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BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ

FACULTY OF CIVIL ENGINEERING

ÚSTAV POZEMNÍHO STAVITELSTVÍ

INSTITUTE OF BUILDING STRUCTURES

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DETACHED FAMILY RESIDENCE

CALCULATION OF FOUNDATIONS

AUTOR PRÁCE

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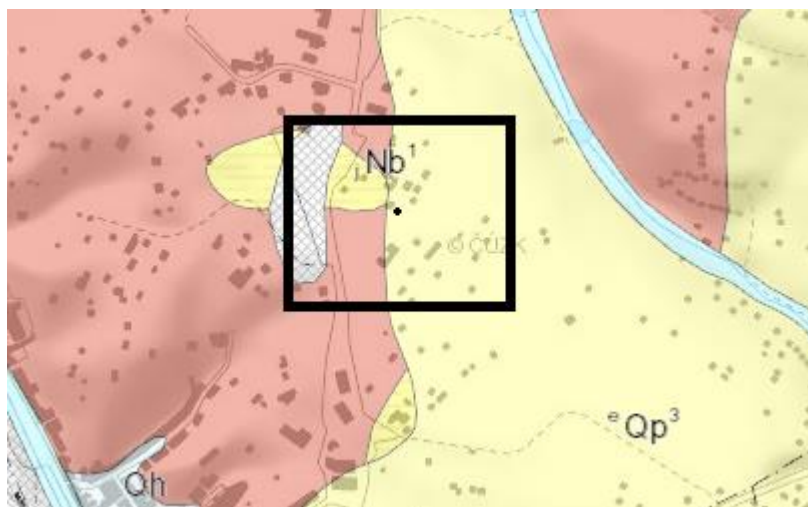
SUPERVISOR











Ing. FRANTIŠEK VAJKAY, Ph.D.

BRNO 2018

The building site is located in Brno- Kralovo Pole, parcel number 251/6

The geological survey conveyed near the plot's location showed the soil type as F4 CS – Sandy clay and Rdt is 150 KPa.



- | | | |
|---|-------------------------------------|---|
|  | hk ^s Q | svahové hlinitokamenité až kamenitohlinité sedimenty |
|  | f ^l Qh | fluviální hlinitopísčité sedimenty, místy štěrkovité |
|  | e^s Qp³ | spraše a sprašové hlíny |
|  | p ^s Q | svahové písčito-hlinité až hlinitopísčité sedimenty |
|  | gd ^{ab}
bv | drobně až středně zrnitý biotit-amfibolický až amfibol-biotitický granodiorit |
|  | j ^l Nb ¹ | šedé vápnité jíly |
|  | gd ^b bv | středně až hrubě zrnitý biotitický granodiorit |
|  | s ^l Nb ¹ | štěrky a písky |
|  | gd ^{bv} | jemně až drobně zrnitý biotitický granodiorit, místy s amfibolem |
|  | e ^{ss} Qp ³ | sprašové hlíny s příměsí svahovin |

SOURCE: GEOLOGY.CZ

PERIPHERAL WALL	thickness [m]	unit load [kN/m3]	loading width	load [kN]
1. PERMANENT LOAD				

1.1 ROOF + CEILING ABOVE 2GF

GRADIENT POLYSTYREN STYRO EPS 150S	0.2	0.25	3.42	0.171	
ISOVER EPS 100S	0.3	0.25	3.42	0.257	
WATERPROOFING BITUMEN STRIP	-		3.42		
OSB BOARD	0.012	6.25	3.42	0.257	
STEICO JOIST	5.1 [kg/m]	0.051	3.42	0.174	
ISOVER UNIROLL PLUS	0.24	0.155	3.42	0.127	
OSB BOARD	0.012	6.25	3.42	0.257	
GYPSUM BOARD	0.012	7.5	3.42	0.308	
			SUM	1.550	kN

1.2 FLOOR + CEILING ABOVE 1GF					
LAMINATE FLOORING	0.07	5	2.26	0.791	
OSB BOARD	0.025	6.25	2.26	0.353	
ISOVER EPS RIGIFLOOR	0.05	0.25	2.26	0.028	
STEICO SJ90 [5.1KG/M]		0.051	2.26	0.115	
ISOVER PIANO	0.12	0.155	2.26	0.042	
GYPSUM BOARD	0.0125	7.5	2.26	0.212	
			SUM	1.542	kN

1.3 CANTILEVER 1AGF					
CERAMIC TILE MULTI TAHITI	0.008	23	1.16	0.213	
ADHESIVE FOR CERMAIC TLES	0.003	16	1.16	0.056	
CEMIX CEMENT SCREED	0.055	20	1.16	1.276	
RIGIPS CEMENT BOARD	0.0125	10	1.16	0.145	
STIECO JOIST SJ 90		0.051	1.16	0.059	
ISOVER UNIROLL PLUS	0.24	0.155	1.16	0.043	
OSB BOARD	0.015	6.25	1.16	0.109	
			SUM	1.901	kN

1.4 FLOOR ABOVE 1GF					
CERAMIC TILES	0.01	23	4.34	0.998	
ADHESIVE FOR CERAMIC TILES	0.005	16	4.34	0.347	
CONCRETE LAYER	0.05	20	4.34	4.340	
ISOVER EPS	0.3	0.25	4.34	0.326	
REINFORCED CONCRETE	0.2	25	4.34	21.700	
			SUM	27.711	kN

1.5 VERTICAL STRUCTURES					
STEICO SW60		0.043	7	0.301	
OSB (15+15)	0.03	6.25	7	1.313	
EQUITONE PANEL	0.008	23	7	1.288	

GYPSUM BOARD	0.0125	7.5	7	0.656	
			SUM	3.558	kN
1.6 FOUNDATION SELFWEIGHT					
	0.39	23	0.752	6.745	kN
	TOTAL PERMANENT LOAD			43.007	kN
	TOTAL DESIGN PERMANENT LOAD			58.05	kN
2. VARIABLE LOAD					
VARIABLE LOAD 1ST FLOOR		1.5	2.26	3.390	
VARIABLE LOAD 2ND FLOOR		1.5	3.42	5.130	
VARIABLE LOAD ROOF (SNOW)	1	0.7	3.42	2.394	
			SUM	10.914	kN
	TOTAL DESIGN VARIABLE LOAD			10.914	kN
	TOTAL ACTING LOAD (PERMANENT+VARIABLE)			68.964	kN

DESIGN OF FOUNDATION STRIPS

BELOW PERIPHERAL WALL

Soil class: F4 CS

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

$G_d=68.964\text{ kN}$

Calculations

Demanded effective area:

$$A_{eff} = \frac{G_d}{R_{dt}}$$

$$A_{eff} = \frac{68.964}{150} = 0.46\text{ m}^2$$

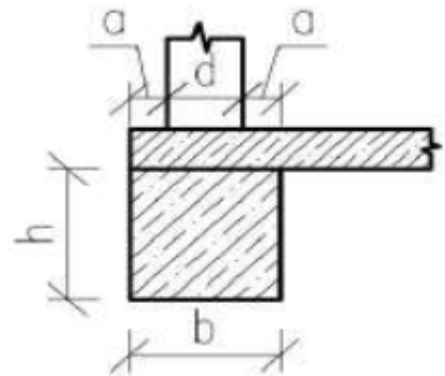
→ strip width ... **B = 0.5 m**

$$a = \frac{(b-d)}{2} = \frac{0.5-0.39}{2} = 0.055$$

→ strip height **H= 0.8m** (frost resistant depth)

Chosen height = 1 m

$$0.5 \times 1 = 0.5\text{ m}^2 > A_{eff} = 0.46\text{ m}^2$$



REVIEW

Stress on the effective area

$$\sigma_{de} = G_d / A_{eff} = 68.964 / 0.5 = 137.93 \text{ kPa}$$

$$\underline{\sigma_{de} = 137.93 \text{ kPa} < R_{dt} = 150 \text{ kPa}}$$