niniejszy dokument podaje organizację i rozmieszczenie warstw w CAD na rysunkach budowlanych w celu informacji i zarządzania plikami.	PN-EN ISO 13567-2: 2017-12 Product technical documentation - Organization and naming of layers in CAD programs - Part 2: Terms, format and codes used in construction documentation This document provides organization and placement of layers in CAD in construction drawings for information and file management.

On 1 March 2018, the Polish Association of Construction Employers, together with the Polish Association of Construction Engineers and Technicians, took the initiative to implement the "BIM Standard PL" project. Work on the "BIM Standard PL" project has already begun and its implementation was planned for 2019. Project initiators hope that this project, which is important for the construction sector, will gain broad support from the industry. The consequence of changes and development is the continuous improvement of IT solutions that allow grouping, processing and sharing of investment data.

There is a need to establish and develop relations with investors, subcontractors and suppliers as it is necessary to proceed with the development of BIM standards for the needs of construction projects implemented in Poland under public procurement.

Everyone involved in the construction industry is aware that newly implemented projects have ever shorter deadlines, are more and more complex and multidimensional, and include many industries and ranges, often strongly interfering with existing buildings and infrastructure, causing the need to rebuild or adapt. If we take into account shorter deadlines, lack of employees on construction sites, rising prices of building materials and numerous difficulties related to risk estimation - all this suggests that the systematic unification of communication between participants of the investment process must be implemented as soon as possible.

This is a big step to implement BIM technology in Poland. Initially, the implementation will take place in the largest construction companies, which is honestly expressed by the participants of the March meeting, but soon and the smaller ones will use BIM technology.

3. Conclusion

A lot is discussed about the advantages of using BIM technology, however, statistics show that it is not obvious for everyone to use these techniques. There are many reasons why BIM is not used, especially for contractors. There will be a lot of entrepreneurs who do not want to use this technology. It seems that BIM is rather for large companies. The costs of implementing BIM are very high, which is why many small enterprises are rather against the implementation of BIM.

The main obstacles to using BIM are:

1. **Experience -** BIM is usually considered a rather difficult process and requires gentleness in the bypass. A few years ago, it was something new and it was not easy to implement it. At present, after the passage of time, theoretically it should not be a problem for most engineers. Unfortunately, lack of experience, experience and above all knowledge about the BIM process are still one of the biggest obstacles to its implementation. Education is now the basis, but without willingness to change, even it will not solve the problem. Despite the lack of experience in the field of intelligent design, now is the perfect time for all kinds of training. BIM is just developing, employment in technology-related positions is increasing, and experienced specialists can teach those less polished with the subject. Smaller companies may be more flexible in responding to BIM by using their advantage, for example lower costs incurred for training and courses.

2. **Reluctance to change** - especially older engineers still not open enough for the changes we notice around them. In the meantime, a more thorough observation of the environment is enough, and we will immediately see this revolutionary transformation that has long since begun and, if not wanting, is inevitable. The BIM revolution is not a fast process. It can be rather compared to the slow coup made by computer software on good old drawing boards. At the moment, exactly the same happens, only with the participation of other curious people. For the full implementation of BIM in our country, a drastic change in our awareness is necessary, extending the field of view of engineers to things that have never been seen before. An open mind culture and a departure from the usual patterns are required. It is visible that quite a liberal way of acting among many designers, managers and construction managers.

3. **Information management problem** - Another challenge that companies have to face is the management and handling of information contained in models that are the essence of classifying the 3D development as BIM. An important role here is played by network integration, i.e. work and cooperation between the uses of the process, which contributes to better results and more efficient work. The company implementing BIM must ensure that all suppliers and subcontractors will follow the same path. Their involvement in the process and correct implementation of technology will lead to more information being managed over time. Interestingly - the mapping and management of all resources is done here in a very similar, traditional way. New legal and design processes must be in place. It happens that the company is forced to choose an experienced partner who will support it with its proficiency, knowledge, experience and all necessary resources. Therefore, you must reject any signs of chaos and start managing information and data in a more orderly way.

4. **Bigger costs** - It can not be denied that the process includes significant expenses for software, training and time devoted to the implementation of technology. The fact is, however, that all expenses must be combined with the potential benefits that BIM can bring

in the future. Companies that have implemented intelligent modeling technology often claim that the effects were better than they expected before its implementation. Another blockade in the process of switching to BIM is the price of software and its incompatibility with traditional 2D software. Managers or managers often face numerous challenges in the form of errors and bad, inaccurate modeling procedures, which is the result of lack of experience in 3D design. In addition, when a company implements its BIM structures, it must radically change the work process. The company must fully adapt to the so-called "value chain". Introducing the necessary modifications, implementing new technologies and implementing BIM will always generate additional costs, but you should look at it from the perspective of potential long-term benefits that will undoubtedly come with modernization.

5. **Big companies lead the way** - Over three-quarters of small companies (employing ten or fewer employees) declare that BIM is unprofitable for them and therefore they do not apply it. While government agencies are struggling with the implementation of BIM throughout the country, smaller enterprises are not open to such changes. The smaller the company, the lower the demand for the widespread introduction of BIM to public procurement. And so, the circle closes. Design offices and contractors feel that BIM simply does not apply to them or will not be sufficiently effective in their work. They also justify their reluctance that projects are not complex enough to use such innovative solutions. The truth, however, is that anyone, even an internal, local project can be made using information modeling processes. In contrast to the general view, BIM can be used in projects of any size - starting from those with the least complexity and ending with those that can not be covered by a small team. The technological change in the AEC industry and the transition from traditional design processes to BIM modeling is inevitable and will sooner or later hit us with all its strength. One should not ask here whether we will be prepared for it, but do we really want this evolution to embrace our working environment as well? Everything is a matter of an appropriate approach and analysis of long-term benefits.

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