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Theme:
- ENERGY PERFORMANCE CALCULATION STRUCTURE IN CROATIA

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Introduction

Implementation of Directive 2002/91/EC

- generally included in the Physical Planning and Building Act (Official Gazette No 76/07)

- details elaborated in the following:

1. Technical regulation concerning energy economy and heat retention in buildings (Official Gazette No 110/08, 89/09)
2. Ordinance on energy certification of buildings (Official Gazette No 113/08, 91/09)
3. Ordinance on the requrements and criteria to be met by energy auditors and energy certifiers of buildings

- additionally, some technical details in the following:

4. Technical regulation on ventilation and air-conditioning systems in buildings (Official Gazette No 3/07)
5. Technical regulation on heating and cooling systems in buildings (Official Gazette No 110/08)

Croatia decided to apply the approach following the methodology generally presented in the "umbrella document" **CEN/TR 15615 Explanation of the general relationship between various CEN standards and the Energy Performance of Buildings Directive (EPBD)**.

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Croatian regulations

Ordinance on energy certification of buildings

- defines energy classes, format and content of an energy certificate.

- includes general calculation methodolology in annexes 6A and 6B for:
1) residential buildings,
2) non-residential buildings.
(doesn't include specific calculation procedures and details)

Example: non-residential buildings (page 1)

Description	Calculation method
Transmission heat transfer coefficient H_T' [W/(m^{2}K)]	According to HRN EN ISO 13789:20XX $H_T = L_D + L_S + H_U$ [W/K] $H_T' = \frac{H_T}{A}$ [W/(m^{2}K)] A ... surface area of a heated part of a building [m^2]
Annual energy need for heating $Q_{H,nd}$ [kWh/a]	According to HRN EN ISO 13790:2008. $Q_{H,nd} = (Q_{Tr} + Q_{Ve}) - \eta (Q_{int} + Q_{sol})$ [kWh/a] Specific value: $\frac{Q_{H,nd}}{A_K}$ [kWh/(m^{2}a)] Specific value: $\frac{Q_{H,nd}}{V_e}$ [kWh/(m^{3}a)] $\eta_{H,gn}$ ... heat gain utilization factor [-] A_K ... surface are of usable floor area of a building [m^2] V_e .... volume of a heated part of a building [m^3] Simplified: $\eta = 1.00$ for a massive building $\eta = 0.98$ for a medium-heavy building $\eta = 0.90$ for a light building
Annual energy need for domestic hot water heating Q_W [kWh/a]	According to HRN EN 15316-3-1:2007 $Q_W = \rho_W c_W V_W (\theta_W - \theta_0)$ [kWh/a] $\rho_W c_W = 1{,}16$ kWh/(m^{3}K) V_W .... annual water consumption [m^3/a] θ_W ... water temperature in a tank[°C] θ_0 ... temperature of mains water [°C]
Annual thermal losses of a heating system $Q_{H,ls}$ [kWh/a]	According to HRN EN 15316:2007 $Q_{H,ls} = Q_{H,em,ls} + Q_{H,dis,ls} + Q_{H,st,ls} + Q_{H,gen,ls}$ [kWh/a] $Q_{H,em,ls}$ ... thermal losses due heat exchange in the space, including regulation according to HRN EN 15316-2-1:2007 [kWh/a] $Q_{H,dis,ls}$ ... thermal losses due to heat distribution, including regulation according to HRN EN 15316-2-3:2007 [kWh/a] $Q_{H,st,ls}$ ... thermal losses due to heat storages, including regulation according to HRN EN 15316-3-3:2007 [kWh/a] $Q_{H,gen,ls}$ ... thermal losses due to heat generation and

Croatian regulations

Ordinance on energy certification of buildings

- includes reference climatic data for energy calculations of buildings in annexes 7A and 7B for:
1) continental Croatia
2) littoral Croatia

Example: continental Croatia

REFERENCE CLIMATIC DATA FOR CONTINENTAL CROATIA
JANUARY DECEMBER (I– XII)

	I	II	III	IV	V	VI
Temperatue	0.°C	3.2°C	7.5°C	11.8°C	15,9°C	19.2°C
Insolation	31.94 kWh/m²	48.61 kWh/m²	94.44 kWh/m²	128.06 kWh/m²	170.00 kWh/m²	181.11 kWh/m²
	I	II	III	IV	V	VI
S	43.61 kWh/m²	57.78 kWh/m²	86.11 kWh/m²	83.61 kWh/m²	87.78 kWh/m²	83.61 kWh/m²
E - W	23.61 kWh/m²	35.56 kWh/m²	66.94 kWh/m²	86.39 kWh/m²	110.56 kWh/m²	116.11 kWh/m²
N	14.17 kWh/m²	20.00 kWh/m²	35.00 kWh/m²	45.28 kWh/m²	57.78 kWh/m²	59.44 kWh/m²
SD = 2900	607	457	385	234	0	0

	VII	VIII	IX	X	XI	XII
Temperatue	21.1°C	20.1°C	16.4°C	11.7°C	6.5°C	1.8°C
Insolation	187.78 kWh/m²	159.44 kWh/m²	118.61 kWh/m²	74.44 kWh/m²	34.72 kWh/m²	24.17 kWh/m²
	VII	VIII	IX	X	XI	XII
S	90.28 kWh/m²	94.17 kWh/m²	99.72 kWh/m²	88.06 kWh/m²	45.56 kWh/m²	32.22 kWh/m²
E - W	121.94 kWh/m²	105.94 kWh/m²	84.72 kWh/m²	55.56 kWh/m²	25.56 kWh/m²	17.22 kWh/m²
N	59,44 kWh/m²	51.67 kWh/m²	37.78 kWh/m²	26.67 kWh/m²	15.28 kWh/m²	11.39 kWh/m²
SD = 2900	0	0	0	245	401	561

Number of days per heating season: Z = 180
Indoor (mean) temperature of the building: θ_i=20°C
Temperatue at the heating seasen start and end: θ_{eg}=12°C
Outdoor design temperature: θ_e=-12°C

Croatian regulations

Ordinance on energy certification of buildings
Reference climatic data

Energy classes are specified for reference climatic data (page 1 of the energy certificate)
- laid down separately for the continental and the littoral Croatia in relation to the number of (real) heating degree days.
- the calculation of energy needs for towns and settlements with **2,200 and more** heating degree days according to reference climatic data for the **continental Croatia**.
- the calculation of energy needs for towns and settlements with **less than 2,200** heating degree days according to reference climatic data for the **littoral Croatia**.

The reference number of heating degree days is determined on the condition that the indoor temperature of a building is 20°C and that the heating season starts or ends when the outdoor temperature on three subsequent days (at 21:00 hours) lies below or exceeds 12°C. This number amounts to:
- **2900** for the **continental** Croatia and
- **1600** for the **littoral** Croatia.

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Croatian regulations

Ordinance on energy certification of buildings

- describes multi-zone building as a buliding:

- consisting of parts that constitute functional wholes with diverse intended use and the possibility of separate heating and cooling systems (a residential part in a non-residential building), or differ in internal design temperature by **over 4°C**;

- whose **10% or more** of net floor area of a conditioned building space are used for a purpose other than the basic one, if the surface area of this net floor area intended for another use exceeds 50 m^2; and

- whose parts that constitute functional wholes have **different heating systems** and/or substantially different regimes of using heating systems;

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Croatian regulations

Technical regulation concerning energy economy and heat retention in buildings

- defines minimum energy performance requirements for new and existing buildings subject to major renovation, technical requirements relating to energy economy and heat retention in buildings.

- includes definitions of a heated air volume, building shape factor, usable floor area, etc.

Example: annual heating requirements for residential buildings heated at a temperature of 18°C or higher

For $f_0 \leq 0.20$	$Q''_{H,nd} = 51.31$ kWh/(m^2·a)
For $0.20 < f_0 < 1.05$	$Q''_{H,nd} = (41.03 + 51.41 \cdot f_0)$ kWh/(m^2·a)
For $f_0 \geq 1.05$	$Q''_{H,nd} = 95.01$ kWh/(m^2·a).

Croatian regulations

Technical regulation concerning energy economy and heat retention in buildings

- when residential and a non-residential public building not equipped with an air-conditioning system, the indoor design temperature of heating is assumed to be $\Theta_{int,set,H} = 20°C$.

- when intermittent heating (non-residential commercial buildings) thermal losses $Q_{H,ht}$ shall be calculated with the averaged indoor temperature; the designed interruption of heating of non-residential public buildings will last 7 hours at an indoor design temperature of 16°C.

- separate energy performance calculation reqired for a part of a building (thermal zone), if differs from the rest of the building in terms of:
1. intended use,
2. indoor design temperature difference value exceeding 4°C,
3. heating system used and
4. heating system use regime.

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Croatian regulations

Technical regulation concerning energy economy and heat retention in buildings

- defines parameters to prevent overheating in summer, i.e. F_w,$g_\perp$,F_c, g_{tot}·f.

- internal heat gains Q_{int} calculated by using a value of 5 W/m^2 of the usable floor area, unless specified otherwise.

- air change rate per hour for buildings where persons stay or work shall be at least n = 0.5h^{-1},
- at the time when the part of the building intended for the work and/or stay of persons is unoccupied, the air change rate of at least n = 0.2 h^{-1} shall be provided,
- measured air flow, with a pressure difference between the indoor and the outdoor air of 50 Pa, shall not exceed n_{50} = 3.0 h^{-1} for buildings not equipped with a mechanical ventilation.

- heat recovery from return air shall be provided, if the building meets cumulatively the following requirements:
- ventilated by a mechanical device,
- air change rate exceeding 0.7 h^{-1}, and
- outdoor air flow rate exceeding a total of 2,500 m^3/h.

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Croatian regulations

Technical regulation concerning energy economy and heat retention in buildings

- includes maximum permitted thermal transmittance values U [W/(m^{2}K)] of building components in Annex C:

No.	Building component	U [W/(m^2·K)]			
		$\Theta_i \geq 18$ °C		12°C < Θ_i < 18 °C	
		$\Theta_{e,mon,min}$ >3 °C	$\Theta_{e,mon,min}$ ≤3 °C	$\Theta_{e,mon,min}$ >3 °C	$\Theta_{e,mon,min}$ ≤3 °C
1	External walls, walls towards garage and attic	0.60	0.45	0.75	0.75
2	Windows, balcony doors, skylight, transparent facade elements	1.80	1.80	3.00	3.00
3	Flat and sloping roofs above heated spaces, ceilings towards attic	0.40	0.30	0.50	0.40
4	Ceilings above outdoor air, ceilings above garage	0.40	0.30	0.50	0.40
5	Walls and ceilings towards unheated spaces and unheated stairwell at a temperatures above 0°C	0.65	0.50	2.00	2.00
6	Walls towards the ground, floors on the ground	0.50[1)]	0.50[1)]	0.80[1)]	0.65[1)]
7	External doors, door towards unheated staircase with opaque door wing	2.90	2.90	2.90	2.90
8	Walls of roller shutter box	0.80	0.80	0.80	0.80
9	Ceilings between dwellings, ceilings between heated working premises of diverse users	1.40	1.40	1.40	1.40

Croatian regulations

Technical regulation concerning energy economy and heat retention in buildings

-includes real climatic data from over 30 Croatian stations in Annex E:

Monthly values:
- air temperatures
- relative humidities
- wind velocity
- global solar irradiation.

Additional data:
- temperature of heating season start and end
- number of heating days
- number of degree-days

REAL CLIMATIC DATA – EXAMPLE FOR STATION ZAGREB GRIČ

JANUARY – DECEMBER (I. – XII.)

zona: II — H: 157 m
referentna postaja: - — ϕ: 45°49′ — λ: 15°59′

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	God.
TEMPERATURA ZRAKA (°C)													
θ_{mm}	0,5	3,1	7,3	11,8	16,3	19,3	21,3	20,6	17,0	11,9	6,4	2,0	11,5
θ_{sdm}	2,5	2,8	2,4	1,4	1,4	1,1	1,2	1,2	1,4	1,4	2,1	2,1	0,6
θ_{min}	-1,9	0,3	3,7	7,8	11,8	14,9	16,6	16,2	13,0	8,5	3,8	-0,2	7,9
θ_{p1}	-10,7	-7,2	-4,9	3,8	7,2	11,3	13,4	13,0	10,1	3,8	-2,9	-7,0	-6,2
θ_{p5}	-7,1	-3,6	-0,3	5,6	10,0	13,7	16,0	15,3	11,6	5,8	-0,4	-5,1	-1,9
θ_{p10}	-5,6	-2,1	1,6	7,0	11,6	14,8	17,0	16,4	12,6	7,1	0,9	-3,0	0,2
θ_{p90}	6,3	8,8	13,2	16,7	20,8	23,9	25,2	24,9	21,2	16,6	12,2	8,0	21,8
θ_{p95}	7,9	10,4	14,4	17,9	21,8	24,9	26,1	25,8	22,2	17,6	13,8	9,8	23,5
θ_{p99}	10,1	12,3	16,9	20,1	23,2	26,4	27,5	27,4	23,8	19,0	16,3	13,1	26,0
θ_{max}	2,8	5,9	11,1	16,3	21,0	24,0	26,2	25,2	21,3	15,5	9,2	4,1	15,2
VLAŽNOST ZRAKA													
p_{mm}	5,2	5,7	6,7	8,4	11,8	15,0	16,2	16,4	14,1	10,8	7,8	5,9	10,4
p_{7h}	5,1	5,6	6,5	8,4	11,8	15,0	16,2	16,3	13,7	10,3	7,6	5,8	10,2
p_{14h}	5,4	5,9	6,8	8,4	11,7	14,9	16,0	16,3	14,3	11,0	8,0	6,0	10,4
ϕ_{mm}	79	73	65	61	64	67	65	68	73	76	79	80	71
ϕ_{7h}	84	80	76	72	75	77	76	81	85	87	85	85	80
ϕ_{14h}	74	65	55	50	52	54	51	54	59	64	71	75	60
BRZINA VJETRA (m/s)													
v_{mm}	1,5	1,8	2,1	2,2	1,9	1,8	1,7	1,6	1,6	1,6	1,6	1,6	1,7

Annual energy needs for heating and cooling of the building

PROGRAMMING ASSIGNMENT – developed for the Ministry of Environmental Protection, Physical Planning and Construction by *Balen, Šimetin*
- developed to support the software algorithm.
- includes the rules to be accepted when using the CEN standards for energy calculations in Croatia (when, for exmple, the standards offer multiple choices in calculation procedures).

Standard **EN ISO 13790**
Energy performance of buildings – Calculation of energy use for space heating and cooling
- calculation of annual energy needs for heating and cooling of the building (monthly-seasonal method, simple hourly dynamic method, detailed dynamic methods)

→ SELECTED: monthly quasy-steady-state method, performed for both *reference* and *real* climatic data.

→ SELECTED: method for cooling follows method a) with utilization factor for losses $\eta_{C,ls}$.

→ SELECTED: method with thermal coupling between zones when $\Delta\theta > 4°C$ (with thermal bridges and heat exchange due to ventilation neglected).

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Annual energy needs for heating and cooling of the building

Standard **EN ISO 13790**
Energy performance of buildings – Calculation of energy use for space heating and cooling

(continued)
→ SELECTED: conditioned floor area A_f calculated with external dimesions.

→ SELECTED: length of heating and cooling seasons by method a) simplified.

→ SELECTED: method a) separate calculation of central pre-heating and pre-cooling.

→ SELECTED: holistic approach including interaction between building needs and recoverable system losses (with iteration).

→ SELECTED: solar heat gains to be calculated with neglecting gains through opaque elements, indirect gains through unconditioned spaces (except greehouses or similar) and radiation to the sky.

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Annual energy needs for heating and cooling of the building

Standard **EN ISO 13790**

Energy performance of buildings – Calculation of energy use for space heating and cooling

(continued)

→ SELECTED: internal gains defaults (when no other input):

q_i = 4.5 W/m^2 for residential bulidings,

q_i = 6 W/m^2 for commercial buildings,

q_i = 5 W/m^2 for non-residential public buildings.

→ SELECTED: internal heat capacity defaults:

C_m = 470 kJ/(m^{2}K) • A_f for heavy zones,

C_m = 330 kJ/(m^{2}K) • A_f for medium heavy zones,

C_m = 180 kJ/(m^{2}K) • A_f for light zones.

“heavy zones” – massive internal and external building parts (density of materials ≥ 1000 kg/m^3)

“medium heavy zones” – massive internal and external building parts

(density of materials ≥ 600 kg/m^3)

“light zones” – those which are not heavy or medium heavy.

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Annual energy needs for heating and cooling of the building

EN ISO 13790

- input of the calculation results in energy 2):

Annual energy need - heating
(reference climatic data)

Energetske potrebe

	Za referentne klimatske podatke		Za stvarne klimatske podatke		Zahtjev	
	Ukupno	Specifično	Ukupno	Specifično	Dopušteno	Ispunjeno
$Q_{H,nd}$ [kWh/a]	11118,1	74,1				
Q_W [kWh/a],						
$Q_{H,ls}$ [kWh/a],						
$Q_{W,ls}$ [kWh/a],						
Q_H [kWh/a],						
$Q_{C,nd}$ [kWh/a],						
$Q_{C,ls}$ [kWh/a],						
Q_C [kWh/a],						
Q_{Ve} [kWh/a],						
E_l [kWh/a],						
E_{del} [kWh/a],						
E_{prim} [kWh/a],						
CO_2 [kg/a]						

Annual energy needs for heating and cooling of the building

Standard **EN 15603**

Energy performance of buildings – Overall energy use and definition of energy ratings

- assesment of energy performance of buildings

→ SELECTED: calculated energy rating, using monthly method, using holistic approach including interaction between building needs and recoverable system losses (with 2 iterations).

→ SELECTED: lightning in residential buildings is included in calculation of the final energy.

→ SELECTED: energy from the on-site renewable sources, is not part of the delivered energy.

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Annual system energy requirements for heating

Standard **EN 15316 -1**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 1: General

- general part on calculation method for determining heating system and domestic hot water system energy requirements (thermal losses, auxiliary energy, recoverable energy)

→ SELECTED: monthly method (general recommendation, adopt where necessary)

Standard **EN 15316 -2-1**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 2-1: Space heating emmision systems

- part on calculation method for determining heat emitters (radiators, convectors, embedded emitters) energy requirements (thermal losses)

→ SELECTED: calculation method according to DIN V 18599-6 (German approach – Annex A)

Annual system energy requirements for heating

Standard **EN 15316 -2-3**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 2-3: Space heating distribution systems

- part on calculation method for determining water-based distribution piping energy requirements (thermal losses)

→ SELECTED: simplified calculation method according to Annexes A1 (annual auxiliary energy) and A3 (annual thermal losses)

Standard **EN 15316 -3-1**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 3-1: Domestic hot water systems, characterisation of needs

- part on calculation method for determining DHW energy requirements

→ SELECTED: calculation method based on required daily volume

alternatively for residential buildings, method based on floor area (12.5 kWh/m^2)

Annual system energy requirements for heating

Standard **EN 15316 -3-2**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 3-2: Domestic hot water systems, distribution

- part on calculation method for determining DHW distribution piping (incl. circulation loop) energy requirements (thermal losses)

→ SELECTED: calculation method for distribution pipes based on pipe lengths and number of tappings per day (Annex A)

alternatively method based on pipe lengths and distribution efficiency (Annex B, when details about piping are not available)

→ SELECTED: calculation method for circulation loop based on physical approach

alternatively method based on pipe lengths and fixed value of loss (when details about piping are not available)

→ SELECTED: simplified method for auxiliary energy for pumps

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Annual system energy requirements for heating

Standard **EN 15316 -3-3**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 3-3: Domestic hot water systems, generation

- part on calculation method for determining DHW generation energy requirements (thermal losses)

- problems: many of the required input data for calculation are missing (no defaults)
  indistinct why use this standard when this calculation can be included in 15316 -4-1

Standard **EN 15316 -4-1**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-1: Space heating generation systems, combustion systems

- part on calculation method for determining heating generation (boiler) energy requirements (thermal losses)

→ SELECTED: calculation method based on case specific boiler efficiency (default data in Annexes B and D)

Annual system energy requirements for heating

Standard **EN 15316 -4-2**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-2: Space heating generation systems, heat pump systems

- part on calculation method for determining heating generation (heat pump) energy requirements (thermal losses)

→ SELECTED: detailed calculation method (BIN - method) (default data in Annex B)

- problem: availability of detailed climatic data

Standard **EN 15316 -4-3**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-3: Heat generation systems, thermal solar systems

- part on calculation method for determining heating generation (thermal solar) energy requirements (thermal losses)

→ SELECTED: monthly calculation method B (based on *f-chart* method) (default data in Annex B)

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Annual system energy requirements for heating

Standard **EN 15316 -4-4**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-4: Heat generation systems, building-integrated cogeneration systems

- part on calculation method for determining heating generation (cogeneration) energy requirements (thermal losses)

→ SELECTED: monthly calculation method, approach depends on use regime (2 methods)

→ SELECTED: auxiliary energy equals 0
recoverable loss equals 0

Annual system energy requirements for heating

Standard **EN 15316 -4-5**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-5: Space heating generation systems, the performance and quality of district heating and large volume systems

- part on calculation method for determining heating generation (district heating) energy requirements (thermal losses)

→ SELECTED: annual calculation method, approach depends on available input data (2 methods)

→ SELECTED: auxiliary energy for substation equals 0
recoverable loss of subsystem equals 0 (when placed in unheated space)

Annual system energy requirements for heating

Standard **EN 15316 -4-6**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-6: Heat generation systems, photovoltaic systems

- part on calculation method for determining electricity generation (photovoltaic) energy requirements

→ SELECTED: annual calculation method of delivered energy

→ SELECTED: auxiliary energy equals 0
heat loss equals 0

Annual system energy requirements for heating

Standard **EN 15316 -4-7**

Heating systems in buildings – Method for calculation of system energy requirements and system efficiencies – Part 4-7: Space heating generation systems, biomass combustion systems

- part on calculation method for determining heating generation (biomass) energy requirements (thermal losses)

→ SELECTED: monthly calculation method, approach depends on system type (2 methods)

→ SELECTED: auxiliary energy for control equals 0
heat loss by ash equals 0

Annual system energy requirements for ventilation

Standard **EN 15241**

Ventilation for buildings – Calculation methods for energy losses due to ventilation and infiltration in commercial buildings

- calculation of energy needs in air treatment

→ SELECTED: monthly calculation method

Standard **EN 15242**

Ventilation for buildings – Calculation methods for the determination of air flow rates in buildings including infiltration

- calculation of ventilation air flows for occupied and unoccupied periods (i.e. for ventilation losses in EN ISO 13790)

→ SELECTED: monthly calculation method

-problem: indistinct how use this standard to calculate simple infiltration (no mechanical system).

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Annual system energy requirements for air conditioning

Standard **EN 15243**

Ventilation for buildings – Calculation of room temperatures and of load and energy for buildings with room conditioning systems

- calculation of annual energy needs in cooling and air conditioning

→ SELECTED: simplified method for latent load calculation neglecting storage effects in building components and furniture

→ SELECTED: monthly calculation method of the system

→ SELECTED: German proposal of the method (example in Annex E2)
alternatively method using degree-days of cooling (example in Annex E3) may be applied, depending on available input data.

Annual energy requirements for lighting

Standard **EN 15193**

Energy performance of buildings – Energy requirements for lighting

- calculation of annual energy use for lighting

→ SELECTED: monthly calculation method (comprehensive) with continental Croatia using default data for Lyon (F) and littoral Croatia using default data for Athens (GR) (Annexes C, D, E)

alternatively simplified method may be applied, depending on available input data (annual energy results, neglecting geographic location and without monthly results, Annexes E, F, G).

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Energy performance and energy rating

Ordinance on energy certification of buildings

- includes tables of primary energy factors and annual CO_2 emmisions in dependence of the energy source
- but, calculation of annual CO_2 emmisions and primary energy is not mandatory in the first phase of implementation of the Ordinance.

Final remarks

- very complex procedure, difficult to follow,
- problems with different symbols in different standards,
- problems with availability of input data,
- problems with consistency of the results
  ("open ends" in the procedures),
- difficult to find "the most practical way"
  (many offered methods in many standards).

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