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N-Zeb and Something More

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N-ZEB AND SOMETHING MORE

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ABSTRACT: In the effort to reduce dependence on fossil fuels and to decarbonize civil constructions, Romania joins the effort of the nations of the European Union by elaborating the technical regulation "Methodology for calculating the energy performance of buildings, indicative Mc 001-2022.

This technical regulation establishes minimum rules that must be respected by investors, designers, and builders for the creation of buildings with almost zero energy consumption (NZEB) and the reduction of greenhouse gas emissions;

This article is a numerical simulation made for a virtual building, complying with the requirements of NZEB according to MC001, simulation that analyzes the energy behavior in different modes of operation and technological equipment.

The result of the simulations is encouraging in the effort to reduce energy consumption, and at the same time, in certain conditions, the result is that of "passivation" of an NZEB construction.

Keywords: decarbonisation, energy efficiency, CO2 emissions, reducing dependence on fossil fuels

1. INTRODUCTION

In the methodology for calculating the energy performance of buildings, indicative MC001/2022, the minimum outside air flows for the ventilation of homes are indicated, is taken into account SR EN 16798-1/NA and recommended corrected thermal resistances for N-ZEB residential buildings, Table 2.4 of MC 001/2022. For the inclusion of a building under N-ZEB construction, are presented in table 2.10a of MC 001/2022, depending on the purpose of the building, maximum allowed limit values of energy consumption for heating, from renewable and non-renewable sources.

The annual heat requirement for heating related to one m³ of interior volume is;

Q=[$(Q_a + Q_v)$-$(Q_i + Q_s)$] [kW*h/(m³*an)]

Q_a=$\frac{24}{1000}$*C*$N_{12}^{\theta_i}$*G_a where $G_a = \frac{\sum(L_j * \tau_j)}{V}$ [kW*h/(m³*an)]

Q_v=$\frac{24}{1000}$*C*$N_{12}^{\theta_i}$*G_v where $G_v = 0{,}34 * n_a$ [kW*h/(m³*an)]

Q_i= 7 [kW*h/(m³*an)]

Q_s= 0,40*$\sum_{ij} l_{Gj} * g_i * \frac{A_{Fij}}{V}$ [kW*h/(m³*an)]

The annual heat demand for heating was calculated for the building envelope in N-ZEB requirements with the addition for heating the infiltrated air in four scenarios.

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S1- the minimum number of air changes according to the norm n_a = 0,5

S2- the maximum number of air changes according to the norm n_a = 1,5

S3- the number of air exchanges calculated for the number of people, 24, and air flow per person of 25 mch, n_a = de 0,851

S4- the number of air changes calculated per number of people, 24, and air flow per person of 25 mch and ε_{RCj} = 90%, n_a = de 0,0851

2. ENERGY CALCULATIONS

A building with the same constructive characteristics will have a different energy behavior depending on the climatic zone in which it is located.

Table 1. the annual heat requirement for specific heating

climatic zone		zone 1	zone 2	zone 3	zone 4	zone 5
CITY		Constanța	București	Iași	Predeal	Trg.Secuiesc
Qa	kWh/m²·an	38,85	43,36	48,01	69,63	63,24
Qv1	kWh/m²·an	29,02	37,67	47,02	77,17	67,74
Qv2	kWh/m²·an	91,59	107,51	124,35	189,31	169,59
Qv3	kWh/m²·an	50,99	62,2	74,18	116,56	103,51
Qv4	kWh/m²·an	3,06	8,69	14,94	30,65	25,48
Qi	kWh/m²·an	21,9	21,9	21,9	21,9	21,9
Qs, gi=0,75	kWh/m²·an	19,20	18,70	17,80	26,70	24,60

The total heat requirement for heating is calculated with the relation$Q$=[$(Q_a + Q_v)$-$(Q_i + Q_s)$] is centralized in Table 2 specifically for the 4 ventilated air treatment scenarios

Table 2. the annual heat requirement for the 4 scenarios

climatic zone		zone 1	zone 2	zone 3	zone 4	zone 5
CITY		Constanța	București	Iași	Predeal	Trg.Secuiesc
Qa+Qv1-Qi-Qs	kWh/m²·an	26,77	40,43	55,33	98,20	84,48
Qa+Qv2-Qi-Qs	kWh/m²·an	89,34	110,27	132,66	210,34	186,33
Qa+Qv3-Qi-Qs	kWh/m²·an	48,74	64,96	82,49	137,59	120,25
Qa+Qv4-Qi-Qs	kWh/m²·an	0,81	11,45	23,25	51,68	42,22
The maximum limit for inclusion in the N-ZEB requirement according to MC 001/2022						
N-ZEB requirement [1]	kWh/m²·an	99,1	103,7	105,9	109,5	113,1
Maximum limit for inclusion in the PASSIVE HOUSE requirement						
passive house requirement [4]	kWh/m²·an	15	20	25	35	30

2. CONCLUSIONS

Compliance with the minimum resistances in a construction to meet the N-ZEB requirement, coupled with a high-performance ventilation system with heat recovery, leads to a building that meets the passive house requirement. "N-ZEB and something more, PASSIVE HOUSE"

References

[1] MC001 2022

[2] SR1907/2014

[3] C107/2005

[4] https://praxis-rb.com/en/keys-passivhaus-standard/ 9.48h/03.10.2024