



TOWARDS DESIGN AND DEVELOPMENT OF A BIM-BASED 3D PROPERTY FORMATION PROCESS

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CURRENT PROPERTY FORMATION PROCESSES IN SWEDEN



Current process of Swedish 3D real property formation (Andrée et al., 2018).



The framework for integrating 3D cadastre with BIM and GIS (Sun et al., 2019).





BUILDING INFORMATION MODELLING – BIM

- BIM is a digital representation of buildings and building components in the lifecycle phases
- Support and improve various business practices for different actors
- Mostly used as physical models to integrate with cadastre
- Not only a model or tool, but also a process and technology



BIM STANDARDS – IFC

Industry Foundation Classes – IFC

- International open standard for the building industry worldwide
- Capable to represent legal spaces and real property boundaries in physical model



Open BIM standards: IFD, IFC, IDM (buildingSMART, 2019)





BIM STANDARDS – IDM

Information Delivery Manual – IDM

To capture and specify processes and information flow during the lifecycle of a facility by bringing many different stakeholders together in a project-specific organization.

- Clarify detailed process
- Help all actors' communication
- Harmonize different product data models delivered and stored
- Identify the results of that activity
- Improve the management more efficiently and collaboratively





BIM STANDARDS – LOIN

Level of Information Need – LOIN

- Level of Detail (LoD) + Level of Information (LoI)
- Define the characteristics of the exchanged objects both as the requirements and the realized exchanged information
- Specify the granularity of information exchanged in terms of *geometrical information*, *alphanumerical information*, and *documentation*
- Provide methods for describing information to be shared according to exchange information requirements of IFC models between actors



Characteristics of the exchanged object (CEN-CENELEC, 2019)





METHODOLOGY

> Purpose

To facilitate a standardized and unambiguous digital 3D property formation procedure on a national level in order to improve and enhance digital Swedish Cadastral and Land Administration Systems

Proposed methodology

- Lifecycle 3D property formation process based on BIM
- Describe the cadastral data exchange and sharing in the process by an IDM process map
- Illustrates the tasks and activities of different actors during the 3D property formation process





- <u>Purposes</u>: the use of the cadastral information • to be delivered in BIM models
- Information delivery milestones: geometrical • information, alphanumerical information, and documentation
- Actors: who are going to request and who are ۲ going to deliver the information during the 3D property formation process
- Objects: organized in one or more breakdown structures, for example IFC_Space

LOIN for



The five phases in the 3D real property formation process

BIM/IFC for Models





IDM PROCESS OF 3D PROPERTY FORMATION IN SWEDEN







IDM PROCESS OF 3D PROPERTY FORMATION IN SWEDEN

- Phases: initiation, preparation, decision, registration, update
- Actors: applicant, the cadastral authority, local municipality, cadastral surveyors, land and environment court.
- Tasks: basic activities through different actors
- Data exchange: input data and output data



INITIATION PHASE

- **Tasks:** Prepare → Submit
- Actors: Applicant
- Data: BIM/IFC models, 3D geodata, CAD Proposed property formation model

		Initiation	
	Applicant	Start Prepare application with 3D models	F
	The Cadastral Authority		
on Procedure	Cadastral Surveyor		
3D Property Formati	Land and Environment Court		
	Local Municipality		
	ata exchange and store	BIM/IFC 3D CAD Model Geodata	

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PREPARATION PHASE

- Tasks: Check → Assign → Inspection → Review
 → Meeting → Design → Report →
 Preliminary registration
- Actors: Applicant, Cadastral authority, Cadastral surveyors, Local municipalities
- Data: Architectural plans, Cadastral map 3D property formation models, drawing appendices





DECISION PHASE

• Tasks: Settle → Conclude → Make decision → Inform

→ Appeal

- Actors: Applicant, Cadastral surveyors, Local municipality, Land and Environment Court
- Data: 3D cadastral dossiers





REGISTRATION PHASE

- **Tasks:** Finalize → Generate → Update
- Actors: Applicant, Cadastral surveyors
- Data: Formal property documents, 3D cadastral index map, the updated register model

UPDATE PHASE

- Tasks: Update
- Actors: Cadastral authority
- Data: Updated 3D city model







CONCLUSIONS

> Conclusions

- Aiming to facilitate a standardized and unambiguous 3D formation process and enhance a holistic cadastral management in 3D for sustainable development in economic, social and environmental aspects.
- Presented a BIM-based methodology for 3D property formation process
- Designed an IDM process map including five actors and data exchange flow

Further research

- Investigate detailed exchange requirements of 3D property formation by using LOIN standards in the IFC models
- Implement practical case study





Thank you for your attention!

Questions???

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