



BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH TATTOO STUDIO

RODINNÝ DOM S TETOVAČÍM ŠTÚDIOM

ENERGY PERFORMANCE CERTIFICATE OF THE BUILDING

BACHELOR'S THESIS

BAKALÁRSKA PRÁCA

AUTHOR

AUTOR

Adela Matušovová

SUPERVISOR

VEDÚCI PRÁCE

prof. Ing. Jitka Mohelníková, PhD.

BRNO 2025

1. INTRODUCTION

The energy performance certificate (EPC) provides an overview of the total energy demand of a building. It includes the energy required for heating, cooling, ventilation, air conditioning, domestic hot water production, and lighting – essentially all the energy needed for the operation of the building. However, the electricity consumption of household appliances is not included.

The evaluation is based on standardized usage and average climatic conditions, rather than actual weather and specific usage habits of the occupants.

The energy efficiency of a building is classified on a scale from A to G, where class A represents very energy-efficient buildings, and class G denotes buildings with poor energy performance. Most buildings fall into class B, while classes A and C are less common.

In accordance with Decree No. 78/2013, the actual building must be compared with a reference building. This reference building has the same key parameters – including floor area, shape, usage, and heating system – but assumes standard values for windows, doors, insulation, and other components affecting energy performance.

When making the comparison, it is important to note that if the actual and reference buildings have similar performance levels, the result typically falls into class C, which is considered acceptable. However, achieving higher energy efficiency (closer to class A) is always preferable.

2. CALCULATION

Prevailing internal temperature in the heating period 20 °C
External design temperature in winter -12 °C

Reduction factor $b = (T_i - T_b) / (T_i - T_e)$
 T_iinternal temperature (20 °C)
 T_e ...external temperature (-12 °C)
 T_b ...other temperature (soil -5 °C)

Specific heat transmission loss HT [W/K]
 $HT = A \cdot b \cdot U$

$\Delta U_1 = 0,02$ for reference building
0,05 for assessed building

For more see table below

Structure	A[m2]	U [W/m2·K]	Reduction b [-]	HTi [W/K]	A [m2]	U[W/m2·K]	Reduction b [-]	HTi [W/K]
R1	84,545	0,24	0,79	16,029732	84,545	0,175	0,79	11,68834625
F1	77,06	0,48	0,48	17,754624	77,06	0,225	0,48	8,32248
F2	159,48	0,48	0,48	36,744192	159,48	0,366	0,48	28,0174464
F4	37,87	0,48	0,48	8,725248	37,87	0,377	0,48	6,8529552
F5	38,98	0,48	0,48	8,980992	38,98	0,238	0,48	4,4530752
W1	230,7	0,45	0,48	49,8312	230,7	0,246	0,48	27,241056
W2	671,357	0,3	1	201,4071	671,357	0,193	1	129,571901
W3	363,118	0,3	1	108,9354	363,118	0,231	1	83,880258
W01	2,4	1,7	1	4,08	2,4	0,732	1	1,7568
W02	1,6875	1,5	1	2,53125	1,6875	0,889	1	1,5001875
W03	15	1,5	1	22,5	15	0,728	1	10,92
W04	10	1,5	1	15	10	0,656	1	6,56
W05	13,5	1,5	1	20,25	13,5	0,763	1	10,3005
W08	6,3	1,5	1	9,45	6,3	0,6	1	3,78
W09	7,2	1,7	1	12,24	7,2	0,68	1	4,896
W10	3,75	1,5	1	5,625	3,75	0,845	1	3,16875
SUM ΣA	1722,9475		ΣHTi	540,084738		ΣHTi		342,9097556
Thermal bridges ΔU			ΣA* ΔU1	34,45895				86,147375
Nominal overall heat transfer loss HT			ΣHTi+ ΔU	540,104738				342,9597556
Average heat transfer coeff.			Uem,req= HT/ΣA+ΔU1	0,31346194		Uem= HT/ΣA+0,05		0,1990193
Class of the building			Uem /Uem,req	0,63490738		Class		B economical

3. CERTIFICATE

Energy certificate of the building						
Detached house Kanianka, PARCEL 129/2, 128/10, 1674/732				Evaluation of building envelope		
Total area: 247m ²				Calculated	Recomended	
<div><div><div>A</div><div>0,5</div></div><div><div>B</div><div>0,8</div></div><div><div>C</div><div>1,0</div></div><div><div>D</div><div>1,5</div></div><div><div>E</div><div>2,0</div></div><div><div>F</div><div>2,5</div></div><div><div>G</div><div></div></div></div> <div>Very efficient</div> <div>Extremely wasteful</div>				0,635		
CLASIFICATION				B		
Average loss by heat transfer U _{em} W/(m2 .K) U _{em} = HT/A				0,199		
Required average loss by heat transfer of building envelope according the standard ČSN 73 0540-2 U _{em,req} W/(m2 .K)				0,313		
Classification factor CI and its corresponding values						
CI	0,50	0,80	1,0	1,5	2,0	2,5
U _{em}	0,174	0,278	0,347	0,521	0,694	0,866
Expiration date:						
Elaborated by:				Name and surname Adela Matušovová		

CONCLUSION

The assessed building falls into class B – economical, in accordance with Czech standards. It demonstrates better energy efficiency compared to the reference building. However, the current objective is to achieve class A, which corresponds to nearly zero-energy buildings.