MORE-CONNECT project newsletter

This project has received funding from the European Union's Horizon2020 framework programme for research and innovation under grant agreement no 633477.

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ISSUE #3 ESTONIAN PILOT BUILDING

Development and advanced prefabrication of innovative, multifunctional building envelope elements for MOdular REtrofitting and CONNECTions

by MORE-CONNECT team

www.more-connect.eu

- *retrofitting technology and the components for buildings' renovation in five geo-clusters across Europe: Portugal, Netherlands, Denmark, Czech Republic, Estonia and Latvia.*

Description of case building and design target

The Estonian pilot project is typical soviet five storey multi apartment building apartment built in 1986. Pilot building is constructed by prefabricated concrete large panel elements. There are 80 apartments with total heated area of 3306 m². Construction date is 1986.

PARAMETERS		BEFORE RENOVATION	DESIGN VALUE
U-VALUES, W/(m²K)	WALL	0.90	0.11
	ROOF	0.80	0.10
	WINDOW	1.6	0.80
	THERMAL BRIDGE	0.13	0.047
HEATING KWH/M²		**168**	**10**
HOT WATER, KWH/M²		59	31
TYPE OF VENTILATION		Natural	Mechanical with heat recovery
HEATING SOURCE		District heating	District heating
INSTALLED PV, M²		-	87
INSTALLED THERMAL SOLAR, M²		-	100

SWOT analysis of Estonian pilot building

STRENGTHS

- Typical building soviet series apartment building: results are easily to disseminate;
- The building is not far from project partner (TUT). This makes possible to make continuous and effective survey during renovation process;
- Mono-functional building makes clear assessment of energy use of the building;

WEAKNESSES

- The building operates as dormitory; but still it is residential building and represents typical construction series built before 1990 in Estonia and other states in Eastern Europe;

OPPORTUNITIES

- to disseminate results to owners, housing associations, and building companies;
- to use PV and solar collectors;

THREATS

- Delay of construction works;

LIVE STREAM OF THE MORE-CONNECT RENOVATION PROCESS

You can follow the renovation process of MORE-CONNECT's Estonian pilot:
https://www.youtube.com/watch?v=CMwy67xezSk
https://www.youtube.com/watch?v=2LaXcznMRzE

MOUNTING OF THE PREFABRICATED PANELS IS EXPECTED IN JUNE/JULY 2017

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Production and Process

Estonian case building has an unsatisfied performance of external building envelope: U_{wall} = 1.0 W/(m²K), U_{roof}= 1.1 W/(m²K), U_{floor} = 0.6 W/(m²K)). During energy audit, thermal bridges, lack or insufficient ventilation, water-proofing failures on balconies and on window drip molds were detected. Windows with plastic frames have high thermal transmittance (U_{window} ≥ 1.8 W/(m²K)) and broken closing mechanisms and fixings. Failures and water leakages in the area of chimney-roof. The overheating during winter season and insufficient thermal comfort at southern part of living spaces on summer period were reported during the detailed energy audit.

Figure 1. Thermal bridges in original wall

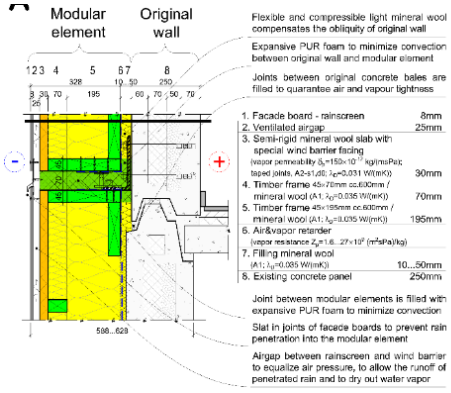
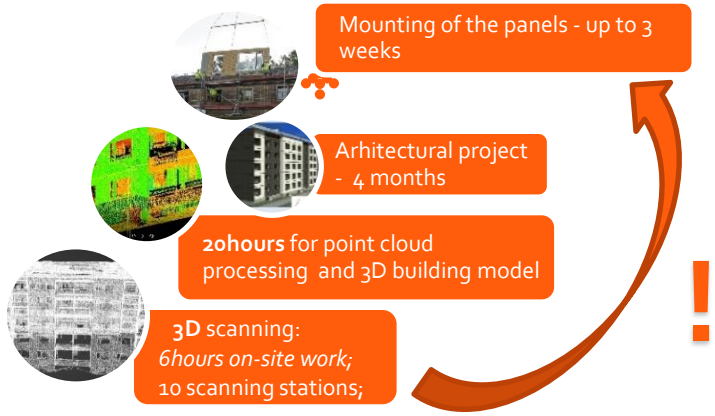


Figure 2. Designed solutions at the different structural points of the pilot building.

The existing concrete panel with a thickness of 250 mm consists from concrete sections and insulation layers: 60 mm external reinforced concrete slab + 70 mm wood-chip insulation layer + 50 mm phenolic foam insulation layer + 70 mm internal reinforced concrete slab. Typical height of panels is 2700 mm and the width varies depending on the dimensions of rooms. The external side of the panels is caulk and finished with paint or wallpaper.



Ventilation systems

The fully mechanical supply/exhaust ventilation will be installed. The integration of ventilation ducts into prefabricated panel allow significant indoor space savings. Sir flowing through the ducts is preheated at the AHU and therefore the theoretical heat loses through building envelope are non-existent as there is no temperature gradient between inside and outside.

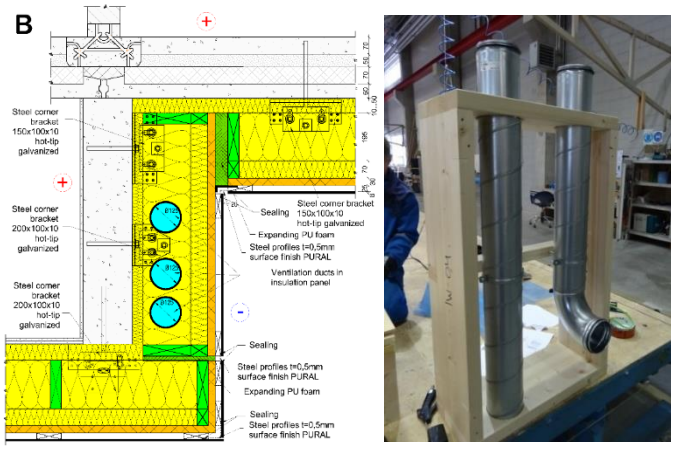


Figure 3. Placement of embedded ventilation ducts on the faced

More information is available on project web-page and publications:

- ✓ Kuusk, K., & Kalamees, T. (2015). nZEB retrofit of a concrete large panel apartment building. Energy Procedia, 78 985-990. http://dx.doi.org/10.1016/j.egypro.2015.11.038
- ✓ Pihelo P., Lelumees M., Kalamees T. 2016. Influence of Moisture Dry-out on Hygrothermal Performance of Prefabricated Modular Renovation Elements. Energy Procedia, 2016, Vol.96, p. 745.-755. ISSN 1876-6102 http://dx.doi.org/10.1016/j.egypro.2016.09.137;
- ✓ Kalamees, T., Lupíšek, A., Sojková, K., Mørck, O., Borodiņecs, A., Almeida, M., Rovers, R. What kind of heat loss requirements NZEB and deep renovation sets for building envelope? In: CESB 2016 – Central Europe Towards Sustainable Building 2016: Innovations for Sustainable Future, Czech Republic, Prague, 22-24 June, 2016.
- ✓ Kuusk K., Kalamees T., Pihelo P. Experiences from Design Process of Renovation of Existing Apartment Building to nZEB. CLIMA 2016 - proceedings of the 12th REHVA World Congress: volume 1. Aalborg: Aalborg University, Department of Civil Engineering, May 2016, p. 10 http://vbn.aau.dk/files/233707163/paper_591.pdf
- ✓ Pihelo P., Kalamees T., Kuusk K. nZEB Renovation with Prefabricated Modular Panels. 11th Nordic Symposium on Building Physics, NSB2017, 11-14 June 2017, Trondheim, Norway
- ✓ Pihelo P., Kalamees T., Kuusk K. Renovation of multi-storey building with prefabricated modular panels to nZEB. Renovation of multi-storey building with prefabricated modular panels to nZEB. 27th to 29th of September 2017, Riga, Latvia

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https://www.researchgate.net/project/MORE-CONNECT-2

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