BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

MUNICIPAL CENTRE IN NIVNICE

MUNICIPAL CENTRE IN NIVNICE

THERMAL ASSESSMENT

MASTER'S THESIS

DIPLOMOVÁ PRÁCE

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1. Technical parameters

1.1. Identification data

Name of the building:	Municipal centre
Type of building:	Civic amenities facility
Purpose of building:	Multifunctional building
Municipality:	Nivnice
Cadastral area:	704679 NIVNICE
Parcel numbers:	65, 64, 63, 61 ,57

1.2. Architectural and urban solution of the building

The subject of the documentation is fire safety solution of newly built municipal centre in town Nivnice, in cadastral area Nivnice [704679], on parcels 65, 64, 63, 61, 57, in the built-up area of town.

Designed building is permanent, detached construction with 2 above ground floors and a partial basement. It is located on flat land, without underground water. The shape of the building is rectangular with total area of 330,72 m2. The building is divided into two separate functional units, post office and administrative area with ceremony hall. Entrances to both parts are from the northeast side, through the first floor.

The roof construction is flat and green with simple intensive type of vegetation. On the roof are placed photovoltaic panels. Façade surface has silicon thin-layered plaster, and it is insulated by mineral wool. Fillings of windows and doors are wooden-aluminium with triple glazing. External shadings from aluminium will be connected to the load-bearing peripheral walls by Propasiv system blocks.

1.3. Layout solution of the building

The building is divided into 2 functionally separate units, post office and administrative area with ceremony hall.

The main entrance to the post office is from the northeast side, through the first floor. The entrance leads through automatic doors to the customer area with delivery window and post office counter. The service office is designed for 2 employees. There is also small kitchen with electrical stove, toilet, washroom and cleaning/changing room. The storage area for delivering and storing of packages has car entrance from northeast side and it has area of 29,73 m2. The total area of post office is 70,41 m2.

The main entrance to the administrative part with ceremony hall is from the northeast side, through the first floor. The entrance leads through automatic doors to the hallway with waiting room. On the first floor there is submission office for the first contact with public, hygienic area, small storage and ceremony hall. Hygienic area contains 2 separate toilets for disabled people, women toilet with 4 WC cabins and separate washroom and men toilet with 2 cabins and1 pisoar and separate washroom. In front of ceremony hall in small foyer with places to sit. 3

Ceremony hall has capacity of total cca 50 people, from which 40 can be seated. Total area is 72,96 m2. Ceiling is 6,35m high, going through 2 floors. Ceremony hall is connected with small storage area for chairs that serves also as a passage for a person leading the ceremony, or if needed as a cloak room.

In the underground floor is located cleaning room below the arm of staircase, technical room with geothermal heat pump and water heater, HVAC room, storage for office furniture, depository and archive. All rooms are considered without a permanent work position.

In the second floor are 3 offices for administrative work and public relations, hygienic area, printing/storage room for office supplies, kitchen, meeting room, mayor’s office with secretary office and vice mayor´s office. The meeting room is designed for 15 people. In hygienic area is washroom for women and toilet with 2 WC cabins and separated washroom for men with toilet with 1 WC cabin and pisoar.

All floors are connected by vertical communication in a form of staircase with electrical elevator.

1.4. Structural solution of the building

The building is standing on strip foundation and foundation slab from plain concrete. Load-bearing system is designed as mixed from masonry locks.

Peripheral walls in 1.P are made of hollow core concrete blocks, BTB 50/30/25 (P+D), LxWxH 500x300x250mm, filled with reinforced concrete. They are insulated by XPS 300 L, thick 80 and160 mm. Peripheral walls in 1.NP and 2.NP are bricked, made of ceramic blocks POROTHERM 30 PROFI, th. 300mm. Thermal insulation is made of mineral wool thick 200 mm, covered by silicon thin-layered plaster - ETICS system. Interior loadbearing wall are also made of ceramic blocks POROTHERM 30 PROFI, th. 300mm. Non-loadbearing partitions are made of ceramic block POROTHERM 11,5 PROFI thick 115 mm and POROTHERM 8 PROFI thick 80mm.

Ceiling structures are made of prefabricated prestressed ceiling panels (SPIROLL) placed on loadbearing walls and connected by concrete. Below spiroll panels on load-bearing walls are made reinforced concrete rings. The U-shaped staircase is designed as a left-hand turn from prefabricated reinforced concrete parts. There is a personal elevator in the mirror area, that is placed into prefabricated elevator shaft from reinforced concrete.

The roof structure is designed as a flat, green, simple intensive roof made of prestressed SPIROLL ceiling panels. The insulation is EPS with lowest thickness of 250 mm. Waterproofing is made of SBS asphalt felts.

Fillings of exterior windows and doors are wooden aluminium with triple glazing. Interior doors are mostly wooden placed in wooden frames, except for automatic doors that are made of safety glass and aluminium. Almost in all rooms is constructed dropped ceiling from plasterboard cassettes on load-bearing grid.

1.5. Climatic conditions of the location

Total area: 330, 72m2

Altitude: 240,24 m.n.m

Air conditions in exterior:

Winter θe = -15°C

Summer θe = +30°C

Soil θe = 5°C

Humidity ϕ 84 %

Air conditions in interior:

Winter θi = 20°C

Winter θi = 15°C basement

Winter θi = 5°C unheated spaces

Summer θi = max 26°C

Additional Δθai 0,6°C

Humidity ϕ 50 %

Volume of the object: 3126 m3

Paved areas: 112,84 m2

Built-up area: 443,57m2

2. Aim of the assessment

The goal of the thermal-technical evaluation is to determine the building's classification based on the standards for its envelope. The calculated heat transfer coefficient (U) [W/m²K] will be compared to the standard reference values, UN,20 and UREC,20 [W/m²K]. The assessment will be conducted following the guidelines outlined in ČSN 73 0540.

3. Background documents

- Situation drawings of surrounding areas
- Plan drawings
- Data from manufacturers
- Standards, norms, regulations
-

4. Used norms and regulations

- Law no. 350/2012 Coll., about Territorial Planning and Building Regulations
- Notice no. 20/2012 Coll., about Technical requirements of buildings,
- Notice no. 62/2012 Coll., about Documentation of buildings,
- Notice no. 78/2013 Coll., about Energy Performance of buildings,
- Act No. 183/2006 Coll., on Spatial Planning and Building Regulations (Building Act), as amended,
- Act No. 406/2000 Coll., on Energy Management, as amended,
- Decree No. 268/2009 Coll., on Technical Requirements for Buildings, as amended,
- Decree No. 499/2006 Coll., on Building Documentation, as amended,
- Decree No. 264/2020 Coll., on the Energy Performance of Buildings,
- ČSN 73 0540-1:2005 Thermal Protection of Buildings – Part 1: Terminology.
- ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements.

- ČSN 73 0540-3:2005 Thermal Protection of Buildings – Part 3: Design Values of Parameters.
- ČSN 73 0540-4:2005 Thermal Protection of Buildings – Part 4: Calculation Methods.

5. Normative Requirements

5.1. Minimum Interior Surface Temperature of the Structure

The minimum interior surface temperature of a structure is determined to prevent the formation and growth of mould on interior surfaces. Mold formation and growth are caused by water vapor condensation on the inner surface of the structure.

According to Article 5.1.1 of ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements, building structures and joints in spaces with a design relative indoor air humidity of less than 60% (φi ≤ 60%) during winter must exhibit an interior surface temperature such that the temperature factor of the inner surface, fRsi, satisfies the condition:

$$fRsi \geq fRsi,N$$

Where:

fRsi [-]: temperature factor of the interior surface of the structure

fRsi,N [-]: required value of the minimum temperature factor of the interior surface, calculated as:

$$fRsi,N = fRsi,cr$$

Here:

fRsi,cr [-]: critical temperature factor of the interior surface, determined based on the formula provided in Article 5.1.4 of ČSN 73 0540-2:2011 + Z1:2012.

For structures in spaces with a design relative indoor air humidity of φi = 50%, the critical temperature factor fRsi can be determined from Table 1 in Article 5.1.4 of ČSN 73 0540-2:2011 + Z1:2012.

Article 5.1.2 of the same standard states that for building structures and joints in spaces with a design relative indoor air humidity greater than 60% (φi > 60%), the above requirement must be met, or the risk of mould growth must be mitigated by other means.

5.2. Heat Transfer Coefficient

The heat transfer coefficient characterizes the thermal insulation properties of building structures and evaluates their impact on heat transmission. It represents the overall heat exchange between two spaces separated by a structure with a specific thermal resistance, R.

According to Article 5.2.1 of ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements, the heat transfer coefficient U [W/m²K] for heated buildings in spaces with a design relative indoor air humidity of $\varphi i \leq 60\%$ must satisfy the condition:

$$U \leq UN$$

Where:

U [W/m²K]: heat transfer coefficient of the structure

UN [W/m²K]: required heat transfer coefficient

The heat transfer coefficient U is expressed by the formula:

$$U = 1 / (Rsi + \Sigma\ (di/\lambda i) + Rse)$$

Where:

Rsi [m²K/W]: thermal resistance of heat transfer at the inner surface, with values:

0.13 for horizontal heat flow

0.10 for upward heat flow

0.17 for downward heat flow

Rse [m²K/W]: thermal resistance of heat transfer at the outer surface, with values:

0.04 for contact with air

0.00 for contact with soil

d [m]: thickness of individual materials

λ [W/mK]: thermal conductivity of individual materials

The required value of the heat transfer coefficient UN [W/m²K] is determined:

For structures in buildings with a predominant design indoor temperature θim between 18°C and 22°C, according to Table 3 in Article 5.2.1 of ČSN 73 0540-2:2011 + Z1:2012.

5.3. Condensed Water Vapor Inside the Structure

If condensed water vapor could compromise the function of a building structure (e.g., its structural or thermal insulation properties), the structure must be designed to prevent water vapor condensation.

Standard ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements, Article 6.1.1, specifies the following conditions:
For building structures where condensed water vapor inside the structure, Mc [kg/m²/year], could endanger its required function, the condition must be met:

$$M_c = 0$$

For other structures where condensed water vapor inside does not threaten their functionality, the following requirement must be met:

$$M_c \leq M_{c,N}$$

Where:
Mc [kg/m²/year]: annual amount of condensed water vapor in the structure
Mc,N [kg/m²/year]: required annual amount of condensed water vapor in the structure

The required values for the annual amount of condensed water vapor are specified in Article 6.1.2 of the same standard and depend on the type of structure:

For single-layer flat roofs, structures with built-in wooden elements, structures with external insulation systems, or external cladding, the lower of the following values applies:

$$M_{c,N} = 0.1 \text{ kg/m}^2\text{/year}$$

3% of the surface weight of the material where condensation occurs, if its bulk density is greater than 100 kg/m³
6% of the surface weight of the material where condensation occurs, if its bulk density is less than 100 kg/m³

For other building structures, the lower of the following values applies:

$$M_{c,N} = 0.50 \text{ kg/m}^2\text{/year}$$

5% of the surface weight of the material where condensation occurs, if its bulk density is greater than 100 kg/m³
10% of the surface weight of the material where condensation occurs, if its bulk density is less than 100 kg/m³

5.4. Annual Balance of Condensation and Evaporation of Water Vapor Inside the Structure

For building structures where limited water vapor condensation is permissible, the annual balance of condensation and evaporation must ensure that no residual condensed water vapor remains inside the structure, which could permanently increase its moisture content.

Standard ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements, Article 6.2, states the condition:

$$M_c \leq M_{ev}$$

Where:

Mc [kg/m²/year]: annual amount of condensed water vapor in the structure

Mev [kg/m²/year]: annual amount of water vapor that can evaporate from the structure

5.5. Floor Surface Temperature Drop

The floor surface temperature drop is determined for the design and verification of floor surface layers concerning their effect on the human body. It expresses the temperature drop between the floor surface and the human foot. It is calculated based on the thermal admittance of the floor, B [Ws0.5/m²K], and the internal surface temperature of the floor, θsi [°C].

According to ČSN 73 0540-2:2011 + Z1:2012, Article 5.5.1, floors are categorized into four groups based on the temperature drop:

Floor Categories Based on Surface Temperature Drop	
Floor Category	Surface Temperature Drop Δθ10,N [°C]
I. Very warm	Up to and including 3.8
II. Warm	Up to and including 5.5
III. Less warm	Up to and including 6.9
IV. Cold	6.9 and above

To classify a floor into a specific category, the floor surface temperature drop must meet the following condition as per ČSN 73 0540-2:2011 + Z1:2012, Article 5.5.2:

$$\Delta\theta_{10} \leq \Delta\theta_{10,N}$$

Where:

Δθ10 [°C] is the actual floor surface temperature drop.

Δθ10,N [°C] is the required floor surface temperature drop.

This requirement does not need to be verified for floors with a permanent surface layer made of textile flooring or floors with a surface temperature consistently higher than 26°C. Such floors are automatically classified into Category I.

The required floor categories based on the purpose of the building and room are specified in Table 8, Article 5.5.3 of ČSN 73 0540-2:2011 + Z1:2012.

In the proposed building, the premises include offices, where the required floor category is II. This requirement will be met.

5.6. Linear and Point Heat Transfer Coefficients

The values of the linear and point heat transfer coefficients characterize the thermal performance of two-dimensional and three-dimensional thermal connections and represent the influence of linear or point thermal bridges on heat transfer.

According to the standard ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements, section 5.4.1, the linear heat transfer coefficient ψ [W/mK] and the point heat transfer coefficient χ [W/K] must meet the following conditions:

$$\Psi \leq \Psi_N \qquad \chi \leq \chi_N$$

Where:

ψ [W/mK]: Linear heat transfer coefficient

ψ_N [W/mK]: Required value of the linear heat transfer coefficient

χ [W/K]: Point heat transfer coefficient

χ_N [W/K]: Required value of the point heat transfer coefficient

The required values of the linear heat transfer coefficient ψN [W/mK] and the point heat transfer coefficient χN [W/K] are determined according to Table 6 in ČSN 73 0540-2:2011 + Z1:2012 Thermal Protection of Buildings – Part 2: Requirements.

Linear joint connections of construction		Linear thermal transmittance ψ [W/(m.K)]	
Required ψN	Recommended ψrec	Recommended ψrec	For passive houses ψpas
External wall connected with another construction (excluding windows), for example, connected with foundation, floor structure over unheated room, another wall, roof, loggia or balcony, bay, internal wall and ceiling (with internal insulation), etc.	≤ 0,20 (*0,7 since 2020)	≤ 0,10	≤ 0,05
External wall connected with a window or door, gate or a part of a glazed curtain wall, at window parapet, window jambs or at lintel position.	≤ 0,10 (.0,7)	≤ 0,03	≤ 0,01
Roof construction connected with a window, for example roof window, skylight, roof entrance cover	≤ 0,30 (.0,7)	≤ 0,10	≤ 0,02

5.7. Thermal Stability

Thermal stability is based on the conditions of thermal comfort. It evaluates the environment of the structure under unsteady thermal conditions, characterizes the thermal properties of the space, and is influenced by the materials used in the room's envelope structures. The primary parameter for assessing thermal stability is the maximum daily temperature of the indoor air.

Thermal Stability in Winter

According to ČSN 73 0540-2:2011 + Z1:2012, section 8.1.1, thermal stability in winter is evaluated based on the temperature drop at the end of a heating break. The evaluation is conducted for the so-called critical room, which is the room in the building with the highest value of the average heat transfer coefficient U.

The temperature drop at the end of the heating break Δθv(t) in the critical room must meet the condition:

$$\Delta\theta v(t) \leq \Delta\theta v,N$$

Where:

Δθv(t) [°C]: Temperature drop in the room during winter

Δθv,N [°C]: Required value of the temperature drop during winter, according to Table 11 in ČSN 73 0540-2:2011 + Z1:2012

Souhrnná tabulka - zimní stabilita

Místnost			
Ozn.	Název	$\Delta\theta_{v,N}$	t
[-]	[-]	[°C]	[h]
MIS-1	Mayors office	6,00	24,00
MIS-2	Ceremony hall	6,00	24,00

Thermal Stability in Summer

The assessment of thermal stability in summer is conducted for the so-called critical room, which is defined as the residential room in the building with the largest area of transparent constructions directly exposed to sunlight and oriented towards the east, southeast, south, southwest, or west.

According to ČSN 73 0540-2:2011 + Z1:2012, the maximum daily air temperature in summer θai,max in the critical room must meet the condition:

$$\theta ai,max \leq \theta ai,max,N$$

Where:

θai,max [°C]: Maximum daily air temperature in the room during summer

θai,max,N [°C]: Required value of the maximum daily air temperature during summer, according to Table 12 in ČSN 73 0540-2:2011 + Z1:2012

Souhrnná tabulka - letní stabilita

Místnost				
Ozn.	Název	$\theta_{ai,max,N}$	$\theta_{ai,max}$	Hod.
[-]	[-]	[°C]	[°C]	[-]
MIS-1	Mayors office	32,00	26,69	+
MIS-2	Ceremony hall	32,00	28,62	+

5.8. Air exchange

The airtightness of the building envelope or its components is assessed by measuring the overall air exchange rate, n50 , at a pressure difference of 50 Pa, expressed in h−1. This is determined experimentally in accordance with ČSN EN 13829. The following condition is recommended:

$$n50 \leq n50,N$$

Here , n50,N represents the recommended value for the total air exchange rate at a 50 Pa pressure difference (h−1) as specified in the table of recommended values.

For spaces equipped with mechanical ventilation or air conditioning, it is advised to maintain minimal air leakage. The calculated natural air exchange rate should satisfy the condition:

$$n \leq 0.05\, h^{-1}$$

When a room is unoccupied, the minimum ventilation rate, n min (h−1), should comply with:

$$n\ min \geq n\ min,N$$

Where n min,N is the recommended minimum ventilation rate (h−1) for unoccupied rooms.

For occupied spaces, the ventilation rate, nnn (h−1), must meet the requirement:

$$n \geq nN$$

Here, nN denotes the required ventilation rate (h−1) for occupied rooms.

Additionally, during the heating season, the room's ventilation rate must also satisfy the necessary requirements.

$$n \leq 1.5\ nN$$

5.9. Standard for nearly zero energy buildings:

The standard specifies both the Required and Recommended values for the heat transfer coefficient. The heat transfer coefficient of the building envelope, U (W/m²K), must not exceed 0.7 times UN,20. Ideally, U (W/m²K) should be less than Urec,20. Thermal conductivity values taken from the catalogue are adjusted by a factor of 1.1 to 1.5 (increased by approximately 10% to 15%), resulting in corrected values of λx1.1 to λx1.5

6. Calculations

See attachment Thermal assessment results from DEKSOFT

7. Results

Souhrnná tabulka - součinitel prostupu tepla (Dle českých technických norem)

Konstrukce		Součinitel prostupu tepla			
		Dle českých technických norem			
Ozn.	Název	U_N	U_{rec}	U	Hod.
[-]	[-]	[W/(m² K)]	[W/(m² K)]	[W/(m² K)]	[-]
STN(z)-1	W01 - Underground peripheral wall - tempered space	1,25	0,85	0,240	x
STN(z)-2	W02 - Underground peripheral wall with dilatation - tempered space	1,25	0,85	0,236	x
STN-3	W03 - Interior load-bearing wall Paint -temp. diff to 5 °C	2,70	1,80	0,518	x
STN-4	W04 - Partition 115mm paint, temp. diff. 5°C	2,70	1,80	1,296	x
STN-5	W05 - Partition 80mm paint, temp. diff. 5°C	2,70	1,80	1,560	x
STN-6	W06 - Peripheral wall	0,30	0,25	0,148	x
STN-7	W06 - Peripheral wall - ceremony hall	0,30	0,25	0,148	x
STN-8	W09 - Plinth	0,30	0,25	0,186	x
PDL(z)-9	F01 - Floor in basement - epoxy	1,25	0,85	0,289	x
PDL-10	F02 - Floor above 1P - Tiles	2,20	1,45	0,256	x
PDL-11	F03 - Floor above 1P - Vinyl	0,75	0,50	0,273	x
PDL(z)-12	F09 - Floor 1.NP on ground - epoxy	1,25	0,85	0,498	x
PDL(z)-13	F10 - Floor 1.NP on ground - tiles	1,25	0,85	0,289	x
PDL(z)-14	F11 - Floor 1.NP on ground - vinyl	0,45	0,30	0,288	x
PDL-15	F07 - Floor above 1.NP - Vinyl	0,75	0,50	0,426	x
PDL-16	F08 - Floor above 1.NP - Tiles	2,20	1,45	0,430	x
STR-17	R01- Roof	0,24	0,16	0,116	x
VYP-18	O01 - 2x1,75m	1,50	1,20	0,782	x
VYP-19	O02 - 2x0,8m	1,50	1,20	0,906	x
VYP-20	O03 - 2x5,9m	1,50	1,20	0,699	x
VYP-21	O04 - 5,5x2,45	1,50	1,20	0,607	x
VYP-22	O05 - 1x1m	1,50	1,20	0,713	x
VYP-23	O06 - 1x4,15	1,50	1,20	0,646	x
VYP-24	O07 - 2x2,25	1,50	1,20	0,634	x
VYP-25	DE 01 - 2x2,59m	1,50	1,20	0,706	x
VYP-26	DE 02 - 2,9x2,59	1,50	1,20	0,692	x
VYP-27	DG - 2x2,59	3,50	2,30	0,540	x

Souhrnná tabulka - součinitel prostupu tepla (Dle českých technických norem)

Konstrukce		Součinitel prostupu tepla			
		Dle českých technických norem			
Ozn.	Název	U_N	U_{rec}	U	Hod.
[-]	[-]	[W/(m² K)]	[W/(m² K)]	[W/(m² K)]	[-]

Legenda:
! ... nevyhovuje požadované hodnotě součinitele prostupu tepla dle ČSN 73 0540-2
+ ... vyhovuje požadované hodnotě součinitele prostupu tepla dle ČSN 73 0540-2
x ... vyhovuje doporučené hodnotě součinitele prostupu tepla dle ČSN 73 0540-2
U ... vypočtená hodnota součinitele prostupu tepla
U_N ... požadovaná hodnota součinitele prostupu tepla dle ČSN 73 0540-2
U_{rec} ... doporučená hodnota součinitele prostupu tepla dle ČSN 73 0540-2

Souhrnná tabulka - teplotní faktor vnitřního povrchu

Konstrukce		Teplotní faktor					
		ČSN 73 0540			ČSN EN ISO 13788		
Ozn.	Název	$f_{Rsi,N}$	f_{Rsi}	Hod.	$f_{Rsi,N}$	f_{Rsi}	Hod.
[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]
STN(z)-1	W01 - Underground peripheral wall - tempered space	0,424	0,941	+	-	-	-
STN(z)-2	W02 - Underground peripheral wall with dilatation - tempered space	0,424	0,942	+	-	-	-
STN-3	W03 - Interior load-bearing wall Paint - temp. diff to 5 °C	0,000	0,877	+	-	-	-
STN-4	W04 - Partition 115mm paint, temp. diff. 5°C	0,000	0,718	+	-	-	-
STN-5	W05 - Partition 80mm paint, temp. diff. 5°C	0,000	0,670	+	-	-	-
STN-6	W06 - Peripheral wall	0,744	0,963	+	-	-	-
STN-7	W06 - Peripheral wall - ceremony hall	0,749	0,963	+	-	-	-
STN-8	W09 - Plinth	0,744	0,954	+	-	-	-
PDL(z)-9	F01 - Floor in basement - epoxy	0,136	0,929	+	-	-	-
PDL-10	F02 - Floor above 1P - Tiles	0,000	0,937	+	-	-	-
PDL-11	F03 - Floor above 1P - Vinyl	0,000	0,933	+	-	-	-
PDL(z)-12	F09 - Floor 1.NP on ground - epoxy	0,136	0,880	+	-	-	-
PDL(z)-13	F10 - Floor 1.NP on ground - tiles	0,136	0,929	+	-	-	-
PDL(z)-14	F11 - Floor 1.NP on ground - vinyl	0,402	0,929	+	-	-	-
PDL-15	F07 - Floor above 1.NP - Vinyl	0,000	0,897	+	-	-	-
PDL-16	F08 - Floor above 1.NP - Tiles	0,000	0,896	+	-	-	-
STR-17	R01- Roof	0,744	0,971	+	-	-	-

Souhrnná tabulka - teplotní faktor vnitřního povrchu

Konstrukce		Teplotní faktor					
		ČSN 73 0540			ČSN EN ISO 13788		
Ozn.	Název	$f_{Rsi,N}$	f_{Rsi}	Hod.	$f_{Rsi,N}$	f_{Rsi}	Hod.
[-]	[-]	[-]	[-]	[-]	[-]	[-]	[-]

Legenda:
! ... nevyhovuje požadované hodnotě
+ ... vyhovuje požadované hodnotě

Souhrnná tabulka - šíření vodní páry v konstrukci

Konstrukce		Šíření vodní páry							
		ČSN 73 0540				ČSN EN ISO 13788			
Ozn.	Název	M_c	$M_{c,N}$	Hod.	Bil.	M_c	$M_{c,N}$	Hod.	Bil.
[-]	[-]	[kg/(m² .a)]	[kg/(m² .a)]	[-]	[-]	[kg/(m² .a)]	[kg/(m² .a)]	[-]	[-]
STN-3	W03 - Interior load-bearing wall Paint -temp. diff to 5 °C	-	-	-	-	0,000	0,000	+	+
STN-4	W04 - Partition 115mm paint, temp. diff. 5°C	-	-	-	-	0,000	0,000	+	+
STN-5	W05 - Partition 80mm paint, temp. diff. 5°C	-	-	-	-	0,000	0,000	+	+
STN-6	W06 - Peripheral wall	-	-	-	-	0,000	0,500	+	+
STN-7	W06 - Peripheral wall - ceremony hall	-	-	-	-	0,000	0,100	+	+
STN-8	W09 - Plinth	-	-	-	-	0,000	0,100	+	+
PDL-10	F02 - Floor above 1P - Tiles	-	-	-	-	0,000	0,500	+	+
PDL-11	F03 - Floor above 1P - Vinyl	-	-	-	-	0,000	0,000	+	+
PDL-15	F07 - Floor above 1.NP - Vinyl	-	-	-	-	0,000	0,500	+	+
PDL-16	F08 - Floor above 1.NP - Tiles	-	-	-	-	0,000	0,500	+	+

Legenda:
! ... nevyhovuje požadované hodnotě / pasivní bilance kondenzace a vypařování
+ ... vyhovuje požadované hodnotě / aktivní bilance kondenzace a vypařování
Poznámka: V tabulce jsou uvedeny pouze základní posouzení. Některé další požadavky (např. vlhkost v místě zabudovaného dřeva) jsou hodnoceny v podrobném protokolu.

8. Conclusion

All constructions, walls, floors, roof and openings will satisfy conditions for heat transfer coefficient, interior surface temperature, condensed water vapour inside the structure and annual balance of condensed and evaporated water vapour.

Floor surface temperature will be satisfied, especially in offices, where the floor category has to be II – warm. If in some offices where is vinyl flooring the temperature will not be satisfied, it is recommended to use carpets as floor covering, since they are of category I – very warm.

All calculations were made by the use of program DEKSOFT – Tepelná technika 1D. Results were compared with standards for nearly zero energy buildings.