THE EFFECTS OF UNHEATED NEIGHBORHOOD ON AN APARTMENT'S LIVING ENVIRONMENT FROM A BLOCK OF FLATS

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Abstract
         This article presents the study of neighborhood effects on the environment to a cold apartment located in a block of flats. Following the study demonstrates that the legislation in force in Romania, with the possibility of unlimited reduce heating of the apartment located in a residential building, is required to be reviewed. The finding emphasizes that in the context of global trends savings this solution to minimize the heating in some apartments in a block, not decrease overall energy consumption, but increase energy embedding by additional insulation systems

INTRODUCTION

Under study apartment, is an apartment located at intermediate level, being a corner apartment. Apartments building is located in the East of Oradea City, Nufarului Street, no. 39, with a GF +8 F, commercial on GF, and residential spaces upstairs.

Climatic Zoning:

- The climate of summer temperatures: III region with Te = +28º C;

- The temperature of winter climate: II region with Te = -15ºC;

The project was developed by I.P.J. Bihor in 1984, contract no. 10855, and built by TCL Oradea.

The study takes into consideration the facts, that the neighboring apartments (side and top) are not heated, generating:

- Thermal house discomfort ;

- Health and hygiene discomfort of the apartment;

- Financial repercussions in order to provide comfort living

MATERIAL AND METHOD

Envelope elements:
- Perimetral closure from 30cm prefab panels:
  - 12,5 cm strenght concrete into interior;

- GBNT 17.5 cm thermoinsulation;
- Regular insulation glass windows.
- Entrance door: new simple PVC;
- Heating sistem: central heating.

Main features of the apartment :
- Built area of the apartment: 84.24 sqm
- Heated area of the apartment: 71.07 sqm
- Usable area: 53.43 sqm
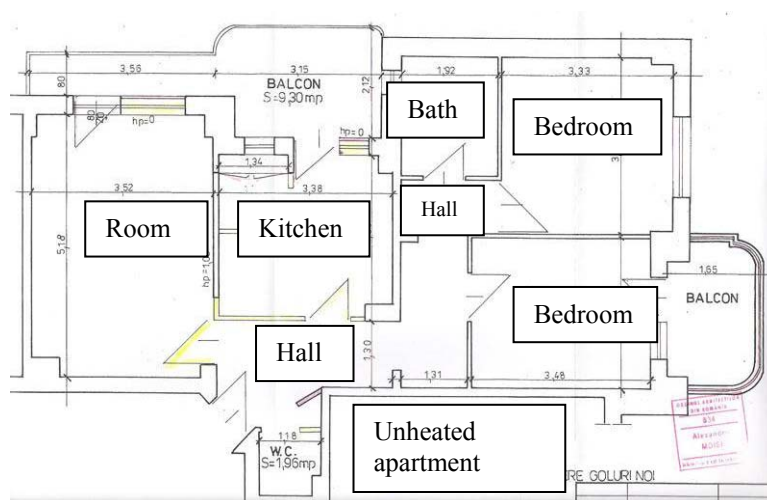- Heated volume: 181.23 m^3

Fig. 1. Apartament map

Interior finishes of the apartment are new and modern:
- plastering trowel on the walls;
- gypsum plaster ceiling here and there;
- washable house paintings;
- tile in bathrooms and kitchen;
- warm floor from laminate parquet in rooms;
- cold floors from hone in bathrooms and kitchen;
- windows with PVC carpentry with doublé glazing.

Exterior finishes:
- original block plaster;
- nonenveloped exterior opaque surfaces;

Due to rational non-use of the living space by all people of building (mostly in the immediate vicinity of the expertised apartment) in the apartment in question appeared visible degradation being detected by mold / dampness on neighborhoods adjacent unheated boundary elements (ceiling / wall) , and the outer walls of the house (see foto reports, fig.1, 2, 3, 4):

Fig. 2. Mold/dampness
to unheated superior apartment

Fig. 3. Mold/dampness
unheated upper floor

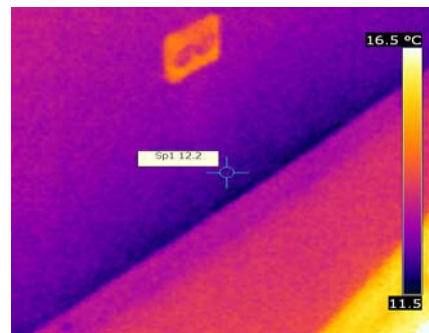Fig. 4. Mold/dampness
exterior wall
(bedroom)

Fig. 5. Mold/dampness
exterior wall
(thermographic image)

The heating sistem

Entire building is centralized heated.

The apartment heating instalation is from henco type pipe made.

Radiators are made by steel equiped with corner dual flow control on input, corner detentors on output and manual vent valves, with dividers.

The thermal energetic consuption is dual monitorized, by entire building input and by each apartment input.

Energetic certification:

Energy Performance Certificate (EPC) developed in "unheated neighborhood" hypothesis falls flat in energy class "D" , and the hypothesis developed in normal operating conditions, with adjoining heated apartment falls in energy class "C".

Energy class differences are not large due space compliance of the flat, due the volumetry, and the fact that is a corner apartment.

Fig. 6. EPC   Fig. 7. EPC
Apartament with unheated neighborhood   Apartament with heated neighborhood

Real characteristics of the envelope are as follow:

Table 1

Element		Total (m²)	R' [m²K/W]	Rm' [m²K/W]
Exterior carpentry	PVC	13.05	0.50	
Exterior walls	Exterior wall	39.12	0.61	
Unheated neighborhoods	Floor	71.07	0.24	0.306
	Wall	13.21	0.23	
TOTAL		136.45		

Minimum necesary characteristics of the envelope by health-hygiene confort condition are as follow:

Table 3

Element		TOTAL (m²)	R'nec [m²K/W]
Unheated neighborhoods	Floor	71.07	0.41
	Wall	13.21	0.31

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Minimal necesary characteristics of the envelope by energy economy condition, considering unheated vicinity are as follows:

Element		Total (m²)	R'min [m²K/W]	Rm' [m²K/W]
Exterior carpentry	PVC	13.05	0.77	
Exterior walls	Exterior wall	39.12	1.10	1.505
Unheated neighborhoods	Floor	71.07	4.50	
	Wall	13.21	1.10	

It was used All Energy ver.5.0 software for apartments.
Photos with Flir EBX thermovision camera were taken.

RESULTS AND DICISIONS

In order to save energy in operation we made comparison between corrected thermal resistance values calculated on elements at real building, and normal values of minimum corrected thermal resistance (the reference building)

Thermo meet performance criteria for energy saving reasons, is not satisfied: R '<R' (mpK / W),on the whole building, the exterior walls and ceiling to neighboring unheated (according tables 1 and 2).

In order to ensure sanitary conditions and operating comfort we made comparison between thermal resistance corrected values, calculated on real building elements and normalized values of required minimum thermal resistance by sanitary reasons for the whole building, for envelope elements to the unheated neighborhood.

From 1 and 3 tables results that thermoenergetic performances criteria considering hygenic-health confort, not passed: $R'^{m} < R'^{nec}$, (mpK/ W), for entire building,   for envelope elements to vicinity.

In order to determine yearly specific and total energy consumption, the corected termal resistance mean value of the apartment envelope was reckoned:

- real apartment with unheated neighborhood (**R** $^{M-real}$)

- equivalent apartment with heated neighborhood (**R** $^{M-ref}$)

$$\mathbf{R}^{M-ref} = \mathbf{1{,}505} > \mathbf{R}^{M-real} = \mathbf{0.306} \text{ (sqmK/ W)}$$

Comparing energetic needs for apartments heating:
 - real apartment with unheated neighborhood :
       class D; q=209.52 kWh/sqm yr
 - equivalent apartment with heated neighborhood:
       class C; q=111.61 kWh/sqm yr

So, for heating, the necesary energy for targeting same parameters is 87 % increased for the real apartment.

CONCLUSIONS

It finds suitable according to energy performance certificates, that energy expertise flat fits in class D, in the current, although under normal conditions, with adjoining heated, it would fit in the energy class C, which would mean an additional significant thermal comfort and hygienic-sanitary convenience.

Owners maintenance bills of expertise apartment are approximately 38% higher than if the neighborhood would be heated.

Reducing thermal comfort because interior temperatures of expertise apartment are lower than parameters for which it was designed, due unheated neighborhoods;

Necessary to remediate existing situation:
- changing legislation, so that residents an apartment block apartments were required to heat to a minimum.
- if the situation persists, rehabilitation it is recommended to owner, expertise apartment enveloping to unheated neighborhoods, which means additional costs for this measure, which exceeds the order the building was designed.

REFERENCES

1. Prada M., 2011, „Expertiza termica a apartamentlui nr. 27, bloc D 122, etaj VII, strada Nufarului, nr. 39, Oradea, jud. Bihor"
2. Legea nr. 372/2005 privind performanța energetică a clădirilor.