

Quick guide to implement the
EU BIM standardisation on infrastructure and construction projects

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EU has been working to create an international standardization of digital cooperation on infrastructure and construction projects. EU BIM Task Group¹ published in July 2017 the *Handbook for the introduction of Building Information Modelling by the European Public Sector*. Part of this work is now embarking as the upcoming ISO/CEN standards like 19650-2² that might replace current national information and communications technology (ICT) regulations.

The client should

1. start by setting a clear goal for the digital collaboration on the project
2. develop a strategy for the use of BIM on the project and formulates how the overall objective and intermediate objectives can be achieved and what competencies should be brought to bear on the project
3. require the overall framework for digital collaboration requires that all parties must ensure that their digital production can be used by and together with other stakeholders in the project
4. require that the collaboration shall at a minimum take place around an open industry standard as IFC and that the building models must be available in the IFC-format for all participants throughout the project from concept to operation. The goal is that the digital collaboration shall provide the client with a good basis for decision-making in terms of execution time, total cost of ownership and subsequent operation and maintenance
5. involve the contractor as early as possible in order to realize the project. The first focus must be on the choice of solutions and 4D production planning that enhances project efficiency and reduces execution time
6. require that the parties on the project can document their Competencies and abilities to fulfil the roles of the digital cooperation
7. require that the all the requirements are contained by the project's BIM Execution Plan (BEP).

Comparing the new international standardization of digital cooperation on infrastructure and construction projects with focus on:

- Roles and responsibilities
- Requirements in relation to digital cooperation
- Competencies and abilities to fulfil the roles of the digital cooperation
- The BIM Execution Plan (BEP)
- Open IFC format

¹ <http://www.eubim.eu/>

² *Organization of information about construction works - Information management using building information modelling, 2018*

- Object oriented design
- Quality and information management
- Managing the digital basis,

with the Danish ICT-regulations from 2013 and MT Højgaards analyses of the subsequent digital practice, shows how to implement the EU BIM standardization on infrastructure and construction projects.

The client should start by setting a clear goal for the digital collaboration on the project, which could also contribute to increased productivity similarly as described in the book *A practical guide to BIM in construction and infrastructure projects*, October 2016:

"For cooperation on the project's BIM to add most value to the project participants, it is necessary to define the objective for the use of BIM on the project. This will ensure a common effort and alignment of expectations about common objectives that support the client's goals as well as achievement of the objectives of the individual project participants".

We recommend that the client first develops a strategy for the use of BIM on the project and formulates how the overall objective and intermediate objectives can be achieved and what competencies should be brought to bear on the project. To begin with, it requires an identification of the objectives, e.g.:

- Effective operation based on early clarification of subsequent operation and maintenance aspects, involving the operating organisation
- Effective construction process with a focus on reducing rework and idle time, involving the workers.

The competencies and resources must be able to handle more than one important element in the digital project and the standard processes, also imply requirements for resources and competencies, e.g.:

- BIM Execution Plan as a framework for the cooperation
- Design quality
- BIM-coordination and ICT-management.

The white paper *Closing the gap with VDC and early involvement* shows that BEPs often do not provide the data required by the contractors on projects, where the contractors are not involved from the outset. In order to address this problem the client can require that:

- The overall framework for digital collaboration requires that all parties must ensure that their digital production can be used by and together with other stakeholders in the project
- The collaboration shall at a minimum take place around an open industry standard as IFC. The goal is that the digital collaboration shall provide the client with a good basis for decision-making in terms of execution time, total cost of ownership and subsequent operation and maintenance
- The contractor must be involved as early as possible in order to realize the project. The first focus must be on the choice of solutions and 4D production planning that enhances project efficiency and reduces execution time.

The client that translates these recommendations to the requirements contained by the project's BEP will ensure a framework for collaboration where the projects profitability is increasing and the stakeholder's exposure to risks and conflicts is reduced.

Zero clashes in the 3D design are not the goal to be focused on by the industry parties to begin with. However, zero critical clashes in the 3D design are both a reasonable and realistic goal and imperative for an efficient digital collaboration.

The client should explicitly require, like the current Danish ICT regulations 118 and 119, that building models must be available in the IFC-format for all participants throughout the project from concept to operation. The use of the IFC format improves the quality of the 3D design – *"The results show a 33% increase in the quality of the design material when projects include IFC as a part of the design material"*.

The use of international standards like COBie offers great benefits for the digital collaboration and enables among others an import of information about building components for O&M systems. It requires a certain degree of standardization in addition to the requirements for use of IFC, for example, requirements for classification and cooperation on IFC. In general any BIM object can become a container for information intended for different purposes and created by different stakeholders. Taking the fragmented supply chain of a construction project into consideration it is known that the actors, contributing with information about specific objects in the BIM, deliver continuously during the project. These elements imply a certain level of complexity in the discipline of information management and increase the need for classification as standard practice in the industry.

The analyses indicate that design documents produced in 3D are of better quality and create the best conditions for subsequent activities. The white paper entitled *The Quality of Design Material in Denmark* from April 2014 showed *"that it is right to demand and focus particularly on ICT coordination to ensure a well-coordinated and strong design material"*. *One of the things that was emphasised was that the use of Building Information Modelling (BIM) "enhances the possibility of coordinating design material prepared by different disciplines by testing the discipline models against each other and identifying defects and deficiencies in coordination. This can form a platform for better execution of the project which will contain fewer errors in case of coordination failures, miscommunication, ambiguities etc"*.

There is a great potential in working with the quality of the 3D design provided to the contractors on a project - the white paper entitled *The Quality of Design Material in Denmark* showed that *"in 56% of all projects internal collision and clash detection reveals material deficiencies that require additional coordination and planning of the design material. Moreover, the analysis shows that in 67% of all cases, collision and clash detection performed when the discipline models are compounded also gives rise to additional coordination and planning of the design material"*.

Critical clashes in the 3D design can be uncovered systematically and handled in the interdisciplinary clash detection and coordination using analysis tools such as Autodesk Navisworks and Solibri Model Checker. It means that approaches to improving the quality of the 3D design can become concrete and measurable, see Appendix B providing an example of benchmarking of e.g. critical clashes in the 3D design of the discipline models (Internal Clash Detection) and the interdisciplinary clash detection (Interdisciplinary Clash Detection).

Benchmarking on critical clashes gives the project parties a real opportunity to show and follow up on the quality of the digital deliverables from all parties. In that way, the industry can achieve a new good practice that drives up productivity when rework, wait times, etc. on site are limited.

Another new element is managing the digital basis, here the new standards set up a framework for how to collaborate on the digital project and how to exchange information during the design and construction process, Common Data Environment (CDE).

References:

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- White paper entitled *EU BIM standardisation on infrastructure and construction projects*, June 2018
- White paper entitled *Critical clashes in the 3D design*, February 2017
- White paper entitled *Efficient digital delivery of construction projects with COBie*, August 2016
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- White paper entitled *Closing the gap with VDC and early involvement*, March 2016
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