Consultative stakeholder meeting
October 23, 2019
Tallinn, Estonia

Introducing a Building Information Model (BIM)-based process for building permits in Estonia

see it. get it. do it.

Funded by the Structural Reform Support Programme of the European Union and implemented by Future Insight Group B.V. in cooperation with the European Commission’s Structural Reform Support Service (SRSS).

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### Introductions

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<th>Organization</th>
<th>Attendees</th>
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<tr>
<td>Ministry of Economic Affairs</td>
<td>- Jaan Saar</td>
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<tr>
<td>and Communications</td>
<td>- Taavi Jakobson</td>
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<td>SRSS</td>
<td>- Michela Foresti</td>
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<td>Future Insight</td>
<td>- Rick Klooster</td>
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<td></td>
<td>- Judith van Deth</td>
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<td>- Léon van Berlo</td>
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<td>- Stephan Meijer</td>
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**Meet other attendees**
Program

- Project so far
- Proof of concept
- Recommendations
- Mockups UX
- Next steps/implementation
- Questions
This project is part of the e-construction platform vision with interdependent links to other ongoing and planned developments.
easy and lossless exchange of standardized and trustworthy data between all stakeholders throughout the building lifecycle

Development and implementation of Unified Construction Classification System

E-construction website

3D digital twin Phase I

Developing standards and norms

Regulatory and legal analysis

Data/Services analysis

Subsurface data analysis

Subsurface 3D database MVP development

Developing standards and norms

E-construction platform & 3D twin MVP development

BIM-based permit process Phase I, analysis and POC

Development and implementation of BIM-based building permit processes in EHR

Development and implementation of new EHR processes

EHR conversion to micro-service architecture

EHR base services upgrade analysis

Redesign of EHR interface and processes

Subsurface 3D database MVP development

E-construction website

Development and implementation of new EHR processes

BIM-based building permit process from January 1st 2021

MoEAC e-construction detailed roadmap 08-2019
1st Consultative stakeholder meeting 11-07-19

- Highlights technical report & meeting
- High level BIM expertise in Estonia
- Increase transparency
- Include area checks (e.g. detailed plans)
- Speed up permit process
- Minimize extra requirements
- Rule-based vs Algorithm-based

Project so far
Proof of Concept

- The starting points
- The interface
- The checks
- Recommendations
The starting points
- IFC for building
- Upcoming “IFC infra extensions”
- CityGML for 3D city models
- ADE’s for extensions of city models
The starting points

- Check both building and usage permit
- Web-based
- Easy interface
- Rule-based & algorithm-based
- Open standards
- Works based on the Estonian BIM standard
The interface
The interface

Server Settings

Address: https://ll-bims-2.bim:

Username: bim@futureinsight

Password: ...........

Token: 

CONNECT
The interface

BIM model check dashboard

**Project listing**

1807_EP_AR_Maleva_with_area.ifc
1807_Maleva.ifc
1823_ES_AR_Kari_with_area.ifc
1823_Kari.ifc
DeR0tterdam.ifc
TestDesign.ifc
duplexx.ifc

Add IFC design
The interface

Turn on/off individual Storeys/ObjectTypes
The interface

Download BCF (Not implemented)

Wave false negatives
The infrastructure

- **Voxel Server**
- **IfcOpenShell**
- **BIM Surfer**
The checks

01. Building maximum height
02. Evacuation routes
03. Facade materials
04. Maximum ground area
05. Location in bounding box
06. Safety barriers / fall protection
07. Spacing minimum door width
08. Maximum storeys above ground
The checks

- ☐ Rule based
- ☒ Algorithm based
- ☒ Building permit
- ☒ Usage permit

Calculates the height from the geometry from the origin (0,0,0) and compares it with a given value. (fixed at 18 m for POC)

False negative when the origin is not set right
02. Evacuation routes

The checks

- Rule based
- Algorithm based
- Building permit
- Usage permit

Calculates the length of the route (voxel based) and checks for the maximum distance (30m in POC) from fire doors (wider than 1.2 m in POC)

False negative when doors aren't classified right
The checks

- Rule based  ☒
- Algorithm based
- Building permit  ☒
- Usage permit

Checks whether the outside walls (isExternal) consists of a certain material (Raudbetoon for POC)

False negatives when the isExternal property is not set right and if material names are (spelled) wrong
Recalculates the total 2D perimeter (including balconies and overhangs) and checks whether the building fits within a certain value (1000m² for the POC)

No false negatives
The checks

05. Location in bounding box (zoning plan)

- ☑ Rule based
- ☑ Algorithm based
- ☑ Building permit
- ☑ Usage permit

Checks for all geometries if they fit within a given bounding box (zoning plan). For the POC one fixed volume is used.

No false negatives
### 06. Safety barriers/fall protection

#### The checks

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<th>Algorithm based</th>
<th>Building permit</th>
<th>Usage permit</th>
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A voxel based check which ‘walks’ through the building, opens doors and checks if you can fall more than 1m.

In the POC, elevator shafts and the ground level give false negatives.
The checks

07. Spacing minimum door width

- Rule based
- Algorithm based
- Building permit
- Usage permit

Checks if the ‘width’ property of IfcDoor is 990 mm or wider. Although a rule based check, this property is quite reliable since the property is usually automatically generated by the authoring tool.

If the ‘width’ property of IfcDoor is manually changed the check will not give the right results.
08. Maximum storeys above ground

The checks

- Rule based
- Building permit
- Algorithm based
- Usage permit

Checks the maximum amount of stories against a given value (6 stories in the POC). It uses the IfcBuildingStorey element which is automatically generated. Only stories above the origin (0,0,0) will be taken into account.

If the origin is set wrong or the roof is also modeled as a storey it will give false negative.
Recommendations

- Scale up to a final infrastructure
- Add the link with 3D Digital Twin
- Specify checks per permit type
- Make a list of the top 10 checks
- Design these checks
- Digitize the necessary regulations (e.g. detailed plans)
- Configure the checks
- Improve the checks
- Expand with new checks
The connection

POC

UX DESIGN FOR BIM SUPPORTED EHR
UX design

- One checking solution serving several BIM processes in EHR (eg. building & usage permit)
- Two types of users (applicant & permit issuer)
Flowchart: BIM supported EHR
Flowchart submission

1. **Applicant**
   - Upload BIM model
     - invalid IFC model
       - revise
       - submit
     - valid IFC model
       - verify
       - BMC checks
       - area checks
   - BIM storage
     - valid IFC?
       - valid
       - invalid

2. **System Automation**
Flowchart assessment
Presentation of the mockups

https://www.figma.com/file/ZUo3HJeYt01IVXRuOiXmT9/estonia?node-id=0%3A1
Next steps

- Take into account feedback from you
- Prepare development funding applications (SF)
- Define detailed requirements with you
  - Compile the list of checks (incl legal validity)
  - Prioritize (complexity vs time saving)
  - Formalize the checks (can input be formalized?)
  - Build automatic checks
  - Refine the checks
- Finalize BIM requirements standard
- Goal for go-LIVE 01.01.2021
Questions
Link: http://bimchecks.futureinsight.nl

Username: bim@futureinsight.nl

Password: BIMEstonia