



BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING
FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES
ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOTEL

7.2- CALCULATION OF FOUNDATIONS

DIPLOMA THESIS
DIPLOMOVÁ PRÁCE

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1. Input data

Construction: Hotel
Location: Suvorovova 2888/9, 902 01 Pezinok
[846163], Slovakia
Cadastral area Pezinok [846163], Stará hora
Plot number 840/3, 840/24

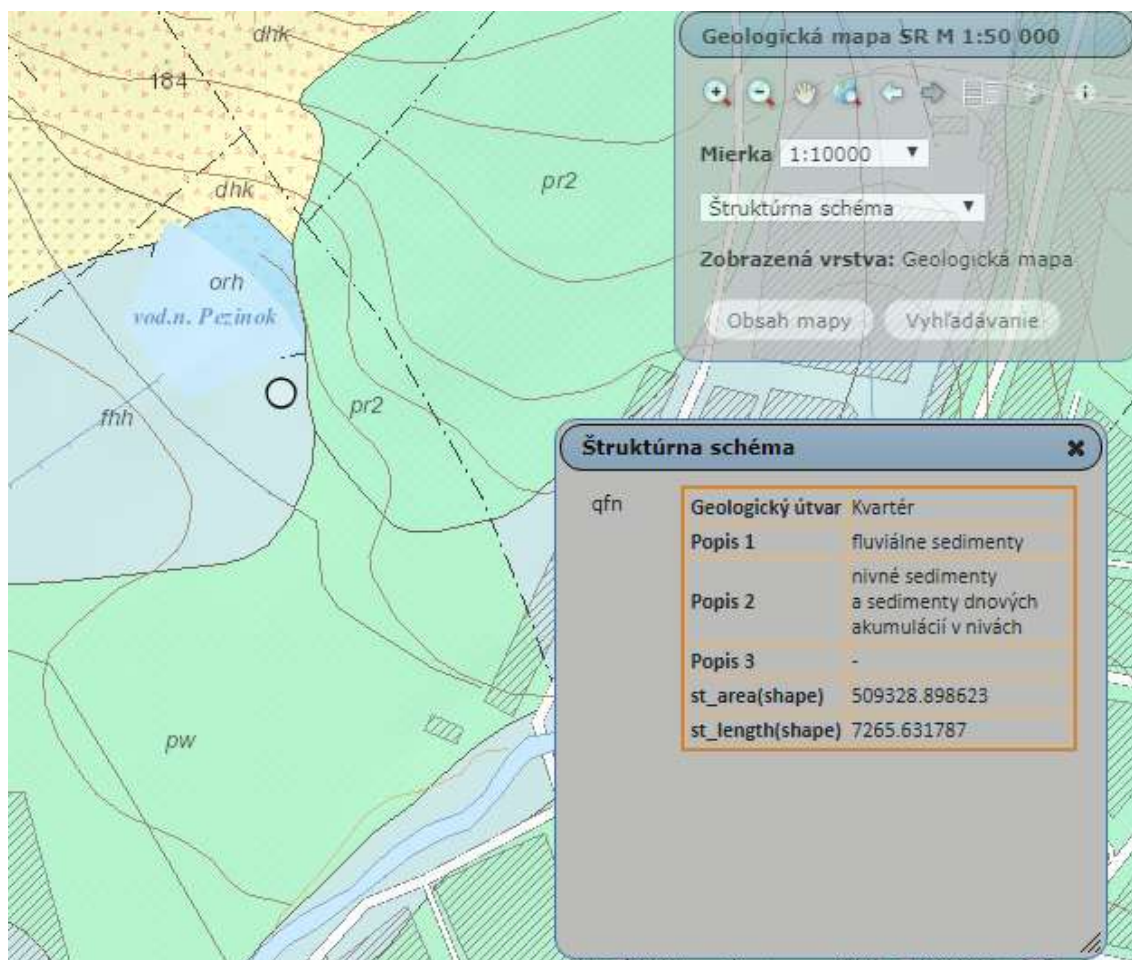
The building is designed as a two floor hotel. Construction is based on Czech brickwork from company Heluz with one main entrance and four side entrances. The main entrance is located in a front /south-western/ side of the building that also faces public communication and the rest is facing surrounding wildlife area and wine yards.

Plot is situated on quaternary soils as can be visible in map. Close geological survey shown there are two groups of soils with their specific geotechnical qualities which are labelled as geotechnical types (GT):

GT1 - Fluvial sediments

GT2 - Sedimentary sediments

GT2 can be described as particles of sedimentation of bottom accumulations in flood plains what generally speaking specifies the soil type as class F4 CS (Fluvial sandy clay). According to ČSN 73 1001 its R_{dt} equals 150 kPa.



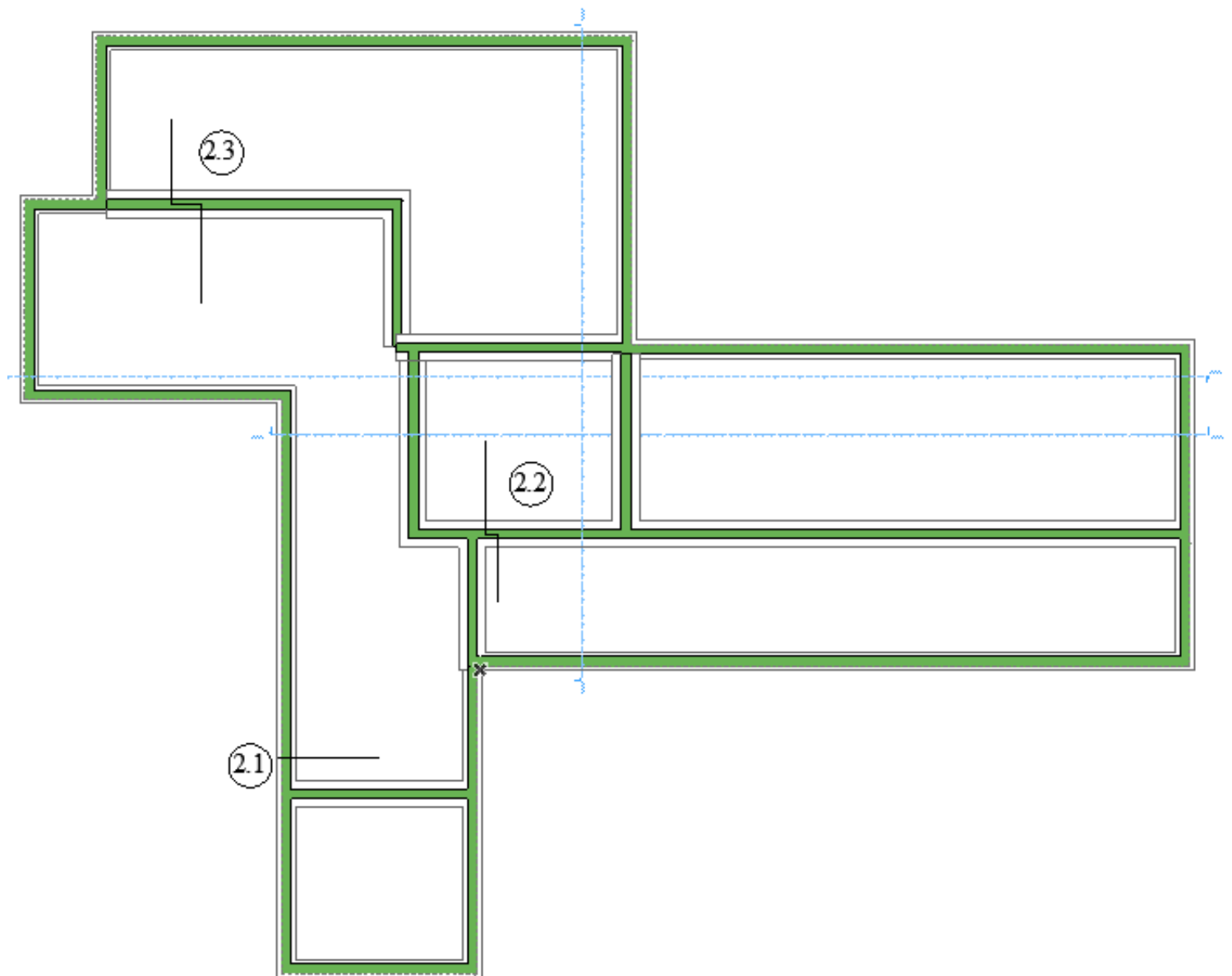
Geological map of plot location, SC: 1:10 000

	veľičina	jednotka	rozmezí hodnot F4	Ø hodnota F4
Objemová tíha ^{*)}	γ_n	[kN.m ⁻³]	18.5	
Pôrodná vlhkosť	w_n	[%]	19.2	
Koeficient filtrace (z křivky zrnitosti)	k_f	[m.s ⁻¹]	7×10^{-7}	
Stupeň konzistence (redukovaný)	I_{CR}	[1]	0.57	
Index plasticity	I_p	[%]	10.1	
Efektívny úhel vnútorného trenia ^{*)}	φ_{ef}	[°]	22 – 27	24.5
Efektívna soudržnosť ^{*)}	c_{ef}	[kPa]	10 – 18	14
Totálny úhel vnútorného trenia ^{*)}	φ_u	[°]	0	
Totálna soudržnosť ^{*)}	c_u	[kPa]	30 – 50	40
Deformačný modul	E_{def}	[MPa]	2.5 – 6	4.3
Poissonovo číslo ^{*)}	ν	[1]	0.35	
Tabulková výpočtová únosnosť ^{*)}	R_d	[kPa]	80 – 150	115

Vysvětlivky: ^{*)} směrné normové charakteristiky dle normy ČSN 73 1001 „Základová půda pod plošnými základy“

Geological characteristics of Fluvial sandy clay F4 CS

2. Design of foundations



2.1 Below external wall

Soil class: F4 CS

Tabular calculated load-capacity $R_{dt} = 150 \text{ kPa}$

$G_d = 170.953 \text{ kN}$ (given by Excel calculations -7.2.1- Calculation of Foundations Excel)

Demanded effective area:

$$A_{eff} = G_d / R_{dt}$$

$$A_{eff} = 170.953 / 150$$

$$A_{eff} = 1.14 \text{ m}^2$$

►►► Strip width equals **$b = 1.0 \text{ m}$**

$$a = (b - d) / 2$$

$$a = (1.0 - 0.4) / 2$$

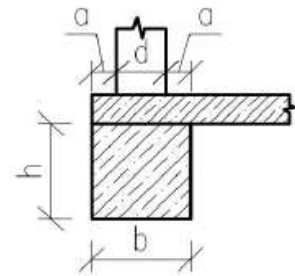
$$a = 0.3 \text{ m}$$

$$h = a * \tan \alpha$$

$$h = 0.3 * 1.5$$

$$h = 0.45 \text{ m}$$

►►► Strip height equals **$h = 1.2 \text{ m}$**



$$1.0 \times 1.2 = 1.2 \text{ m}^2 > 1.14 \text{ m}^2 \quad \text{►►►} \quad A_{eff} = 1.2 \text{ m}^2$$

Stress on the effective area:

$$\sigma_{de} = G_d / A_{eff}$$

$$\sigma_{de} = 170.953 / 1.2$$

$$\sigma_{de} = 142.46 \text{ kPa}$$

$$\sigma_{de} = 142.46 \text{ kPa} < R_{dt} = 150 \text{ kPa} \quad \text{- comply}$$

$$b = 1.0 \text{ m}$$

$$h = 1.2 \text{ m}$$

2.2 Below internal wall

Soil class: F4 CS

Tabular calculated load-capacity $R_{dt} = 150 \text{ kPa}$

$G_d = 263.428 \text{ kN}$ (given by Excel calculations -7.2.1- Calculation of Foundations Excel)

Demanded effective area:

$$A_{\text{eff}} = G_d / R_{dt}$$

$$A_{\text{eff}} = 263.428 / 150$$

$$A_{\text{eff}} = 1.76 \text{ m}^2$$

►►► Strip width equals **$b = 1.3 \text{ m}$**

$$a = (b - d) / 2$$

$$a = (1.3 - 0.5) / 2$$

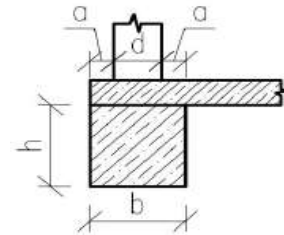
$$a = 0.4 \text{ m}$$

$$h = a * \tan \alpha$$

$$h = 0.44 * 1.5$$

$$h = 0.6 \text{ m}$$

►►► Strip height equals **$h = 1.4 \text{ m}$**



$$1.3 \times 1.4 = 1.82 \text{ m}^2 > 1.76 \text{ m}^2 \quad \text{►►►} \quad A_{\text{eff}} = 1.82 \text{ m}^2$$

Stress on the effective area:

$$\sigma_{de} = G_d / A_{\text{eff}}$$

$$\sigma_{de} = 263.428 / 1.82$$

$$\sigma_{de} = 144.74 \text{ kPa}$$

$$\sigma_{de} = 144.74 \text{ kPa} < R_{dt} = 150 \text{ kPa} \quad - \text{ comply}$$

$$b = 1.3 \text{ m}$$

$$h = 1.4 \text{ m}$$

2.3 Below internal wall

Soil class: F4 CS

Tabular calculated load-capacity $R_{dt} = 150 \text{ kPa}$

$G_d = 289.030 \text{ kN}$ (given by Excel calculations -7.2.1- Calculation of Foundations Excel)

Demanded effective area:

$$A_{eff} = G_d / R_{dt}$$

$$A_{eff} = 289.030 / 150$$

$$A_{eff} = 1.93 \text{ m}^2$$

►►► Strip width equals **$b = 1.4 \text{ m}$**

$$a = (b - d) / 2$$

$$a = (1.4 - 0.5) / 2$$

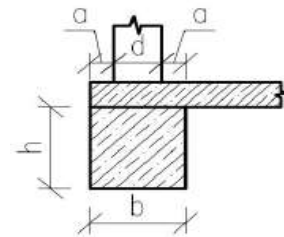
$$a = 0.45 \text{ m}$$

$$h = a * \tan \alpha$$

$$h = 0.45 * 1.5$$

$$h = 0.675 \text{ m}$$

►►► Strip height equals **$h = 1.4 \text{ m}$**



$$1.4 \times 1.4 = 1.96 \text{ m}^2 > 1.92 \text{ m}^2 \quad \text{►►►} \quad A_{eff} = 1.96 \text{ m}^2$$

Stress on the effective area:

$$\sigma_{de} = G_d / A_{eff}$$

$$\sigma_{de} = 289.030 / 1.96$$

$$\sigma_{de} = 147.46 \text{ kPa}$$

$$\sigma_{de} = 147.46 \text{ kPa} < R_{dt} = 150 \text{ kPa} - \text{comply}$$

$$b = 1.4 \text{ m}$$

$$h = 1.4 \text{ m}$$

3. Conclusion

Object is founded on peripheral foundation strip and inner foundation strip.

Simple preliminary calculation complies the requirements.