European Calculation Tools for Energy Efficient Buildings

Simon Wössner |

Fraunhofer IBP

Fraunhofer-Institut für Bauphysik IBP

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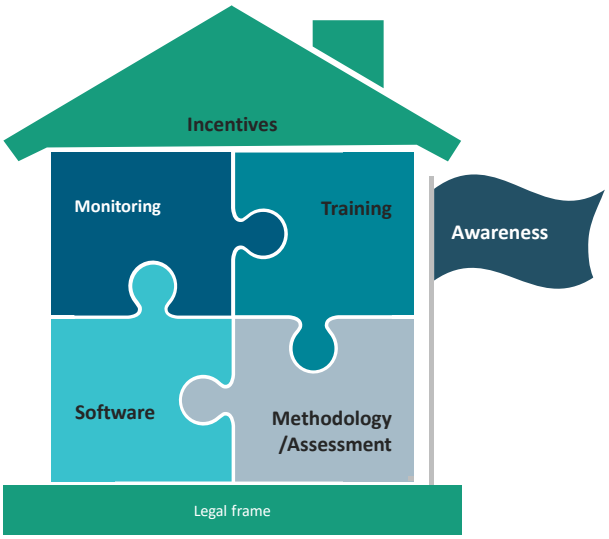
Energy Efficiency is…
a rather complex thing

Affects us all and includes a lot of stakeholders and therefore depends on a solid and reliable structure

Coordinated and, above all, interlocking components form a reliable framework for assessing energy efficiency requirements.

National and international frameworks must be aligned! EPBD gives a good guidance on which direction to go.



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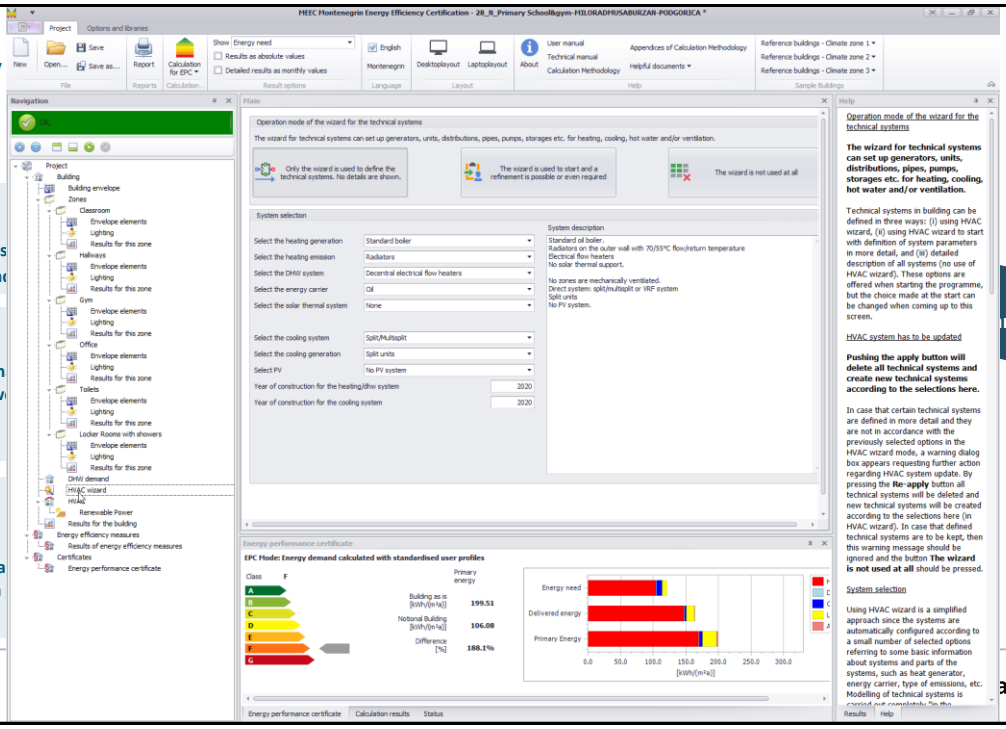

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1.1 Minimum energy performance values for residential buildings

Minimum energy performance values for residential buildings

#	Parameters	Reference value		
		Climate Zone I	Climate Zone II	Climate Zone III
Heat transfer coefficient				
1	U-Value: External walls, walls to the garage, walls to the attic	0,40 W/m²K	~~0,30 W/m²K~~ 0,35 W/m²K	~~0,3 W/m²K~~ 0,35 W/m²K
2	U-Value: Windows, balcony doors, roof windows, transparent façade elements	2,0 W/m²K	2,0 W/m²K	~~1,3 W/m²K~~ 1,6 W/m²K
3	U-Value: Flat and pitched roofs above heat space, ceilings towards the attic	0,40 W/m²K	0,40 W/m²K	0,30 W/m²K
4	U-Value: Ceilings beyond external air, ceilings beyond garages	0,40 W/m²K	0,40 W/m²K	0,30 W/m²K
5	U-Value: Walls and ceilings towards the non-heated rooms, non-heated stairs of temperature above 0 °C, rooms that are occasionally used and areas of other purpose	0,50 W/m²K	0,30 W/m²K	0,30 W/m²K
6	U-Value: Walls to the ground, floors on the ground	0,50 W/m²K	0,50 W/m²K	0,5 W/m²K
7	U-Value: Exterior heated stairs, do			2,9 W/m²K
Solar thermal prope				
8	g-Value window			0,60
9	Fc in wintertime	1,00	1,00	1,00
10	Fc in summertime	0,40	0,40	0,40
Other parameters for the building fabric				
11	Thermal bridges	In accordance with recommended solutions		
12	Condition of building	Windows and façade walls in normal condition		

In force since July 2024 in Montenegro!

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Training

Awareness

Methodology
/Assessment

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Energy Efficiency is…

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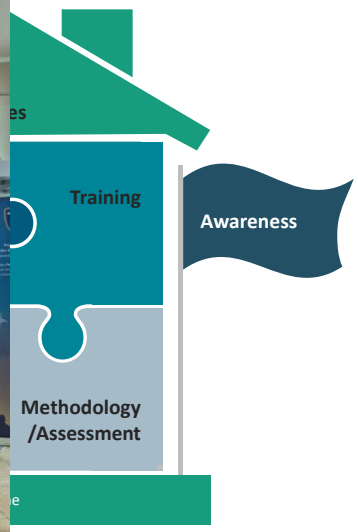

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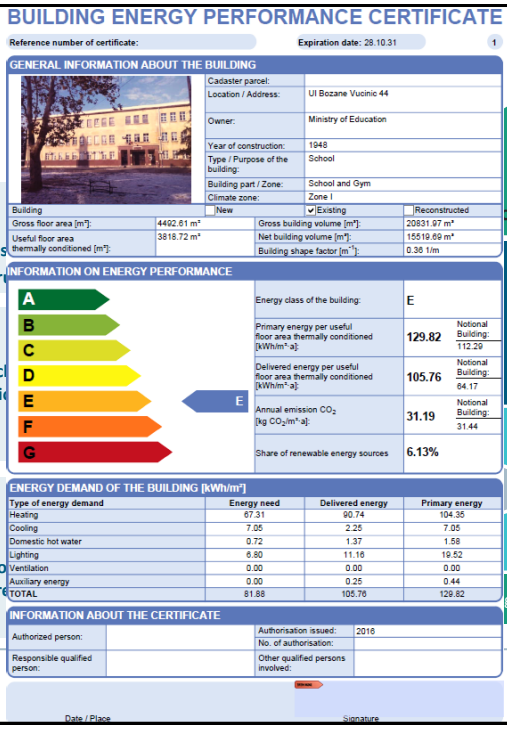


BUILDING ENERGY PERFORMANCE CERTIFICATE

Reference number of certificate: | Expiration date: 28.10.31 | 1

GENERAL INFORMATION ABOUT THE BUILDING

Cadaster parcel:	
Location / Address:	Ul Bozane Vucinic 44
Owner:	Ministry of Education
Year of construction:	1948
Type / Purpose of the building:	School
Building part / Zone:	School and Gym
Climate zone:	Zone I

Building	☐ New	☑ Existing	☐ Reconstructed
Gross floor area [m²]:	4492.61 m²	Gross building volume [m³]:	20831.97 m³
Useful floor area thermally conditioned [m²]:	3818.72 m²	Net building volume [m³]:	15519.69 m³
		Building shape factor [m⁻¹]:	0.36 1/m

INFORMATION ON ENERGY PERFORMANCE

A B C D E F G — E

Energy class of the building:	E	
Primary energy per useful floor area thermally conditioned [kWh/m²·a]:	129.82	Notional Building: 112.29
Delivered energy per useful floor area thermally conditioned [kWh/m²·a]:	105.76	Notional Building: 64.17
Annual emission CO_2 [kg CO_2/m²·a]:	31.19	Notional Building: 31.44
Share of renewable energy sources	6.13%	

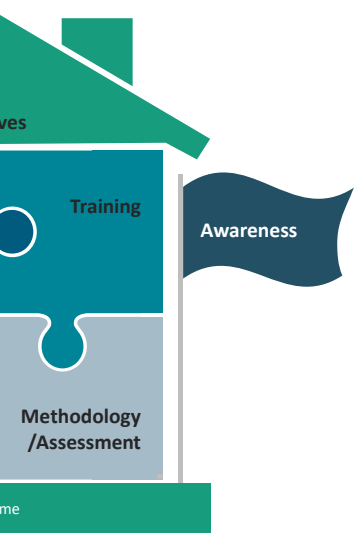
ENERGY DEMAND OF THE BUILDING [kWh/m²]

Type of energy demand	Energy need	Delivered energy	Primary energy
Heating	67.31	90.74	104.35
Cooling	7.05	2.25	7.05
Domestic hot water	0.72	1.37	1.58
Lighting	6.80	11.16	19.52
Ventilation	0.00	0.00	0.00
Auxiliary energy	0.00	0.25	0.44
TOTAL	81.88	105.76	129.82

INFORMATION ABOUT THE CERTIFICATE

Authorized person:		Authorisation issued:	2016
		No. of authorisation:	
Responsible qualified person:		Other qualified persons involved:	

Date / Place | Signature



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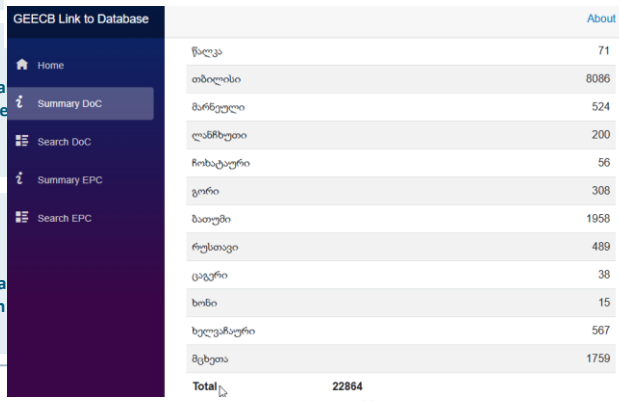
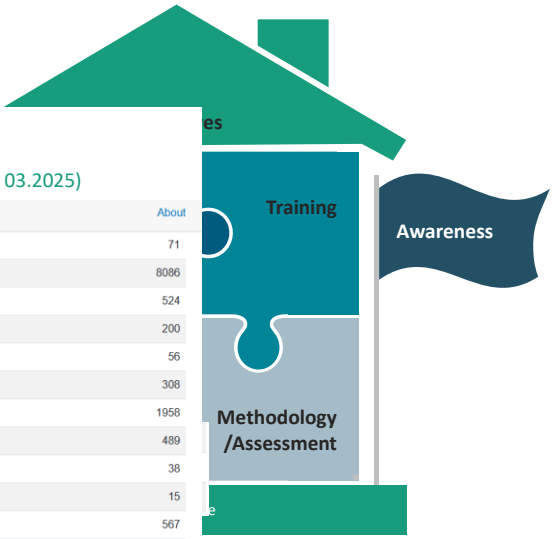
Registrar Database

22,864 Declaration of conformity (12,140 unique) (31. 03.2025)





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Energy Performance In BUILT Environment

When are energy efficiency calculations carried out?

Energy concepts are created in the preliminary planning phase → low level of detail, focus is on rapid consideration of various concepts (building envelope, systems engineering, renewable energies)

1

In the approval phase, compliance with the minimum requirements must be demonstrated → Declaration of conformity. Applications for funding are usually also submitted in this phase.

2

In the detailed planning phase, more precise calculations are carried out - in some cases using simulation calculations due to the significantly higher level of detail.

3

Once the construction phase is complete, the final energy performance certificate is issued.

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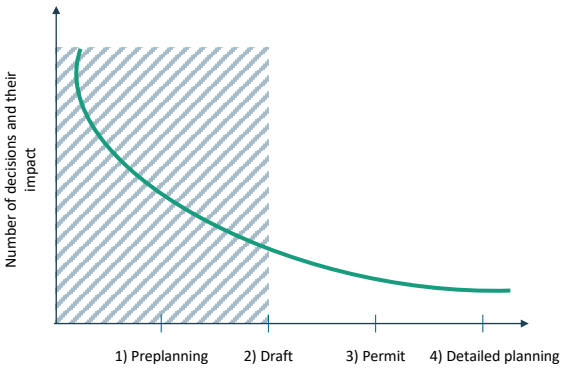

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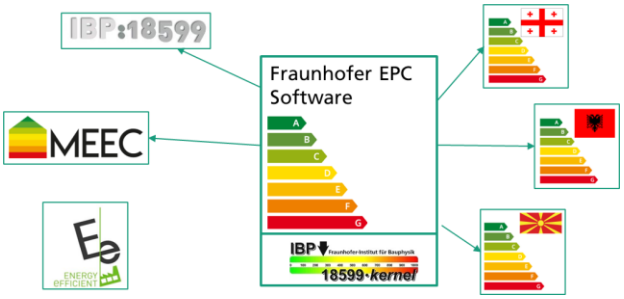
FraunhoferEPCSoftware

FraunhoferEPCSoftware presents national editions for energy auditors

Highly adapted products to the countries rules / regulations with an international approved calculation engine / methodology

Distributed without license fees to reduce barriers

Part of a solution set with software, support in EPBD implementation, cost optimal studies, trainings, …



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Calculation API

Calculation tools for energy demand calculation

Since 2005, the Fraunhofer IBP has been developing the "ibp18599kernel." This is a calculation library with a comprehensive implementation of DIN V 18599:2007 to 2024.

Certificates according to EnEV 2009 to GEG 2023 with automatic parameterization of the reference building, as well as according to the regulations of the KfW Efficiency Programs and the Federal Funding for Energy Efficient Buildings (BEG), is included.

Additions in the calculation kernel family 2023 with a pre-parameterization module and a module for simplified potential assessment for the BEG.

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Quality assurance for software – EPC And LCA (QNG)

Gütegemeinschaft Bilanzierungswerkzeuge

Association of software companies developing EPC software for Germany based on DIN V 18599

Founded after public doubts on comparable calculation results of EPC software in 2010

Quality control scheme for EPC Software
Gütesiegel

EPC and LCA (QNG)

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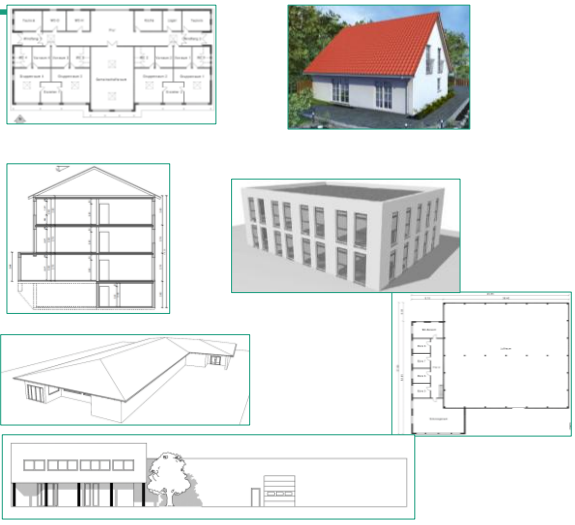
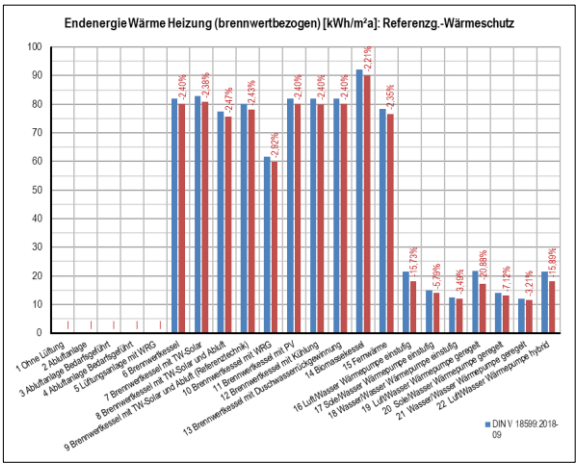
Quality assurance for software – EPC And LCA (QNG)

Gütegemeinschaft Bilanzierungswerkzeuge





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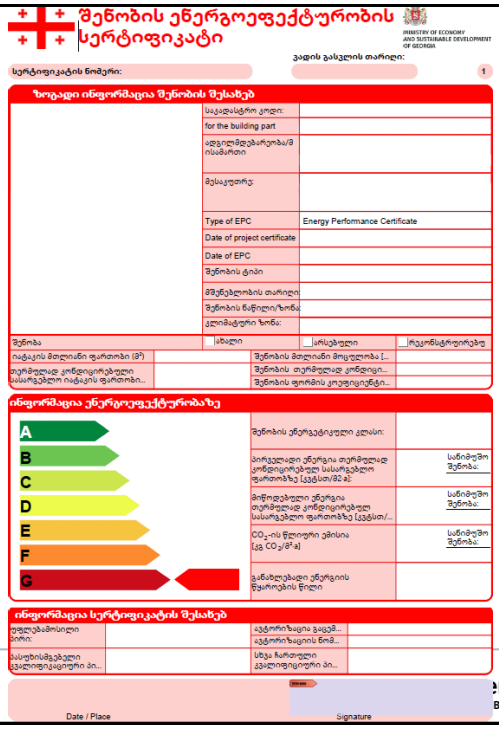
Energy Performance Certificate

The most important instrument for raising awareness of energy-efficient construction.

All buildings in the EU will gradually be issued with a certificate.

A strengthening of the role of energy performance certificates is foreseen in the upcoming EPBD amendment.

Other mechanisms also access the energy performance certificate -> EU Taxonomy Directive.



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Energy Performance Certificate

The most i
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All building
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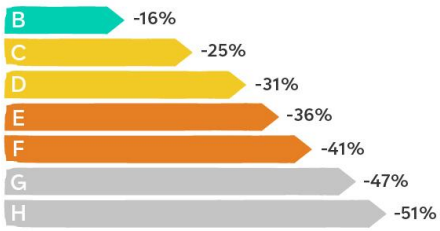
certificate

price reductions according to energy efficiency class
for real estate in rural areas



Quelle: Auswertung der bei ImmoScout24 inserierten Wohnungen und Einfamilienhäuser zum Kauf (Bestand, älter als zwei Jahre) in Q1 2023

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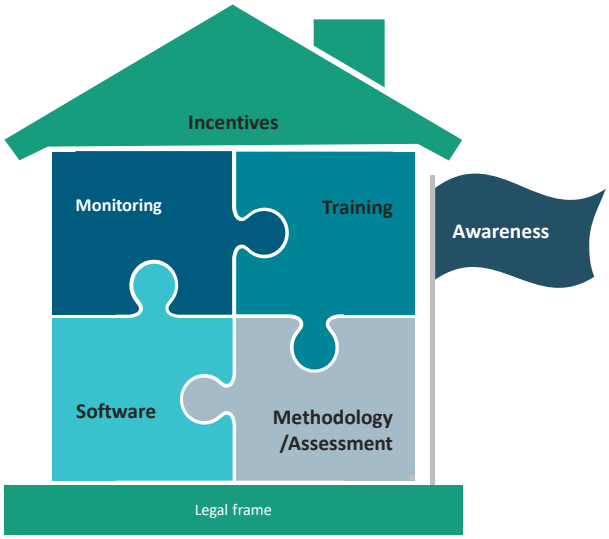
Energy Efficiency is…
achievable

We have 20+ years of experience not only in implementing a calculation standard computationally but also in understanding it, especially in its whole not just in the formulas itself!

We have the skills and experience to identify solutions, but also problems in calculations, present them clearly, and present meaningful solutions.

We understand the customers through our experience and can develop well – tailored solutions.



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Contact

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