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CONTRIBUTIONS ON THE WOODEN MATERIALS THERMO INSULATOR PANELS USED IN HOUSING CONSTRUCTION

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Abstract: *The present researches aimed at the possibility of combining some local thermal insulator materials (mineral wool, polystyrene, PAL) in order to obtain a sandwich type structure with thermo-physical properties which fits the preoccupations area concerning the heat transfer through panels that consist walls for wooden prefabricated buildings and the correction coefficient calculus as a ratio between the experimental determined heat transfer coefficient and the theoretical determined one. Knowing this correction coefficient allows a better design from dimensional and thermal point of view of the constructions, having a similar composition with those studied*
Key words: *Sandwich, Wood, Heat transfer, Mineral wool, Coefficient, Structure.*

1. INTRODUCTION

This paper intends to fundament the research aiming towards the thermic transfer by using panels for prefab houses, taking into account the fact that the “problem” concerning the realization of a lower thermic coefficient at a low price stays opened for the further research in various domains.

Offers a personal perspective on the research concerning the construction of wood based panels used in building houses. In the future, common materials will be exclusively used (among those frequently used in wood houses- construction) in order to satisfy the highest expectations, materials that have remarkable thermo-physical properties and correspond entirely to the ecological orientation of nowadays society.

Advantages: a high degree of efficiently, fast heating, no oxygen consume, uniform heat, silent functioning, heating costs 50% lower than for the traditional heating convection systems, without maintenance, without heating loss (through pipes or chimneys), easy to use, without any electric fog whatsoever (IGEF stipulation),100% ecological.

The paper concerns research referring to the thermic transfer trough this type of panels, research on the thermo-insulating layer and on its technology, the realization of experimental models together with research directed to the influence of the thermo-insulating panel as number of layers and types of material, the determination of the so-called correction coefficient extremely important from a dimensional and thermical planning’s point of view. 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.

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.

The building can be decomposed in various surfaces (walls) that can be also decomposed in various elements:

- o 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

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 thermic bridge we understand a region where the thermic insulation is interrupted and by which there is a heat loss to the exterior. These thermic bridges can damage the insulation. The more significant thermic 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 ventilation (natural or through controlled ventilation systems) must not exceed a loss level of about 50W.

The system of heating and obtaing hot water (using an external or local primary energy source) reffers usually to a boiler or to a thermical micro-central (local source), associated to heaters or warmed panels.

The construction site means the altitude and its dependance of the average exterior temperature, a important element for the calculation.

The achieved results can be used as a rough guide for thicknesses larger than those studied in the thesis. The aim of the research is the possibility to compound some indigenous thermal insulator material (i.e. mineral wool, polystyrene, PAL) in order to obtain a "sandwich" structure with thermo-physical properties which matches the author preoccupations.

By using the constructive solutions adopted for the version of structures , the study of the influence of the thickness of the PAL sheets on the thermal transfer coefficient was considered.

For this purpose, the data obtained experimentally and the calculated data were put together in table 1 in order to explain graphically this influence.

Table 1: Table of cumulative data for triplestratified sample

Sample	**Thickness (mm)**	**Thermal transfer coefficient determined experimentally λ_e (W/mK)**	**Thermal transfer coefficient determined theoretically λ_t (W/mK)**	**Thermal resistance determined theoretically R (m^2K/W)**	**Correction coefficient $c = \frac{\lambda_e}{\lambda_t}$**
PpvpP 16,20,50,20,16	122	0,046	0,053	2,285	0,867
PpvpP 16,30,50,30,16	142	0,041	0,052	2,749	0,788
PpvpP 16,40,50,40,16	162	0,044	0,050	3,215	0,880
PpvpP 16,50,50,50,16	182	0,041	0,049	3,706	0,836
PpvpP 18,20,50,20,18	126	0,049	0,055	2,302	0,890
PpvpP 18,30,50,30,18	146	0,042	0,053	2,766	0,792
PpvpP 18,40,50,40,18	166	0,040	0,051	3,233	0,784
PpvpP 18,50,50,50,18	188	0,042	0,050	3,700	0,840

By maintaining the layer of mineral wool consistent in the middle we modifying the two layers of polystiren but keeping the 16 mm PAL sheets.

The results are presented graphically in figure 1.

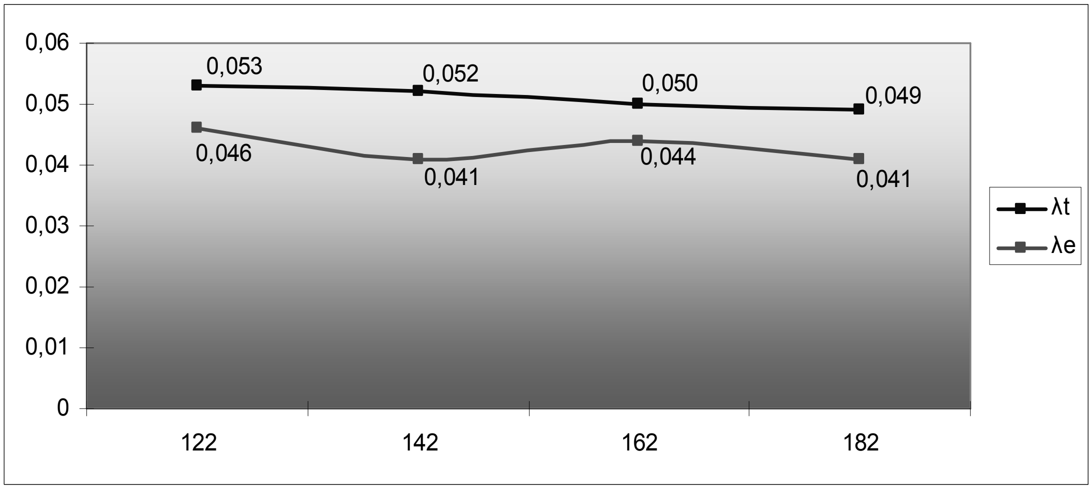

Figure 1: The variation of the thermal transfer coefficient λ_e şi λ_t function of the thickness of the sample (for PAL of 16 mm)

The variation of the thermal transfer coefficient determined theoretically shows a liniar decrease, while due to the lack of homogeneity of the component layers, the thermal transfer coefficient determined experimentally shows an almost sinusoidal variation.
By maintaining the thickness of the themal insulation layer consistent, but modifying the thickness of the PAL from 16 mm to 18 mm, one can notice figures for the thermal transfer coefficient that are very similar to the previous ones, their variation being indicated in the graphic below.

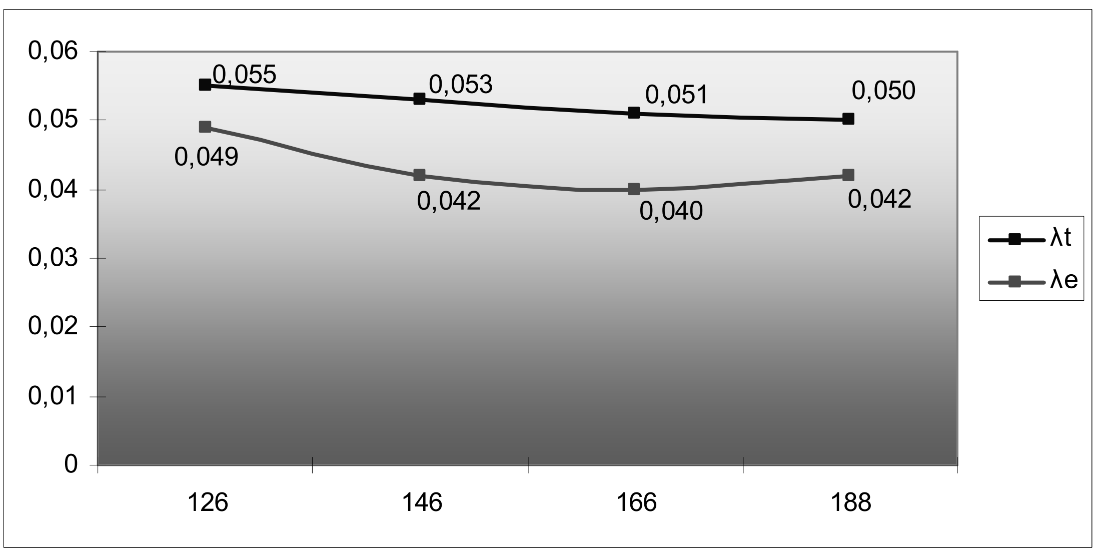

Figure 2: The variation of the thermal transfer coefficients λ_e şi λ_t function of the thickness of the sample (for 18 mm PAL sheets)

Having the graphic representations separately for each category of sampl and considering that the thermal insulated layer is consistent, it was possible to represent on the same graphic the variation of the thermal transfer coefficient determined experimentally.

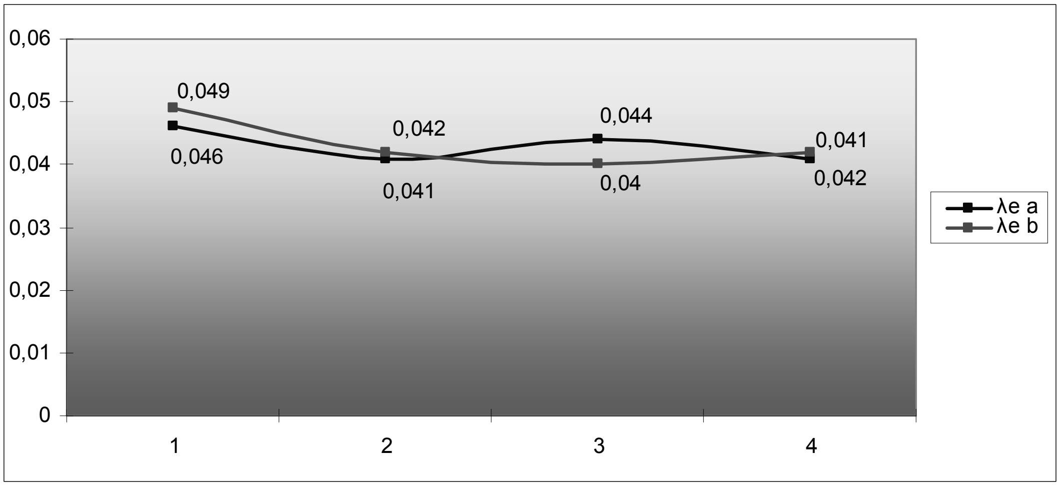

Figure 3: The variation of the thermal transfer coefficients λ_e function of the thickness of the sample: a – for 16 mm PAL; b – for 18 mm PAL

2. CONCLUSIONS

The very small difference between the variation of the thermal transfer coefficient in the two categories of structures and also the close figures of these coefficients justifies the fact that by replacing the 16 mm PAL sheets with 18 mm PAL sheets has not got a significant influence on the heat transfer through these types of sample.

The achieved results can be used as a rough guide for thicknesses larger than those studied in the thesis. Te aim of the research is the possibility to compound some indigenous thermal insulator material (i.e. mineral wool, polystyrene, PAL) in order to obtain a "sandwich" structure with thermo-physical properties which matches the author preoccupations.

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