NEARLY ZERO ENERGY BUILDING AND PASSIVE HOUSE – SUSTAINABLE SOLUTIONS FOR RESIDENTIAL BUILDINGS

Goal of the project

The idea of this project arose from the need to develop solutions that reduce the energy consumption in the Romanian residential building sector. The main goal of the NEZEBUILD research project is related to the design and detailing of technical solutions in order to achieve the nearly zero energy building standard, resulting in the validation of such designs through extensive monitoring. Design, detailing and execution include the construction elements, finishes and installations system.

Short description of the project

In Dumbravita (near Timisoara), a house was designed and built as a duplex. Half of the duplex was designed as a passive house (PH) and the other half as a nearly zero energy building (NZEB). During the design and use of energy efficient buildings, the need arose to implement a monitoring system with a good quality/price balance, necessary in order to validate the theoretical design. The PH and NZEB are equipped with monitoring systems. Through the monitoring process of the two houses, the energy consumption is measured and thermal comfort parameters are kept under observation. The monitoring systems register data which is uploaded to a web server. The components of the monitoring systems (central units and several ambient/energy sensors) resulted from the need to make data available online and the physical measurements that had to be taken. All project activities aim at developing a recommendation design guide regarding PH an NZEB based on experimental research.

Project implemented by

- Project Partnership comprising Politehnica University of Timisoara - CCI Department and Arhitim.

Implementation period

2012 – 2016

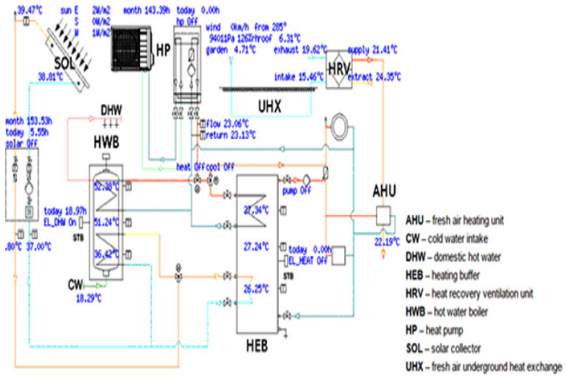
Main activities

- Design and detailing of NZEB system including procurement of materials, equipment and elaboration of energy performance certificate for NZEB.
- Elaboration of research reports and scientific papers.
- Energy performance assessment of the passive house using the recorded data from the monitoring system.
- Execution of finishes for the NZEB, mounting of HVAC system and procurement of all the other necessary equipment.
- Design of the monitoring system and initiation of the monitoring activities for the NZEB.
- Elaborating a comparative PH vs. NZEB study on energy efficiency; optimization of global cost for NZEB;
- life-cycle assessment of NZEB.
- Dissemination of recommendations and general rules for implementing energy efficient residential houses in temperate climate.

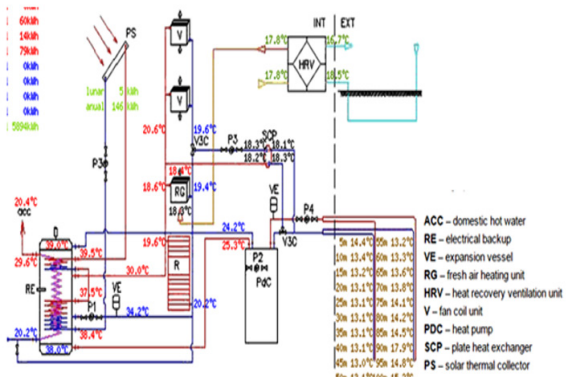
a) Normal image

b) Thermal image

Fig. 1 General view of house



a) Passive house



b) Nearly zero energy building

Fig. 2 Schematic representation of the buildings services

Results

Currently, the most relevant results consist in:

1. validation, verification and centralization of data obtained through the monitoring systems;
2. analysis of the monitoring data and energy certification based on actual measured energy consumption of PH;
3. completion of the finishing and equipping works on the NZEB;
4. installation of the monitoring system and initiation of the monitoring for NZEB;
5. evaluation of the energy consumption for the NZEB, registered since the initiation of the monitoring process (January 2014);
6. monitoring and evaluation of the energy produced by the solar photovoltaic panels installed for the NZEB;
7. elaboration of a comparative study between the PH and the NZEB in order to identify the advantages and disadvantages that characterize each type of house.

Applicability and transferability of the results

The topic of the project is closely related with the increasing concern of nowadays society on reducing the energy consumption in buildings. The targeted groups of the project are scientist, specialists in the energy efficiency field and stakeholders. The project deliverables will assure the transfer of knowledge, generating further „know-how" for scientific community and for practicing specialists (civil and environmental engineers, electrical and energy engineers, architects, technicians).

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Research Centre

- Research Centre for Retrofitting of Constructions – RECO
- CCI Department

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