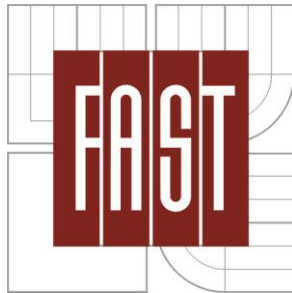


VYSOKÉ UČENÍ TECHNICKÉ
V BRNĚ

BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

RODINNÝ DŮM
FAMILY HOUSE

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE
AUTHOR

JAROSLAVA SLÁMOVÁ

VEDOUCÍ PRÁCE
SUPERVISOR

Ing. arch. IVANA KOŠÍČKOVÁ, Ph.D.

BRNO 2014



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 Jaroslava Slámová

Název Rodinný dům

Vedoucí bakalářské práce Ing. arch. Ivana Košíčková, Ph.D.

Datum zadání bakalářské práce 30. 11. 2013

Datum odevzdání bakalářské práce 30. 5. 2014

V Brně dne 30. 11. 2013



prof. Ing. Miloslav Novotný, CSc.
Vedoucí ústavu

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

Podklady a literatura

Studie dispozičního řešení stavby, katalogy a odborná literatura, Zákon č.183/2006 Sb., Zákon č. 350/2012, kterým se mění zákon č. 183/2006 Sb., Vyhláška č.499/2006 Sb., Vyhl. č. 62/2013, kterou se mění vyhláška č. 499/2006 Sb., Vyhláška č.268/2009 Sb., Vyhláška č.398/2009 Sb., platné ČSN, Směrnice děkana č. 19/2011 a dodatky.

Zásady pro vypracování (zadání, cíle práce, požadované výstupy)

Zadání VŠKP: Projektová dokumentace stavební části k provedení novostavby rodinného domu o dvou nadzemních podlažích bez podsklepení.

Cíl práce: vyřešení dispozice pro daný účel, návrh vhodné konstrukční soustavy, nosného systému a vypracování výkresové dokumentace včetně textové části a příloh podle pokynů vedoucího práce. Textová i výkresová část bude zpracována s využitím výpočetní techniky. Výkresy budou opatřeny jednotným popisovým polem a k obhajobě budou předloženy složené do desek z tvrdého papíru potažených černým plátnem s předepsaným popisem se zlatým písmem. Dílčí složky formátu A4 budou opatřeny popisovým polem s uvedením seznamu příloh na vnitřní straně složky.

Požadované výstupy dle uvedené Směrnice:

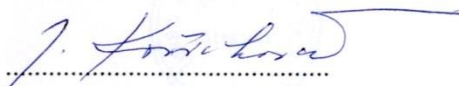
Textová část VŠKP bude obsahovat kromě ostatních položek také položku h) Úvod (popis námětu na zadání VŠKP), položku i) Vlastní text práce (projektová dokumentace dle vyhlášky č. 499/2006 Sb.) a položku j) Závěr (zhodnocení obsahu VŠKP, soulad se zadáním, změny oproti původní studii).

Příloha textové části VŠKP v případě, že bakalářskou práci tvoří konstruktivní projekt, bude povinná a bude obsahovat výkresy pro provedení stavby (technická situace, základy, půdorysy řešených podlaží, konstrukce zastřešení, svislé řezy, pohledy, detaily, výkresy sestavy dílců popř. výkresy tvaru stropní konstrukce, specifikace, tabulky skladeb konstrukcí – rozsah určí vedoucí práce), zprávu požární bezpečnosti, stavebně fyzikální posouzení stavebních konstrukcí.

Struktura bakalářské/diplomové práce

VŠKP vypracujte a rozčleňte podle dále uvedené struktury:

1. Textová část VŠKP zpracovaná podle Směrnice rektora "Úprava, odevzdávání, zveřejňování a uchování vysokoškolských kvalifikačních prací" a Směrnice děkana "Úprava, odevzdávání, zveřejňování a uchování vysokoškolských kvalifikačních prací na FAST VUT" (povinná součást VŠKP).
2. Přílohy textové části VŠKP zpracované podle Směrnice rektora "Úprava, odevzdávání, zveřejňování a uchování vysokoškolských kvalifikačních prací" a Směrnice děkana "Úprava, odevzdávání, zveřejňování a uchování vysokoškolských kvalifikačních prací na FAST VUT" (nepovinná součást VŠKP v případě, že přílohy nejsou součástí textové části VŠKP, ale textovou část doplňují).


.....
Ing. arch. Ivana Košíčková, Ph.D.
Vedoucí bakalářské práce

Abstrakt

Předmětem bakalářské práce je zpracování projektové dokumentace stavby rodinného domu. Rodinný dům je dvojpodlažní, nepodsklepený. Stavba je založena na základových pasech, nosná konstrukce je navržena převážně ze systému Porotherm, doplněna železobetonovými stropy a dřevěnou konstrukcí pultové střechy. Objekt je situován na parcelách č. 594 a 597 v obci Velešovice, katastrální území Velešovice, Jihomoravský kraj.

Klíčová slova

Rodinný dům, samostatně stojící, keramické bloky, Porotherm, železobetonový strop, pultová střecha, Velešovice

Abstract

The subject of bachelor's thesis is creation of project documentation of construction of a family house. The family house is a two-storey building, without basement. The building is founded on foundation strips, load-bearing structures are designed mainly from system Porotherm, completed with reinforced concrete ceilings and timber structure of mono-pitched roof. The object is situated on parcels n.594 and 597 in municipality of Velešovice, cadastral area Velešovice, South Moravian region.

Keywords

Family house, detached, ceramic blocks, Porotherm, reinforced concrete ceiling, mono-pitched roof, Velešovice

Bibliografická citace VŠKP

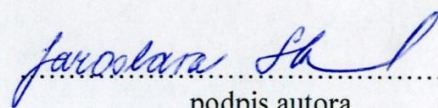
SLÁMOVÁ, Jaroslava. Rodinný dům. Brno, 2013. 32 s., 114 s příl. Bakalářské práce. Vysoké učení technické v Brně, Fakulta stavební, Ústav pozemního stavitelství. Vedoucí práce Ing. arch. Ivana Košíčková, Ph.D..

Prohlášení o původnosti VŠKP

Prohlášení:

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

V Brně dne 26.5.2013



.....
podpis autora
Jaroslava Slámová

Poděkování

Poděkování:

Tímto bych ráda poděkovala vedoucí bakalářské práce Ing. arch. Ivaně Košíčkové, Ph.D. za vedení práce, její trpělivost a ochotu během konzultací.

Obsah (Content)

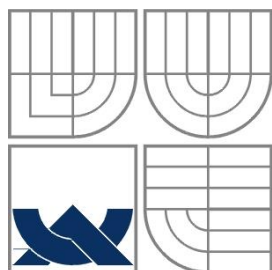
- a) titulní list
- b) zadání VŠKP
- c) abstrakt, klíčová slova (abstract, keywords)
- d) bibliografická citace
- e) prohlášení o původnosti práce
- f) poděkování
- g) obsah (content)
- h) úvod (introduction)
- i) vlastní text práce (main text part)
 - A. Accompanying report (Průvodní zpráva)
 - B. Summary technical report (Souhrnná technická zpráva)
 - C. Situation (Situace)
 - D. Documentation of objects (Dokumentace)
- j) závěr (conclusion)
- k) seznam použitých zdrojů (list of sources)
- l) seznam použitých zkratk (list of used abbreviations)
- m) seznam příloh (list of appendixes)
- n) přílohy

Úvod

Bakalářská práce se zabývá řešením projektové dokumentace pro provedení stavby rodinného domu v obci Velešovice, Jihomoravský kraj. Rodinný dům je dvojpodlažní nepodsklepený. Objekt je navržen pro čtyřčlennou rodinu. Dispozičně je řešen jako 5+kk. Z hlediska architektonického stylu je stavba zpracována jako funkcionalistická; z hlediska konstrukčního je navržena na základových pasech, svislé nosné konstrukce jsou ze zděného systému Porotherm, vodorovné konstrukce jsou železobetonové a pultová střecha má dřevěnou konstrukci.

Introduction

Bachelor's thesis is focused on solution of project documentation for realization of a family house in municipality of Velešovice, South Moravian Region. The family house has two floors above ground without basement. The object is designed for four-member family. The disposition is 5+kk. From point of view of architectonic style the building is elaborated as functionalistic; from the construction point of view it is placed on foundation strips, the vertical load-bearing constructions are made of masonry system Porotherm, the horizontal load-bearing constructions are from reinforced concrete and mono-pitched roof has timber construction.



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RODINNÝ DŮM A. ACCOMPANYING REPORT

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

AUTOR PRÁCE
AUTHOR

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SUPERVISOR

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BRNO 2014

A. Accompanying report

A.1 Identification data

A.1.1. Structure data

Name of construction: Family house

Location of construction: Velešovice, parcels n. 594 and 597, cadastral area Velešovice, South Moravian region

A.1.2. Designer data

Designer: Jaroslava Slámová, Velešovice 318, student

A.3 Territory data

The total area of territory that is dealt with in the project is 1368 m².

The area doesn't belong to any conservation zone, protected zone or flood zone.

The construction has no effect on the present surrounding constructions.

A.4 Building data

Type of building: New construction

Purpose of use: Living

Lifetime of building: Permanent

Built-up area: 93.70 m²

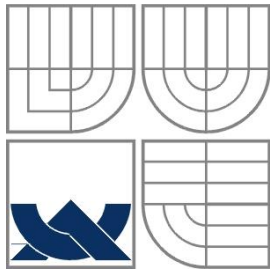
Usable area: 149.28 m²

Residential area: 93.80 m²

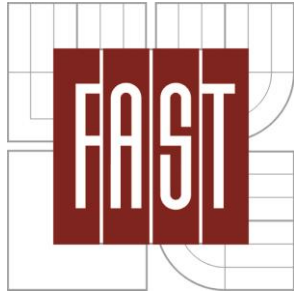
Expected number of inhabitants: 4

Expected initiation of construction process: May 2015

Expected expenses: 3.178.000,-



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RODINNÝ DŮM B. SUMMARY TECHNICAL REPORT

BAKALÁŘSKÁ PRÁCE
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BRNO 2014

B. Summary technical report

B.1 Description of territory of construction

B.1.a Characteristics of building parcel

The placement of new plot of building will be placed in the street part of parcels n.594 and n.597, in cadastral area of Velešovice, and will be established by connection of halves of these two parcels.

Parcels n.594 and n.597 are currently used as gardens. Terrain of parcels is totally plane.

B.1.b Data from geological survey

According to the geological survey of the location of construction there is no risk of radon occurrence. The soil is calcareous clay. The level of underground water is not risky for the new building.

B.1.e Influence of the building to surrounding buildings and parcels

The new building will not influence anyhow the surrounding building and parcels.

B.1.h Connection to the transport and technical infrastructure

The new building will be connected to the district road by access road, as it is far from it 5 m.

The new building will be connected to the technical infrastructure of the municipality.

B.2 General description of the building

B.2.1 Purpose of the building, capacity of the building

The new building is designed for the purpose of living for a four-member family.

B.2.2. Urban and architectonic solution

B.2.2.a Urban solution

The new building will be placed in the municipality of Velešovice, in the part of the village that is already built-up. The opposite side of the street, where will be building placed is occupied by houses with flat and pitched roofs, meanwhile the side of the street where will be placed the new building is mainly used for gardens.

B.2.2b Architectonic solution

The composition of new building is solved with rectangular floor plan, in simple shape of block with inclined mono-pitched roof. The building is designed in disposition 5+kk, with garage stand for two cars on the street (western) side of the building and terrace on the garden (eastern) side of the building. The garage stand, considered as building object 2, is a porch, sheltered by timber construction of roof supported by timber columns.

The façade is wooden, made of dark brown massaranduba wood laths. In the northern façade, where is the main entrance, the immediate surrounding surface of the door is with imitation of stony facing.

Solution of openings is with euro-windows and euro-doors, with color of frames dark brown, glass is translucent and parapets are of aluminum metallic color.

B.2.8 Fire safety solution

The fire safety will be solved by fulfillment of fire safety standards. Fire safety solution is specified in appendix *Folder D: Fire safety report*.

B.2.9 Energy concept

The object is equipped with very well solved thermal insulation; the thermal bridges will be minimized. Windows are made of double glass.

The building's is categorized as A – building highly economical.

B.2.10 Hygienic requirements of the building

B.2.10.a Heating

Heating is solved via central heating. As heating safeguard is used portable convector heater, which can raise the temperature in any room. Bathroom of the second floor is equipped with heating ladder. As complementary source of heat is a fireplace placed in the living room.

B.2.10.b Ventilation

The ventilation of the rooms of building is natural by windows. In the kitchen there is placed a kitchen hood above the cooker for ventilation of kitchen exhaust fumes.

B.2.10.c Water supply

The supply of potable water is provided by connection to local water piping.

B.2.10.d Waste water

Domestic water is drained to the local waste water piping. The rain water is solved with drainage. The local waste water piping is mixed for domestic and rain sewerage, with outlet to the local brook in case of overflowing with rain water.

B.2.10.e Illumination and shading

Natural illumination is caused with natural sunlight, artificial illumination of building interior is provided by artificial electric lighting. Windows will be equipped with internal jalousie.

B.2.11 Principles of protection of building from external negatives

No solution of protection contra radon was made, since there is low radon risk. There are no special requirements for seismicity, noise or floods.

B.4 Transport solution

The object is placed along the main communication road of the village. There is no garage; parking is solved with roofed parking place for two cars.

B.5 Solution of vegetation

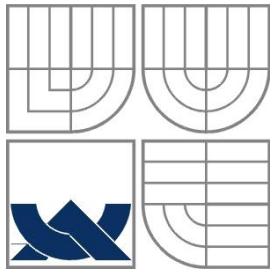
For the purpose of construction there is need of saw dawn of fruit trees in the parcel. Amount of the vegetation cut will be renewed by planting new fruit trees in the southern border of the parcel.

B.7 Protection of environment

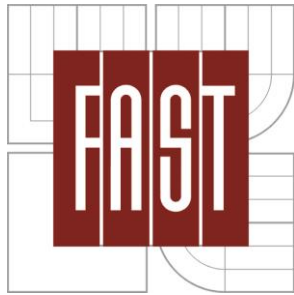
The new building has no negative impact on environment. There is no source of noise inside the building that could impact the surroundings.

B.8 Principles of organization of construction site

The construction site will be connected to the main communication of the municipality via secondary road on the southern side of the site. All the prescriptions and rules of safety of work, health of work and usage of technical devices will be fulfilled.



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RODINNÝ DŮM C. SITUATION

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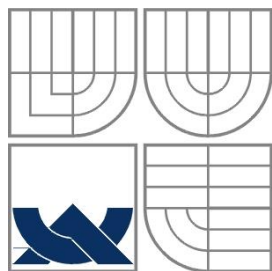
C. Situation

See appendix *Folder C: Drawings*.

Situation drawing of further relations, 1:500, drawing n.1.

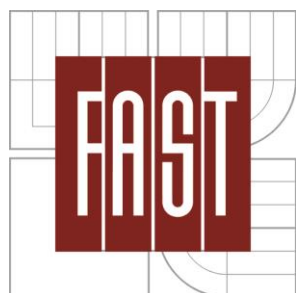
Cadastral situation, 1:1000, drawing n. 2.

Coordination situation drawing, 1:200, drawing n.3.



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RODINNÝ DŮM D. DOCUMENTATION OF OBJECTS

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

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BRNO 2014

D. Documentation of objects

D.1 Documentation of building object

D.1.1 Architectonic-structural solution

D.1.1.a Technical report

Architectonic, material and disposition solution

The building is of simple rectangular shape, with two floors above ground level and without basement. The entry to the plot of the parcel is provided by access road on the western side of the parcel, which is also the street side. The building is complemented with a roofed garage stand connected with the access road. Main entrance door of the building is placed on the northern side. This solution has been chosen for the reason of minimized openings on the northern side, so the interior of the building keeps its privacy. The second, side entrance is placed in the western part of the building. This entrance is situated there to ease the connection of store-technical room with the garden and with the garage stand.

The uncomplicated rectangular shape completed with mono-pitched roof was partly chosen for the reasons of minimization of heat losses, partly to manage the current trend of simplicity.

The façade is solved with wooden laths of th.5cm; specifically the material is massaranduba and is placed all over the surface, except immediate surroundings of the main entrance door, where is imitation of stony facing.

Roof is mono-pitched sloped in angle of 7° from south to north, with metallic decking Lindab of anthracite color. There is chimney on the north-east side of the roof is not visible in the view from south.

The disposition is 5+kk, technical room and terrace, as solution of living for a four member family.

The building has living room together with kitchen and dining room, with surface area of 40 m^2 . The living room is designed as the room with the highest possibility of social contact of the family, and so the highest use. Next is in the first floor situated the workroom of woman, where is also placed the washing machine and equipment for the woman's hobbies. Neighboring room is technical room also used for storage of other hobby equipment or small tools for gardening.

In the second floor there are three bedrooms; the biggest with view to east is for parents and two equally sized and solved rooms facing the south are for children.

Connection of the two floors is via monolithic concrete staircase of U-shape.

The hygienic rooms are situated in the first and second floor. Separate toilet is placed in the first floor, in second floor there is also separate room for toilet and separate bathroom with shower enclosure.

The connection of the building and its garden is via living room, which is connected with sliding glass door with terrace. From wood-covered terrace is the direct descent to the garden greenery.

Construction solution and technical characteristics of the building

Foundations

Foundations are designed as foundation strips of thickness 600mm, completed under the floor level with reinforced concrete slab with kari sieve of thickness 150mm.

Foundation strips ground plan copy the ground plan of the external load bearing wall, as they are mainly placed only under the load-bearing walls and these are only the external walls. The foundation is placed also under the chimney and under the internal load bearing wall supporting the ceiling under 1NP. The foundation strip under the internal load bearing wall of length 3000mm is connected with the main foundation strip structure. This strip has also the function of support of staircase.

The strips are deep 800 mm under the ground, 1050 mm under the level of first floor.

Foundations made of concrete C16/20, placed in the 100 mm thick soil bedding of foundation as the crossing between the strip and former soil. The strips are insulated with thermal insulation from extruded polystyrene ISOVER XPS STYRODUR of thickness 100 mm, in the overall height of the strip.

The thin slab is made of concrete C20/25, reinforced with kari sieve of B500B steel bars.

Both the slab and the strips are placed on the bedding of compacted gravel, thickness 100mm.

At the bottom of the foundation is located a drainage pipe, placed in compacted gravel of thickness 350 mm, finished with soil infill of thickness 450 mm and with pebble gutter pavement of thickness 100 mm on the top.

The hydro-insulation is provided with PVC layer Fatrafol of thickness 4mm, extended to the height of 250 mm of external load-bearing masonry. On the hydro-insulation is placed horizontal thermal insulation ISOVER and separation layer, topped with the floor structure composed of cement coating and floor finishing differing according to the purpose of the room above.

In the western side there is a permeate in the foundation strip for water supply and sewerage piping, in the southern there is permeate for electric wiring.

Vertical structures

The vertical structures are made from system of masonry blocks Porotherm.

External load bearing walls are made of blocks Porotherm 36.5T Profi, ceramic blocks filled with mineral wool. These blocks are characterized with excellent thermal properties, which are completed with 100mm thick thermal insulation ISOVER HARDSIL, special for aerated façades.

The internal load bearing wall supporting the ceiling above 1NP because of the staircase opening is made of ceramic blocks Porotherm 25 P+D, which is raised up to height of 4.1m above the ground floor level.

The internal partitions are made of blocks Porotherm 15 P+D.

All vertical structures in the interior are finished with lime-cement coating.

The openings are filled with euro-windows with wooden frames with double glass or wooden euro-doors. The finishing of openings is solved with system of lintels Porotherm (Porotherm 7 and Porotherm XL according to project documentation).

Horizontal structures

The building has two ceiling structures – above first floor and above second floor. The solution of ceilings is provided with monolithic two-way reinforced concrete slabs, fixed on the horizontal structure.

Concrete used is C25/30 with steel bars B500B.

The ceiling above first floor serves also as floor for the second floor. On the concrete structure is placed sound insulation ISOVER of thickness 40mm, separation layer from PE foil, cement coating 50 mm and floor finishing according to the purpose of the room placed on the floor.

The ceiling above second floor has the function of separation the space from the roof structure and the reason of aeration; apart from the roof structure there is no load on the ceiling above second floor.

Formwork for the ceiling construction is of system PERI.

Staircase

The connection of two floors is solved as monolithic reinforced concrete staircase. The staircase is connected as a console to the foundation strip of the building.

The height of a single stair is 172.22 mm, the width is 281.71 mm.

It is U-shaped, located in the northern part of the building.

The finishing of the stairs is made with wooden decking (according to the project documentation). The hand rails are wooden, tube shaped.

In the second floor the staircase is protected by vertical wooden bars in distance of 80mm.

Roof structure

Roof is mono-pitched, with inclination of 7°. The structural part is made of timber elements, placed on reinforced concrete rings located directly on external load-bearing masonry extension or on vertical concrete wall extension, depending on current height of the roof and according to the project documentation.

The roof is aerated via space between the ceiling above first floor and the roof structure. Roof is insulated with thermal insulation ISOVER UNI of thickness 180mm, placed on the ceiling.

The elements of the structure is of timber wall plates of dimensions 200×150×12600 mm, timber rafters of dimensions 100×240×7685 mm. Elements of the roof are finished with OSB decking, covered with roof covering Lindab Click of anthracite colour.

The elements of the roof structure are specified in the project documentation.

The roof is protected from the small animals with protection sieve Lindab. Gutter system is Lindap Rainline, color anthracite metallic paint. Horizontal gutter is placed in the northern side of the building; two vertical gutters are placed each one on each side of northern façade.

Mounting of the system will be done according to the manufacturer's instructions and recommendations.

External finishing of walls – façade

The external façade consists of wooden laths from tropical wood massaranduba of dark brown color. Laths are of thickness 50 mm, placed all around the surface of building.

Internal finishing

The internal walls and ceiling are covered with lime-cement coating. The finishing varies according to the type and purpose of the specific rooms. Ceramic tiles will be placed in the kitchen, bathroom, toilets and technical room with storage; in other rooms the walls will be painted according to the desire of investor with suitable type of color.

The staircase is finished with wooden decking.

The floor finishing varies according to the type and purpose of the specific rooms from ceramic tiles in the hygienic rooms and kitchen to floating floor in the habitable rooms and workroom. The type of floor finishing is specified in the project documentation.

Openings

Windows and door in the living room are of euro-window type, with wooden frames of dark brown color. There are with double glass. Type of opening is specified in the project documentation.

External doors are of euro-window type, wooden with wooden frames of dark brown color. Type of opening is specified in the project documentation.

The internal doors are wooden, of dark brown colors. The height is standard; the width varies according to specific room that is connected with the specific door. The internal doors are with garnish frame.

Construction of the roofed garage stand

As a building object two is to the main building attached a roofed garage stand for two vehicles. Its roof structure is supported by 9 timber columns in same axial distance. Roof structure is rectangular, with slight inclination, covered with Lindab click roof decking.

Terrace

Terrace is the connection of the building with the garden. It is placed in the eastern side of the building. The terrace is finished with wooden decking, material massaranduba of dark brown color. The terrace is in the same height level as the first floor level.

Building physics

Thermal protection of building

The building is designed to minimize heat losses and to be classified in the low energy standard. The minimization of heat losses is created with the simple shape, minimization of openings on northern and western side of the building and mono-pitched roof with low slope angle and with the use of low-energetic materials as the ceramic masonry blocks filled with mineral wool used in external walls complemented with additional thermal insulation and façade with aerated layer.

The building belongs to energetic category A of energy label.

The detailed calculation of energetic efficiency of building is specified in the appendix *Folder E: Thermal evaluation of the building*.

Illumination

Natural illumination of the building is provided by natural sunlight. The habitable rooms as living room and bedrooms are placed on southern and eastern sides of the building, which is the most favorable for natural light.

Acoustics

The building has no specific requirements on acoustics, since its purpose is living. Internal acoustic insulation is provided in the vertical constructions by internal walls Porotherm 14P+D with great acoustic properties; horizontal constructions are insulated with acoustic insulation ISOVER of thickness 40 mm.

D.1.1.b Drawings part

See *Folder C: Drawings*.

Drawing n.5: Floor plan of 1st floor, 1:50

Drawing n.6: Floor plan of 2nd floor, 1:50

Drawing n.7: Section A-A', 1:50

Drawing n.8: Section B-B', 1:50

Drawing n.9: Section C-C', 1:50

Drawing n.12: Roof construction, 1:50

Drawing n.9: Southern view, 1:50

Drawing n.9: Northern view, 1:50

Drawing n.9: Eastern view, 1:50

Drawing n.9: Western view, 1:50

D.1.2 Structural-construction solution

D.1.2.a Technical report

Detailed description of load-bearing constructions and technological procedures

Foundations

The object is founded on concrete foundation strips of thickness 600 mm. The concrete used is C 16/20, placed on 100 mm thick soil bedding of foundation in the crossing between the strip and former soil.

The shape of foundations copies the shape of ground plan of external masonry of the building. Under the chimney there is additional foundation element of 600×600 mm connected to the main foundation strip. With foundation is also provided the internal load-bearing wall; the foundation of this wall is of dimensions 600×3000 mm, connected with the main strip with 600mm wide strip. This element has also the function of support for the staircase.

On the top of the strips is placed a foundation slab from concrete C 20/25, reinforced with kari sieve. In the contact between the foundation slab and former soil is 100 mm thick soil bedding.

The strips are in deep of 800 mm under the level of the ground; 1050 mm under the level of the first floor.

The thermal insulation of the foundations is provided with thermal insulation from extruded polystyrene ISOVER XPS STYRODUR, thickness 100 mm, in overall height of the strip up to height overlapping 250 mm the level of the terrain. Total height of the thermal insulation is 1050 mm.

At the bottom side of the foundation is placed a drainage pipe; placed in compacted gravel of height 350 mm, finished with soil infill of 450 mm and with pebble gutter pavement of thickness 100 mm.

The solution of hydro-insulation of the building is with PVC layer Fatrafol of thickness 4 mm, placed between the foundation slab and construction of the floor; it is extended to the height of 250 mm in the vertical direction and placed in the external side of the masonry.

There are two permeates in the foundation strips. In the western side for water supply piping and waste water piping; in the southern side there is permeate for electric wiring.

Vertical constructions

The external load-bearing masonry is executed from ceramic blocs filled with mineral wool Porothersm 36.5 T Profi of thickness 365 mm. Internal load-bearing wall is executed from ceramic blocks Porothersm 25 AKU P+D. Internal non-load-bearing wall is executed from ceramic blocks Porothersm 14 P+D. The blocks are placed on mortar Porothersm Profi. First layer of masonry is placed on mortar Porothersm Profi AM for easier and exact placement of blocks on the foundation or the ceiling slab.

The solution of finishing of openings is via ceramic lintels Porothersm (Porothersm 7 and Porothersm XL according to the project documentation).

Horizontal constructions

The solution of ceilings above 1st and 2nd floor is provided by two-way reinforced concrete slab. The concrete used is C 25/30 reinforced with steel bars B500B. The slab is thick 250 mm and fixed in the vertical construction.

Roof structure

Roof is of mono-pitched type, with slope of 12%. Roof construction is made of timber elements placed. Roof structure is placed over reinforced concrete ceiling slab over 2nd floor via reinforced concrete rings of cross section dimensions 250×250 mm. Concrete rings are placed on vertical extensions of masonry wall.

According to the current height of roof section is wall extension with concrete extension (according to the project documentation). The thermal insulation of the roof structure is provided by thermal insulation ISOVER UNI of thickness 180 mm.

The structure of the roof is designed as timber roof truss, with rafters of cross section dimensions 100×240 mm placed on timber wall plates of cross section dimensions 200×150 mm. Axial distance of rafters is 725 mm and 800 mm. Material of timber elements is spruce timber, to which is provided protection painting.

The roof covering consists of double decking OSB boards of thickness 15 mm, on which is placed separation layer from PE foil DEKFOL DTB 150. On the separation layer is placed the metal light roof covering plates Lindab Click.

Aeration of the space between the roof structure and reinforced concrete slab is secured by protection aeration sieve, protecting the space from the entry of insects and small animals.

Mounting of all elements will be done according to the instructions of the manufacturer.

Staircase

Staircase is designed from monolithic concrete C16/20. It is U – shaped, fixed with the internal and external load-bearing wall.

Construction of other objects

As part of the building is considered roofed garage stand for two cars in the street side of the building. The dimensions of the stand are 6000×5500 mm. Nine timber columns of cross-section 100×100 mm are supporting a timber based roof construction. Roof construction is made of rafters of dimensions 100x150 mm; slope of the roof is 2%. Roof covering is on the base of black board (serving as hydro-insulation), finished with wooden decks on which is placed metal covering Lindab. The metal sheeting and gutter system of the roof is zinc-plated.

The material is spruce timber. For the protection against action of microorganism, insects and unfavorable climate, the material is painted with brown impregnation color. The impregnation is done with rolling. After the impregnation the material is painted with dark brown lacquer with UV protection.

Openings

The window openings are provided with euro-windows IV88 Ecologic. The material of the window frame is thermowood, thermally modified wood, which is not necessary to be painted with protection paint. This type of window is adapted to be used in buildings with higher thermal efficiency. The thickness of the

window is 88 mm, it is with triple glass, where the space between layers is filled with argon, which has better thermal properties than air. The thermal bridges are eliminated with help of aluminum parapet Gutmann Spree and warm distance frame Chromatech ultra.

The door openings are provided with euro-doors Euro IV88, with double stripping. The material is thermowood. Main entrance door are in combination of wood and glass; in the glass filling is used triple glass with warm distance frame, minimizing the thermal bridges. Side entrance door is made of wood only.

The internal door openings are DORSET Standart, wooden, ganished, of standard dimensions.

Particular dimensions of openings are specified in the project documentation, appendix *Folder C – Drawings: Listing of doors and Listing of windows*.

Insulations

Thermal and sound insulation

The object is insulated to minimize heat losses to the exterior. Thermal insulation is from manufacturer ISOVER.

- a) Insulation of foundations: extruded polystyrene ISOVER STYRODUR C of thickness 100 mm, extended to height 500 mm above the terrain level.
- b) Insulation of floor above terrain: foam polystyrene ISOVER EPS PERIMETR of thickness 150 mm.
- c) Insulation of floor above 1st floor: desks ISOVER N of thickness 40 mm.
- d) Insulation of vertical load-bearing structures: mineral wool ISOVER HARDSIL of thickness 100 mm.
- e) Insulation of roof structure: desks of mineral felt ISOVER UNI of thickness 100 mm.

Hydro-insulation

- a) Insulation from the terrain: PVC foil Fatrafol 4 mm extended to the height of 250 mm above terrain level.
- b) Insulation of the roof: PE foil DEKFOL 3 mm.

Chimney

Chimney will be provided by brickwork chimney system CIKO, formed by chimney inset, insulation and coating of ceramic blocks.

Flooring

Floor finishing is from ceramic tiles RAKO and floating floor BEFAG; type of flooring in each specific room is described in the project documentation.

Tiling

Tiling of kitchen and hygienic rooms is provided with ceramic tiles RAKO; heights of tiling are specified in project documentation.

Tinsmith's work

Gutter system is system Lindab Rainline from galvanized steel. Particular dimensions of openings are specified in the project documentation, appendix *Folder C – Drawings: Listing of tinsmith's work*.

Façade

The solution of external façade is made of wooden laths from tropical wood massaranduba of dark brown color. Wooden laths are of dimensions 20×50 mm.

The type of façade is adapted to be anchored on masonry type of vertical structures. The type of profile is cut edge, cut in angle 30°.

The auxiliary construction consists of a wooden grate anchored with metal nibs. To the wooden grate are anchored wooden laths with woodscrews from stainless steel.

The starting point of placing nibs is the upper windows; the placing of nibs is in axial distance of 1000 mm. The nibs are anchored to the masonry via wall plugs, designated for the use with masonry of Porotherm blocks. Around the windows the nibs are placed in smaller distance for the reason of double lathing.

Around the building perimeter is placed the starting batten, from where is began the placing of thermal insulation from mineral wool ISOVER HARDSL thickness 100 mm. The direction of placing is upwards and targeted to the masonry.

There must be a space cut out from the safety foil for the pass of metal nibs. Safety foil is placed with overlap of lower strip by upper strip. As the insulation the safety foil is placed direction upwards. The pass of metal nibs must be secured with double-sided tape.

The prisms of wooden grate are impregnated and with woodscrews are fixed to the metal nibs. There must be provided a dilatation between two prisms. The aerated layer in the lower and upper side of the façade is covered with protection sieve serving as the protection against the entry of insects, birds and small animals.

The laths are placed from the upper frame of upper windows. The length is cut to ensure the anchoring on the prism of wooden grate. In the horizontal direction there is no dilatation between the laths. They are anchored to the grate with woodscrews – 2 woodscrews per one lath.

The solution in the corners is with corner prism.

There is no special treatment of the wooden façade; it is resistant to the UV radiation, rain and decay. The material however changes in time its color.

D.1.2.b Drawings part

See appendix Folder C – Drawings.

Drawing n.4: Foundations, 1:50

Drawing n.10: Ceiling above 1st floor, 1:50

Drawing n.11: Ceiling above 2nd floor, 1:50

Drawing n.17: Detail A – Socle, 1:10

Drawing n.18: Detail B – Mounting of ceiling above window

Drawing n. 19: Detail C – Stair finishing

Drawing n. 20: Detail D – Mounting of roof construction above ceiling slab

D.1.3 Fire safety solution

Solution of fire safety is specified in appendix *Folder D – Fire safety.*

Závěr

V Bakalářské práci byl navržen rodinný dům pro čtyřčlennou rodinu v obci Velešovice, Jihomoravský kraj. V rámci návrhu byly splněny normové požadavky na tepelnou techniku budovy, požární bezpečnost budovy a komfort vnitřního prostředí budovy.

V rámci práce byly provedeny změny oproti prvotním návrhům před začátkem práce, a to konkrétně změna typu střechy a lehké změny v dispozičním řešení domu, z důvodu estetického řešení a zkvalitňování komfortu interiéru budovy.

Conclusion

In bachelor's thesis was designed a family house for a four-member family in the municipality of Velešovice, South Moravian Region. Within the design were satisfied requirements of thermal efficiency of building, fire safety of building and overall comfort of building's interior.

Within the bachelor's thesis were done changes as distinct from the preliminary design before the start of the work, concretely change of type of the roof and slight changes in the disposition solution of the building, for aesthetic reasons and reason of increase of comfort of building's interior.

Seznam použitých zdrojů (List of sources)

Legislativa (Legislation)

Vyhláška 499/2006 Sb., o dokumentaci staveb
Zákon č. 183/2006 Sb., o územním plánování
Vyhláška 23/2008 Sb., o technických podmínkách požární ochrany staveb
Vyhláška 246/2001 Sb., o požární prevenci
Vyhláška č. 501/2006 Sb., o obecných požadavcích na výstavbu

Použité normy (Used standards)

ČSN 73 4301 – Obytné budovy
ČSN 73 0580 – Denní osvětlení budovy
ČSN 73 0532 – Akustika, ochrana proti hluku v budovách
ČSN 73 0540 – Tepelná ochrana budov
ČSN 01 3420 – Výkresy pozemních staveb – kreslení výkresů
ČSN 73 0802 – Požární bezpečnost staveb – Požadavky na požární odolnost stavebních konstrukcí

Webové stránky (Webpages)

www.isover.cz
www.wienerberger.cz
www.lindabstrechy.cz
www.rako.cz
www.topdoorsostrava.cz
www.stavebnipouzdro.cz
www.oknasirer.cz
www.tzb-info.cz
www.ciko-kominy.cz
www.ikatastr.cz
www.arakolin.cz
www.befag.cz

Použitý software (Used software)

Microsoft Office 2010
Nemetschek Allplan 2012

Seznam použitých zkratk (List of used abbreviations)

ČSN – česká státní norma

VŠKP – vysokoškolská kvalifikační práce

RC – reinforced concrete

mm – millimeter

m – metr

n. – number

th. – thickness

Seznam příloh (List of appendixes)

Folder B – Studies

- 1 Study of 1NP
- 2 Study of 2NP
- 3 Study of section
- 4 Study of views

Folder C – Drawings

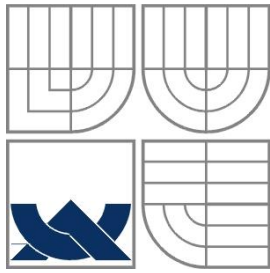
- 1 Situation of further relations
- 2 Cadastral situation
- 3 Situation
- 4 Foundations
- 5 Floor plan 1NP
- 6 Floor plan 2NP
- 7 Section A-A'
- 8 Section B-B'
- 9 Section C-C'
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- 20 Detail D – Staircase
- 21 Listing of tinsmith's and locksmith's work
- 22 Listing of joinery

Folder D – Fire safety

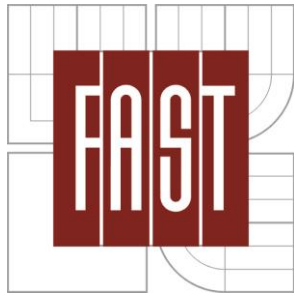
- 1 Fire safety report
- 2 Fire safety situation

Folder E – Evaluation of building physics

- 1 Evaluation of building physics



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APPENDIXES
SEE FOLDERS B, C, D, E

BAKALÁŘSKÁ PRÁCE
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