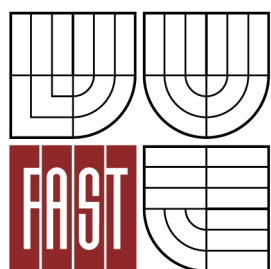




**VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ**  
BRNO UNIVERSITY OF TECHNOLOGY



**FAKULTA STAVEBNÍ**  
**ÚSTAV POZEMNÍHO STAVITELSTVÍ**

FACULTY OF CIVIL ENGINEERING  
INSTITUTE OF BUILDING STRUCTURES

## **LOW ENERGY DETACHED HOUSE**

LOW ENERGY DETACHED HOUSE

**BAKALÁŘSKÁ PRÁCE**  
BACHELOR'S THESIS

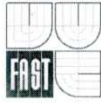
**AUTOR PRÁCE**  
AUTHOR

Tomáš Šenovský

**VEDOUCÍ PRÁCE**  
SUPERVISOR

doc. Ing. JIŘÍ SEDLÁK, CSc.

BRNO 2012




# VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ FAKULTA STAVEBNÍ

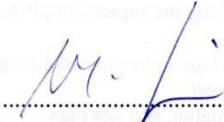
**Studijní program** B3607 Civil Engineering  
**Typ studijního programu** Bakalářský studijní program s výukou v anglickém jazyce a prezenční formou studia  
**Studijní obor** 3608R001 Pozemní stavby  
**Pracoviště** Ústav pozemního stavitelství

## ZADÁNÍ BAKALÁŘSKÉ PRÁCE

**Student** Tomáš Šenovský  
**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

  
.....  
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

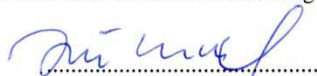
A/ Basic documents

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

**Declaration:**

I declare, that I worked out bachelor thesis alone and that I stated all used information sources.

**Prohlášení:**

Prohlašuji, že jsem bakalářskou práci zpracoval samostatně, a že jsem uvedl všechny použité, informační zdroje.

V Brně dne 23.5.2012  
(In Brno, date)



.....  
podpis autora (signature)

**PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ  
FORMY VŠKP**

**( DECLARATION OF COMPLIANCE OF PAPER AND  
ELECTRONIC FORM OF VŠKP)**

**Declaration:**

I declare, that the electronic form of submission is identical with the paper form of submission.

**Prohlášení:**

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

V Brně dne 23.5.2012



.....  
podpis autora  
Tomáš Šenovský

## **Abstrakt**

Předmětem mé bakalářské práce je zpracování dokumentace novostavby rodinného domu v nízkoenergetickém standardu pro čtyřčlennou rodinu. Objekt je dvoupodlažní, nepodsklepený. Střecha sedlová, hlavní orientace objektu je na jih.

## **Abstract**

The subject of my bachelor thesis is making project documentation for new family house in low energy standard for 4 member family. The object is two-storey, without basement. Roof is double-pitched, main orientation of the object is to the south.

## **Klíčová slova**

Bakalářská práce, rodinný dům, samostatně stojící objekt, dvoupodlažní, sedlová střecha, nízkoenergetický standard

## **Key words**

Bachelor thesis, family house, detached object, two-storey, double-pitched roof, low energy standard

### **Bibliografická citace VŠKP**

ŠENOVSKÝ, Tomáš. *Low energy detached house*. Brno, 2012. 61 s., 31 s. příl. Bakalářská práce. Vysoké učení technické v Brně, Fakulta stavební, Ústav pozemního stavitelství. Vedoucí práce doc. Ing. Jiří Sedlák, CSc..

**Thanks:**

I would like to thank my supervisor of bachelor thesis doc. Ing. Jiří Sedlák, CSc. for proper leading and supervision, patience and helpful advices during consultation

**Poděkování:**

Na tomto místě bych rád poděkoval panu doc. Ing. Jiřímu Sedlákovi, CSc. za čas strávený při konzultacích této práce a za rady a připomínky k ní.

V Brně dne 23.5.2012  
(In Brno, date)

.....  
podpis autora (signature)



## INTRODUCTION

My bachelor thesis deals with the construction of family house in low energy standard for four member family. Object is situated in Zlín region, in village Dolní Lhota. Designed object is two-storey, without basement. There is designed double pitched collar roof. A goal of my work is to design energy efficient building which will be a comfortable refuge for family with children.

## ÚVOD

Má bakalářská práce se zabývá tématem výstavby rodinného domu v nízkoenergetickém standardu pro čtyřčlennou rodinu. Objekt je situován ve Zlínském kraji, ve vesnici Dolní Lhota. Navržený objekt je dvoupodlažní, nepodsklepený. Střecha je navržena sedlová s hambálkovou soustavou. Cílem mé práce je navrhnout energeticky výhodnou stavbu, která bude příjemným útočištěm pro rodinu s dětmi.

## **SEZNAM POUŽITÝCH MATERIÁLŮ A ZDROJŮ (LIST OF USED SOURCES AND MATERIALS)**

### **A) POUŽITÉ PRÁVNÍ PŘEDPISY (USED LEGISLATION)**

Public Notice 268/2009 Coll., about technical requirements for construction  
Public Notice 499/2006 Coll., about structure documentation  
Regulation No. 23/2008 Coll., about technical conditions for fire protection of buildings  
Act. No. 183/2006 Coll., Building Act  
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)

### **B) POUŽITÉ ČSN A EN NORMY (USED CZECH AND EUROPEAN STANDARDS)**

ČSN 73 4301 Residential buildings  
ČSN 01 3420 Construction drawings – Presentation of general arrangement drawings  
ČSN 73 0540-2 Thermal protection of buildings  
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

### **C) WEBOVÉ STRÁNKY VÝROBCŮ A DODAVATELŮ (WEB PAGES OF MATERIAL PRODUCERS AND SUPPLIERS)**

<a href="http://www.velux.cz">www.velux.cz</a>	<a href="http://www.wienerberger.cz">www.wienerberger.cz</a>	<a href="http://www.tondach.cz">www.tondach.cz</a>
<a href="http://www.isover.cz">www.isover.cz</a>	<a href="http://www.icopal.cz">www.icopal.cz</a>	<a href="http://www.knauf.cz">www.knauf.cz</a>
<a href="http://www.vekra.cz">www.vekra.cz</a>	<a href="http://www.porextherm.com">www.porextherm.com</a>	<a href="http://www.betonbroz.cz">www.betonbroz.cz</a>
<a href="http://www.region-noe.at">www.region-noe.at</a>	<a href="http://www.tzb-info.cz">www.tzb-info.cz</a>	<a href="http://www.cemix.cz">www.cemix.cz</a>
<a href="http://www.schiedel.cz">www.schiedel.cz</a>	<a href="http://www.sunflex.cz">www.sunflex.cz</a>	

## **FOLDER CONTENTS:**

### **FOLDER A: BASIC DOCUMENTS**

1. TASK OF BACHELOR THESIS
2. DECLARATION OF COMPLIANCE (IN CZECH AND ENGLISH)
3. THANKS (IN CZECH AND ENGLISH)
4. BIBLIOGRAPHIC QUOTATION VŠKP (IN CZECH)
5. ABSTRACT AND KEY WORDS (IN CZECH AND ENGLISH)
6. INTRODUCTION (IN CZECH AND ENGLISH)
7. LIST OF USED SOURCES AND MATERIALS (IN CZECH AND ENGLISH)
8. FOLDER CONTENTS

ADJUSTED DOCUMENT: POPISNÝ SOUBOR ZÁVĚREČNÉ PRÁCE

### **FOLDER B: STUDIES**

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| 2. SITUATION                   | 1:200 |
| 3. DISPOSITION STUDY OF 1NP    | 1:100 |
| 4. DISPOSITION STUDY OF 2NP    | 1:100 |
| 5. CROSS-SECTION               | 1:100 |
| 6. ELEVATIONS                  | 1:100 |
| 7. ACCOMPANYING REPORT         |       |

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| 02. SITUATION  | 1:200 |
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| 07. ROOF CONSTRUCTION                                | 1:50  |
| 08. CROSS SECTION                                    | 1:50  |
| 09. LONGITUDINAL SECTION                             | 1:50  |
| 10. ELEVATIONS                                       | 1:50  |
| 11. ELEVATIONS                                       | 1:50  |
| 12. DETAIL OF RIDGE                                  | 1:10  |
| 13. DETAIL OF LOGGIE                                 | 1:10  |
| 14. DETAIL OF HIDDEN GIRDER                          | 1:10  |
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| 19. TABLE OF ELEMENTS                                | -     |
| 20. TABLE OF ELEMENTS                                | -     |
| 21. TABLE OF ELEMENTS                                | -     |

22. COMPOSITION OF ROOF AND WALLS	1:10
23. COMPOSITION OF FLOORS	-

### **FOLDER C2: TECHNICAL DOCUMENTS-CALCULATIONS**

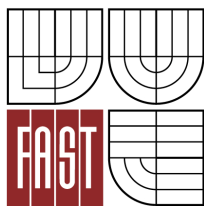
1. GEOGRAPHIC SPECIFICATIONS
2. FOUNDATION CALCULATION-DIMENSIONING
3. CALCULATION OF HEAT PASSAGE COEFFICIENT
4. CALCULATION OF STAIRS DESIGN

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2. ATTACHMENT 2- B. SUMMARY TECHNICAL REPORT
3. ATTACHMENT 3- F. TECHNICAL REPORT
4. ATTACHMENT 4- ENERGY LABEL OF BUILDING ENVELOPE

### **FOLDER C4: FIRE PROTECTION SOLUTION**

1. FIRE SAFETY REPORT
2. FIRE SAFETY SITUATION



VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ  
FAKULTA STAVEBNÍ

## POPISNÝ SOUBOR ZÁVĚREČNÉ PRÁCE

<b>Vedoucí práce</b>	doc. Ing. Jiří Sedlák, CSc.
<b>Autor práce</b>	Tomáš Šenovský
<b>Škola</b>	Vysoké učení technické v Brně
<b>Fakulta</b>	Stavební
<b>Ústav</b>	Ústav pozemního stavitelství
<b>Studijní obor</b>	3608R001 Pozemní stavby
<b>Studijní program</b>	B3607 Civil Engineering
<b>Název práce</b>	Low energy detached house
<b>Název práce v anglickém jazyce</b>	Low energy detached house
<b>Typ práce</b>	Bakalářská práce
<b>Přidělovaný titul</b>	Bc.
<b>Jazyk práce</b>	Čeština
<b>Datový formát elektronické verze</b>	
<b>Anotace práce</b>	Předmětem mé bakalářské práce je zpracování dokumentace novostavby rodinného domu v nízkoenergetickém standardu pro čtyřčlennou rodinu. Objekt je dvoupodlažní, nepodsklepený. Střecha sedlová, hlavní orientace objektu je na jih.
<b>Anotace práce v anglickém jazyce</b>	The subject of my bachelor thesis is making project documentation for new family house in low energy standard for 4 member family. The object is two-storey, without basement. Roof is double-pitched, main orientation of the object is to the south.
<b>Klíčová slova</b>	Bakalářská práce, rodinný dům, samostatně stojící objekt, dvoupodlažní, sedlová střecha, nízkoenergetický standard
<b>Klíčová slova v anglickém jazyce</b>	Bachelor thesis, family house, detached object, two-storey, double-pitched roof, low energy standard

## **A.1. IDENTIFICATION OF THE STRUCTURE**

### Place of object

City: Dolní Lhota u Luhačovic  
Cadastral area: Valašské Klobouky  
Parcel number: 1514/15

### Investor

Name: Juste Pécuchet  
Address: Horní Lhota 713  
763 23, Dolní Lhota u Luhačovic

### Designer

Name: Tomáš Šenovský  
Address: Horní Lhota 173  
763 23, Dolní Lhota u Luhačovic

Structure is designed at the edge of the village Dolní Lhota. Object is situated on the modified terrain.

Family house is two storey detached object without basement. Layout dimensions are 10,97 x 8,73 m. Object is designed for 4 people family. House is designed as low-energetic. In the first floor, there is entrance, technical room, toilet, corridor, office, staircase, closet, kitchen and living room with entrance to terrace. In the second floor there is bathroom, toilet and 3 bedrooms.

Built up area: 95,77 m<sup>2</sup>  
Surface area of 1.NP + 2.NP: 158,88 m<sup>2</sup>

## **A.2. DATA ABOUT PREVIOUS LAND USAGE, BUILDING SITE AND PROPERTY RELATIONS**

Building site : Dolní Lhota

Lots: 1514/17, k. ú. Valašské Klobouky

This is a newly pledged area, which have served as arable land. The area was equipped with engineering networks and communications. On land are no existing buildings, fences, trees or bushes. Parcel is owned by the investor.

## **A.3. DETAILS ABOUT THE SURVEY OF CONNECTION TO THE TRANSPORT AND TECHNICAL INFRASTRUCTURE**

It was made geological and radon survey. Appearance of radon in soil is low. The parcel is accessible from existing road. The building will be connected to public water supply, sewerage, gas and low voltage on the border of lot.

## **A.4. INFORMATION ABOUT FULLFIMENT OF THE REQUIREMENTS CONCERNED AUTHORITIES**

Into documentation requirements have been put requirements of the government organizations and owners of power distribution systems and engineering networks. These requirements were set

conditions within the territorial management. They were also determined during the construction management.

#### **A.5. INFORMATION ABOUT KEEPING OF THE GENERAL REQUIREMENTS TO THE CONSTRUCTION PROCESS**

The building documentation is prepared in accordance with public notice no. 501/2006 Coll. about general requirements for use of area. Project documentation is compliant with public notice no. 137/1998 Coll. about technical requirements for building works.

#### **A.6. INFORMATION ABOUT HOLDING THE CONDITIONS OF REGULATORY PLAN AND PLANNING PERMISSION**

Solved area in land-use planning is reserved for housing. The project respects the structural level restrictions and requirements on the shape of roofs.

#### **A.7. FACTUAL AND TIME LINKS OF THE STRUCTURE ON THE RELATED AND CONDITIONAL STRUCTURES**

In the area are finished public roadway and technical service lines, because of it building works can be started immediately after completion of building administration. Building of family house has no direct connection to surrounding buildings.

#### **A.8. CONSTRUCTION TIME ESTIMATION, DESCRIPTION OF THE CONSTRUCTION PROCESS**

Start of 1.9.2012 – 1.12.2013 finish

Building process:

- Location of building
- Field edits, digging of foundations
- Concreting of foundations, hydroinsulation
- Connections to public networks
- Vertical and horizontal load bearing structures
- Roof truss and roofing
- Openings
- Surface finishing

#### **A.9. SUPPOSED PRICE**

Price is calculated by unit price, this is only assumption.

Enclosed space:	620 m <sup>3</sup>
Unit price:	5000 CZK
Price:	3 100 000 CZ

#### **Conclusion:**

There is need to follow personal safety according to public notice no. 591/2006Coll.

All works and used technology cannot affect environment.

All changes proceeded during the construction works must be consulted with designer.

## **B.1. URBAN, ARCHITECTONIC AND CONSTRUCTION ENGINEERING SOLUTION**

### **a) Evaluation of building site**

Building site is located in the dead end street in village Dolní Lhota. Building service connections are prepared on the boundary of lot. This parcel is slightly sloped to the west. On the west side there is road access. On the north side neighbour's house. On the east side grass field and on the south side non built-up parcel. In front of building entrance there will be paved footpath from road. Also there will be paved parking place for a car next the road and place for garbage bin.

### **b) Urban and architectural solution**

Building is designed in low energy standart. It is two storey house, without basement and with collar roof. The architectural expression of the object is based on the composition of the surrounding area. The building is located on a modified solid slightly sloping terrain.

In the first floor, there is access to the technical room and hall from main entrance. From hall in the clockwise direction there are: WC, office, staircase (with closet under the second flight). Last space is big living room connected with kitchen. This will be the main area, where family will be in connection, therefor it is situated to the southwest. We can also step out to the terrace and garden from living room.

In the second floor clockwise are these rooms: WC, bathroom, staircase, 2 children bedrooms with access to shared loggia oriented to south. Last room is bedroom of parents.

Building is built up from ceramic blocks with precast-monolithical slabs. Foundation strips are establish in antifreeze depth. External walls are masoned from ceramic blocks with thermal insulation inside. There is no need to add thermal insulation into another layer. Partitions are also from ceramic blocks with good accoustic properties. Ceiling above first floor is slab with lost formwork. Roof truss is provided with thermal insulation and plasterboards.

Family house will be connected to the public networks as: water supply pipe, sewerage system, electricity, communication cables (telephone, internet and tv) and gas. All these networks are accessible from the boundary of lot. Heating will be central powered by condensing gas boiler placed in technical room.

## **B.2. MECHANICAL RESISTIVITY AND STABILITY**

The actual structure is designed in a coherent system in complying with the building design principles.

Extended solution of construction system is part of technical report. Static recognition is done by authorized static engineer.

## **B.3. FIRE SAFETY**

It is dealt with in a separate fire report, which is part of project documentation.

## **B.4. ENVIRONMENT PROTECTION**

The course of execution of works will have no negative impact on the surrounding environment. In construction is not used any harmful materials.



During the use of building will be produced waste, which will be accumulated in garbage bin and taken away by the authorized company.

## **B.5. SAFETY AT UTILIZATION**

The building is designed so that it is safe to use. Supplier of construction has to ensure the safety of persons receiving an object to as avoid endangering their health and property. It is necessary to keep safety regulations, applicable safety regulations must be labeled in accordance with relevant standards

## **B.6. HYGIENE AND HEALTH PROTECTION**

Project documentation is designed in accordance with public notice no. 20/2006 Coll. about care of people's health.

Lightning and ventilation is sufficient in natural way.

Heating is designed as central heating with condensing gas boiler used as a heat source.

## **B.7. NOISE PROTECTION**

Building structures are designed to satisfy the requirements of BS 730532 Acoustics - noise protection in buildings and related acoustic properties of building products - Requirements. All installations are properly insulated, risers and sewers will be coated with mineral wool to absorb sound waves.

## **B.8. ENERGY SAVING**

Building structures are designed to satisfy the requirements of law no. 406/2006 Coll. about handling with energy. New doors and windows in the outer shell and a new roof insulation including proposed in accordance with the opinion energy facility is a guarantee of future energy savings and heat. Energy assessment of the building is part of the project. Building is designed as low energy house. According to the energy label of building, house is integrated as efficient, sign B.

## **B.9. USE OF BUILDING FOR MEN WITH REDUCED ABILITY OF MOVEMENT AND ORIENTATION**

Project documentation is designed in accordance with law no. 183/2006 Coll. Building law and public notice 369/2001 Coll. about general requirements for use of buildings with reduced ability of movement and orientation.

## **B.10. PROTECTION OF BUILDING AGAINST DETRIMENTAL EFFECT OF EXTERNAL ENVIRONMENT**

There was proceeded radon index research with low result. Waterproofing layer will protect building against radon sufficiently.

As a protection against lightning and other effects of atmospheric electricity on the building will be installed lightning rod.

## **B.11. PROTECTION OF INHABITANTS**

There is no requirement for additional protection of inhabitants.

## **B.12. ENGINEERING STRUCTURE**

Building will be connected to the public networks such as water supply, gas, communication cables, low voltage and sewerage.

## **B.13. TRAFFIC SOLUTION**

Building will be connected to the existing road.

## **B.14. PRODUCTIVE AND NON-PRODUCTIVE TECHNOLOGIC INSTALLATIONS AND APPARATUS**

There are no technological equipment on building.

## **F.1. IDENTIFICATION OF THE STRUCTURE**

### Place of object

City: Dolní Lhota u Luhačovic  
Cadastral area: Valašské Klobouky  
Parcel number: 1514/15

### Investor

Name: Juste Pécuchet  
Address: Horní Lhota 713  
763 23, Dolní Lhota u Luhačovic

### Designer

Name: Tomáš Šenovský  
Address: Horní Lhota 173  
763 23, Dolní Lhota u Luhačovic

## **F.2. OBJECT PURPOSE**

Subject of project documentation is new family house. Object will be used for living of 4 member family.

## **F.3. URBAN, ARCHITECTONIC AND CONSTRUCTION ENGINEERING SOLUTION**

### **a) Evaluation of building site**

Building site is located in the dead end street in village Dolní Lhota. Building service connections are prepared on the boundary of lot. This parcel is slightly sloped to the west. On the west side there is road access. On the north side neighbour's house. On the east side grass field and on the south side non built-up parcel. In front of building entrance there will be paved footpath from road. Also there will be paved parking place for a car next the road and place for garbage bin.

### **b) Urban and architectural solution**

Building is designed in low energy standart. It is two storey house, without basement and with collar roof. The architectural expression of the object is based on the composition of the surrounding area. The building is located on a modified solid slightly sloping terrain.

### Disposition:

In the first floor, there is access to the technical room and hall from main entrance. From hall in the clockwise direction there are: WC, office, staircase (with closet under the second flight). Last space is big living room connected with kitchen. This will be the main area, where family will be in connection, therefor it is situated to the southwest. We can also step out to the terrace and garden from living room.

In the second floor clockwise are these rooms: WC, bathroom, staircase, 2 children bedrooms with access to shared loggia oriented to south. Last room is bedroom of parents.

### Technical solution:

Building is built up from ceramic blocks with precast-monolithical slabs. Foundation strips are established in antifreeze depth. External walls are masoned from ceramic blocks with thermal insulation inside. There is no need to add thermal insulation into another layer. Partitions are also from ceramic blocks with good acoustic properties. Ceiling above first floor is slab with lost formwork. Roof truss is provided with thermal insulation and plasterboards.

Family house will be connected to the public networks as: water supply pipe, sewerage system, electricity, communication cables (telephone, internet and tv) and gas. All these networks are accessible from the boundary of lot. Heating will be central powered by condensing gas boiler placed in technical room.

### Statistical data:

Parcel area	2719 m <sup>2</sup>
Paved area	70,02 m <sup>2</sup>
Built up area	95,77 m <sup>2</sup>
Floor area of building	158,88 m <sup>2</sup>
Enclosed space	620 m <sup>3</sup>
Number of flats	1
Number of people	4

### **c) Technical and structural solution**

#### **Excavations**

Before excavations start building has to be placed accurately. Arable ground of thickness 200 mm will be removed and stored in eastern part of building lot for future terrain edits.

Excavations of foundation strips will be done mechanically and finished manually. Foundation pit has to be protected against fall of ground into. Shape, sloping and dimensions are taken from drawings. Excavations will be checked by building inspector or designer for proper depth and width. Excavated ground will be used for embankments and has to be compacted properly.

#### **Foundations**

Strip foundations are made of concrete C 16/20 XC2. Depth of strip fulfils antifreeze depth which is 800 - 1200 mm. Dimensions are designed according to attached calculation. On these strips there are built up foundation walls from Beton Brož blocks 500/400/250 filled with concrete. Lining of foundation is made of extruded polystyrene Styrodur 3035 CS – STYRODUR 60mm. Foundation slab is 100 mm, it is reinforced by ø6/150/150 KARI net. Foundation slab will be provided with waterproofing layer Glasbit G200 S 40 which also ensures radon screen out.

#### **Vertical constructions**

External load-bearing walls are from ceramic blocks Porotherm T PROFI 365 mm on the mortar Porotherm T. Mortar will be applied by mortar cart. Internal load bearing walls are from Porotherm 24 P+D and 30 P+D. There is also placed column 300x300 mm made from hollow bricks. Partitions are designed from Porotherm 11,5 AKU and 14 P+D.

On internal sides of walls will be used plaster or glued ceramic tiles according to the surfaces in legends of room.

For proper construction of walls there is need to be familiar with Porotherm manual which includes detailed information with process description. All those requirements has to be followed.

Lightweight wall in the second floor is designed according to the Isover catalogue and will be built up with corresponding to the attached detail.

Chimney Schiedel is designed according to the needs of condensing boiler, all producer requirements has to be satisfied.

### **Horizontal constructions**

Lintels above doors and windows are ceramic Porotherm lintels with height 238 mm for loadbearing walls and 71 mm for partitions. Width and height of placing is specified in drawings.

Ring beam will be made of reinforced concrete as a part of ceiling.

Floor structures are designed as Porotherm Miako ceiling 190 mm with 60 mm concreting, total thickness 250 mm. There is one hidden girder, which has to be checked by statical calculation. Under the loggia the ceiling thickness is reduced to 190 mm (Miako 150 mm, 40 mm concrete).

For concreting of slab and ring there will be used concrete C 20/25 and steel 10505 R.

### **Roof**

Roof is designed as collar roof with slope 30°. Among rafters of dimensions 80/220 mm will be placed thermal insulation Isover Unirol Profi 220 mm. Waterproofing layer Isover Tyvek Solid will be nailed to truss by contralathing 50/30 mm. Roof cover is Tondach Samba 11 on lathing 50/35 mm. Color will be specified by investor during the construction.

From the bottom roof truss will be equiped with vapourbarrier Isover Vario KM Duplex UV. As a suspended ceiling there are plasterboards Knauf Red.

### **Surfaces and flooring**

External facade is made of Porotherm TO 30 mm and Porotherm Universal 5 mm. Color will be chosen by investor.

Internal plasters are made of 2 layers. Core layer Cemix 012 and stucco plaster Cemix 033. Colors of paintings will be chosen by investor. In kitchen, toilets and bathroom there is ceramic cladding glued by Cemix Flex Klasik 075.

Flooring will be made from PVC or ceramic tiles. Patterns and colors will be chosen by investor. Compositions are given in drawings.

### **Staircase**

Staircase is designed as selfsupporting concrete slab. It has two flights and semilanding.

There has to be done statical calculation of reinforcement. Reinforcement in detail of connection to the ceiling is only for imagination.

### **Wall openings**

Openings in external walls are from producer VEKRA.

Plastic windows Vekra Premium with tripple glazing,  $U = 0,8 \text{ W/m}^2\text{K}$ . Plastic entrance door Vekra Classic with tripple glazing,  $U = 1,2 \text{ W/m}^2\text{K}$ .

Colors will be chosen by investor.

Internal doors will be wooden into steel doorframe. Investor will specified producer and colors during construction.

### **Thermal insulation**

House is designed in low energy standard, therefor all the structures are designed according to the recommended values of U. Roof is insulated with 220 mm Isover Unirol Profi, floor on the ground with Isover EPS Grey 150 200 mm. Sandwich lightweight wall has insulation 260 mm thick (more specified in detail of composition).

In the part of loggia there has to be used vacuated thermal insulation POREXTHERM, two layers of thickness 30 mm. Handrail of loggia can not be anchored throught this insulation, therefor it will be anchored from side throught the facade.

### **Waterproofing layers**

Floor on the ground is insulated Glasbit G200 S 40 which also ensures radon screen out. Roof is insulated with Isover Tyvek Solid. Vapourbarrier of roof is Isover Vario KM Duplex UV.

### **d) Connection to traffic and technical infrastructure**

The parcel is accessible from existing road.

The building will be connected to public water supply, sewerage, gas and low voltage on the border of lot.

Water piping, sewer piping, heating and electricity lines are solved by specialized projects.

### **e) Technical and transport infrastructure**

Not required.

### **f) Environmental impact**

Building to its character will not have a negative impact on the environment. Waste from construction will be transported to the municipal landfill, where will be disposed of professionally. Supplier ensure normal precautions against leakage of fuels and oils.

### **g) Non-barrier solution on public areas and roads**

Building does not need to fulfill conditions for people with reduced mobility.

### **h) Survey and measurement**

There was made radon index survey with result = low appearance. Waterproofing layer Glasbit G200 S 40 ensures radon screen out.

Classifying of soil properties is part of attachment.

Proper placing of networks in the ground are taken from distrubutors and consulted with neighbours for any changes.

#### **i) Basis for staking layout – referential site and elevation system**

The basis for the development of documentation is own geodetic planimetry in the system JTSK.

#### **j) Influence upon neighboring properties**

The project is designed to achieve compliance with the layout of networks and sufficient distance from buildings and other facilities. For short time may increase noise and dust.

#### **k) Ensuring health protection and safety of work**

During all works is necessary to follow general regulations of work safety, working with tools and other equipment.

### **F.4. MECHANICAL RESISTIVITY AND STABILITY**

The actual structure is designed in a coherent system in complying with the building design principles.

Extended solution of construction system is part of technical report. Static recognition is done by authorized static engineer.

### **F.5. FIRE SAFETY**

It is dealt with in a separate fire report, which is part of project documentation.

### **F.6. HYGIENE HEALTH AND ENVIRONMENT PROTECTION**

The course of execution of works will have no negative impact on the surrounding environment. In construction is not used any harmful materials.

During the use of building will be produced waste, which will be accumulated in garbage bin and taken away by the authorized company.

Project documentation is designed in accordance with public notice no. 20/2006 Coll. about care of people's health.

Lightning and ventilation is sufficient in natural way.

Heating is designed as central heating with condensing gas boiler used as a heat source.

### **F.7. SAFETY AT UTILIZATION**

The building is designed so that it is safe to use. Supplier of construction has to ensure the safety of persons receiving an object to as avoid endangering their health and property. It is necessary to keep safety regulations, applicable safety regulations must be labeled in accordance with relevant standards

### **F.8. NOISE PROTECTION**

Building structures are designed to satisfy the requirements of BS 730532 Acoustics - noise protection in buildings and related acoustic properties of building products - Requirements. All

installations are properly insulated, risers and sewers will be coated with mineral wool to absorb sound waves.

#### **F.9. ENERGY SAVING**

Building structures are designed to satisfy the requirements of law no. 406/2006 Coll. about handling with energy. New doors and windows in the outer shell and a new roof insulation including proposed in accordance with the opinion energy facility is a guarantee of future energy savings and heat. Energy assessment of the building is part of the project. Building is designed as low energy house. According to the energy label of building, house is integrated as efficient, sign B.

#### **F.10. USE OF BUILDING FOR MEN WITH SHORT ABILITY OF MOVEMENT AND ORIENTATION**

Project documentation is designed in accordance with law no. 183/2006 Coll. Building law and public notice 369/2001 Coll. about general requirements for use of buildings with reduced ability of movement and orientation.

#### **F.11. PROTECTION OF BUILDING AGAINST DETRIMENTAL EFFECT OF EXTERNAL ENVIRONMENT**

There was proceeded radon index research with low result. Waterproofing layer will protect building against radon sufficiently.

As a protection against lightning and other effects of atmospheric electricity on the building will be installed lightning rod.

#### **F.12. PROTECTION OF INHABITANTS**

There is no requirement for additional protection of inhabitants.

#### **F.13. ENGINEERING STRUCTURE**

Building will be connected to the public networks such as water supply, gas, communication cables, low voltage and sewerage.

#### **F.14. TRAFFIC SOLUTION**

Building will be connected to the existing road.

#### **F.15. PRODUCTIVE AND NON-PRODUCTIVE TECHNOLOGIC INSTALLATIONS AND APPARATUS**

There are no technological equipment on building.