Building Energy Renovation through Timber Prefabricated Modules
BERTIM Project

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Main objectives

Improve building energy renovation process with timber prefabricated modules into an automated process

- Enhance the competitiveness of timber manufacturing companies and speed-up their processes through digital tools. Provide a BIM-based collaboration web tool (RenoBIM) for the data sharing and decision-making

- Develop prefabricated timber modules for building energy efficient renovation
Igual puedes poner en el recuadro marrón el nombre de la conferencia y las fechas
Lasarte Arlanzon, Natalia, 21/06/2018
Enhance the competitiveness of timber manufacturing companies

Current situation: Complex process with many stages:

- Data collection
- Desig & modelling
- Cost-benefit/energy assessment
- Manufacturing
- Installation

Different actors and skills, several software tools

BERTIM proposal:
A digital workflow to smoothly reuse the data and support collaboration

Data exchanges using Open BIM formats (IFC 2x3 / IFC 4)

Develop prefabricated timber modules for building energy efficient renovation

- Prefabricated 2D façade panels
  - For envelope insulation
  - For HVAC system retrofitting through the façade
- Prefabricated 3D rooftop residential modules with integrated RES

The design of the 2D panels fulfills:
- Reduction of 50% the energy consumption of the building
- Mass manufacturing process for prefabricated modules
- Transport of the modules in regular trucks
- Non-intrusive installation procedure
- Innovative connection system for quick modules’ installation in building façade
Typical RenoBIM use case

1) Check project feasibility
2) Cost/energy analysis based on a virtual building model
4) Cost/energy analysis from the IFC model (more accurate)
5) Selection of the optimal panel

RENOBIM PLATFORM

RenoBIM principles

- Not to develop from scratch → integration of existing tools through Open BIM (IFC) formats
  - Energy simulation, Web 2D/3D editing, CAD/CAM for fabrication
- BIM model requirements tailored to the process
- Intuitive web interfaces for non-experts, but relying in professional engines like Energy Plus
- Goal: speed-up the early decision-making

Targeted users

- Primary: technical and sales/marketing staff in the manufacturing company
- Secondary: architects/designers
Building surveying practice

- Placement of targets for future data capture with a total station
- Assembly of point clouds is prepared with targets to be registered and processed by Trimble Realworks software
- 69 outside and inside scan positions are realised in one day with a laser scanner
- Geo-location of this point cloud is completed with a GPS Leica
- 360° panoramic photos are delivered through Trimble Scan Explorer

3D modelling process

- The point cloud imported into Revit
- Storeys are defined and lines are created to define the best average direction of facades
- Modelling based on typical families (walls, windows, doors, floors, columns…)
- Conceptual space zoning for energy simulation purposes
3D modelling specific methods

Very specific methods have been defined through “support measures” to obtain the specific accuracy required: e.g. here for an opening, to define the largest dimensions to be included in the masonry.

First step in 3D view
Second step in horizontal cut
Third step in facade view

Feasibility analysis

End users enter data related to the building:
- Generic aspects of BERTIM methodology (e.g. legislation, structure, building condition...)
- Specific restrictions of manufacturers, linked to their products or processes (free distances, building geometry...)

An automatic report is generated with fulfilled/not fulfilled restrictions (or not checked).
Virtual geometry vs BIM/IFC

Define a virtual building manually:
- Lat/Lon, Orientation, Nº storeys
- Shape type & basic dimensions
- Neighbouring building heights & distances

Upload a georreferenced IFC file

Cloud energy simulations

- Automatic generation of Energy Plus geometries
- Automatic detection of surface conditions (ground, external, partition, adiabatic...)
- Mapping to preset usage templates

Simplified approach

BIM/IFC approach

- Launch parallel cloud simulation with different alternatives (e.g. different insulation materials or thickness)
- Compare to current situation
Design configurator

Once a panel type has been selected, design the façade splitting layout → preliminary and quick dimensioning

Final result in a 3rd party IFC viewer

Import in CAD/CAM (Dietrich’s): further detailing for fabrication

8 modules added on façade NE

2 of the modules further detailed in Dietrich’s tool
Conclusions

- **BIM → the power is in the information → more accurate data = better decisions**
- **Key: purpose of the BIM model**
  - What we need to model and how → direct influence in modelling time and costs
- **Key: Collaboration**
  - Integration of actors of the supply chain
  - Optimization of time and reuse of data
  - Data reuse → data exchanges → need of standards → Open BIM
- **BIM not only for “big ones” → it can be tailored to SMEs’ needs**

Thank you for your attention!

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