# Insulated Concrete Forms as Thermal Envelope Used for the Romanian Passive Office Building in Bragadiru - Ilfov

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*Abstract:* - This building is the first passive office building in Romania which was planned in year 2007 and built in 2008, in Bragadiru. We want to present the advantages of the passive sustainable and energy efficient concept , put in value in this first passive romanian office building. We wish to share our experience and to point out that the passive house standard is a success, and can be used as base for a nZEB. Starting from the planning of an energy efficient and sustainable solution and continuing with the building process, we have obtained an environment-friendly result by using the ICF energy efficient building system- AMVIC.

*Key-Words:* - Thermal envelope, insulated concrete forms ICF, energy efficiency, passive house

## 1 Planning the first romanian office building

It is possible to create an innovative, sustainable office building by respecting the passive house standard with a very easy to build efficient energy technology. That means neopor insulated concrete forms -ICF- produced in Romania, at Bragadiru, for the envelope and excellent work areas for headquarters of Amvic Group.

Fig.1 View from plane of the Amvic ICF Fabric


Fig.2 View of the principal facade and the office building

This building is the first passive office building in Romania which was planned in year 2007 and built in 2008, in BRAGADIRU. This is an example, most of all for the authorities, to show in reality the very big advantages of the passive house standard. We have the hope that this will increase the courage of the architects, engineers and especially of authorities

from east Europe to use ICF for the thermal envelope of the new buildings and reaching the target of nZEB. We want to present how positive, the sustainable efficient energy concept was put in value in this first passive romanian office building. What should be emphasized here is that we considered all conditions of the real estate for maximum benefit of its advantages. Starting from the planning of an energy efficient and sustainable solution and continuing with the building process which was very simple, we have obtained an environment- friendly result by using the ICF energy efficient building system- AMVIC.


Fig.3 Neopor corner ICF for passive buildings


Fig.4 Neopor current ICF


Fig.5- CE Mark for ICF Amvic

The insulated concrete forms are the most easy way to build a passive house. With this system we have build a solid edifice who will be resistant at the earthquaqes, to the tornades and any authers climate catastrofes. The build time was very short, we spend a lot of time and money concerning the materials and the manodopera. Passive ICF eliminates the thermal bridges. The construction details offers a very good insulated anvelope for the building. Exterior insulation of the exterior wall is 18 cm of neopor with density of 24 kg/m3.


Fig.6 View of the ICF installation


Fig.7 Certificate of the mark


Fig.8 View of the ICF installation -

The neopor ICF are producing with 3 installations in a very modern fabric. The technology is very energy efficient and with advanced procedures. The installations are using steam under pressure , who is in the nearby central with special installations produced.
The fabrication process is also very efficient – min. 1 milion ICF pro year.

The product has the CE mark and it is allready on the market in Romania, Bulgaria, Suisse, Creta, Hungary, Cyprus, Finland. In this year, the ICFs for passive houses will be exported also in Germany and Austria as well in the authers states of the European Union.


Fig.9


Fig.10


Fig.11

Installation for ICF for passive buildings

## 2 Energy Efficient Solutions

We try to put in value and speculate the local conditions in our advantage, to make the most efficient possible the energy saving for all the processes in this building.

The insulated concrete forms –ICF- fabric offer partial protection for this building. We have a heat-earth recovery in the garden who offer preheating or precooling of the fresh air for the entire building. The building is oriented with its main facade towards South. Within the space of the building with commercial and office purpose, the cold and hot water consumption being usually reduced. The lighting will be made by electric lamps with reduced consumption and sensitive system related to the illumination opportunity. Equipments like heating pumps, regenerative heat exchangers (between introduced air and evacuated air, fresh earth-air), solar panels and all

equipments are with a low energy consumption (fans, pumps).

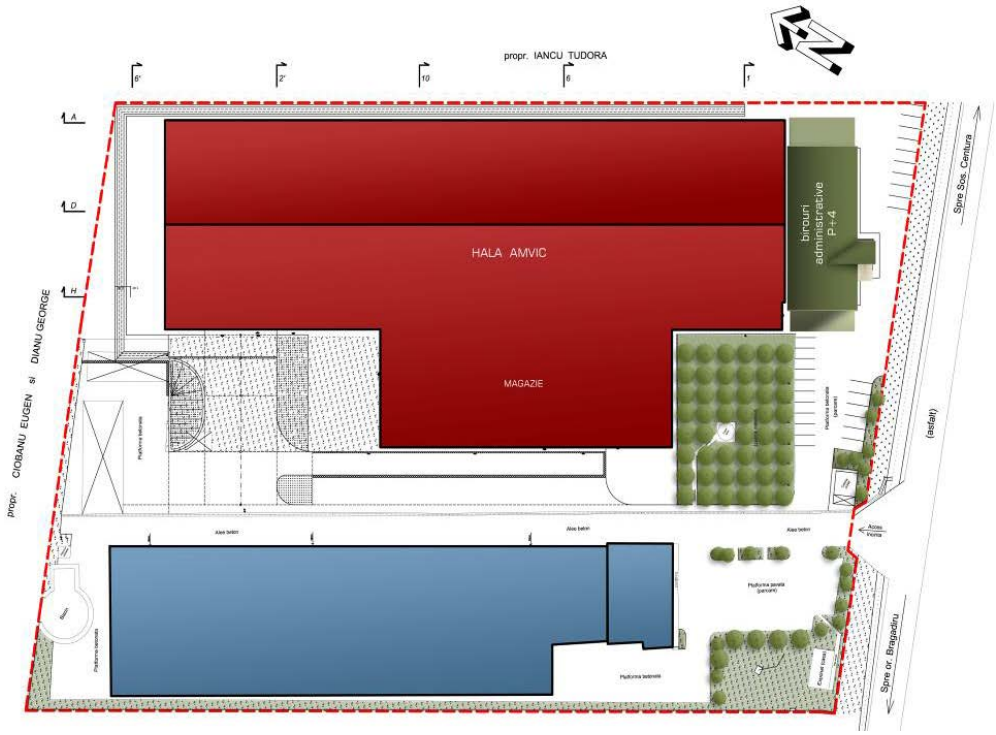


Fig.12 Site plan

The heating system of the building is made with hot air generally prepared with unconventional sources: soil heating taking over, pre-heating in a battery with heat carrier from a surface of solar receptor from an industrial process, heating recovery from the air exhausted, and final heating being accomplished with heating pump water - water.
During summer, the interior air –conditioning is accomplished, that is its cooling by means of a reversible heating pump. The electric power necessary to generate the cooling task will be approximately three times lower than the heating effects.
For the air-conditioning dimensioning and the hot water preparation necessary for the functioning of the building, an assessment of the necessary heating and, respectively, of cold for the administrative house was accomplished under different challenging climatic conditions , summarized under the form of some equivalent temperatures.

In wintertime we use steam from the production process of insulated concrete forms as a source for the additional heating system. This offers gratis energy to be used in the building.
Other important aspects are:
- for envelope and structure of the building we have used Neopor ICF with an additional thermal insulation of Polystyrene (24kg/$m^3$) to the exterior and Thermofloc to the interior;
- for the thermal insulation of the roof we used Thermofloc and Polystyrene ;
- the U-value of glazing is 0,5 W/ ($m^2$ K),of the whole window (incl.aluframe) 0,8 W/ ($m^2$ K)
- jalousie for solar protection;
- for preheating/ precooling of the fresh air we have a awaduct (Rehau) in the garden nearby;
- the building has a good protection on the north side , consisting of the production hall;
- using renewable energy of sun;
- heatpumps for floor heating system;

Fig.13 View of the solar instalation

Fig.14 View of the solar instalation

Due to the technological processes within the plant that is located close to the passive house the flow of hot technological water with an approximate temperature of 70 °C that totalize a maximal volume of 120 mc for a three hours interval, for the day period and for approximately 9 months each year. During the very cold period of the year, this heating source is reduced as a consequence of the reduction of the technological process for producing expanded polystyrene. This source of energy is used in order to increase the temperature of the fresh air at the output of the switch with soil and before entering the filtration stage. The heating pump is the key equipment of this appliance and it functions in the cooling mode or in the heating mode, according to the season. Waste energies represent the energy sources of the heating pump; these types of energy can be renewable or with low heat potential and they are freely disposed in the nature.
Moreover, in order to increase the energetic efficiency of the building, by means of reducing the power consumption in the warm period of the year, the cooling down the space with external air (free cooling) can be accomplished, according to the necessities; the flow of air can increase for a greater

efficiency of the cooling process until a maximal value of 150% of the value of the nominal flow.
Thus, heating accumulated over a day in the inertial elements of the building will be evacuated by means of free cooling phenomenon the next day the cooling unit being only used to eliminate the heating and humidity gains due to human activity as well as to the heating gains due to the equipment used. It is not recommended to accidentally open the windows for a natural ventilation because this action must be very well correlated with the external temperature as a random usage can lead to supplementary energetic consumptions.

## 3 Conclusion

Fig.15 presents the energy saving for each equipment as well as the global saving that is accomplished using the energetic loops developed in the functional scheme. Moreover, an approximate value of 50% is represented by the energy recovered from the environment (soil, sun) and from the energy of the interior air, thus resulting only the necessary quantity for producing 50% of the total power. The insulation degree is highlighted once again by the energy need for the heat pump 3 that only covers the power losses to the exterior.

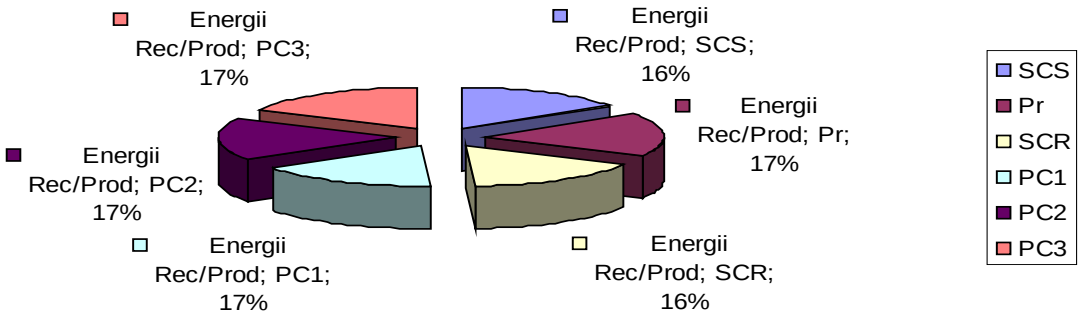


Fig.15 Recovered energy/ Products for attaining the indoor heat comfort

This building is finished and more two companies are doing theirs activities as well inside of this building; during the cold period and also warm period, the building is in process to monitoring of the energetic consumptions and to the analysis of their improvements. This monitoring as well as the entire building was part of the program "INOVARE", in collaboration with Politechnica University of Bucharest, based on the European Union Grand Projects and the Research Department of Amvic Group Romania.
The use of an innovative technology for the thermal envelope of the building made possible the use of energy from renewable sources and will make possible in the future, relatively easy to improve the energy efficiency to the nZEB standard.

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