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FOUR MAJOR CLALENGES THAT SUPPORT THE OPTIMIZATION OF THE HEATING SYSTEMS USED IN BUILDING CONSTRUCTION

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Abstract: *The paper present a broad research in composite materials.The main purpose of many researches now is to achieve a composite material structure which can be used in wall panels building up. Finding a solution to the problem initiated in this project will result in a energetical efficienty growth, and in energy saving especially in the constructions/housing field because of the utilisation of intelligent composit material*
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1. INTRODUCTION

To reduce the energy consumption is nowadays an important challenge for all involved scientists, who are interested in every advanced research.Reduction of heat transfer through a house wall is a critical question, and this paper deals with this question, which practical results are very important.Civil construction industry is highly interested in achieving certain results in this field, therefore the research is a must. Materials used in wall construction are various, and we are interested in finding out economical solutions with the energy supply cutting down. In respect of this idea, wood and composite materials are an extraordinarily suitable compound, according to the previous research made by the authors.
Wood is the oldest material used by man. In the last few decades, for no relevant reason, wood was thought not to be resistent enough, or burning very easy. Despite this, there are alot of wooden buildings that lasted for hundreds of years. The modern technologies nowadays improve wood properties and offer to its beneficiary the rliability and the confort needed.

These new thermo-insulated panels can be successfully used both for exterior and interior wall for all kinds of buildings. A profound study of frequently used composite materials is highly needed, the research around the world concerning this subject being very impressive. In this respect the moulding of composite materials structures for resisting wall panels elements is pursued.
The wood houses are seen nowadays as well, as a habitat solution, and in the western countries they represent a part of the every day life, better than a fashion trend. The realisation of such dwellings warrants the confort, the durability and the beauty helped by the modern building tehnologies and best quality equipement.Along with the standard projects, the companies plan and realize wooden houses at the client's will, ensuring in the same time the delivery of the product in only a few week after the blueprint is realised.
In the same time, the clients, helped by the company's advisors can decide themselves the shape, the interior and exterior arrangements or different details of their house.For buiding houses it is used composit wooden material or other composit materials shaped in panels, specified on functions and destinations, materials that give resistence in time and a special look, realised using very modern tehnologies and, besides, all the equipements materials and accessories are conceveid realised and used for this kind of constructions.
The companies offer modular building solutions planned in order to adapt easily to any kind of space and to fulfill the client's expectations and demands. They are based on double wooden panelised panels, stratidied or

composit, with a special insulation and a special one, in order to avoid condense, depending on the wall's specificity.
Thus, the wooden material will not modify it's shape and properties if humidity occurs and it is very nice and offers a lot of confort.
The wainscotted panels are recommended while a room is destined to be used as a bathroom, the succesive layers of insulation, hydro-insulation and the final one (the wooden one) form its walls and respect the shapes and the special characteristics of the space.
The structural wainscot or composit panel is, usually, the simplest solution for the wooden houses and it has the same advantages as the full wood panel. The full wood panel is seldom used because of its high price and it is also used in a modular solution, with walls builtthis time in a single wood layer of 45-80 cm width with all the qualities needed for a special looking, highly functional building.
The prefab wood buildings can be divided in two categories: on wood frames and with prefab panels
The wood framed constructions they are built using panels shaped on these frames, planned after the client's will in wooden constructions specialised workshops. The wooden frame is mounted by using metalic elements such as: metal plates, nails, bolts, etc and it is composed by the inferior sole, the superior sole, pillars and intermediary teraverses.
The pillars are mounted perpendicularly and the intermediary traverses, between the pillars, paralel to the soles. The distance between the pillars has to be of about 60-80 cm, depending on the walls' width. The holes for the doors and for the windows can be placed anywhere, because the panel's structure allows it.
The panels resist at permanent loads proceeding from its own heaviness but also from that of others' elements as well, element sthat lean against them. At horizontal stress, such as the action of the wind, wooden-based or plaster-cardboard panels are used for stiffening. The walls, the panels and partially the roof, are elements realised in workshops. The panels are transported at the construction site where the foundation is already made. Basic inferior beams are attached to them and to those beams, the walls' panels will be mounted. At the superior part of the panels, the beams are fixed, serving as a superior belt, and sustaining and framing the walls at the ground-floor. After that, if it is necesary, the mounting of the panels that constitute as a foundation for the next storey will be done.
A building conceived like this can be built in 2-3 days, before the roof. After the building is done, the insulating of the walls and of the attics follows: an insulating material is placed in the empty space of the panels and a thin sheet is applied to avoid condensation, at the exterior part of the external walls. The finishing of the external wall can be made by using one of the following materials: massif wood wainscoating, wood wainscoating counterfeit, mortar or an external layer of brick.
Prefab panel buildings are similar to those built on wood frames. The differences occur in blueprinting, the elements processing and the execution technology.
The panel's structure consists of massif wood squeleton that forms a frame with stiffening traverses. The prefab elements are assembled on the site than the panels are mounted and finally the finishing of the exterior walls and the execution of the roof follows.
The prefab panel houses are preferred by the buiders only if they are produced serially which might be a desadvantage for the clients that wish to have a sole exemplar house. It is also the case for the houses with a "sandwich" structure.
As the name suggests, they are built on a multi-layer structure with delimited functional elements in order to allow an optimal individual dimension for each and every one of the components. Every building type has a static self-portant structure which insures durability and safety in exploitation. For the sandwich type ones, this function is ensured by a massif wood structure based on a system of pillars and traverses. The resistance structure of modern wood buildings is made of resinous wood, reinforced with OSB panels and other junction metal elements. This type of structure has a lot of advantages: obtaining a light and very resistant structure; the elasticity of the wood provides safety in case of an earthquake; the efficient and economic use of wood;the realisation of the building in a short time.
The building can be decomposed in various surfaces (walls) that can be also decomposed in various elements:

- the surfaces of the opaque or transparent walls:
  - exterior walls
  - terraces
  - panels (towards the garage, attics, etc.)
  - windows and doors (gates)
- a jonction line between panels and walls

The coefficent $K_{referință}$ [$W/m^2 \cdot K$] , represents a medium coefficent of loss through the walls, being a global heat shift coefficent $K_{ref.} = 1/R_p$ where , R_p ,represents the thermical resistence of the wall. The conductive thermical resistence of a wall depends on the wall's thickness ( ) and on the material's conductiveness coefficent ( ): R_p = .
In order to fiind the correct solutions from a thermical point of view, we must take into account the following:

- *the insulation* of the walls, of the roofs, or terraces;
- the presence of *thermical bridges*;
- the types of *windows and window frames;*
- *ventilation;*
- *the system of producing heat and hot water;*
- the construction *site.*

In what the *insulation* of different elements is concerned, the materials have a great importance. Their resistance must be higher than the minimum one depending on the destination and on the type of wall.
By *thermical bridge* we understand a region where the thermical insulation is interrupted and by which there is a heat loss to the exterior. These thermical bridges can damage the insulation. The more significant thermical bridges occur at the connections between:

- walls and superior panels
- walls and intermediary panels
- walls and inferior panels
- separating walls and inferior panels
- separating walls and exterior panels
- separating walls and intermediary panels
- separating walls and superior panels

Windows and window frames have different thermical qualities, depending on the materials that have been used (glass, wood, plastic, metal). They must have a global thermical resistance following reglementations or calculations of minimum thermical loss.
The objectives of the heat transfer research:

- *obtaining a coherent quality balance* for a building's structure because any wall assembly must have a covenient, suitable insulation;
- establishing a *conventional energy consomption value* for a building as a **C** coefficient (kilowatore primarly energy / year – Kwh/year) equal to the total of different forms of consumption (heating, warm water, ventilation, climatisation, auxiliary equipments, lighting, etc.),

The scheme below represents a complete, anual,energetic balance of a building and shows that a dwelling has, by its very conception to:

- *be well insulated,* to minimize the energy loss in winter and to avoid climatization in summer;.
- *have well oriented surfaces* in order to optimize solar heating in winter and avoid excessive heat in summer

Exigences related to the summer confort reffer to the inner temperature that caaot be higher than a certain value (25- 26ºC), windows closed. This temperature depends on:

- the nature of the walls, opaque surfaces, transparent ones, especially, their orientation and inclination
- climate region
- building thermical inertia
- solar protection: volets, stores, etc.

Research motivation:
There are 4 major clalenges that support the optimization of the heating systems:
The social reason directed towards the thermical charges and costs control by improving the thermical performances of a building without depending on the region;
Simplicity – helping the implementation of reglelemtations and inovations in this field , that would encourage specialists to fiind simple, maleable, low cost technical solutions;

The motivation connected to competitiveness of the solutions on the intern and extern market reffering to the calculation methods and to the construction materials'properties (defined by the european reglementations as well);

The motivation connected to the environment protection: reffering to the fight against the hot-house effect. The Rio, Kyoto and Bologna conventions had established objectives of lowering the emission of gas with hot-house effect. The heating consomption of the buildings has this effect for about a quarter of the total emission of hot-house effect gas. Therefore, founding solutions to this problem is compolsury.

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