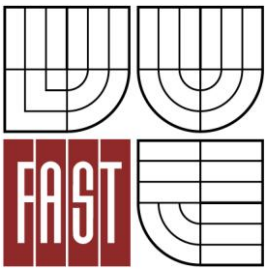
VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

FOLDER A - BASIC DOCUMENTS

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE — KRISTÝNA BUIGLOVÁ
AUTHOR

VEDOUCÍ PRÁCE — doc. Ing. JIŘÍ SEDLÁK, CSc.
SUPERVISOR

BRNO 2012

FOLDER CONTENT:

1. ASSIGNMENTS OF BACHELOR PROJECT
   a) FRONT SHEET
   b) TASK OF BACHELOR THESIS
   c) BIBLIOGRAFIC QUOTE OF ACADEMICAL QUALIFICATION WORK
   d) ABSTRACT IN CZECH AND ENGLISH LANGUAGE
   e) KEYWORDS IN CZECH AND ENGLISH LANGUAGE
   f) DECLARATION
   g) ACKNOWLEDGEMENTS
   h) CONTENT OF FOLDERS
   i) INTRODUCTION
   j) LIST OF SOURCES
   k) LIST OF ABBREVIATIONS AND SYMBOLS
2. INSERTED LISTS
   a) POPISNÝ SOUBOR ZÁVĚREČNÉ PRÁCE
   b) PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ FORMY VŠKP

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ
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FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

LOW ENERGY DETACHED HOUSE

LOW ENERGY DETACHED HOUSE

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE
AUTHOR
Kristýna Buiglová

VEDOUCÍ PRÁCE
SUPERVISOR
doc. Ing. JIŘÍ SEDLÁK, CSc.

BRNO 2012

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
FAKULTA STAVEBNÍ

Studijní program	B3607 Civil Engineering
Typ studijního programu	Bakalářský studijní program s výukou v anglickém jazyce a prezenční formou studia
Studijní obor	3608R001 Pozemní stavby
Pracoviště	Ústav pozemního stavitelství

ZADÁNÍ BAKALÁŘSKÉ PRÁCE

Student	Kristýna Buiglová
Název	Low energy detached house
Vedoucí bakalářské práce	doc. Ing. Jiří Sedlák, CSc.
Datum zadání bakalářské práce	30. 11. 2011
Datum odevzdání bakalářské práce	25. 5. 2012

V Brně dne 30. 11. 2011

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ fakulta stavební DĚKANÁT - 1 -

.....
doc. Ing. Miloslav Novotný, CSc.
Vedoucí ústavu

.....
prof. Ing. Rostislav Drochytka, CSc.
Děkan Fakulty stavební VUT

Podklady a literatura

- Directives of the Dean No. 9/2009
- Building Programme defined by the text-based description
- Architectural study or sketches of the building, site conditions and requirements
- Technical Specifications, Eurocodes and National/European standards for building design and civil engineering
- Building Code No 183/2006 Sb., Public Notice No. 499/2006 Sb., Public Notice No. 268/2009 Sb. for the Czech students or keep to the terms of national Building Codes legislation in own country.

Zásady pro vypracování

Architectural and structural design of the building as required by building codes in the documentation for building permit.
Graphic requirements and design documentation of the project:
- Drawings will be graphically elaborated on a white paper with the PC graphic editor
- Drawings will be equipped by unified description field (label) for each drawing unit. For the project defence and examination committee drawings will be folded and
fix up into specific paper coverings and put into fixed cover table with required lettering for Bachelor project (BP)
- Supplements of text and calculation sheets will be put in writing by technical lettering, typed print or PC text editors
- Editing and form of the main cover table in the format A4 (see sample for the BP at the Institute ÚPST). Cover tables for BP will be from the hard paper and covered by black fabric and head plate will be described and printed with gilded writing (letters)
- BP will be completed into three parts A, B and C and put into the cover tables
- Individual parts of BP will be equipped by description field (label) in the front page and with the table of contents inside.

Předepsané přílohy

Licenční smlouva o zveřejňování vysokoškolských kvalifikačních prací
A/ Basic documents
1. Assignments of Bachelor Project
2. Documents from the supervisor of Bachelor Project
B/ Studies
C/ Project drawings and technical documents (project in the level for realization)
1. Technical report
2. Technical situation and site plan
3. Foundations
4. Ground floor plans
5. Roof constructions, roofing and drainage system
6. Vertical cross sections
7. Front and side views
8. Building details and technical specifications of building components, external constructions and floor compositions
9. Assembly plan of precast structures or formwork drawings of cast in situ concrete
10. Report of fire safety and protection of building structures
11. Thermal assessment of external constructions of the building

.....

doc. Ing. Jiří Sedlák, CSc.
Vedoucí bakalářské práce

Bibliografická citace VŠKP

BUIGLOVÁ, Kristýna. *Low energy detached house*. Brno, 2012. 86 s., 46 s. příl. Bakalářská práce. Vysoké učení technické v Brně, Fakulta stavební, Ústav pozemního stavitelství. Vedoucí práce doc. Ing. Jiří Sedlák, CSc..

Abstract in Czech and English language

Bakalářská práce, kterou jsem vypracovala je projektem pro realizaci nízkoenergetického rodinného domu v Olomouci. Navržený rodinný dům je umístěn na pozemku parcela č. 153/30 k. ú. Nová Ulice. Pozemek se nachází na ulici Zirmova. Rodinný dům je řešen jako dvoupodlažní nepodsklepená stavba obsahující jednu bytovou jednotku. Je navržený pro pětičlennou rodinu. Dům je zastřešen plochou střechou. Součástí rodinného domu je i garáž pro osobní automobil. Na střeše garáže je navržena odpočinková terasa, která je doplněna o extenzivní zelenou střechu. Funkčně je rodinný dům rozdělen na denní část (1.NP) a klidovou část (2.NP). Práce obsahuje základní výpočty potřebné k vytvoření projektové dokumentace, která je zpracována dle platných norem.

The aim of my bachelor´s thesis is elaboration of the project in the level for realization of low energy detached house in Olomouc. Designed family house is located on parcel number 153/30 in cadastral area Nová Ulice. Plot is situated at Zirmova street. Family house is designed like as a two-storey detached house containing one dwelling unit without basement. It is suitable for five member family. Family house is roofed with flat roof construction. Garage is a part of house and it is designed for one car. There is designed a resting terrace on the garage roof which is completed by extensive green roof. The family house is functionally divided into a social part (first floor) and private / resting part (second floor). Thesis contains basic calculations needed for project documentation design which is elaborated according to valid standards.

Keywords in Czech and English language

Nízkoenergetický dům, dvoupodlažní stavba, nepodsklepená stavba, bytová jednotka, plochá střecha, odpočinková terasa, extenzivní zelená střecha, denní část, klidová část, projektová dokumentace, platné normy

Low energy detached house, a two-storey house, without basement, a dwelling unit, flat roof, a resting terrace, extensive green roof, a social part, a resting part, project documentation, valid standards

Declaration:

I hereby declare that this bachelor´s thesis is my own work and that I stated all used information sources.

Prohlášení:

Prohlašuji, že jsem bakalářskou práci zpracovala samostatně a že jsem uvedla všechny použité informační zdroje.

V Brně dne 25. 5. 2012
(In Brno, date)

Kristýna Brigová
.....
podpis studenta (Signature)

Acknowledgements
I would like to gratefully acknowledge the supervision of doc. Ing. Jiří Sedlák, CSc.
I would like to thank him for his kind supervising of this thesis and his helpful advice and insightful comments during consultations.

Poděkování:
Tímto bych ráda poděkovala vedoucímu bakalářské práce doc. Ing. Jiřímu Sedlákovi, CSc. za jeho vlídné vedení mé bakalářské práce a za jeho podporu a cenné připomínky při konzultacích.

CONTENT OF FOLDERS:

FOLDER A – BASIC DOCUMENTS

- ASSIGNMENTS OF BACHELOR PROJECT
  a) FRONT SHEET
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2. SITUATION
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   b) SITUATION – LOCATION OF HOUSE ON THE PLOT, 1:250
3. FLOOR PLAN OF THE 1st FLOOR, 1:100
4. FLOOR PLAN OF THE 2nd FLOOR, 1:100
5. SECTION A-A´, 1:100
6. THE SOUTH-EAST AND THE SOUTH-WEST VIEWS, 1:100
7. THE NORTH-EAST AND THE NORTH-WEST VIEWS, 1:100

FOLDER C1 – PROJECT DRAWINGS

1. SITUATION
   a) SITUATION – FURTHER RELATIONS, 1:500
   b) SITUATION - MUNICIPAL ENGINEERING, 1:250
2. FLOOR PLAN OF FOUNDATIONS, 1:50
3. FLOOR PLAN OF THE 1st FLOOR, 1:50
4. FLOOR PLAN OF THE 2nd FLOOR, 1:50
5. SHAPE OF FLOOR CONSTRUCTION ABOVE 1st FLOOR, 1:50
6. SHAPE OF FLOOR CONSTRUCTION ABOVE 2nd FLOOR, 1:50
7. FLOOR PLAN OF ROOF CONSTRUCTION, 1:50
8. SECTION A-A´, 1:50
9. THE SOUTH-EAST AND THE SOUTH-WEST VIEWS, 1:100
10. THE NORTH-EAST AND THE NORTH-WEST VIEWS, 1:100
11. DETAIL - SOCLE OF FAMILY HOUSE, 1:10
12. DETAIL - WINDOW LINTEL, 1:10
13. DETAIL - WINDOW SILL, 1:10
14. DETAIL - ANCHORAGE OF MONOLITHIC STAIRCASE TO THE CEILING, 1:10
15. DETAIL - ATTIC OF FAMILY HOUSE, 1:10
16. DETAIL - RAIN RIGGOT OF FAMILY HOUSE, 1:10

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1. TABLE OF WALL COMPOSITION
2. TABLE OF ROOF COMPOSITION
3. TABLE OF FLOOR COMPOSITION
4. TABLE OF BUILDING COMPONENTS- WINDOWS
5. TABLE OF BUILDING COMPONENTS- DOORS
6. TABLE OF BUILDING COMPONENTS

FOLDER C3 – CALCULATIONS

1. CALCULATION OF FOUNDATIONS
2. CALCULATION OF STAIRCASE
3. THERMAL ASSESMENT OF STRUCTURES

FOLDER C4 – TEXT PART

1. ACCOMPANYING REPORT
2. SUMMARY TECHNICAL REPORT
3. TECHNICAL REPORT
4. ENERGY LABEL REPORT
5. GEOLOGICAL REPORT - SURVEY
6. RADON REPORT – SURVEY

FOLDER C5 – FIRE SAFETY

1. FIRE SAFETY REPORT
2. SITUATION - FIRE PREVENTION DISTANCES, 1:250

INTRODUCTION:

This bachelor´s thesis deals with design of low energy house for five member family. Family house is located in the western part of a city Olomouc, in cadastral area Nová Ulice. It is oriented along the shorter plot side with its entrance northbound to the access road. Family house is designed in the same style like as existing buildings and its position on the plot respects building line of neighbouring family houses. It is designed like as a two-storey detached house containing one dwelling unit without basement. Family house is roofed with flat roof construction. The main aim of bachelor´s thesis is to design energy saving house that will comply with the national standards. Composition of structure satisfies all requirements as thermal property limits, load bearing capacity, strength, fire protection and acoustic protection.

LIST OF SOURCES:

Legislation:

Act. No. 183/2006 Coll., Building Act

Public Notice 499/2006 Coll., about structure documentation

Public Notice 268/2009 Coll., about technical requirements for constructuon

Regulation No. 23/2008 Coll., about technical conditions for fire protection of buildings

Regulation No. 268/2011 Coll., about which change regulation No. 23/2008 Coll.

Regulation No. 246/2011 Coll., about Ministry of Interior determine fire safety conditions and state fire supervision (Regulation about fire prevention)

Standards:

ČSN 73 4301 Residential buildings

ČSN 01 3411 Large scale maps – Drawings and marks

ČSN 01 3420 Construction drawings – Presentation of general arrangement drawings

ČSN 73 0540 Thermal protection of buildings

ČSN EN ISO 6946 Building components and building elements – Thermal resistence and thermal transmittance – Calculation method

ČSN 1991-1-1 Eurocode 1: Actions on structures

ČSN 73 0810 Fire safety of buildings – General requirements

ČSN 73 0802 Fire safety of buildings – Non-industrial buildings

ČSN 73 0833 Fire safety of buildings – Buildings for dwelling and lodging

ČSN 73 0873 Fire safety of buildings – Equipment for fire water supply

Literature:

KLIMEŠOVÁ, Jarmila. *Nauka o pozemních stavbách.* CERM s.r.o. Brno, 2005

DOSEDĚL, Antonín a kolektiv. *Čítanka výkresů ve stavebnictví.* Sobotáles. Praha, 2004

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KUTNAR, Zdeněk. *Ploché střechy, skladby a detaily.* DEKTRADE a.s., 2011

VRÁNA, Jakub a kolektiv. *Technická zařízení budov v praxi.* GRADA, 2007

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www.gradus-sro.cz
www.weber-terranova.cz
www.tzb-info.cz
www.cuzk.cz
www.geology.cz
www.geofond.cz

LIST OF ABBREVIATIONS AND SYMBOLS

No. – number

Coll. – collection

th. – thickness [mm], [m]

Rdt - bearing capacity of soil [MPa]

λ - thermal conductivity [W/m·K]

R - thermal resistence [m2·K/W)]

HT - total heat transmission losses [W/K]

Uem,N - mean required coefficient of heat transfer [W/(m2·K)]

Uem,rec - mean recommended coefficient of heat transfer [W/(m2·K)]

CI – class index

pv - calculated fire load [kg · m^2]

BPV – height systeme used in Czech Republic

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
FAKULTA STAVEBNÍ

POPISNÝ SOUBOR ZÁVĚREČNÉ PRÁCE

Vedoucí práce	doc. Ing. Jiří Sedlák, CSc.
Autor práce	Kristýna Buiglová
Škola	Vysoké učení technické v Brně
Fakulta	Stavební
Ústav	Ústav pozemního stavitelství
Studijní obor	3608R001 Pozemní stavby
Studijní program	B3607 Civil Engineering
Název práce	Low energy detached house
Název práce v anglickém jazyce	Low energy detached house
Typ práce	Bakalářská práce
Přidělovaný titul	Bc.
Jazyk práce	Čeština
Datový formát elektronické verze	.pdf

Anotace práce	Bakalářská práce, kterou jsem vypracovala je projektem pro realizaci nízkoenergetického rodinného domu v Olomouci. Navržený rodinný dům je umístěn na pozemku parcela č. 153/30 k. ú. Nová Ulice. Pozemek se nachází na ulici Zirmova. Rodinný dům je řešen jako dvoupodlažní nepodsklepená stavba obsahující jednu bytovou jednotku. Je navržený pro pětičlennou rodinu. Dům je zastřešen plochou střechou. Součástí rodinného domu je i garáž pro osobní automobil. Na střeše garáže je navržena odpočinková terasa, která je doplněna o extenzivní zelenou střechu. Funkčně je rodinný dům rozdělen na denní část (1.NP) a klidovou část (2.NP). Práce obsahuje základní výpočty potřebné k vytvoření projektové dokumentace, která je zpracována dle platných norem.
Anotace práce v anglickém jazyce	The aim of my bachelor´s thesis is elaboration of the project in the level for realization of low energy detached house in Olomouc. Designed family house is located on parcel number 153/30 in cadastral area Nová Ulice. Plot is situated at Zirmova street. Family house is designed like as a two-storey detached house containing one dwelling unit without basement. It is suitable for five member family. Family house is roofed with flat roof construction. Garage is a part of house and it is designed for one car. There is designed a resting terrace on the garage roof which is completed by extensive green roof. The family house is functionally divided into a social part (first floor) and private / resting part (second floor). Thesis contains basic calculations needed for project documentation design which is elaborated according to valid standards.
Klíčová slova	Nízkoenergetický dům, dvoupodlažní stavba, nepodsklepená stavba, bytová jednotka, plochá střecha, odpočinková terasa, extenzivní zelená střecha, denní část, klidová část, projektová dokumentace, platné normy
Klíčová slova v anglickém jazyce	Low energy detached house, a two-storey house, without basement, a dwelling unit, flat roof, a resting terrace, extensive green roof, a social part, a resting part, project documentation, valid standards

PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ FORMY VŠKP

Prohlášení:

Prohlašuji, že elektronická forma odevzdané práce je shodná s odevzdanou listinnou formou.

V Brně dne 25.5.2012

.....

podpis autora
Kristýna Buiglová

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

FOLDER C3 – CALCULATIONS

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE — KRISTÝNA BUIGLOVÁ
AUTHOR

VEDOUCÍ PRÁCE — doc. Ing. JIŘÍ SEDLÁK, CSc.
SUPERVISOR

BRNO 2012

FOLDER CONTENT:

1. CALCULATION OF FOUNDATIONS
2. CALCULATION OF STAIRCASE
3. THERMAL ASSESMENT OF STRUCTURES

BACHELOR´S THESIS			BUT FACULTY OF CIVIL ENGINEERING INSTITUTE OF BUILDING STRUCTURES	
STUDENT	KRISTÝNA BUIGLOVÁ			
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
CALCULATION OF FOUNDATIONS			SCALE -	DRAWING NUMBER C3.1

CALCULATION OF PERMANENT LOAD

flooring- 2nd floor

Description of layer	Dimension		Areal weight	Mass unit weight	Load		
	b	h	ρ_1	ρ_2	G_k	γ_G	G_d
	[m]	[m]	[kg.m^{-2}]	[kg.m^{-3}]	[kN.m^{-2}]	[-]	[kN.m^{-2}]
ceramic tiles	1,000	0,010	-	2200,000	0,220	1,350	0,297
concrete screed	1,000	0,050	-	2300,000	1,150	1,350	1,553
smooth bitumen sheet A330H	-	-	-	-	-	1,350	-
accoustic insulation, EPS RigiFloor	1,000	0,040	-	20,000	0,008	1,350	0,011
totally					**1,378**		**1,860**

Calculation of permanent load of roofing:

Description of layer	Dimension		Areal weight	Mass unit weight	Load		
	b	h	ρ_1	ρ_2	G_k	γ_G	G_d
	[m]	[m]	[kg.m^{-2}]	[kg.m^{-3}]	[kN.m^{-2}]	[-]	[kN.m^{-2}]
river gravel	1,000	0,050	-	1500,000	0,750	1,350	1,013
hydroinsulating foil, dekplan77	1,000	0,002	-	1400,000	0,028	1,350	0,038
thermal insulation, EPS 100S Stabil	1,000	0,220	-	20,000	0,044	1,350	0,059
asphaltic sheet from modified SBS	1,000	0,004	-	1400,000	0,056	1,350	0,076
totally					**0,878**		**1,185**

INTERNAL LOAD BEARING WALL POROTHERM 30P+D

Calculation of total load

Description of construction	Dimension			Area weight	Mass unit weight	Load	Force		
	b [m]	h [m]	Length [m]	ρ_1 [kg.m^{-2}]	ρ_2 [kg.m^{-3}]	G_k [kN.m^{-2}]	F_k [kN]	γ [-]	F_d [kN]
permanent load									
roof construction	4,650	1,000	1,000		-	0,878	4,083	1,350	5,512
floor construction- 2nd f.	4,650	-	1,000	-	-	3,130	14,555	1,350	19,649
load bearing wall- 2nd f.	0,300	2,670	1,000	-	800,000	-	6,408	1,350	8,651
flooring- 2nd floor	4,350	-	1,000	-	-	1,378	5,994	1,350	8,092
floor construction- 1st f.	4,650	-	1,000	-	-	3,130	14,555	1,350	19,649
load bearing wall- 1st f.	0,300	2,750	1,000	-	800,000	-	6,600	1,350	8,910
partition walls+plaster	15% from the sum of permanent load								10,569
variable load- imposed load									
flooring- 2nd floor	4,350	-	1,000	-	-	1,500	6,525	1,500	9,788
variable load- snow load									
snow territory- II.	4,650	1,000	1,000			0,800			3,720
Totally									**94,539**

Note: snow territory- II. Sk = 1,0 kN.m-2, S = μi·Cs·Ct·Sk = 0,8·1,0·1,0·1,0 = 0,8 kN.m-2

Design of foundation:

Initial values		
bearing capacity of soil	R_{dt} =	200,00 MPa
loading	F =	94,54 kN
spreading angle	α =	60,00 °
thickness of wall	d =	0,30 m

Values for α	
material	α
rustic masonry	-
pure concrete	60°
reinforced c.	45°

Calculation of dimensions			
width of foundation (preliminary)	$b = \frac{F}{R_{dt}} =$	0,473	m
width of foundation (designed)	b =	0,600	m
racking	$a = \frac{b-d}{2} =$	0,150	m
depth of foundation	$h = a \cdot tg\alpha$	0,263	m

Values for tgα	
material	tgα
rustic masonry	2 až 3
pure concrete	1,5 až 2
reinforced c.	0,5 až 1

Note: minimal depth of foundation is 0,8m and according to the geological conditions => h = 1,2m

Check:

σs = F/A ≤ Rdt	where F= (0,6·1,2 ·23)·1,35 + 94,539 = 116,89 kN

σs = F/A = 116,89/0,6·1,0 = 194,825 kPa ≤ Rdt = 200 kPa

EXTERNAL LOAD BEARING WALL POROTHERM 30P+D

Calculation of total load

Description of construction	Dimension			Area weight	Mass unit weight	Load	Force		
	b [m]	h [m]	Length [m]	ρ_1 [kg.m^{-2}]	ρ_2 [kg.m^{-3}]	G_k [kN.m^{-2}]	F_k [kN]	γ [-]	F_d [kN]
permanent load									
attic	0,300	0,420	1,000	-	800,000	-	1,008	1,350	1,361
roof construction	2,750	1,000	1,000	-	-	0,878	2,415	1,350	3,260
floor construction- 2nf f.	2,900	-	1,000	-	-	3,130	9,077	1,350	12,254
load bearing wall- 2nd f.	0,300	2,670	1,000	-	800,000	-	6,408	1,350	8,651
flooring- 2nd f.	2,750	-	1,000	-	-	1,378	3,790	1,350	5,116
floor construction- 1st f.	2,900	-	1,000	-	-	3,130	9,077	1,350	8,578
load bearing wall- 1st f.	0,300	2,750	1,000	-	800,000	-	6,600	1,350	6,237
partition walls+plaster	15% from the sum of permanent load								6,614
variable load- imposed load									
flooring- 2st floor	2,750	-	1,000	-	-	1,500	4,125	1,500	6,188
variable load- snow load									
snow territory- II.	2,750	1,000	1,000			0,800			2,200
Totally									**60,457**

Note: snow territory- II. Sk = 1,0 kN.m-2, S = μi·Cs·Ct·Sk = 0,8·1,0·1,0·1,0 = 0,8 kN.m-2

Design of foundation:

Initial values		
bearing capacity of soil	R_{dt} =	200,00 MPa
loading	F =	60,46 kN
spreading angle	α =	60,00 °
thickness of wall	d =	0,30 m

Values for α	
material	α
rustic masonry	-
pure concrete	60°
reinforced c.	45°

Calculation of dimensions			
width of foundation (preliminary)	$b = \frac{F}{R_{dt}} =$	0,302	m
width of foundation (designed)	b =	0,500	m
racking	$a = \frac{b-d}{2} =$	0,100	m
depth of foundation	$h = a \cdot tg\alpha$	0,175	m

Values for tgα	
material	tgα
rustic masonry	2 až 3
pure concrete	1,5 až 2
reinforced c.	0,5 až 1

Note: minimal depth of foundation is 0,8m and according to the geological conditions => h = 1,2m

Check:

σs = F/A ≤ Rdt	where F= (0,5·1,2 ·23)·1,35 + 60,457 = 79,087 kN

σs = F/A =79,087/0,5·1,0 = 158,174 kPa ≤ Rdt = 200 kPa

BACHELOR´S THESIS			BUT FACULTY OF CIVIL ENGINEERING INSTITUTE OF BUILDING STRUCTURES
STUDENT	KRISTÝNA BUIGLOVÁ		
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.		
LOW ENERGY DETACHED HOUSE			FORMAT: A4 DATE: 25.5.2012
CALCULATION OF STAIRCASE			SCALE: - DRAWING NUMBER: C3.2

Calculation and design of staircase

1) Design of constructional height of floor:

CH= 3080 mm

2) Height of one staircase step h´:

h´= 160 mm…….for apartment house 150-180 mm, also for family house

3) Calculation of heights in staircase flight:

n = CH/h´= 3080/160 = 19,25 → 18 heights

4) Final height of staircase step:

h = 3080/18 = 171,11 mm

5) Width of staircase step:

2h + b = 630 mm→ b = 630 – 2h = 630 – 2x171,11 = 287,78 mm→ rounded to 280 mm

6) Angle of staircase flight:

tg α = h/b = 171,11 /280 = 31,43°

7) Length of staircase flight:

L = (n – 1) x b = 8 x 280 = 2240 mm

8) Design of width of staircase flight:

B = 1000 mm

9) Design of width of landing:

B + 260 mm = 1260 mm

10) Headroom height and clearance height

h1 = 1500 + 750/ cos α = 2387 mm

h2 = 750 + 1500 cos α = 2018 mm

11) *Conclusion:*

I have designed monolithic half-turn staircase with the angle of 31,43°. The height of staircase step will be 171,11 mm and its width will be 280 mm. Construction of handrail will be made from steel and glass filling and its height will be 1000 mm. Staircase will be anchored to external load bearing wall and ceiling construction.

In Olomouc 05/2012

Done by: Kristýna Buiglová

BACHELOR´S THESIS			BUT FACULTY OF CIVIL ENGINEERING INSTITUTE OF BUILDING STRUCTURES	
STUDENT	KRISTÝNA BUIGLOVÁ			
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
THERMAL ASSESMENT OF STRUCTURES			SCALE -	DRAWING NUMBER C3.3

Overall heat transfer coefficient- flat roof construction

ČSN EN ISO 6946 Building components and building elements- Thermal resistance and thermal transmittance-Calculation method

Appendix C
Calculation of overall heat transfer coefficient of inclined layers

C.1 Generally
λ- thermal conductivity
R0- thermal resistance, including surface thermal resistance (for flat roof- Rse= 0, Rsi= 0,10 m2·K/W)
R1- maximum thermal resistance of inclined layer
d1- maximum thickness of inclined layer

C.2 Calculation for common shapes
C.2.1 Right angle area

U = 1/R1 x ln (1+ R1/R0) [W/(m2·K)]
R= d/λ [m2·K/W)]

	d1 [m]	d01 [m]	d02 [m]	d03 [m]	d04 [m]	d05 [m]	λ1,01 [W/m·K]	λ02 [W/m·K]	λ03 [W/m·K]	λ04 [W/m·K]	R1 [m2·K/W)]	R01 [m2·K/W)]	R02 [m2·K/W)]	R03 [m2·K/W)]	R03 [m2·K/W)]	R04 [m2·K/W)]	ΣR0 [m2·K/W)]	Rsi [m2·K/W)]	ΣR0 + Rsi	Uj [W/(m2·K)]	Aj [m2]	Uj x Aj
1´	0,040	0,245	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	1,053	6,447	0,009	0,033	0,280	0,019	6,789	0,100	6,889	0,135	12,750	1,722
2´	0,035	0,220	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,921	5,789	0,009	0,033	0,280	0,019	6,131	0,100	6,231	0,150	14,830	2,220
3´	0,035	0,255	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,921	6,711	0,009	0,033	0,280	0,019	7,052	0,100	7,152	0,132	19,340	2,544
4´	0,025	0,220	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,658	5,789	0,009	0,033	0,280	0,019	6,131	0,100	6,231	0,153	10,840	1,654
5´	0,010	0,245	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,263	6,447	0,009	0,033	0,280	0,019	6,789	0,100	6,889	0,142	3,335	0,475

d01- thickness of thermal insulation
d02- thickness of hydroinsulation layer
d03- thickness of vapour barrier and airproofing layer
d04- thickness of horizontal l. b. construction
d05- thickness of plaster

λ1,01- thermal conductivity of thermal insulation
λ02- thermal conductivity of hydroinsulation layer
λ03- thermal conductivity of vapour barrier and airproofing layer
λ04- thermal conductivity of horizontal l. b. construction
λ05- thermal conductivity of thickness of plaster

R03- table value of thermal resistance of horizontal l. b. construction

Σ Aj	61,095
Σ Aj x Uj	8,61473

C.2.3 Triangular area- the thinnest at the top

U = 2/R1 (1- R0/R1 x ln (1+ R1/R0)) [W/(m2·K)]
R= d/λ [m2·K/W)]

	d1 [m]	d01 [m]	d02 [m]	d03 [m]	d04 [m]	d05 [m]	λ1,01 [W/m·K]	λ02 [W/m·K]	λ03 [W/m·K]	λ05 [W/m·K]	R1 [m2·K/W)]	R01 [m2·K/W)]	R02 [m2·K/W)]	R03 [m2·K/W)]	R04 [m2·K/W)]	R05 [m2·K/W)]	ΣR0 [m2·K/W)]	Rsi [m2·K/W)]	ΣR0 + Rsi	Uj [W/(m2·K)]	Aj [m2]	Uj x Aj
1- 6x	0,040	0,180	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	1,053	4,737	0,009	0,033	0,280	0,019	5,078	0,100	5,178	0,170	24,000	4,089
2- 2x	0,065	0,180	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	1,711	4,737	0,009	0,033	0,280	0,019	5,078	0,100	5,178	0,159	22,520	3,579
3-2x	0,035	0,220	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,921	5,789	0,009	0,033	0,280	0,019	6,131	0,100	6,231	0,146	3,440	0,503
4-2x	0,025	0,220	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,658	5,789	0,009	0,033	0,280	0,019	6,131	0,100	6,231	0,150	1,840	0,276
5	0,035	0,255	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,921	6,711	0,009	0,033	0,280	0,019	7,052	0,100	7,152	0,129	1,330	0,171
6	0,040	0,245	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	1,053	6,447	0,009	0,033	0,280	0,019	6,789	0,100	6,889	0,132	1,800	0,237
7	0,010	0,245	0,002	0,004	0,230	0,015	0,038	0,160	0,120	0,800	0,263	6,447	0,009	0,033	0,280	0,019	6,789	0,100	6,889	0,142	0,124	0,018

d01- thickness of thermal insulation
d02- thickness of hydroinsulation layer
d03- thickness of vapour barrier and airproofing layer
d04- thickness of horizontal l. b. construction
d05- thickness of plaster

λ1,01- thermal conductivity of thermal insulation
λ02- thermal conductivity of hydroinsulation layer
λ03- thermal conductivity of vapour barrier and airproofing layer
λ04- thermal conductivity of horizontal l. b. construction
λ05- thermal conductivity of thickness of plaster

R03- table value of thermal resistance of horizontal l. b. construction

Σ Aj	54,93
Σ Aj x Uj	8,85621

C.3 Design procedure:
Total overall heat transfer coefficient of inclined layers
U = Σ Uj x Aj/ Σ Aj

Σ Uj x Aj	17,471
Σ Aj	116,025
U	0,151

Urec,20 = 0,16 W/(m2·K) > U = 0,151 W/(m2·K) < UN,20 = 0,24 W/(m2·K)

Overall heat transfer coefficient- external load bearing construction

material	d [m]	λ [W/m·K]	R [m2·K/W)]
POROTHERM UNIVERSAL plaster	0,010	0,800	0,013
POROTHERM 30 P+D	0,300	0,230	1,304
facade thermal insulation, EPS 70F	0,150	0,036	4,167
thin silicone plaster	0,003	0,700	0,004

R= d/λ [m2·K/W)]
Rsi= 0,13 m2·K/W
Rse= 0,04 m2·K/W
Rt= Rsi+Rse+R [m2·K/W)]
U= 1/Rt [W/(m2·K)]

ΣR [m2·K/W)]	5,488
Rt [m2·K/W)]	5,658
U [W/(m2·K)]	0,177

Urec,20 = 0,25 W/(m2·K) > U = 0,177 W/(m2·K) < UN,20 = 0,30 W/(m2·K)

material	d [m]	λ [W/m·K]	R [m2·K/W)]
POROTHERM UNIVERSAL plaster	0,010	0,800	0,013
POROTHERM 30 P+D	0,300	0,230	1,304
facade thermal insulation, Rockwool MAX E	0,120	0,036	3,333
thin silicone plaster	0,003	0,700	0,004

R= d/λ [m2·K/W)]
Rsi= 0,13 m2·K/W
Rse= 0,04 m2·K/W
Rt= Rsi+Rse+R [m2·K/W)]
U= 1/Rt [W/(m2·K)]

ΣR [m2·K/W)]	4,654
Rt [m2·K/W)]	4,824
U [W/(m2·K)]	0,207

Urec,20 = 0,25 W/(m2·K) > U = 0,207 W/(m2·K) < UN,20 = 0,30 W/(m2·K)

Overall heat transfer coefficient- floor construction above the terrain

material	d [m]	λ [W/m·K]	R [m2·K/W)]
flooring- eg. ceramic flooring	0,010	1,010	0,010
concrete screed	0,060	1,200	0,050
smooth bitumen sheet A330H	-	-	-
thermal insulation, EPS 100S STABIL	0,180	0,038	4,737
concrete screed	0,050	1,200	0,042
geotextile	-	-	-
hydroinsulation, FATRAFOL 803	0,002	0,160	0,013

R= d/λ [m2·K/W)]
Rsi= 0,17 m2·K/W
Rse= 0
Rt= Rsi+Rse+R [m2·K/W)]
U= 1/Rt [W/(m2·K)]

ΣR [m2·K/W)]	4,851
Rt [m2·K/W)]	5,021
U [W/(m2·K)]	0,199

Urec,20 = 0,30 W/(m2·K) > U = 0,199 W/(m2·K) < UN,20 = 0,45 W/(m2·K)

Overall heat transfer coefficient- window opening

heat transfer coefficient of tripple glass		Ug [W/(m2·K)]	0,7
heat transfer coefficient of window frame		Uf [W/(m2·K)]	0,91

Values are given by producer- SULKO s.r.o. .

Urec,20 = 1,2 W/(m2·K) > U = 0,80 W/(m2·K) < UN,20 = 1,5 W/(m2·K)

Overall heat transfer coefficient- entrance door

heat transfer coefficient of tripple glass		Ug [W/(m2·K)]	0,6
heat transfer coefficient of window frame		Uf [W/(m2·K)]	0,85

Values are given by producer- SULKO s.r.o. .

Urec,20 = 1,2 W/(m2·K) > U = 0,7 W/(m2·K) < UN,20 = 1,7 W/(m2·K)

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BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

FOLDER C4 – TEXT PART

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE — KRISTÝNA BUIGLOVÁ
AUTHOR

VEDOUCÍ PRÁCE — doc. Ing. JIŘÍ SEDLÁK, CSc.
SUPERVISOR

BRNO 2012

FOLDER CONTENT:

1. ACCOMPANYING REPORT
2. SUMMARY TECHNICAL REPORT
3. TECHNICAL REPORT
4. ENERGY LABEL REPORT
5. GEOLOGICAL REPORT - SURVEY
6. RADON REPORT - SURVEY

BACHELOR´S THESIS

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SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.	

BUT
FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

LOW ENERGY DETACHED HOUSE

ACCOMPANYING REPORT

FORMAT	A4
DATE	25.5.2012
SCALE	-
DRAWING NUMBER	C4.1

VYTVOŘENO VE VÝUKOVÉM PRODUKTU SPOLEČNOSTI AUTODESK

CONTENT:

A) IDENTIFICATION DATA ABOUT CONSTRUCTION AND INVESTOR

Identification of building: New construction of family house, Zirmova street, Olomouc

Type of building: Low energy detached house

Investor: Šimonovská Jana Ing., Výstavní 313/26, Olomouc, Chomoutov, 783 35

Locality: Parcel number 153/30, Zirmova street, Olomouc

Cadastral area: Nová Ulice

Designer: Kristýna Buiglová, Rybízová 14, 779 00 Olomouc

B) MAIN CHARACTERISTIC OF BUILDING AND ITS PURPOSE

Family house is designed like as a two-storey low energy detached house containing one dwelling unit without basement and with attached garage. It is suitable for five member family. Family house is oriented along the shorter plot side with its entrance northbound to the access road. From the north-east side of house there is attached garage. The garage is one-storey construction with warm flat roof that is divided into green roof construction and terrace. The house is covered with warm flat roof too. Construction of foundation is solved by foundation strips. External load bearing wall is made from brick blocks POROTHERM 30 P+D, thickness of 300mm and it is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150mm. The garage is made from brick blocks POROTHERM 30 P+D, thickness of 300mm and it is not insulated.

C) DATA ABOUT PRESENT USE OF AREA AND DEVELOPMENT OF AREA, DATA ABOUT BUILDING PLOT AND PROPRIETARY LEGAL RELATIONS

Plot is located in the western part of a city Olomouc, in cadastral area Nová Ulice. This area is newly divided into separate parcels that are prepared for further housing development in accordance with planning study. It respects building line of existing buildings.

This parcel is unutilized so far and it is in property of investor. An entrance will be ensured by existing communication where are all municipal engineering.

List of plots which are effected by construction

Region: Olomouc

Cadastral area: Nová Ulice

Parcel number	Area m2	Type of plot Usage of plot	Proprietor	LV
153/23	493	other area / different	SJM Kubíček Jiří a Kubíčková Eva	7556
153/24	797	other area / different	Bahounek Michal MUDr.	7880
153/25	959	other area / different	SJM Skácel Tomáš MUDr. a Skácelová Lenka MUDr.	7603

153/29	991	other area / different	Šimonovská Jana Ing.	9033
153/31	799	other area / different	SJM Lébr Josef Ing. a Lébrová Jana Ing.	9080
153/35	1077	other area / different	Šimonovská Jana Ing.	9033
153/36	1004	other area / different	Šimonovská Jana Ing.	9033

D) DATA ABOUT SURVEYS PERFORMED AND ACCESS TO THE ROUTES, TO THE TECHNICAL INFRASTRUCTURE

Surveys performed

- Engineering geological study
- Radon survey

Access to the routes

- Access to the family house by public communication from existing Zirmova street

Access to the technical infrastructure

- Electric power distribution- it is not a part of project documentation
- Waterpiping- connection to existing waterpipe with future extending
- Sewerage- sewer connection to sanitary sewer
- Gas pipeline- connection to low-pressure gas pipeline

E) INFORMATION ABOUT THE FULFILMENT OF REQUIREMENTS OF TOUCHED AUTHORITIES

Any known requirements about touched authorities.

F) INFORMATION ABOUT COMPLIANCE WITH GENERAL REQUIREMENTS FOR CONSTRUCTION

Complete project documentation is done according to the principles and requirements of public notice 137/1998 Sb.

G) DATA ABOUT FULFILMENT OF PLANNING PERMISSION

Construction of family house is in accordance with planning permission that solves this territory.

H) SUBJECT AND TIME LINKS OF CONSTRUCTION ON THE SURROUNDING BUILDINGS AND OTHER MEASURES IN THE RELATED AREA

Due to the fact that the construction site is owned by an investor and infrastructure is accessible by existing municipal engineering we can say that construction does not have any effect on surrounding buildings and area development.

I) SUPPOSED TIME-LIMIT OF CONSTRUCTION INCLUDING DESCRIPTION OF CONSTRUCTION PROCESS

Construction will start by protection of approach area. Also the marking of all engineering services will be done by their administrators. Then excavation works will be taken and then concreting of foundation strips. After discharging of all technological requirements construction can start. After finishing of load bearing masonry walls and roof construction a part against enter of other persons will be done. Building site will be protected by a fence. Subsequently distributions will be done. Finally plastering works and other finishing works will be done. All the works have to be made in accordance with technological requirements and there will pointed responsible person who will check accuracy and correctness of processes.

J) STATISTICAL DATA

Disposition	5+1 and garage
Height of family house	6,860 mm
Clear height of 1.NP	2,750 mm
Clear height of 2.NP	2,670 mm
Plot area	766 m²
Built-up area	181,495 m²
Surface area	249,260 m²

In Olomouc 05/2012

Done by: Kristýna Buiglová

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SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
SUMMARY TECHNICAL REPORT			SCALE -	DRAWING NUMBER C4.2

CONTENT:

Protection against pollution of atmosphere by exhaust gas and dust

Protection against pollution of communication and excessive dustness

Protection against pollution surface water and ground water and sewerage

Waste produced during the construction

12. ENSURING HEALTH PROTECTION AND SAFETY OF WORK

Marking and securing of building

Conditions of health protection and safety of work

Plan of health protection and safety of work

B) MECHANICAL RESISTIVITY AND STABILITY

C) FIRE SAFETY

Bearing capacity and stability over required time perion

Reduction of fire epansion and spreading

Reduction of fire spreading onto neighboring building

D) HYGIENE, SAFETY OF DWELLERS AND FUNCTION OF BUILDING

E) SAFETY IN USE

F) NOISE PROTECTION

G) ENERGY SAVING AND HEALTH PROTECTION

H) SOLUTION OF ACCESS OF PERSONS WITH DISABLE MOBILITY

I) PROTECTION AGAINST HARMFUL IMPACT OF ENVIRONMENT

J) PROTECTION OF POPULATION

K) ENGINEERING CONSTRUCTIONS (OBJECTS)

Dewatering of territory

Water supply

Energy supply

Traffic solution

Finishing works of environment

Electronic communicatio

L) PRODUCTIVE AND NON PRODUCTIVE TECHNOLOGICAL EQUIPMENTS OF BUILDINGS

A) URBAN, ARCHITECTONIC AND CONSTRUCTION ENGINEERING SOLUTION OF BUILDING

1. EVALUATION OF BUILDING SITE

Object of building permission

Object of project documentation for building permission is construction of new family house and technical infrastructure. Building plot is in property of investor.

Evaluation of construction site

Family house is designed like as a two-storey low energy detached house containing one dwelling unit without basement and with attached garage. It is suitable for five member family. Family house is oriented along the shorter plot side with its entrance nortbound to the access road. From the north-east side of house there is attached garage.

Plot is located in the western part of a city Olomouc, in cadastral area Nová Ulice. This area is newly devided into separate parcels that are prepared for further housing development in accordance with planning study. It respects building line of existing buildings.

2. URBAN AND ARCHITECTONIC SOLUTION OF BUILDING

Urban solution

Urban solution comes out of land study and concept tries to follow street line of existing buildings. Furthermore solution of construction is unfluenced by cardinal directions. In locality there are designed similar buildings.

Architectonic solution

The design of family house comes out of planning study that defines basic conditions for construction. Family house is designed in the same style like as existing buildings and its position on the plot respects building line of neighbouring family houses.

The house entrance is accessible through the entrance hall from which you can go to the other parts of house. The object is functionally divided into a social part (first floor) and private / resting part (second floor). The social part consists of the work room, bathroom, kitchen, living room, pantry and staircase. The Living room provides an access onto the terrace.

The second floor, resting part consists of two bedrooms for children which are connected by common bathroom and dressing room. Furthermore there is one bedroom for parents that have access onto the terrace. Parents have their own bathroom and dressing room accessible only from their bedroom.

The concept is simple and economically available. Internal disposition of building respects project economy. Habitable rooms are designed in accordance with Czech standards. Size of building is suitable for four or five member family. It is possible to do some changes in disposition according to client´s demand.

Art solution

Locality of new construction tries to be moderate but no monotonous. Facade of family house is light in grey tone and door and window openings are in alluminium tone. Terrace railing is made from stainless steel with glass filling and it is one of the most distinctive element of family house.

3. TECHNICAL SOLUTION WITH DESCRIPTION OF BUILDING CONSTRUCTION AND ENGINEERING CONSTRUCTION AND SOLUTION OF EXTERNAL AREA

Dispositional solution

Generally dispositional solution arises from architectonic solution and location of construction.

number of room	description	area [m²]
1.01	ENTRANCE HALL	11,390
1.02	HALLWAY and STAIRCASE	24,270
1.03	PANTRY	5,680
1.04	GARAGE	21,880
1.05	STOCK ROOM	10,940
1.06	LIVING ROOM	29,150
1.07	KITCHEN	20,800
1.08	BATHROOM	7,360
1.09	WORK ROOM	13,440

number of room	description	area [m²]
2.01	HALLWAY	10,750
2.02	BATHROOM	10,460
2.03	GREEN ROOF	17,100
2.04	TERRACE	19,000
2.05	BEDROOM	23,380
2.06	DRESSING ROOM	9,950
2.07	BEDROOM	12,800
2.08	DRESSING ROOM	7,650
2.09	BATHROOM	10,800
2.10	BEDROOM	18,560

Disposition	5+1 and garage
Height of family house	6,860 mm
Clear height of 1.NP	2,750 mm
Clear height of 2.NP	2,670 mm
Plot area	766 m²
Built-up area	181,495 m²
Surface area	249,260 m²

Structural technical solution

House foundations are designing like as foundation strips. Their depth and width design is based on preliminary calculation of loading. During the design of foundation strips we estimate Rd = 200 kPa and we follow results from geological survey. External and internal load bearing walls are designed from brick blocks POROTHERM 30 P+D, thickness of

300mm and external wall is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150 mm. Partition walls are made from brick blocks POROTHERM 11,5 AKU. Horizontal load bearing constructions (ceilings) are made from ceramic blocks MIAKO and POT girders. The thickness of ceiling constructions is 230 mm. The 1st floor and the 2nd floor is connected by monolithic half-turn staircase with the angle of 31,43°. The height of staircase step will be 171,11 mm and its width will be 280mm. Staircase will be anchored to external load bearing wall and ceiling construction. Family house is covered by warm flat roof construction which finishes by river gravels. The garage is one-storey construction with warm flat roof that is divided into green roof construction and terrace. It is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and it is not insulated.

4. CONNECTION TO TRAFFIC AND TECHNICAL INFRASTRUCTURE

Connection to traffic infrastructure

Connection of designed construction to public traffic infrastructure is from existing street.

Connection to technical infrastructure

Connection of object to municipal engineering (sewerage system, gas pipeline, water pipeline, electric distribution)- all connectors and distributions are described in project documentation (situation drawing C1.1b) in more details.

5. SOLUTION OF STATIONARY TRAFFIC

Technical infrastructure in solved territory

Considering the purpose and range of construction it does not have influence on traffic density in solved territory. Existing technical infrastructure consists of underground distributions mainly.

Solution of infrastructure of stationary traffic

It is a construction of new family house and parking is ensured by garage.

Compliance with conditions determined by designing of buildings in undermined territory

It is not related to building construction.

6. ENVIRONMENTAL IMPACT

Construction of family house will not have negative impact on the environment. There is designed condensing heating boiler, the heating does not burden substantially surroundings.

The basic legislation on waste management are the Act on Waste No. 185/2001 Coll. Decree No. 381/2001 Coll., Issuing waste cataloque and Decree No. 383/2001 Coll. On details of waste management. These regulations are valid from 1.1.2002.
Operation of the facility creates other household waste which will be collected in the bin located on private property, its removal will be regularly provided by city engineering services, specialized contracting organizations.
In the implementation of construction should be paid attention to minimize the occurrence of excessive noise and dust. Furthermore, we must avoid pollution of soil and groundwater and unwarranted damage of green areas during construction process.

Waste created from the usage of object- municipal refuse, residual water

Family house is connected to sanitary service pipe so that sanitary waste water and rain water is taken away to it.

Noise produced during the realization of construction

Requirements on noise abatement comes out of law 258/2000 Sb. about protection of public health and following public notice no. 148/2006 Sb. about protection of health against unfavourable effects of noise and vibrations, that determine the highest allowable values of noise in protected external area of building and in protected external area.

Noise produced by traffic

Noise situation in touched territory is not influenced by realisation of construction.

Noise of technical equipment and utilities

Noise emissions of designed object to external space and its effect on surrounding buildings will not exceed given values by hygienic demands.

7. SOLUTION OF ACCESS OF PERSONS WITH DISABLE MOBILITY, NON-BARRIER FRONTAGE ROAD

Solution is designed in compliance with requirements appendix no.1 of public notice 369/2001 Sb. in version of public notice 492/2006 Sb.

8. SURVEY AND MEASUREMNT

Engineering geological study and radon survey were done in touched territory. On the examined plot is needed sufficient technical protection of building against the penetration of radon from natural environments. Quality of radon protection of building and design of insulation barrier is achieved by accurate and professional project implementation procedures in accordance with the standard CSN 730601 Protection of buildings against radon from the soil.

Sufficient radon protection of building which is situated in the area with medium radon index is design of contact constructions of first tightness category. Building constructions under the contact of subbase have to have constant layer of radon insulation (foil or asphalt felt). These radon insulations have to be attested with sufficient coefficient of diffusion.

9. BASIS FOR STAKING LAYOUT- REFERENTIAL SITE AND ELEVATION SYSTEM

Documentation is done in positional system JTSK and height system BPV.

10. DIVISION IN BUILDING OBJECTS AND OPERATIONAL SETS

Building construction is divided into family house and garage- BO1.

11. INFLUENCE UPON NEIGHBORING PROPERTIES

Protection against the noise and vibrations

Contractor is obliged to use proper machinery and mechanism and their loudness does not have to exceed allowable values.

Protection against pollution of atmosphere by exhaust gas and dust

Contractor is obliged to ensure the operations of vehicles producing exhausted pollutants equal to the valid decrees and regulations on the conditions of operations of vehicles on the road.

Protection against pollution of communication and excessive dustness

Vehicles going from the site must be properly cleaned to prevent pollution of public roads mainly by soil, concrete mixtures and so on. Internal part of building site communication and surfaces are regularly cleaned and in the case of dust spray.

Protection against pollution surface water and ground water and sewerage

During construction is necessary in carrying out construction works and operation ensure building site in appropriate way to prevent pollution of groundwater. It involves especially appropriate draining of rainwater from the foundation pit, operational, production and storage areas.

Waste produced during the construction

Waste producer is responsible for waste management until they are passed to the beneficiary. Waste will be separated on construction site, it will be stored either directly on the transport vehicles or containers located in the area of the site.

12. ENSURING HEALTH PROTECTION AND SAFETY OF WORK

Marking and securing of building

Building site will be fenced. By means of identification and security of structures and mode of entry of workers at construction sites will be established in the contractual relationship between the investor and the contractor.

Conditions of health protection and safety of work

All workers must be briefed about security requirements for work before they start with construction. All employees must use the prescribed protective equipment. The workplace must be kept clean and tidiness. Protection against a fire must be kept and also suitable equipments must be close to workplace. Work on building site must be followed by prescribed technological procedures.

Plan of health protection and safety of work

Before starting work on the building site a plan of health protection and safety of work will be developed in accordance with the law.

B) MECHANICAL RESISTIVITY AND STABILITY

Static of construction is done in compliance with technological requirements, standards and general regulations on building. Before the start of construction we are oblique to consult the

design of load bearing constructions with responsible person (structural designer) and enclose the static calculations to project documentation.

C) FIRE SAFETY

Fire safety report describes all needed requirements. It is separate part of project documentation (folder C5).

D) HYGIENE, SAFETY OF DWELLERS AND FUNCTION OF BUILDING

New family house will not have a negative impact on the environment and surrounding objects. The designed window openings fully comply sun radiation and ventilation. The object and its substructure is insulated against thermal bridges, pressure water and medium radon. Noisy works must not be carried out at night or on the weekends. The operation will not have negative impacts on the environment.

E) SAFETY IN USE

It is new construction there are not any danger technological mechanisms. During design and during realisation of construction the government regulations must be kept 591/2006 Sb. about close minimal demands on safety of work and health protection.

F) NOISE PROTECTION

Building will not be secondary protected against traffic noise, only primarily and it will be done by its own structural system of peripheral construction.

G) ENERGY SAVING AND HEAT PROTECTION

It is solved in more details in the thermal assessment of structures (folder C3) and in the energy label report (folder C4).

H) SOLUTION OF ACCESS OF PERSONS WITH DISABLE MOBILITY

Building does not have special demands on barrier solution.

I) PROTECTION AGAINST HARMFUL IMPACT OF ENVIRONMENT

The object and its substructure is insulated against thermal bridges, pressure water and medium radon. Other influences are not known.

J) PROTECTION OF POPULATION

Nowadays it is not considered to prepare for massive threat of city and thus the requirements for the establishment of shelters for all residents in the place of their stay.

K) ENGINEERING CONSTRUCTIONS (OBJECTS)

Dewatering of territory

Building will be connected to main sanitary service pipe.

Water supply

The object will be connected to main water system.

Energy supply

Gas pipeline and public lighting and distribution of voltage.

Traffic solution

It is solved in more details in chapter one of this report.

Finishing works of environment

Building will be connected to existing communication. There will be done reconstruction of garden and new planting of the plot.

Electronic distribution

Distribution of weak current is not a part of this project documentation.

L) PRODUCTIVE AND NON PRODUCTIVE TECHNOLOGICAL EQUIPMENTS OF BUILDINGS

It is not concerned with building.

In Olomouc 05/2012

Done by: Kristýna Buiglová

BACHELOR´S THESIS			BUT FACULTY OF CIVIL ENGINEERING INSTITUTE OF BUILDING STRUCTURES	
STUDENT	KRISTÝNA BUIGLOVÁ			
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
TECHNICAL REPORT			SCALE -	DRAWING NUMBER C4.3

CONTENT:

A) GENERAL INFORMATION

Identification of building: New construction of family house, Zirmova street, Olomouc

Type of building: Low energy detached house

Investor: Šimonovská Jana Ing., Výstavní 313/26, Olomouc, Chomoutov, 783 35

Locality: Parcel number 153/30, Zirmova street, Olomouc

Cadastral area: Nová Ulice

Designer: Kristýna Buiglová, Rybízová 14, 779 00 Olomouc

B) MAIN CHARACTERISTIC OF BUILDING AND ITS PURPOSE

Family house is designed like as a two-storey low energy detached house containing one dwelling unit without basement and with attached garage. It is suitable for five member family. Family house is oriented along the shorter plot side with its entrance northbound to the access road. From the north-east side of house there is attached garage. The garage is one-storey construction with warm flat roof that is divided into green roof construction and terrace. The house is covered with warm flat roof too. Construction of foundation is solved by foundation strips. External load bearing wall is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and it is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150 mm. The garage is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and i tis not insulated.

Brief description of urban, architectural, disposition and structural solution is stated in the accompanying and summary technical report.

C) STRUCTURAL AND TECHNICAL SOLUTION

1. PREPARATION OF THE BUILDING SITE AND EARTHWORKS

Earthworks start with removing of topsoil over the area of future building. The thickness of layer is expected around 200-300 mm. The soil will be stored on the construction site and the investor will use it for garden creation after finishing of construction.

Excavations works are based on digging of trenches for foundation strips. The depth is given by design into non-freezing zone and their width is design according to calculated loading-floor plan of foundations (folder C1) and calculation of foundation (folder C3).

Most of the base structure will be implemented into the formwork. Therefore the excavations will be extended to each side about 600 mm from the edge of consider foundation structure.

During digging we have to respect given standards for protection of foundation base (to prevent freezing, to prevent ingress of surface water, etc.). In the case of groundwater seepage into the trench excavation is necessary to protect the wall by sheeting and draw water from it.

2. FOUNDATIONS

According to geological report, the founding conditions are simple and structure as well. See geological report – survey (folder C4).

Below the load bearing walls we design foundation strips with width 500 mm, 600 mm, 650 mm and 950 mm from armoured concrete C20/25. Their depth is design according to

geological profile and it is 1200mm. They are continuously over concreted by base concrete slab C16/20 with kari net. Its thickness is 150 mm. Below this slab is compacted gravel sand subbase 100 mm thick.

After concreting and after technological break, there will be placed thermal insulation of strip from STYRODUR 2800C, th. 120 mm from the external side of foundation.

3. VERTICAL LOAD BEARING CONSTRUCTIONS

External load bearing wall is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and it is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150 mm. Hydroinsulation is designed from FATRAFOL 803 foil, thickness of 2 mm. Internal load bearing wall is made from the same type of brick. Partitions are made from POROTHERM 11,5 AKU. During brickwork we have to follow technological requirements given by producer. Full brick piers are design for supporting of staircase.

Lintels are made from POROTHERM system and they are specified in folder C2. Installation partitions are made from gypsum board RIGIPS system with metal framing.

4. HORIZONTAL LOAD BEARING CONSTRUCTION (CEILING)

Floor construction above 1st floor and 2nd floor is made from ceramic blocks MIAKO (19/50 PTH, 19/62,5 PTH and 8/50 PTH) and POT girders 160x175. The thickness of ceiling constructions is 230 mm. Specification of floor units is described in project drawings number C1.5 and C1.6. There are made some crawl spaces for chimney and installations. Their description and dimensions are apparent from previous named project drawings. Stiffening of structure is solved by reinforced concrete monolithic ring at the level of ceiling. It has the same thermal protection as external loadbearing walls

5. STAIRCASE

The 1st floor and the 2nd floor is connected by monolithic half-turn staircase with the angle of 31,43°. The height of staircase step will be 171,11 mm and its width will be 280mm. Staircase will be anchored to external load bearing wall and ceiling construction.

6. ROOF CONSTRUCTION

Load bearing construction of roof of family house is made from POROTHERM ceiling and it is covered by warm flat roof construction. Description of separate layers is listed in folder C2. Its design has to ensure sufficient thermal protection of building and its detailed description is given in folder C3. Load bearing construction of roof of attached garage is also designed from POROTHERM ceiling and it is designed like as warm flat roof as well. Description of separate layers is listed in folder C2.

7. CHIMNEY

For the heating and preparation of hot domestic water is designed condesing boiler (24 kW)- TURBO JUNKERS ZSN 24-6 AE CERASTAR that is installed in the room 2.02 and additional heating is ensured by use of fireplace- in the room 1.06 connected to chimney SCHIEDEL UNI 20 360x360. Combustion ways have to fulfill requirements of government regulation n.91/2010 about conditions of fire protection during usage of chimney and ČSN 73 4301- Residential building- Chimneys and smoke flue- design, implementation and

connection of fuel appliances. Top of the chimney is 1500 mm above the roof ridge and exhaust from condesing boiler is 1000 mm above the roof ridge.

8. PARTITIONS

Partitions are made from POROTHERM 11,5 AKU. During brickwork we have to follow technological requirements given by producer.

9. LINTELS

Lintels are made from POROTHERM system and they are specified in folder C2. Additionally for supporting of staircase we put two I profiles on the masonry pier and internal load bearing wall from each side. They are specified in folder C2.

10. FLOOR COMPOSITION

Details of the floor compositions are described in folder C2 and details. Floor construction on the ground needs sufficient thermal insulation to ensure thermal protection of building so that we put there polystyrene EPS 100S STABIL, thickness 180 mm and for construction of the 2nd floor we need acoustic insulation EPS RigiFloor 4000, thickness of 40 mm.

11. HYDROINSULATION AND RADON INSULATION, VAPOUR BARRIER

As a hydroinsulation and radon insulation of foundations is designed FATRAFOL 803 foil with thickness of 2 mm. It is placed minimally 300 mm above the terrain. Placement is described in detail drawing. As a hydroinsulation of roof construction of family house and attached garage we design foil from PVC-P, dekplan 77.

As protective vapour barrier of foundations is used embossed foil DELTA and for both roof constructions is used modified sheet from SBS, glastek 40 special mineral.

Insulation of wet areas like as bathrooms is solved by spattle material on the walls and floors and by placing of ceramic tiles and ceramic facing.

12. THERMAL, ACOUSTIC AND IMPACT SOUND INSULATION

External load bearing wall is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150 mm. Foundations are insulated by polystyrene STYRODUR 2800C, thickness 120 mm. Floors on the ground are insulated by polystyrene EPS 100S STABIL, thickness 180 mm and floors of 2nd floor have acoustic insulation EPS RigiFloor 4000, thickness of 40 mm.

13. SURFACE FINISHING

Internal plasters are made from POROTHERM UNIVERSAL PLASTER with thickness of 10 mm. Extenal facade is insulated by External Thermal Insulation Composite System, ETICS. Design of facade has to be in accordance with ETICS requirements and we have to follow technilogical proces. Surface finishing is made from thin layer of silicone plaster with thickness of 3 mm and its colour varies. It is apparent from drawings.

14. CARPENTRY, LOCKSMITH AND OTHER ADDITIONAL PRODUCTS

Internal and external doors are specified in folder C2. Timber door linings are a part of producer supply.

Internal and external window sills are a part of producer supply. They will be specified by investor during order.

Railing of internal staircase is made from stainless steel and its height is 1000 mm. External railing of attic is made from stainless steel as well but with glass filling. Its height is aslo 1000 mm. Both types of railings will be designed in accordance with ČSN 743305 – The protective railings.

Anchoring elements and fixing elements are a part of building supply.

15. TINSMITHS PRODUCTS

Flashing of attic is made from metal sheeting. Flashing of chimney and exhaust of condesing boiler is done continuously with attic as well as flashing of ventilating pipe.

16. PAINTINGS

Interiors are panted in varying colours. Investor will specified them. Colour of external facade is apparent from drawings. It is in the same tone like as neighbouring buildings.

17. VENTILATION

Ventilation is designed as natural ventilation through the windows

18. EXTERIOR ARRANGEMENTS

Around the building is designed ground apron with concrete curb for drainage of rainwater.

Olomouc 05/2012

Done by: Kristýna Buiglová

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STUDENT	KRISTÝNA BUIGLOVÁ			
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
ENERGY LABEL REPORT			SCALE -	DRAWING NUMBER C4.4

REPORT- Energy labelling of building envelope

Identification data

Type of building	Family house
Address (city, street, PSČ)	Olomouc, Zirmova street, 779 00
Cadastral area and cadastral place	Nová Ulice
Owner, or future owner	Šimonovská Jana Ing.
Proprietor or corporation of proprietors	
Adrdress	Výstavní 313/26, Olomouc- Chomoutov
Phone number/e -mail	

Building characteristic

Volume of building V – external volume of heated zone, excluding loggias, labels, attics and foundation	903,548 m³
Total area A – sum of external areas of cooled constructions bordering volume of building	548,768 m²
Volume factor of building A/V	0,607 m²/m³
Prevailling internal temperature in heating period	20°C
External design temperature in winter period	-15°C

Energy characteristic of important cooled constructions- reference building

cooled construction	Area Ai [m2]	required (recommended) coefficient of heat transfer UN,20 (Urec,20) [W/(m2·K)]	temperature reduction factor bi [-]	heat transmission losses Hтi Σ(Ai x Ui x bi) [W/K]
EW1	239,857	0,30 (0,25)	1	71,957
EW2	32,623	0,60 (0,40)	1	19,574
EW3	5,050	0,30 (0,25)	1	3,030
F	119,25	0,45 (0,30)	0,429	23,021
R	116,613	0,24 (0,16)	1	27,987
W	31,625	1,5 (1,2)	1	47,438
D	3,75	1,7 (1,2)	1	6,375
totally	548,768			199,382
Thermal binding between construction		ΣAi x (Σψi . l +Σχi)/Ai = ΣAi x ΔUtbm		10,975
Total heat transmission losses **Hт** [W/K]		Σ (Ai x Ui x bi) + Ai x ΔUtbm		210,357
Mean required coefficient of heat transfer **Uem,N** according to 5.3.4 and table 5		Uem,N,20 = Σ (UN,j x Aj x bj)/ ΣAj + 0,02 the biggest value is 0,5 for new residential building		0,363
Mean recommended coefficient of heat transfer **Uem,rec** according to 5.3.2		Uem,rec = 0,75 x Uem,N		0,272

Energy characteristic of important cooled constructions- evaluated building

cooled construction	Area Ai [m2]	coefficient of heat transfer Ui [W/(m2·K)]	temperature reduction factor bi [-]	heat transmission losses Hтi Σ(Ai x Ui x bi) [W/K]
EW1	239,857	0,177	1	42,455
EW2	32,623	0,177	1	5,774
EW3	5,050	0,207	1	1,045
F	119,25	0,199	0,429	10,180
R	116,613	0,151	1	17,609
W	31,625	0,8	1	25,300
D	3,75	0,7	1	2,625
totally	548,768			104,988
Thermal binding between construction		ΣAi x (Σψi . l +Σχi)/Ai = ΣAi x ΔUtbm		10,975
Total heat transmission losses **Hт** [W/K]		Σ (Ai x Ui x bi) + Ai x ΔUtbm		115,964
Mean coefficient of heat transfer **Uem**		Uem= Hт / A		0,211
Classification class of the building envelope		class= Uem / Uem,N,20= 0,211/0,363= 0,581		**B**

Constructions fulfill the requirements on overall heat transfer coeff. according to ČSN 73 0540-2.

EW1- external load bearing wall
EW2- external load bearing wall
EW3- external load bearing wall
F- floor construction above the terrain
R- roof construction
W- window openings
D- door opening

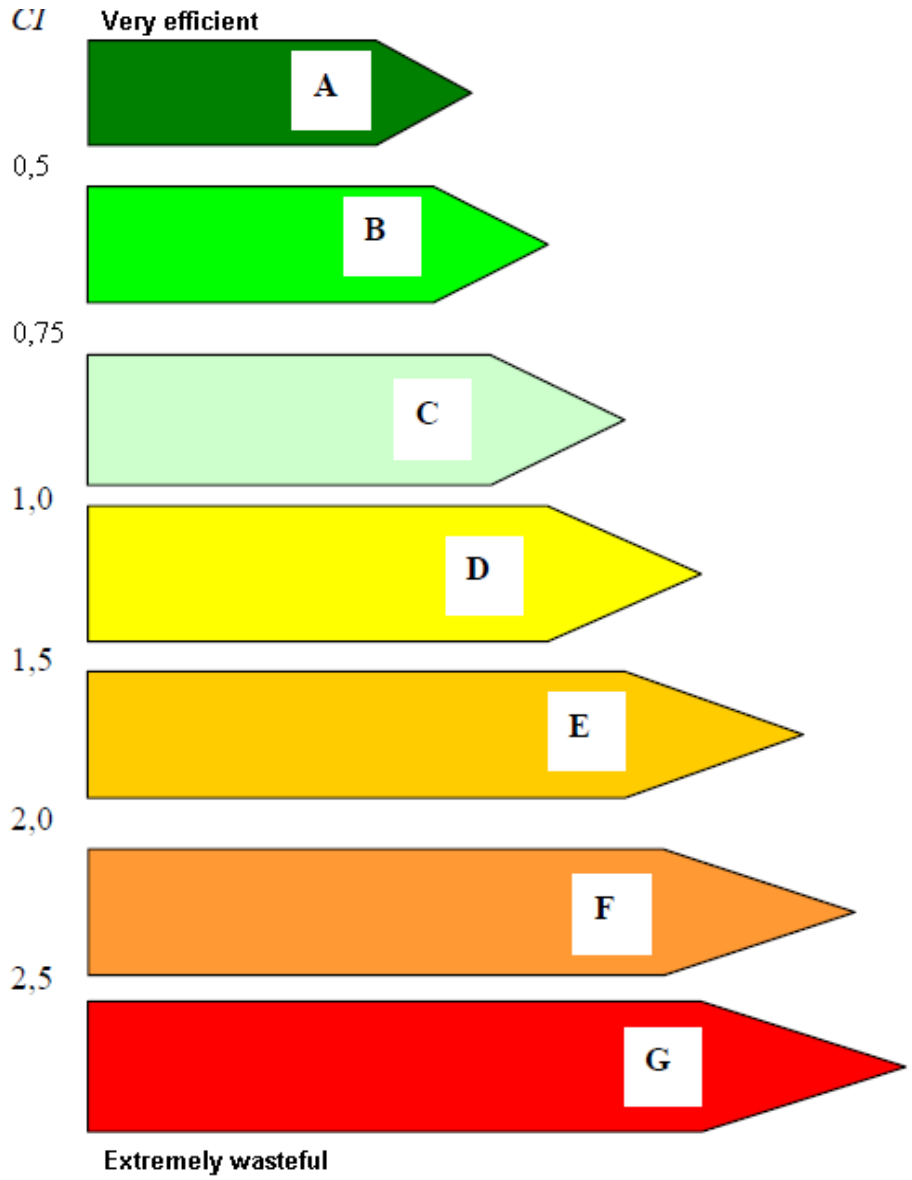
Classification classes of heat transfer by enevelope of evaluated building

Rating category	Mean heat transfer coefficient Uem [W/(m2·K)]	Verbal formulation of classification class	Classification indicator CI
A	Uem ≤ 0.5 Uem,N	very efficient	← 0,5
B	0,5 Uem,N < Uem ≤ 0.75 Uem,N	efficient	← 0,75
C	0,75 Uem,N < Uem ≤ Uem,N	acceptable	← 1,0
D	Uem,N < Uem ≤ 1,5 Uem,N	unacceptable	← 1,5
E	1,5 Uem,N < Uem ≤ 2,0 Uem,N	inefficient	← 2,0
F	2,0 Uem,N < Uem ≤2,5 Uem,N	very inefficient	← 2,5
G	Uem > 2,5 Uem,N	extremely inefficient	

Classification: **B - Energy saving**
Date of issuance of energy label:
Authot of energy label: Kristýna Buiglová
Address of author: -
IČO: -
Author: Kristýna Buiglová Signature:

ENERGY LABEL
OF BUILDING ENVELOPE

Type of building: Family house Address: Zirmova street, Olomouc, 779 00	Evaluation of building envelope	
Total surface area: Ac = 249,260 m^2	actual	recommended



Mean coefficient of heat transfer Uem (W . m^{-2}.K^{-1}) Uem = HT/A	0,211	0,272
Required value of the average heat transfer coefficient of the building envelope according to CSN 73 0540-2 Uemn,20 (W . m-2.K-1)	0,363	0,363

Classification indicators and their corresponding values of Uem for A/V= 0,607m^2/m^3

CI	0,50	0,75	1,0	1,5	2,0	2,5
U_{em}	0,182	0,272	0,363	0,545	0,726	0,908

Validity of label untill:	Date: Name and surname: Kristýna Buiglová

This report and energy label is in accordance with European directive and council number 2002/91/ES and enclosure EN 15217. It was done in accordance with ČSN 73 0540 and according to project documentation of building.

CLASSIFICATION CI= Uem/Uem,N,20= 0,211/0,363= 0,581

In Olomouc 05/2012

Done by: Kristýna Buiglová

BACHELOR´S THESIS			BUT FACULTY OF CIVIL ENGINEERING INSTITUTE OF BUILDING STRUCTURES	
STUDENT	KRISTÝNA BUIGLOVÁ			
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
GEOLOGICAL REPORT - SURVEY			SCALE -	DRAWING NUMBER C4.5

CONTENT:

A) BRIEF DESCRIPTION OF BUILDING

Family house is designed like as a two-storey detached house containing one dwelling unit without basement and with attached garage. It is suitable for five member family. The house is covered with a warm flat roof. Construction of foundation is solved by foundation strips. External load bearing wall is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and it is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150 mm. The garage is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and i tis not insulated.

Cadastral area: Olomouc, Nová Ulice

Parcel number: 153/30

Disposition	5+1 and garage
Height of family house	6,860 mm
Clear height of 1.NP	2,750 mm
Clear height of 2.NP	2,670 mm
Plot area	766 m²
Built-up area	181,495 m²
Surface area	249,260 m²

Placing of building → construction site

B) DATA FROM THE INSTITUTE OF GEOTECHNICS

1) Použité podklady

Olomouc – Závěrečná zpráva z IG průzkumu pro objekty garáže a učebny na Tabulovém vrchu v Olomouci. Geodet n. p. Brno, 1977, z. č. 11556 – IG, J. Rumížek

Olomouc – Tabulová vrch, Závěrečná zpráva o IG průzkumu základových poměrů staveniště budov v areálu kasáren na Tabulovém vrchu v Olomouci. Geodet n. p. Brno, 1986, z. č. 860079, A. Pavelka.

Geologická mapa ČR, M 1 : 50000, list 24 – 22 Olomouc

Geologická dokumentace vrtů MV 1, MV 2 z archivu Geofondů Praha

2) Přehled geologických a hydrogeologických poměrů

Studované území ve smyslu regionálního členění reliéfů ČSR (ČSAV, 1972) náleží k provincii Západní Karpaty, soustavy Vněkarpatské sníženiny, podsoustavy Západní Vněkarpatské sníženiny celku Hornomoravského úvalu, podcelku Prostějovské pahorkatiny.

Geologicky zájmové území náleží k neogénu a to k jezernímu cyklu – pliocénu. Jedná se o sladkovodní pestrou sérii písků a jílů, jejichž povrch jsme ověřili v hloubce 0,7 – 1,5 m pod povrchem dnešního území.

Je to střídání bílých, žlutých, zelenožlutých, zelených, zelenošedých, rezavých, červených, hnědých, fialových, šedých a šedočerných jemně až hrubě zrnitých, vápnitých křemenných písků s polohami jílovitých jemně až středně zrnitých křemenných, jemně slídnatých nevápnitých písků.

Často se vyskytují polohy písčitých, slídnatých nevápnitých jílů a málo tříděnými křemennými zrny.

Jen místy je jíl slabě jemně písčitý a jemně slídnatý. Střídání jednotlivých vrstev je bohaté a hranice mezi nimi ostrá. Maximální mocnost pliocénních sedimentů je 160 m. Kvartérní sedimenty jsou zde zastoupeny navážkami a humózními hlínami a celkové mocnosti 0,7 – 1,5 m.

Hladina podzemní vody byla zjištěna ve vrtech J2 a J7 v hloubce 10,3 – 11.3 m pod terénem.

Předpokládaný charakteristický geologický profil:

Vrt J7

Kóta terénu: 255,1 m. n. m.

Vrtmistr: P. Hoffmann, UGB

Hloubeno: 27. 2. 1986

0,0 – 0,5 Hlína černohnědá, ornice

0,5 – 1,2 Hlína tmavě hnědá, pevná

Pliocén:

1,2 – 1,8 Jílovitá hlína červenohnědá, šedě smouhovaná, pevná

1,8 – 2,7 Jílovitá hlína písčitá rezavě hnědá, pevná

2,7 – 3,6 Jílovitá hlína písčitá červenohnědá, šedě skvrnitá pevná

3,6 – 4,1 Hlinitý písek jemně zrnitý žlutozelený červeně smouhovaný, ulehlý

4,1 – 6,5 Jílovitá hlína písčitá, červenohnědá, pevná

6,5 – 12,0 Jílovitá hlína písčitá, žlutohnědá, pevná

Hladina podzemní vody naražená v hl. 10,3 m pod ter.

Vrt ukončen v hl. 12,0 m.

3) Geotechnické vlastnosti zemin

Laboratoř mechaniky zemin zpracovala odebrané neporušené vzorky zemin. Výsledky laboratorních rozborů jsme geotechnicky zhodnotili a níže uvádíme půdněmechanické charakteristiky doporučené do statických výpočtů.

Kvartérní sedimenty vzhledem ke svému charakteru a mocnosti nebudou tvořit základovou půdu a proto se jimi nebudeme dále zabývat.

3.1) Pliocéní sedimenty

Povrch těchto sedimentů jsme ověřili v hloubce 0,7 – 1,5 m pod povrchem stávajícího území (viz. kap. 2). Připomínáme, že se jedná o pestrou sérii písků a jílů, jejichž vrstvy se bohatě střídají a hranice je ostrá.

a) Jíly a písčité jíly mají index plasticity Ip = 0,207 – 0,282. Podle ČSN 731001, se jedná o zeminy vysoce plastické tř. F6CI.
b) Jílovitá hlína písčitá ev. Písčitá hlína mají index plasticity Ip = 0,100 – 0,190 a náleží tudíž mezi zeminy středně plastické do tř. F6 CI.
c) Jílovitý písek, hlinitý písek jsou jemně až středně zrnité, místy prachové. Podle čl. 50 náleží mezi zeminy písčité do tř. S5 SC.

4) Inženýrskogoelogické zhodnocení

Základové poměry (kap. 2) lze klasifikovat jako jednoduché.

Projektovaný dvoupodlažní RD je stavba nenáročná.

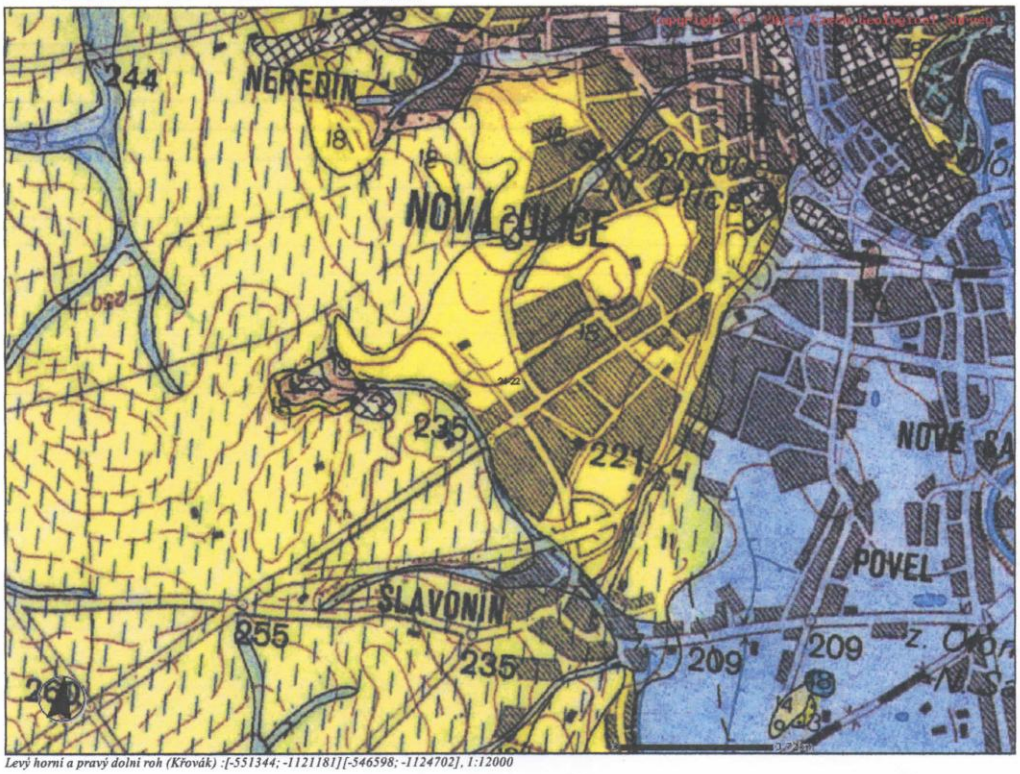
Při návrhu základů nenáročných staveb v jednoduchých základových poměrech se postupuje podle 1. Geotechnice kategorie, t. j. používá se tabulková výpočtová únosnost. Rdt = 200kPa

Ve smyslu ČSN 733050, změny b/77 (zemní práce) zařazujeme zeminy na staveništi podle jejich těžitelnosti:

Geological map

Česká geologická služba Mapový server

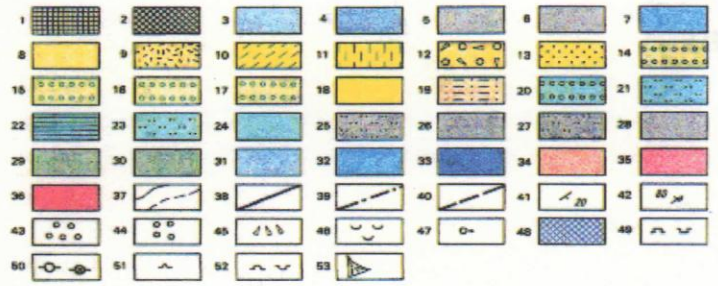
GeoInfo



Levý horní a pravý dolní roh (Křovák) :[-551344; -1121181] [-546598; -1124702], 1:12000

Legend to the geological map

Legenda ke geologické mapě "2422 - Olomouc"



KVARTÉR, holocén: 1 – skládky; 2 – navážky, deponie; 3 – fluviální písčité hlíny, místy s příměsí štěrku; 4 – fluviální písčité hlíny spraš. charakteru; 5 – hnilokaly; 6 – slatiny; 7 – deluviofluviální hlíny; 8 – deluviální převážně ronové hlíny;
pleistocén - holocén: 9 – deluviální kamenitohlinité až hlinitokamenité sedimenty (lokálně včetně deluviofluviálních sedimentů);
pleistocén nečleněný: 10 – deluviosoliflukční sedimenty; 11 – spraše; 12 – proluviální hlinitopísčité štěrky (štěrky výplavových kuželů);
pleistocén svrchní: 13 – naváté písky; 14 – fluviální písčité štěrky;
pleistocén střední: 15 – fluviální písčité štěrky nenakonické terasy; 16 – fluviální písčité štěrky kralické terasy; 17 – fluviální písčité štěrky brodecké terasy;
TERCIÉR: neogén, pliocén: 18 – písky, štěrky, silty a jíly ("pestrá pliocénní série");
miocén: 19 – vápnité jíly a písky (spodní baden, moray);
PALEOZOIKUM: karbon: 20 – paseriální slepence, souvrství myslejovické (svrchní visé); 21 – drohy, souvrství myslejovické (svrchní visé); 22 – laminované břidlice a prachovce, souvrství myslejovické (svrchní visé); 23 – drohy, místy s drobnozrnnými slepenci, souvrství moravické (svrchní visé); 24 – břidlice a prachovce, souvrství moravické (svrchní visé); 25 – souvrství rozstáňské (střední visé); 26 – břidlice, prachovce a jemnozrnné drohy, souvrství rozstáňské (střední visé); 27 – drohy, souvrství hornobenešovské (spodní a střední visé); 28 – břidlice a prachovce, souvrství hornobenešovské (spodní a střední visé); 29 – břidlice a pískovce souvrství protivanovské (spodní visé); 30 – břidlice a prachovce, souvrství andělskohorské (tournai);
devon: 31 – laminované vápence s laminami břidlic, vápence vilémovické, souvrství macošské (givet-frasn); 33 – dolomity, ložánecké vápence (eifel); 34 – křemenné pískovce, bazální klastické souvrství (spodní devon?);
PROTEROZOIKUM: 35 – biotitické granodiority, mylonitizované, kataklastické; 36 – biotitické diority, mylonitizované;
37 – geologická hranice ověřená, předpokládaná (či přechod); 38 – zlom; 39 – zlom zakrytý; 40 – zlom předpokládaný; 41 – směr a sklon vrstevnatosti (foliace) - normální sled; 42 – směr a sklon vrstevnatosti (foliace) - překocený sled; 43 – přímás štěrků v arnici (kvartér); 44 – přímás štěrků v arnici (spodní baden); 45 – bloky fasových (litotamniových) vápenců; 46 – sesuv; 47 – významné prameny; 48 – zatopené lůžabny; 49 – lom v provozu, opuštěný; 50 – štěrkovna v provozu, opuštěná; 51 – pískovna; 52 – hliniště v provozu, opuštěné; 53 – morfologicky výrazné výplavové kužele.

C) DATA FROM GEOFOND

Soil profiles

List of soil profiles based on the deep bores.

Příloha č. 3

PETROGRAFICKÉ POPISY MĚLKÝCH NEVYSTROJENÝCH VRTŮ

Označení objektu **: MV-1**
Datum hloubení : 6. 10. 2009
Vrtná souprava : Botec-Scheitza na podvozku Tatra 815 6x6.1, GEOBE s.r.o.
Naraž. hladina p. v. : nenaražena
Průměr vrtání : 180 mm

hloubka (m p.t.)	*geologický profil*
0,0 – 1,1	navážka, hnědošedá (hlína s úlomky kamení, kusy betonu, úlomky cihel), BZ,
1,1 – 1,2	písčitá hlína s ojedinělými valouny štěrku, žlutá, tuhá, slabě uhličitá, BZ,
1,2 – 1,5	jílovitý písek s ojedinělými valouny štěrku, žlutý, střední, ulehlý, slabě uhličitý, BZ,
1,5 – 1,8	jílovitý písek, žlutý, střední, ulehlý, bez uhličitanů, BZ,
1,8 – 2,2	písčitá hlína se štěrkem, hnědožlutá, tuhá, bez uhličitanů, BZ,
2,2 – 3,0	písčitá hlína, hnědá, tuhá až pevná, bez uhličitanů, BZ.

Dokumentoval: Andrej Kapinus Dne: 6. 10. 2009

Označení objektu **: MV-2**
Datum hloubení : 6. 10. 2009
Vrtná souprava : Botec-Scheitza na podvozku Tatra 815 6x6.1, GEOBE s.r.o.
Naraž. hladina p. v. : nenaražena
Průměr vrtání : 180 mm

hloubka (m p.t.)	*geologický profil*
0,0 – 0,7	navážka, světle hnědá (hlína s úlomky kamení a cihel), BZ,
0,7 – 0,9	navážka, černošedá (velké kusy kamení s hlínou), BZ,
0,9 – 1,8	navážka, hnědožlutá (jílovitý písek s úlomky cihel a kamení) BZ,
1,8 – 2,8	jílovitý písek se štěrkem, žlutý, ulehlý, slabě uhličitý, BZ,
2,8 – 3,0	písčitá hlína, hnědá, tuhá, bez uhličitanů, BZ.

Dokumentoval: Andrej Kapinus Dne: 6. 10. 2009

Příloha č. 3

Označení objektu : **MV-3**
Datum hloubení : 6. 10. 2009
Vrtná souprava : Botec-Scheitza na podvozku Tatra 815 6x6.1, GEOBE s.r.o.
Naraž. hladina p. v. : nenaražena
Průměr vrtání : 180 mm

hloubka (m p.t.)	*geologický profil*
0,0 – 1,6	navážka, hnědá (hlína s úlomky cihel a kamení), SLZ,
1,6 – 2,2	písek slabě jílovitý, žlutý, střední, uhličitý, BZ,
2,2 – 2,7	velmi slabě jílovitý písek s ojedinělými valouny štěrku, žlutý, střední BZ,
2,7 – 2,8	písčitý jíl, hnědý až rezavě hnědý, tuhý, slabě uhličitý, BZ,
2,8 – 2,9	jílovitý písek, žlutý, střední, ulehlý, BZ,
2,9 – 3,0	písčitý jíl, hnědý, tuhý, slabě uhličitý, BZ.

Dokumentoval: Andrej Kapinus Dne: 6. 10. 2009

Označení objektu : **MV-4**
Datum hloubení : 6. 10. 2009
Vrtná souprava : Botec-Scheitza na podvozku Tatra 815 6x6.1, GEOBE s.r.o.
Naraž. hladina p. v. : nenaražena
Průměr vrtání : 180 mm

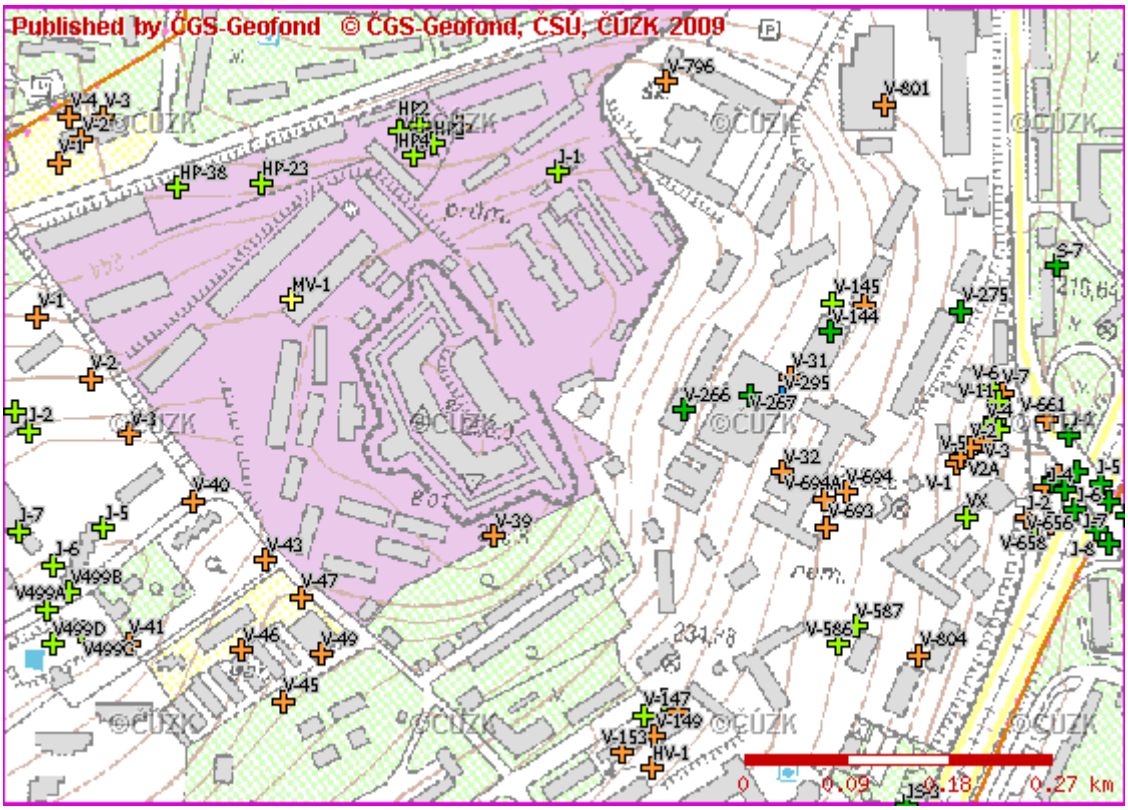
hloubka (m p.t.)	*geologický profil*
0,0 – 0,5	navážka, hnědá (hlína, kamení, úlomky cihel), BZ,
0,5 – 1,0	navážka, šedá (kamení, drť), BZ,
1,0 – 1,4	navážka, hnědá (hlína s úlomky cihel a kamení), BZ,
1,4 – 2,0	navážka, žlutá (písek s úlomky cihel), BZ,
2,0 – 3,0	písek, žlutý, ulehlý, slabě uhličitý, BZ.

Dokumentoval: Andrej Kapinus Dne: 6. 10. 2009

Vysvětlivky:

BZ **bez zápachu**
SLZ **slabý zápach**
Z **zápach**
SZ **silný zápach**
VSZ **velmi silný zápach**

Map of used deep bores



In Olomouc 05/2012

Done by: Kristýna Buiglová

BACHELOR´S THESIS			BUT FACULTY OF CIVIL ENGINEERING INSTITUTE OF BUILDING STRUCTURES	
STUDENT	KRISTÝNA BUIGLOVÁ			
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.			
LOW ENERGY DETACHED HOUSE			FORMAT	A4
			DATE	25.5.2012
RADON REPORT - SURVEY			SCALE -	DRAWING NUMBER C4.6

CONTENT:

A) BRIEF DESCRIPTION OF BUILDING

Family house is designed like as a two-storey detached house containing one dwelling unit without basement and with attached garage. It is suitable for five member family. The house is covered with a warm flat roof. Construction of foundation is solved by foundation strips. External load bearing wall is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and it is insulated by facade polystyrene EPS 70F CLIMA Rda, thickness of 150 mm. The garage is made from brick blocks POROTHERM 30 P+D, thickness of 300 mm and i tis not insulated.

Cadastral area: Olomouc, Nová Ulice

Parcel number: 153/30

Disposition	5+1 and garage
Height of family house	6,860 mm
Clear height of 1.NP	2,750 mm
Clear height of 2.NP	2,670 mm
Plot area	766 m²
Built-up area	181,495 m²
Surface area	249,260 m²

Placing of building → construction site

B) BASIC TERMINOLOGY

Radon

Most elements in nature has a stable core. In addition, there is a group of elements - natural radionuclides from the radioactive decay process, which results in new features.
One of the natural radionuclides present in all rocks, uranium is U238. Radioactive decay being used to produce radium and radon Ra226 Rn222. Arise from the radon daughter products - isotopes of polonium and bismuth. They are unlike radon gas metal character, bind to them and aerosol particles are inhaled into the lungs. There contributing to the internal irradiation of the body approximately 55%.

Requirements for evaluation of radon index

Radon index- index describing the degree of risk of radon penetration from geological bedrock in a given area of land

Obligation to ensure the determination of radon index of the land and provide the results of radon survey requires applicants for residential building construction of § 6 paragraph 4 of Law No. 18/1997 Coll. Implementing Decree No. SÚJB 307/2002 Coll. On Radiation Protection defines the criteria and details on the determination of radon index.

Measurement, evaluation and assessment of the occurrence of radon gas permeability of soils is determined by the underlying need for determination of radon index of building land surveyed for the purposes of radiation protection requirements for subsequent project preparation and implementation of civil protection directed to prevent or reduce exposure of individuals from natural sources of ionizing radiation.

Map of radon index of geological bedrock

Map of radon index of geological bedrock is based on the results obtained in the Radon Program of the Czech Republic. This program is being implemented since 1990 and is managed by the State Office for Nuclear Safety and next to the CGS and other institutions working on it Radon Risk Association. Associated companies are engaged in measuring radon in soil and buildings.

Category of radon index of geological bedrock, indicated in map 1: 50 000, expresses statistically the predominant category in a given geological unit. The results of radon measurements in specific locations may therefore differ from this category, mainly due to differences between regional and local geology.

Using maps of radon index of geological bedrock

Radon index of geological bedrock determines the probability with which one can expect the level of radon in the geological unit. The main source of radon in penetrating objects are rocks in the basement of the building. Higher categories of radon index of bedrock and therefore determines a higher probability of radon values above 200 Bq.m-3 in existing buildings (value EOAR). At the same time also indicates the degree of attention that must be given to measures against radon penetration from the ground at the newly built buildings.

The prevailing category of radon index does not mean that the particular type of rock in the measurement of radon on the construction site with only a single encounter radon index categories. A common phenomenon is that approximately 20% to 30% of measurements fall

into another category of radon index, which is due to local geological conditions of the measured areas.

It is obvious that the determination of radon index categories on the construction site can not be carried out by subtracting maps of any scale, but only by measuring of radon in the soil in a particular place in order to take account of local, often highly variable geological conditions.

C) RADON SURVEY

Measurement method and equipments

A sample of soil gas from soil collected from a depth of 80 cm below the surface of a hollow rod sucked into scintillation chamber. The chamber has a wall covered with a special substance that the impact of alpha particles, accompanying the conversion of uranium, radium and radon, issues flashing lights. They are registered by sensitive photomultipliers and calibration equations is then calculated as number of bursts of radon in soil gas. This quantity is measured in kBq.m-3. The value of eg 20 kBq.m-3 means that within one second place in the cubic meter of soil gas to 20,000 radioactive transformations.

On each of the measured area is removed from 15 samples of soil gas, in order to reduce the influence of inhomogeneity and local differences in permeability of the soil. The depth is chosen to be closer to the basics of building and to remove the influence of climatic phenomena on the surface of the soil (temperature changes, humidity, wind, etc.). Radon concentration and permeability of the control variables for the determination of radon index categories on the construction site. In the Czech Republic used a standard uniform methodology and radon is classified by the index tab.1.

Tab.1 - Classification of foundation soil in terms of radon index.

Category of radon index	**Volume aktivity of radon (kBq.m^{-3}) for permeability of subbase**		
	low	**medium**	**high**
1. low	< 30	< 20	< 10
2. medium	30 - 100	20 - 70	10 - 30
3. high	> 100	> 70	> 30

During the research work, they found that there is no difference in the determination of radon index categories on the construction site, where soil gas samples collected from a depth of 80 cm before or after digging foundations. The growth of radon with depth is not all the same types of rocks, eg granites is higher, while in sedimentary and metamorphic rocks usually does not occur. The possible influence of radon increases with depth is eliminated by the table for the classification of the classified value 3 quartile (75% quantile) set of measured data. Also, seasonal variations do not affect the classification of radon areas in the category because changes in the value of radon are also, accompanied by changes in permeability.

D) BASIC GEOLOGICAL CONDITIONS

From the geological point of view, the consider area is in the middle of the Upper Moravian valley. Deeper bedrock consists of crystalinic rocks of brunovistulicum on which neogene marine sediments of the Upper Miocene with lithological representation, calcareous clays mostly of the Lower Badenian sediment. On this ground in the Upper Moravian valley during pliocene settled powerful series called pliocene diverse representation of lithological alternation of fine to coarse grained non calcareous siliceous sands, clayey sands, micaceous clays and medium siliceous gravel. Pliocene sediments in the area reaching up to the surface positions, where they are changing with layers of clay and humic built-up areas with various powerful heterogeneous horizon of gravels and clays (navážek).

E) RESULT OF RADON SURVEY

Radon index

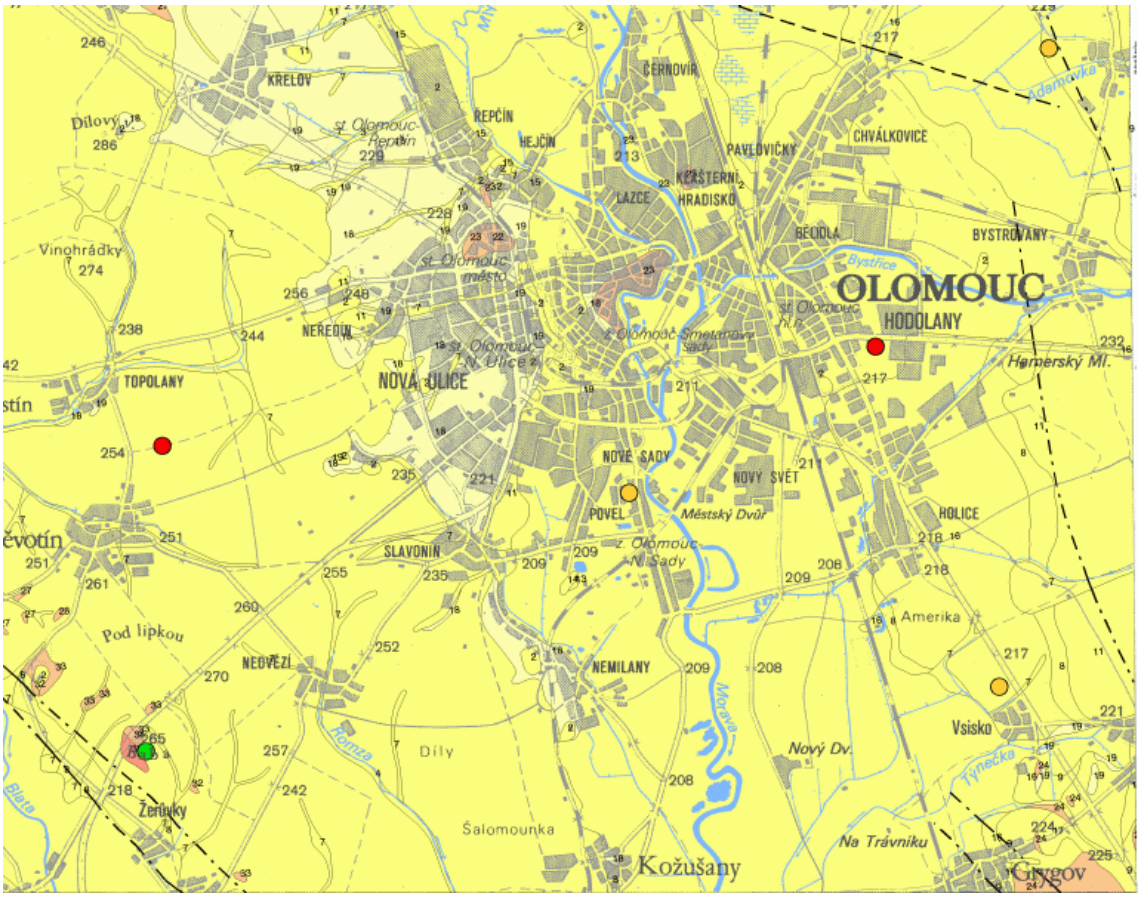
Detached family house which is located in the cadastral area of Olomouc - Nová Ulice with parcel number 153/30 is fully situated in the medium category of radon index. Result was obtained from radon index map of geological bedrock and from radon surveys which were done closely to the related area.

General recommendation

On the examined plot is needed sufficient technical protection of building against the penetration of radon from natural environments. Quality of radon protection of building and design of isolation barrier is achieved by accurate and professional project implementation procedures in accordance with the standard CSN 730601 Protection of buildings against radon from the soil.

Sufficient radon protection of building which is situated in the area with medium radon index is design of contact constructions of first tightness category. Building constructions under the contact of subbase have to have constant layer of radon insulation (foil or asphalt felt). These radon insulations have to be attested with sufficient coefficient of diffusion.

Map of radon index of geological bedrock



LEGENDA

Převažující kategorie radonového indexu geologického podloží:

- nízká
- přechodná (nehomogenní kvartérní sedimenty)
- střední
- vysoká

Plochy měření radonového indexu geologického podloží podle radonové databáze ČGÚ a Asociace Radonové Riziko:

- nízká kategorie
- střední kategorie
- vysoká kategorie
- tektonika (zvýšený radonový index)
- kontury geologických jednotek (čísla uvnitř jednotek odpovídají litologickému typu)

F) CZECH GEOLOGICAL SURVEY

Survey - georeport - enclosure 1

In Olomouc 05/2012

Done by: Kristýna Buiglová

RADON V PODLOŽÍ

Posudek číslo: 3735

Datum: 12. říjen 2011

Lokalizace: souřadnice středu vybraného území (S-JTSK):
X = 1122397, Y = 548690
katastrální území:
obec:

Rozsah území: 1000 m x 1000 m

Klárov 131/ 3, 118 21 Praha 1, Tel.: (+420) 257 089 442, Fax: (+420) 257 531 376, E-mail: georeporty@geology.cz, www.geology.cz

ÚVOD - informační služba

- Informační služba poskytuje **signální informaci** o předpokládané přítomnosti zdraví nebezpečného prvku **radonu v podloží (radonový index**). Má sloužit jako výchozí podklad pro práci specialistů i pro větší informovanost veřejnosti a usnadnění řešení životních situací jednotlivých občanů. Veřejnosti však doporučujeme konzultovat se specialisty jakákoliv vážná rozhodnutí, která by chtěla učinit na základě tohoto reportu, a to především v případě vyšších stupňů rizikovosti.
- **Report nenahrazuje lokální odborný průzkum ani posudek!**
- **Mapa radonového indexu** vyjadřuje převažující kategorii radonového indexu v jednotlivých geologických jednotkách nebo horninových typech na základě statistického zpracování dat o radonu z podloží. Horninové typy jsou označeny čtyřmi **kategoriemi radonového indexu** - **nízký, přechodný, střední a vysoký**. Přechodný index je používán pro nehomogenní kvartérní sedimenty (mezi nízkým a středním indexem).
- **Mapy radonového indexu** jsou primárně určeny pro rozmisťování stopových detektorů do objektů a v žádném případě z nich nelze odečítat kategorii radonového indexu na stavebním pozemku **před novou výstavbou**. To je možné provést **pouze měřením na konkrétní lokalitě podle metodiky schválené Státním úřadem pro jadernou bezpečnost (SÚJB).** Signální informace poskytované službou jsou však důležité jako výchozí základní informace pro předpoklad potřeby lokálního měření a protiradonových opatření při zakládání a rekonstrukci staveb a při používání lokálních zdrojů podzemní vody jako pitné.
- Informační služba prezentuje také konkrétní evidované (SÚJB) hodnoty **lokálních měření radonového indexu** geologického podloží. Jako doplňující údaj jsou uvedeny geometrické průměry výsledků **měření radonu v budovách** za jednotlivá katastrální území (SÚRO), které odrážejí především radonový index podloží, účinnost konkrétních protiradonových opatření a případně i obsah radonu v použitých stavebních materiálech budov.

OBSAH

Geografická lokalizace vybraného území v základní topografické mapě 1:50 000
Geologická charakteristika vybraného území - geologická mapa v měřítku 1:50 000 (GEOČR50)
Charakteristika území z hlediska radonu v podloží - mapy vybraného území: mapa radonového indexu geologického podloží vycházející z geologické mapy a mapa lokálních měření radonového indexu geologického podloží
Charakteristika území z hlediska radonu v podloží - popis vybraného území z hlediska sledovaného geofaktoru a plošný rozsah jednotlivých zastižených kategorií radonového indexu
Závěr a doporučení shrnuje údaje o převládajícím a nejvýše dosaženém stupni rizikovosti sledovaného geofaktoru a základní doporučení pro uživatele.
Kontakty na odborného garanta služby a oblastního geologa

Odkazy na související informace k tématu reportu
Definice použitých pojmů a nezbytných odborných termínů a popis fenoménu
Nejdůležitější legislativa

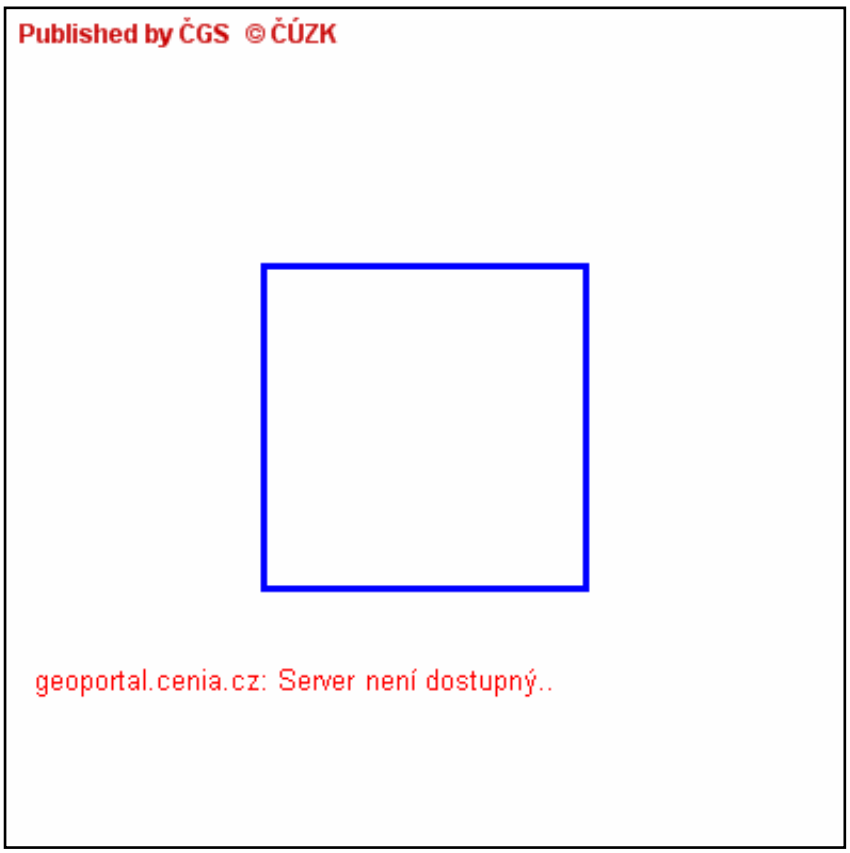
HODNOVĚRNOST DAT

Na sestavování reportu byly použity vstupní podklady v měřítku 1:50 000. Proto i vypovídající schopnost reportu odpovídá tomuto rozlišení.

AUTORSKÁ PRÁVA

GEOGRAFICKÁ LOKALIZACE

Mapa 1. Topografie ZM 1:50 000



Měřítko 1 : 25 000 (1 cm = 250 m)

0 0,5 1 km

vybrané území

Způsob výběru lokality: výběrem v mapě

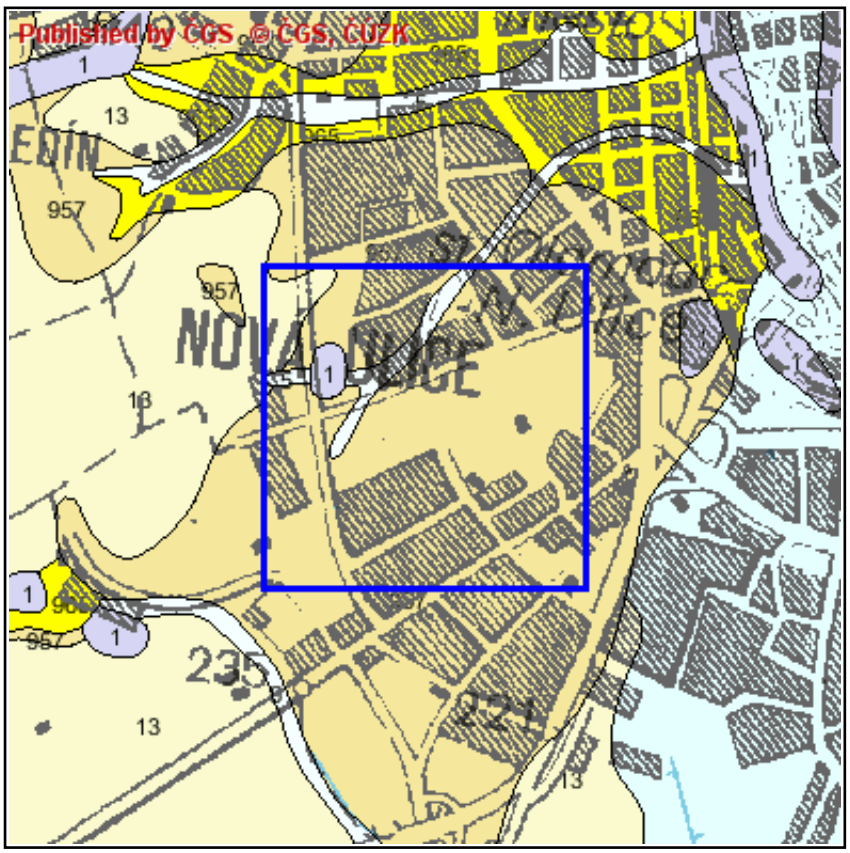
Lokalizace: souřadnice středu vybraného území (S-JTSK): X = 1122397, Y = 548690
katastrální území:
obec:
kraj:

Rozsah území: 1000 m x 1000 m

Zasažené mapové listy ZM 1 : 50 000 (ČÚZK):

GEOLOGICKÁ CHARAKTERISTIKA

Mapa 2. Geologie (GEOČR50)



Měřítko 1 : 25 000 (1 cm = 250 m)

0 0,5 1 km

vybrané území

Legenda

Index hornina - typ horiny - stáří

REGION: KVARTÉR ČESKÉHO MASIVU A KARPAT

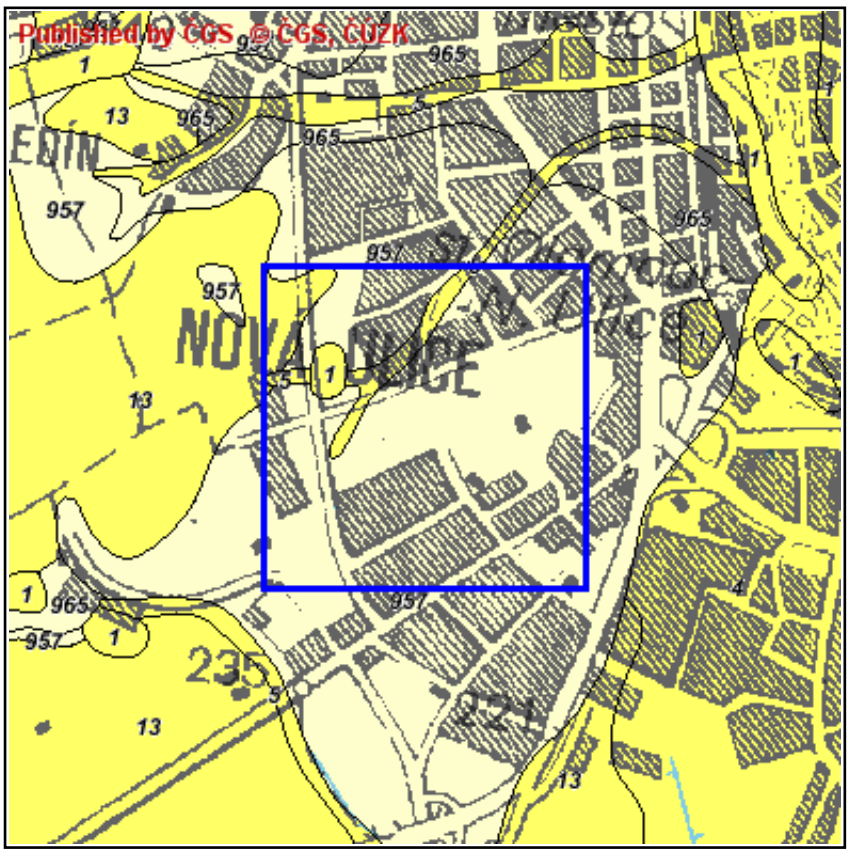
1	antropogenní uloženiny, vytěžené prostory - sedimenty nezpevněné - kvartér
4	nivní sedimenty (hlína, písek, štěrk) - sedimenty nezpevněné - kvartér
5	splachové sedimenty (hlína, písek, štěrk) - sedimenty nezpevněné - kvartér
13	naváté sedimenty (spraš, sprašová hlína) - sedimenty nezpevněné - kvartér

REGION: KARPATSKÁ PŘEDHLUBEŇ

957	jezerní a říční sedimenty (písek, štěrk, prach, jíl) - sedimenty nezpevněné - neogén
965	mořské sedimenty (vápnitý jíl, písek) - sedimenty nezpevněné - neogén

CHARAKTERISTIKA ÚZEMÍ Z HLEDISKA RADONU V PODLOŽÍ - MAPY

Mapa 3. Radonový index geologického podloží



Měřítko 1 : 25 000 (1 cm = 250 m)

0 0,5 1 km

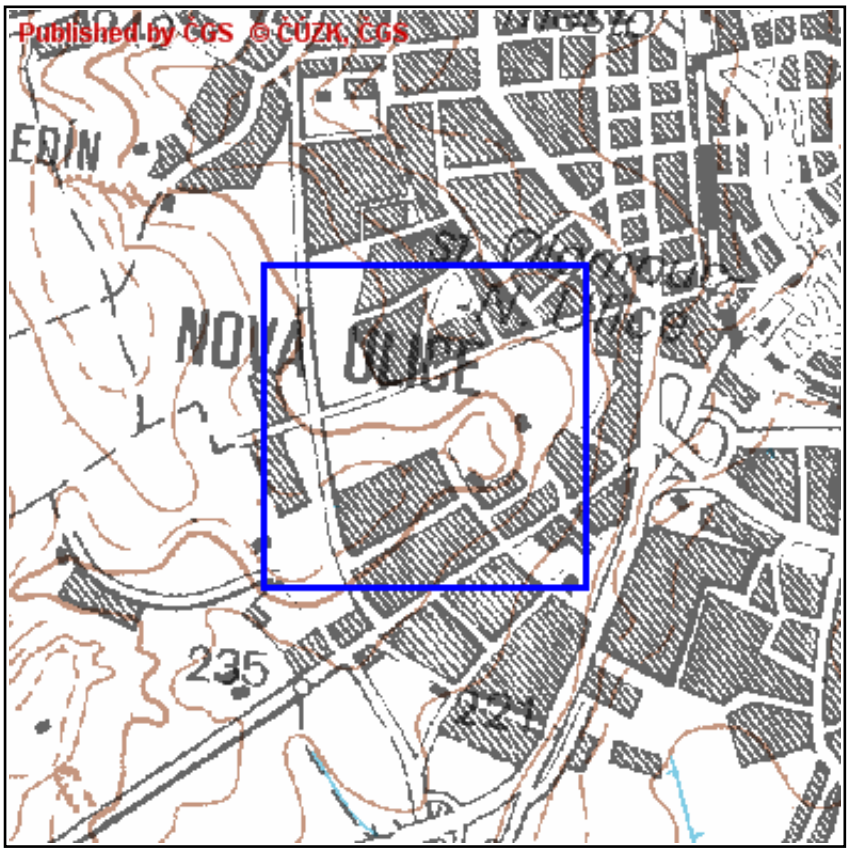
vybrané území

Legenda

Převažující kategorie radonového indexu geologického podloží:

- nestanovena
- nízká - 1
- přechodná (nehomogenní kvartérní sedimenty) - 2
- střední - 3
- vysoká - 4
- zlomy a jiná tektonika (zvýšené radonové riziko)
- 15 kontury geologických jednotek (čísla uvnitř jednotek odpovídají jednotlivým horninám)

Mapa 4. Lokální měření radonového indexu geologického podloží



Měřítko 1 : 25 000 (1 cm = 250 m)

0 0,5 1 km

vybrané území

Počet zastižených objektů: 0

Legenda

Kategorie radonového indexu geologického podloží měřených lokalit

- neurčena
- nízká - 1
- střední - 2
- vysoká - 3

5049 číslo objektu (měřená lokalita)

hranice katastrálního území

CHARAKTERISTIKA ÚZEMÍ Z HLEDISKA RADONU V PODLOŽÍ - POPIS

Jaká je kategorie radonové indexu zastižených hornin geologického podloží ve vybraném území?
viz mapa 2,3

Plocha vybraného území [%]	Radonový index		Hornina		
	Kategorie	Stupeň rizika	Legenda číslo	Horninový typ	Stáří - útvar
90	nízký	1	1810	písek, štěrk, silt, jíl	neogén
2	přechodný	2	1	navážka, halda, výsypka, odval	kvartér
4	přechodný	2	7	sediment smíšený	kvartér
4	přechodný	2	16	spraš, sprašová hlína	kvartér

Jaká je kategorie radonového indexu geologického podloží konkrétních měřených lokalit evidovaných ve vybraném území?
viz mapa 4, data SÚJB

Objekt číslo	Lokalita	Průměrná koncentrace radonu [kBqm-3]	Radonový index	
			Kategorie	Stupeň rizika

Jaká je průměrná koncentrace radonu (geometrický průměr) v dosud měřených budovách v katastrálních územích vybraného území?
viz mapa 4, data SÚRO

			Průměrná koncentrace radonu [kBqm-3]	

ZÁVĚR A DOPORUČENÍ

– převládající stupeň rizikovosti ve vybraném území

rizikový geofaktor: **radon v podloží (radonový index)**
převládající stupeň rizika: **1 - nízká** ze škály 1-4 *
rozsah z plochy vybraného území: 90%
viz mapa: 3

omezení využití území a doporučení:
V této části území s velkou pravděpodobností nebudou potřeba speciální protiradonová opatření; u výstavby postačí běžná hydroizolace. Místní zdroje podzemní vody budou z hlediska obsahu radioaktivních prvků pravděpodobně splňovat hygienické limity pro pitné účely.

– nejvyšší dosažený stupeň rizikovosti ve vybraném území

rizikový geofaktor: **radon v podloží (radonový index)**
nejvyšší dosažený stupeň rizika: **2 - přechodná** ze škály 1-4 *
rozsah z plochy vybraného území: 10%
viz mapa: 3

omezení využití území a doporučení:
Je nutné počítat s možností zvýšené koncentrace radonu v podloží. Doporučuje se odborné změření koncentrace radonu v podloží v místě vaší plánované stavby, příp. změření radonu ve stávajícím objektu. Při využívání místních zdrojů podzemní vody pro pitné účely se doporučuje analýza podzemní vody na radioaktivní prvky.

Případné aktivity ve vybraném území doporučujeme konzultovat s odborníkem.

* riziko vrůstá s vyššími čísly škály

KONTAKTY

Pokud budete potřebovat geologické informace přesahující obsah reportu, navštivte internetové stránky České geologické služby **www.geology.cz** nebo kontaktujte odborného garanta této služby **www.geohazardy.cz** nebo příslušného oblastního geologa **www.geology.cz/extranet/sgs/sog**.

ODKAZY NA SOUVISEJÍCÍ INFORMACE

Portál Státní geologické služby www.geologickasluzba.cz
Česká geologická služba www.geology.cz
Státní ústav radiační ochrany www.suro.cz
Státním úřadem pro jadernou bezpečnost - Registr www.sujb.cz

DEFINICE POUŽITÝCH POJMŮ A POPIS FENOMÉNU

- **Radon (Rn-222)** je zdraví nebezpečný prvek, který vzniká radioaktivní přeměnou uranu U-238. Radon může pronikat do objektů jednak z hornin a zemin, které jsou pod základy staveb, jednak z vody, dodávané do objektů a také ze stavebních materiálů, jejichž základem jsou obvykle přírodní materiály. Hlavním a trvalým zdrojem radonu je však horninové prostředí. V určitých typech hornin a zemin jsou různé obsahy radonu v závislosti na jejich vývoji a složení.
- **Jak dlouho působí?** Radon je generován z podložních hornin neustále, vzhledem k poločasu přeměny mateřského prvku uranu U-238 (cca 4,5 miliardy let) je uvolňování radonu časově neomezeným jevem.
- **Čím je nebezpečný?** Radon se váže se na aerosoly v ovzduší, které při vdechnutí ulpívají na plicní výstelce a zvyšují tak vnitřní ozáření lidského organismu, způsobující rakovinu plic.
- **Jaké jsou doporučené postupy chování?** Detailní doporučené postupy pro snížení expozice radonu jak v podzemní vodě, v existujících objektech, tak i při výstavbě nových objektů naleznete na internetových stránkách www.suro.cz.
- **Kdo získává informace o geofaktoru?** Problematikou radonu v podloží se zabývá Česká geologická služba (ČGS, www.geology.cz), problematikou koncentrace radonu v budovách, stavebních materiálech a ve vodních zdrojích se zabývá Státní ústav radiační ochrany (SÚRO, www.suro.cz). Praktická měření koncentrace radonu provádějí firmy s povolením k činnosti vydaném Státním úřadem pro jadernou bezpečnost (SÚJB, www.sujb.cz - Registr).
- **Co je to radonový index?** Radonový index (dříve radonové riziko) je kombinací třetího kvartilu koncentrace radonu v souboru 15 měřených hodnot na stavebním pozemku a výsledné propustnosti horninového prostředí. Stavební pozemky jsou charakterizovány třemi **kategoriemi radonového indexu: nízká, střední, vysoká.** Podle výsledné kategorie radonového indexu pozemku navrhnou certifikované firmy způsob založení objektu a ochrany proti pronikání radonu z podloží.

Nejdůležitější legislativa

- **Vyhláška Státního úřadu pro jadernou bezpečnost č. 307/2002 Sb.**, ve znění vyhlášky č. 499/2005 Sb., o radonu v podloží a v objektech.

- **Vyhláška č. 462/2005 Sb.**, o distribuci a sběru detektorů k vyhledávání staveb s vyšší úrovní ozáření z přírodních radionuklidů a stanovení podmínek pro poskytnutí dotace ze státního rozpočtu.

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

FOLDER C5 – FIRE SAFETY

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE — KRISTÝNA BUIGLOVÁ
AUTHOR

VEDOUCÍ PRÁCE — doc. Ing. JIŘÍ SEDLÁK, CSc.
SUPERVISOR

BRNO 2012

FOLDER CONTENT:

1. FIRE SAFETY REPORT
2. SITUATION - FIRE PREVENTION DISTANCES, 1:250

BACHELOR´S THESIS

STUDENT	KRISTÝNA BUIGLOVÁ	
SUPERVISOR	doc. Ing. JIŘÍ SEDLÁK, CSc.	

BUT
FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

LOW ENERGY DETACHED HOUSE

FIRE SAFETY REPORT

FORMAT	A4
DATE	25.5.2012
SCALE	-
DRAWING NUMBER	C5.1

CONTENT:

A) BACKGROUND PAPERS

- Project documentation
- ČSN 73 0810- Fire protection of building- General requirements
- ČSN 73 0802- Fire protection of building- Non-industrial buildings
- ČSN 730833- Fire protection of building- Buildings for dwelling and lodging
- ČSN 73 0873- Fire protection of building- Equipment for fire water supply
- Public notice 23/2008sb.
- Public notice 268/2011sb.
- Public notice 246/2001sb.

B) BRIEF DESCRIPTION OF BUILDING

General description of building:

Project documentation solved new building of family house for five member family.

BO- 01 Family house- building is designed like as a two-storey building without basement and with warm flat roof construction.

Building has two storeys.

Built-up area- 181,495 m^2

Surface area of the 1st floor and the 2nd floor- 249,260 m^2

Description of dispositional solution:

Building has two storeys. Connection between them is ensured by internal monolithic staircase construction that is anchored to external load bearing wall and ceiling construction.

Description of constructional solution:

- Vertical bearing construction
  - external load bearing wall is made from Porotherm 30 P+D
  - internal load bearing wall is made from Porotherm 30 P+D
- Horizontal bearing construction
  - floor construction above the 1st floor- POT and Miako ceiling, th.230mm
  - floor construction above the 2nd floor- POT and Miako ceiling, th 230mm
- Thermal insulation
  - system ETICS- ETICS weber therm clima, th. 150mm
- Roof construction
  - roof construction of family house- gravel roofing, without operation
  - roof construction of attached garage- combined green and ceramic roofing, with operation

- Staircase
  - Monolithic
- Window infilling
  - Windows and entrance door are plastic

C) DIVISION INTO FIRE SECTORS AND FIRE CHARACTERISTIC

Fire sectors:

Building, together with a garage, is a one fire sector.

Area of fire sector- 249,260 m^2

Fire characteristic:

Building is examined according to the ČSN 73 0833 as a building OB1.

Fire height of building- h= 3,080 m

Construction system- DP1 (non-flammable)

D) FIRE RISK, DEGREE OF FIRE SAFETY, SIZE OF FIRE SECTORS

According to the enclosure B ČSN 73 0802 we determine calculated fire load pv= 45,75 kg · m^2.

According to the paragraph 4.1.1c) ČSN 73 0833 we determine degree of fire safety- II.DFS.

E) EVALUATION OF CONSTRUCTION FIRE RESISTANCE

Construction resistance

material	demand ČSN 73 0802	actual value
external bearing wall- POROTHERM 30 P+D		
1st floor	REW 30 DP1	180 DP1
2nd floor	REW 15 DP1	180 DP1
floor construction- POROTHERM ceiling		
1st floor	RE 30 DP1	RE 120 DP1
2nd floor	REW 15 DP1	RE 120 DP1
Garage	REW 15 DP1	RE 120 DP1
internal bearing wall- POROTHERM 30 P+D		
1st floor	R 30 DP1	180 DP1
2nd floor	R 15 DP1	180 DP1

Thermal insulation EPS 70F CLIMA Rda- system ETICS weber therm clima does not influence fire safety of building according to the 4.2.4 ČSN 73 0833. Thermal insulation has fire reaction class E but it is a part of compact ETICS system that has fire reaction class B.

Roof sheet layer of family house and garage will be made from PVC foil which has fire reaction class $B_{roof,}$ t1 so that it satisfies conditions of Public note 268/2011. It is not in the fire hazardous area.

Fire safety strips are not demanded for buildings OB1. Height difference of roof construction is not needed and building is designed like as detached house.

Additionally, for approval of building certificates will be submitted in accordance with appropriate Public notes and acts.

F) EVALUATION OF MATERIAL PROPERTIES

- POROTHERM 30 P+D
  - reaction to fire, class A1
- ETICS EPS 70F CLIMA Rda
  - reaction to fire, class B
- floor construction POT and MIAKO ceiling
  - reaction to fire, class A1

G) EVACUATION- ESCAPE WAYS

According to the ČSN 73 0833 for dwelling buildings of group OB1 we consider sufficient escape way for evacuation of people with width 0,9m and door opening with width 0,8m. The length of escape ways is not evaluated.

Clearance width of entrance door- 0,9m → satisfies

Doors that are on the escape ways have to ensure fast and easy passing.

H) FIRE HAZARDOUS AREA

Fire prevention distance depends on the size of fire open area and fire load. For evaluation of fire prevention distance we use an enclosure F, table F.1 of ČSN 73 0802.

$p_o \geq 40\%$

- The south-east elevation
  - $S_p = lxh_u = 10,5x5,5 = 57,75m^2$
  - $S_{po} = 8,375m^2$
  - $S_{po} / S_p \, x \, 100 = 16\% \rightarrow p_o = 40\%$
  - fire prevention distance- 5,9m
- The south-west elevation
  - $S_p = lxh_u = 11,75x4,5 = 52,875m^2$
  - $S_{po} = 10,5m^2$

- S_{po}/ S_p x 100= 20% → p_o= 40%
- fire prevention distance- 5,9m

- The north-east-elevation
  - S_{p1}= lxh_u = 10,325x3,75= 38,72 m^2
  - S_{po1}= 9 m^2
  - S_{po1}/ S_{p1} x 100= 23% → p_{o1}= 40%
  - fire prevention distance- 5,9m
  - S_{p2}= lxh_u = 0,9x2,15= 1,935m^2
  - S_{po2}= 1,935m^2
  - S_{po2}/ S_{p2} x 100= 100% → p_{o2}= 100%
  - fire prevention distance- 4,7m
- The north-west elevation
  - S_{p1}= lxh_u = 4,25x2,5= 10,625m^2
  - S_{po1}= 5,75m^2
  - S_{po1}/ S_{p1} x 100= 54% → p_{o1}= 60%
  - fire prevention distance- 3,4m
  - S_{p2}= lxh_u = 2,5x2= 5m^2
  - S_{po2}= 5m^2
  - S_{po1}/ S_{p1} x 100= 100% → p_{o1}= 100%
  - fire prevention distance- 4,7m

See the situation plan. Design building does not interfere by its fire hazardous area in neighbouring plots. It is not situated in hazardous area of other buildings. Fire prevention distances satisfy conditions.

I) WATER FOR EXTINGUISHING

- external hydrants
  - according to the ČSN 73 0873 there have to be mounted underground hydrants on the main pipeline DN min.100mm, distance from the building mus not be bigger than 150m
- internal hydrants
  - are not demanded according to the paragraph 4.4b) ČSN 73 0833.

J) EMERGENCY ROUTES

Building will be placed cca 10m from a road so that it fulfils requirements of ČSN 73 0833 paragraph 4.4.1.

K) FIRE EXTINGUISHERS

In accordance with enclosure 4 of Public note 23/2008sb. one powder extinguisher with fire ability 183B (powder extinguisher 6kg) will be place inside a garage.

Its positioning will be in accordance with Public note 246/2001Sb.

L) TECHNICAL EQUIPMENTS

- ventilation
  - natural self-ventilation by windows
- heating, domestic hot heating
  - is ensured by gas boiler (24 kW)- TURBO JUNKERS ZSN 24-6 AE CERASTAR that is installed in the room 2.02
  - additional heating by use of fireplace- in the room 1.06
  - domestic hot heating will be ensured by gas boiler mentioned above
  - air supply of fireplace will be designed in accordance with producer
  - in the room 1.06 there must not be installed other device which can produce reverse flue
- combustion ways
  - combustion ways have to fulfill requirements of government regulation n.91/2010 about conditions of fire protection during usage of chimney and ČSN 73 4301- Residential building- Chimneys and smoke flue- design, implementation and connection of fuel appliances

M) SPECIAL REQUIREMENTS FOR CONSTRUCTION

Any special requirements.

N) FIRE SAFETY DEVICES

According to the Public notice 23/20008Sb. family house has to be equiped by autonomous fire detector and smoke detector.

Reccomended placing- rooms number 1.02 and 2.01

O) SAFETY SIGNS

Movable fire extinguisher and main electric switch will be signed according to the ČSN ISO 3864, ČSN 010813 and government regulation NV 11/2002sb. warning protection signs and tables.

P) CONCLUSION

- project documentation solved new building of family house for five member family. Family house is designed like as low energy detached house with two-stories

- family house forms one fire sector, two-storey, that is classified into II. DFS
- design construction systems satisfy requirements of ČSN 73 0802 for II. DFS
- escape ways satisfy requirements of ČSN 73 0833
- family house does not interfere by its fire hazardous area into neighbouring plots
- one powder extinguisher with fire ability 183B (powder extinguisher 6kg) will be place inside a garage
- family house has to be equiped by autonomous fire detector and smoke detector.
  - Reccomended placing- rooms number 1.02 and 2.01
- for approval of building certificates will be submitted in accordance with appropriate Public notes and acts
- a part of FSR is a layout of situation with signed fire prevention distances

In Olomouc 05/2012

Done by: Kristýna Buiglová