



VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

DETACHED FAMILY RESIDENCE

MAIN TEXT PART OF BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

BACHELOR'S THESIS

AUTOR PRÁCE

AUTHOR

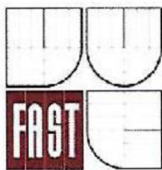
JANET KLAUDIE DE CEITA

VEDOUČÍ PRÁCE

SUPERVISOR

Ing. FRANTIŠEK VAJKAY, Ph.D.

BRNO 2016



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ZADÁNÍ BAKALÁŘSKÉ PRÁCE

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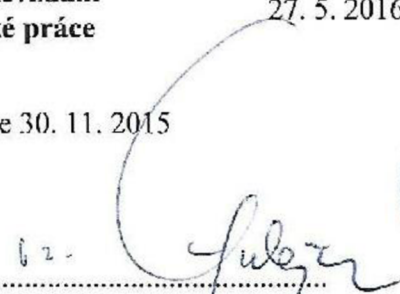
Název Detached Family Residence

Vedoucí bakalářské práce Ing. František Vajkay, Ph.D.

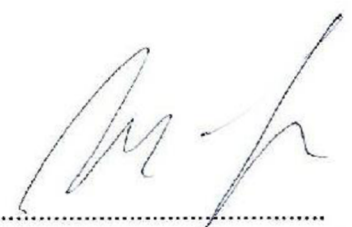
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V Brně dne 30. 11. 2015

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

Podklady a literatura

(1) směrnice děkana č. 19/2011 s dodatkem 1 a přílohami 1, 2, 3 a 5; (2) studie dispozičního, konstrukčního a architektonického řešení stavby; (3) katalogy a odborná literatura; (4) Zákon o územním plánování a stavebním řádu (stavební zákon) č. 183/2006 Sb. ve znění zákona č. 350/2012 Sb.; (5) Vyhláška č. 499/2006 Sb. ve znění vyhlášky č. 62/2013 Sb.; (6) Vyhláška č. 268/2009 Sb.; (7) Vyhláška č. 398/2009 Sb.; (8) platné normy ČSN, EN, ISO včetně jejich změn a dodatků.

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

*** Zadání VŠKP (BP) *** Zpracování projektové dokumentace (dále PD) pro provedení stavby stavebního objektu. Objekt je situován na vhodné stavební parcele. V rámci zpracování PD je nutné vyřešit rovněž širší vztahy, tj. *zázemí* objektu, venkovní parkovací plochy, napojení objektu na stávající inženýrské sítě, technickou a dopravní infrastrukturu atp.

*** Cíle práce *** Vyřešení dispozice zadaného objektu s návrhem vhodné konstrukční soustavy a nosného systému stavby na základě zvolených materiálů a konstrukčních prvků. PD objektu bude rozdělena na textovou a přílohovou část. PD bude obsahovat výkresy situace, základů, půdorysů všech podlaží, konstrukce zastřešení, svislých řezů, technických pohledů, 5 detailů, výkresy sestavy dílů popř. výkresy tvaru stropní konstrukce, specifikace a výpisy skladeb konstrukcí. Součástí dokumentace bude i stavebně fyzikální posouzení objektu a vybraných detailů, požární zpráva a další specializované části, budou-li zadány vedoucím BP.

*** Požadované výstupy *** BP bude členěna v souladu se směrnicí děkana č. 19/2011 a jejím dodatkem a přílohami. Výkresová, textová a přílohová část PD bude vložena do složek s klopami formátu A4 opatřených popisovým polem a uvedením obsahu na vnitřní straně každé složky. Všechny části PD budou zpracovány na bílém papíru s využitím PC v textovém a grafickém CAD editoru. Výkresy budou opatřeny popisovým polem. Textová část bude obsahovat také položku h) "Úvod", i) "Vlastní text práce" jejímž obsahem budou průvodní a souhrnná technická zpráva a technická zpráva pro provádění stavby podle vyhlášky č. 499/2006 Sb. ve znění vyhlášky č. 62/2013 Sb. a j) "Závěr". BP bude mít strukturu dle pokynu umístěném na www.fce.vutbr.cz/PST/Studium.

Struktura bakalářské/diplomové práce

VŠKP vypracujte a rozčleňte podle dále uvedené struktury:

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



Ing. František Vajkay, Ph.D.
Vedoucí bakalářské práce

Abstrakt

Předmětem této bakalářské práce je návrh samostatně stojícího jednogeneračního rodinného domu. Cílem této práce bylo navržení objektu vyhovujícímu svým dispozičním řešením pětičlenné rodině. Objekt je téměř na rovinném terénu na vybraném pozemku katastrálního území města Brna, v Modřicích v ulici Polní. Dům má dvě nadzemní podlaží a je nepodsklepený s vegetační střechou. Součástí rodinného domu je také i garáž pro dva osobní automobily. Hlavní vstup je orientován na sever. Obvodové zdivo také i vnitřní je navrženo ze systému Heluz. Strop nad prvním nadzemním podlažím je monolitický železobetonový. Výkresová dokumentace potřebná pro realizaci nového rodinného domu je zpracována včetně pěti konstrukčních detailů. Výkresová část byla zpracována v počítačovém programu Autocad. Součástí práce je také požární a tepelně-technické řešení.

Klíčová slova

Rodinný dům, dvoupodlažní, monolitický železobetonový strop, plochá střecha, vegetační střecha, zděná konstrukce Heluz

Abstract

The subject of this thesis is to design a detached single-family house. The aim was to create an object suitable for a five-member family by its disposition solution. The building is located in almost flat terrain on a specific plot of cadastral area of Brno city, Modřice Street Field. The house has two floors and no basement with vegetation roof. Part of the house is also a garage for two cars. The main entrance is oriented to the north. External as well as internal walls are designed in a technology of Heluz system. Ceiling above first above-ground floor is monolithic reinforced concrete. The project documentation which is needed for a realization of a new detached house is worked up with five structural details including. Drawing part was processed in a computer program AutoCad. The work also includes fire safety and thermotechnical solution.

Keywords

Family house, two-storeyed, monolithic reinforced concrete ceiling, flat roof, green roof, brick construction Heluz

Bibliografická citace VŠKP

Janet Klaudie de Ceita *Detached Family Residence*. Brno, 2016. 43 s., 159 s. příl. Bakalářská práce. Vysoké učení technické v Brně, Fakulta stavební, Ústav pozemního stavitelství. Vedoucí práce Ing. František Vajkay, Ph.D.

Declaration:

I declare, that I worked out the Bachelor's Thesis independently 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 28.4.2016

.....
podpis autora
Janet Klaudie de Ceita

Thanks

I would like to thank my supervisor of Bachelor's Thesis Ing. František Vajkay Ph.D., for professional guidance, help and advice during process of my work.

I would also like to thank my family and friends, specially my classmates, for moral support and assistance they provided me during processing my thesis , which I greatly appreciate.

Poděkování

Ráda bych poděkovala vedoucímu mé bakalářské práce Ing. Františku Vajkayovi Ph.D., za odborné vedení, pomoc a rady při zpracování této práce.

Také bych chtěla poděkovat své rodině a přátelům, hlavně splužákům, za morální podporu a pomoc, kterou mi poskytovali při zpracování mé bakalářské práce, a které si nesmírně vážím.

V Brně dne 28.4.2016

.....
podpis autora
Janet Klaudie de Ceita

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1. INTRODUCTION

The Bachelor's Thesis is focused on elaboration of project documentation for detached single-family house, suitable for a five-member.

This building is located in Brno-Modřice, in Polní Street. It has two floors and no basement with vegetation roof. Part of the house is also a garage for two cars. The main entrance is oriented to the north.

The building stays on foundation strips from plain concrete. Both vertical load-bearing and non-load bearing structures are from HELUZ blocks walling system. All peripheral walls are from HELUZ family 44 2 in1 masonry blocks. There are two types of internal walls one of them is from HELUZ family 25 2in1 masonry blocks and the other one is consider to be internal in the first floor and external in the second one, this wall is made from the same material as the peripheral wall. Horizontal load-bearing structure above first and second floor is from monolithic reinforced concrete slabs. Above the second floor and as well as above the garage there is a green roof which only diferes in type of inclination. Above the second floor there is a roof inclined to both sides with a inclination of 3% and above the garage in the first floor there is a roof inclined to only one side with the inclination of 3%. Both types of roof have an attic around.

Disposition of the house is done in accordance with valid regulations and standards. The design intention was to create a building which exterior appearance corresponds with surrounding buildings. Therefore, there is a green roof, a simple two-rectangular shape and simple color of the house.

2. OWN TEXT PART OF THE BACHELOR'S THESIS



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A ACCOMPANYING REPORT

A.1 Identification data

A.1.1 Data about the construction

Name of construction:	Detached Family Residence
Place of construction:	cadastral area Modřice [697931]
parcel number	444/4
Township:	Brno-venkov [583391]
Region:	Jihomoravský
Subject of documentation:	Documentation for execution of works

A.1.2 Data about the builder

Name:
Address:
E-mail:

A.1.3 Data about the designer

Name:	Janet Klaudie de Ceita
Address:	Říčanská 25, 635 00 Brno
E-mail:	deCeitaJ@fce.vutbr.cz

A.2 List of input data

The amount and type of input documents used for the preparation of design is decided by the Building Office.

A.3 Data about the area

The parcel with parcel number 444/2 is located in a small town Modřice, 8km far from Brno in South Bohemia and is determined for family house construction. There is a construction of a family house on the parcel. The plot is flat. The parcel has an irregular shape which is the union of three rectangles. The access road to the parcel is about 6,7 m wide but becomes thinner in the last section, about 3 m wide. There are no obstacles on the parcel which would be needed to be taken away at the expense of the investor. The investor is also the owner of the parcel.

Data about building plot

Parcel number:	444/4
Township:	Brno-venkov [583391]
Cadastral area:	Modřice [697931]
LV number:	2450
Acreage:	668 m ²
Parcel type:	Parcel of cadastre estate
Map sheet:	DKM
Determination of acreage:	from S-JTSK coordinates
Parcel type:	garden

Data about property rights' relationships

List of affected lands according to cadastral estate:

Parcel number: 444/3, township: Brno-venkov, cadastral area: Modřice, parcel type: Parcel of cadastre estate, map sheet: DKM, acreage: 559 m², parcel type: garden, owner: Marek Jiří Ing. a Marková Iveta MUDr.,

Parcel number: 444/8, township: Modřice, cadastral area: Modřice, parcel type: Parcel of cadastre estate, map sheet: DKM, acreage: 875 m², parcel type: garden, owner: Koudar Ivan Ing. Ph.D. a Koudarová Miroslava Bc.,

Parcel number: 444/11, township: Brno, cadastral area: Modřice, parcel type: Parcel of cadastre estate, map sheet: DKM, acreage: 844 m², parcel type: garden, owner: Koudar Ivan Ing. Ph.D. a Koudarová Miroslava Bc

Parcel number: 460/33, township: Brno, cadastral area: Modřice, parcel type: Parcel of cadastre estate, map sheet: DKM, acreage: 144 m², parcel type: garden

Parcel number: 445/19, township: Brno, cadastral area: Modřice, parcel type: Parcel of cadastre estate, map sheet: DKM, acreage: 756 m², parcel type: other area, owner: Bednář Miroslav and Bednářová Lenka.

Ownership right to parcel number 444/4 is cadastral area of township Modřice, written in Cadastre estate. There are no restriction on ownership rights.

Data about executed surveys

The geological survey conveyed near the plot's location showed the soil type as F4 CS - Fluvial sandy clays class and Rdt is 150KPa. These soils are quite suitable for building foundations.

According to hydrogeological survey no underground water was found. On the basis of this review, no restrictions for construction in terms of underground water are necessary. Quaternary fluvial sandy clays class F4 are according to hydrogeological point of view for water usually poorly permeable, therefore it fulfills, dependent the proportion of coarser fraction, rather function polo insulator, which retards infiltration rainwater into the underlying layers.

During the drilling work was JV1 probe encountered the level of groundwater at a depth of 5.0 meters, standing level was measured at a depth of 2.8 meters. The water table is therefore tense. Groundwater level in summer and winter, without significant rainfall. Business does not think like most. Achieving long-term highs

are expected in the spring and during snowmelt.

Data about connection to traffic infrastructure

Along the Northern borders of the plot there is a service road for the access to the houses. To this road, the driveway from concrete tiles will be connected to.

The plot is not connected to engineering networks; therefore, the following works must be done:

- Water connection pipes with water-meter shaft placed at builder's plot. The piping from water-meter shaft to the family house will be built.
- Rainwater and sewage will be taken to single underground sewage system located on parcels no. 444/3 via newly constructed connection. Sewer inspection shaft will be built on the builder's plot.
- Connection of low-voltage power line will end on plot border in masonry pillar signed as MHB.
- Low pressure gas pipe connection will end on plot border in masonry pillar signed as MGC.

Information about fulfillment of requirements of concerned authorities

Documentation meets all requirements of concerned authorities.

Information about compliance of general requirements for construction

All requirements for construction are fulfilled in the documentation. These are requirements stated by Building Law 186/2006 Coll. and Notice no. 137/1998 Coll. about general requirements for construction, and Notice no.502/2006 Coll. about change of notice about general technical requirements for construction. Documentation abides mandatory standards ČSN, such as ČSN 73 4301 Residential buildings, ČSN 73 0540 Thermal technology of buildings, and hygienic regulations and requirements about health protection and healthy living conditions.

Data about fulfillment of regulation plan, zoning permission, eventually land use planning in construction according to § 104 article 1 of Building Law

All conditions are fulfilled; building is in accordance with approved land use plan of Brno city.

A.4 Data about the construction

The detached family house is a newly constructed structure. It is to design a detached single-family house suitable for a five-member family by its disposition solution. There are no legal obstacles and according to the law the building does not belong to any protected constructions.

Design and project documentation follow the general technical rules for construction according to existing decrees and standards. Project documentation of the building meets all the requirements of concerned authorities and follows the existing decrees and standards. The house has two floors and no basement with vegetation roof. Part of the house is also a garage for two cars. The access for disabled people is not necessary. The building shape is of two rectangles, one bigger – residential part, and one smaller – garage, technical room and storage.

Number of parking places: 2 cars in a garage, 2 cars outside

Built area: 175,297 m²

Paved areas: 112 m²

Floor area: 183 m²

Number of residential units: 1

The final price is based on price index of average budget price in 2016. Price of one-flat family house is 5291 CZK/m³. Total volume of the building is $V = 1263 \text{ m}^3$.

Supposed implementation costs are therefore about 6 682 553 CZK. Final price would differ according to purchase price of individual material.

A.5 Division of the object into parts

The building is divided into 3 objects according to coordination situation.

Parts: Residential area

Non-residential area

Utility network.



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B SUMMARY TECHNICAL REPORT

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B SUMMARY TECHNICAL REPORT

B.1 Description of the parcel

The parcel with parcel number 444/4 is located in a small town Modřice, 8km far from Brno in South Bohemia and is determined for family house construction. There is a construction of a family house on the parcel. The plot is flat. The parcel has an irregular shape which is the union of three rectangles. The access road to the parcel is about 6,7 m wide but becomes thinner in the last section, about 3 m wide. There are no obstacles on the parcel which would be needed to be taken away at the expense of the investor. The investor is also the owner of the parcel.

On the the East, there is a neighbouring structure – newly built family house with fence along border of the neighbouring plot. On the West and South there are gardens also dividing individual parcels. Across the road in the North, there is also newly built family house. There are no undermined areas in given location.

Data about building plot

Parcel number:	444/4
Township:	Brno-venkov
Cadastral area:	Modřice [697931]
LV* number:	2450
Acreage:	668 m ²
Parcel type:	Parcel of cadastral estate
Map sheet:	DKM
Determination of acreage:	from S-JTSK coordinates
Parcel type:	garden

Data about executed surveys

The geological survey conveyed near the plot's location showed the soil type as F4 CS - Fluvial sandy clays class and Rdt is 150KPa. These soils are quite suitable for building foundations.

According to hydrogeological survey no underground water was found. On the basis of this review, no restrictions for construction in terms of underground water are necessary. Quaternary fluvial sandy clays class F4 are according to hydrogeological point of view for water usually poorly permeable, therefore it fulfills, dependent the proportion of coarser fraction, rather function polo insulator, which retards infiltration rainwater into the underlying layers.

During the drilling work was JV1 probe encountered the level of groundwater at a depth of 5.0 meters, standing level was measured at a depth of 2.8 meters. The water table is therefore tense. Groundwater level in summer and winter, without significant rainfall. Business does not think like most. Achieving long-term highs are expected in the spring and during snowmelt.

B.2 General description of the building

B.2.1 Purpose of the object, basic capacity of function unit

The subject of this project is to design a pleasant, healthy and ecologically friendly detached single-family house. The aim is to create an object suitable for a five-member family, ideally two adults and two to three children, by its disposition solution.

B.2.2 Urban and architectural solution

The terrain of Modřice is flat, which allows the sunlight to reach most parts of the house during whole year. This resulted in such a disposition of the house, the living room and most of the rooms in the second floor are facing South. The family house has a shape of two rectangles one bigger which is the residential part and the smaller one, on residential part. In the non-residential part, which is located to the West, is the garage,

storage room and technical room. In the technical room which is also a laundry room there is a direct access to the garden faced to the south part. In the other part of the house which has two floors, the first floor is the common space used as meeting point for the family, there are located kitchen, living and dining room, office, bathroom, entrance and the corridor which gave us the access to the second floor by stairs. The second floor is the quiet zone used as resting part, there are all bedrooms for the children and parents as well. In the parents' room which is the master room there is a bathroom included. In the second floor there is also a bathroom for all the floor. The building itself is placed in the Norther part of the plot. The southern part as well as the Eastern are used as a garden.

The house has two above-ground floors and is without a basement. The roof is a green roof and the ceiling is made from monolithic slab. The utility network of the house is going to be connected to public utility network underneath the road.

The floor level of the first floor is defined as $\pm 0,000$ and refers to 191 m.a.s.l. There are two types of used surfaces of exterior facade – wooden strips in some small areas around the windows and acrylic white color.

Aluminum wooden triple-glazing windows VEKRA Alu design Classic were designed. The entrance doors are from the same material as windows, VEKRA Alu design Classic and for the back doors opening I design the doors from the same distributor as for entrance door, the only thing which differs is from the esthetical design. Aluminum garage doors are made from TRIDO STANDARD. All above-mentioned windows and doors are in the same grey color. Paving around the house is designed of concrete blocks BEST-ARCHIA and BEST-KORZO of caramel color.

B.2.3 Layout and operational solutions, production technology

The disposition of the house was designed for needs of the family. First floors is intended as common space, where the family can meet. On the other hand, the second floor is supposed to a quiet zone. Parents have one room with a bathroom included and each child has its own. There is a bathroom for children located in the second floor. This disposition of the house creates ideal balance between common and private spaces.

B.2.4 Barrier-free use of the building

This family house was not designed as a barrier-free

B.2.5 Safety during usage

There are no special requirements on safety during usage.

B.2.6 Basic technical description of the buildings

a) Foundations

The foundation strips are made of plain concrete of class C20/25, and HELUZ bricks which are below the top soil about 375+375 mm, thickness of those depends of the thickness of the wall above them. In this family house there are three different thickness of foundations. There is external wall which foundation has a thickness of 1000 mm, internal wall made from HELUZ family 25 2in1 has a thickness of its foundation 950 mm and finally the wall which separate residential part from non-residential one is made from HELUZ family 44 2in1 and its foundation strips have a thickness of 1350mm. These huge thickness of foundation strips is due to soil type which is made from fluvial sandy clays and partially also because of the load transferring by the house itself. All the foundation strips are 1160 mm below the flooring level $\pm 0,000$ (refers to 191 m.a.s.l.). The foundation slab is made of concrete reinforced by KARI net in thickness of 150 mm. The diameters of reinforcement are according to structural design.

b) Hydroinsulation

Hydroinsulation is done underneath the whole structure above foundation slab with the help of hydroinsulation strips GALSTEK 40 Special mineral and ELASTEK 40 Special mineral. Hydroinsulation in form of asphalt felts is also located in the composition of the roof above 1st as well as 2nd floor.

c) Vertical load-bearing structures

All vertical load-bearing structures are from HELUZ blocks walling system. All

peripheral walls are from HELUZ family 44 2 in1 masonry blocks with dimensions of 247x440x249 - on is white acrylic exterior paint, and on some parts especiallz around windows in each floor there is a wooden facade. There are two tipos of internal walls one of them is from HELUZ family 25 2in1 with dimensions of 247x250x249 and the other one is consider to be internal in the first floor and external in the second one, this wall is made from the same material as the peripheral wall.

d) Horizontal load-bearing structures

Ceiling above first as well as second floor is constructed as monolithic reinforced concrete slab. The thickness of the slab structure is– 200 mm and above external walls the thickness is 250 mm due to the HELUZ ring located there. Concrete class and diameter of reinforcement is done according to static calculation.

e) Roof

The roof system used in this family house is a system of green roof. The roof above the garage has an inclination of 3% to just one side and has only one drainage pipe, which is a perforated pipe to divert water into the rain drainage. The roof above the residential part has an inclination of 3% on both sides and has 2 drainage pipes on both sides. The main distributor is DEK.

f) Thermal insulation

Thermal insulation of floor of the first floor is in residential part of the house ISOVER EPS 70S - 140 mm thick, in garage ISOVER PEIMER 120 – 120 mm thick. Thermal insulation of ceiling structure between first and second floor is done by ISOVER EPS T-N - 50 mm. Green roof above the residential pat as well as above the non-residential one is insulated by 200 mm ISOLVER.

g)Windows and doors

Aluminum wooden triple-glazing windows VEKRA Alu design Classic were designed. The entrance doors are from the same material as windows, VEKRA Alu design Classic. Aluminum garage doors are made from TRIDO EXCLUSIVE. The entrance doors are from the same material as windows, VEKRA Alu design Classic and for the back doors opening I design the doors from the same distributor as for entrance door, the only thing which differs is from the esthetical design. Aluminum garage doors are

made from TRIDO STANDARD. All above-mentioned windows and doors are in the same grey color. For more information, see List of Openings in Annex D.

h) Floor

There are two different types of floor finishes – ceramic tiles and laminated floor. In the kitchen, corridor, bathrooms and technical room there are ceramic tiles placed, the other rooms have laminated flooring. There is also a thermal insulation on the floor the thickness depends on the position of the layer ((see part g) Thermal insulation). For more information, see Compositions in Annex D.

B.2.7 Technical and technological equipment

In the first floor of the family house there is a bathroom, technical or laundry room and a kitchen. In the second floor there are two bathrooms one in the master room and the other has an access from the corridor. The bathroom of the master room is above the bathroom from the first floor that's one there will be only one pipe for both of them which will connect to the other pipe located in the entrance room because of the bathroom located above it. Sewerage of kitchen is partially lead individually and then is connected with sewerage from both shafts. Sewerage of garage is connected to one from laundry room. Drinking water, low voltage power lines and sewerage pipes go through foundation strips to desired places. There are four regular washbasins, one kitchen sinks, one shower, two bathtub, three toilets, one washing machine and one dishwasher

B.2.8 Fire safety solution

For more information about fire safety solution see the annex of fire safety report.

B.2.9 Principals in energy saving

Energy saving solution is made in accordance to ČSN 73 0540 - 2. The Energy performance of the building was assessed as B – very economical. For more information, see Annex Building Physics.

B.2.10 Hygienic, working and communal environment requirements

Ventilation of the house is ensured by natural ventilation via windows and doors, also forced ventilation in bathrooms, kitchen and corridors is designed. Gas condensed boiler Vaillant VU 246/5-3 EcoTEC Plus provides heating and hot domestic water. Heating can be also ensured by fireplace on wood.

B.2.11 Principles of protection of buildings against negative effects of environment

The object is protected against penetration of radon by hydroinsulation of foundation slab. Protection against noise – see Annex Building Physics.

B.3 Connection to infrastructure

There are four connections to the building:

- Connection of water pipes with drinking water that is about 6 m long. There is a water meter shaft.
- Two sewerage connections, one of them is 14m long and the other one is 8,2 m with sewer inspection shafts.
- Low voltage power lines are 6,9 m long with main house box electrometer
- Low pressure gas pipes are about 15,2 m long with main gas closure

All above-mentioned connections are connected to public utility network system.

B.4 Traffic solution

The parcel is directly connected to the constructed service road. There is a sidewalk which give as access to the river side. The parcel is easily accessible.

B.5 Vegetation and terrain solution

There is a family house places on the parcel. The terrain is flat, and there is a grass in the garden side. The all parcel has a fence around.

B.6 Description of the effects of construction on the environment and its protection

All used materials meet the hygiene requirements for emissions and foreign substances. During the construction around the building site the dust and noise will be increased.

Conditions to minimize these negative effects will be determined. Finished object will not bother neighborhood with dust or noise by its operation.

The construction does not have any negative effect on the environment.

B.7 Protection of population

All the necessary requirements for the location of buildings and building solutions from the point of view of protection of population according to Decree no. 380/2002 Coll., preparation and execution of the tasks of civic protection are fulfilled.

B.8 Organizational principles during the construction

a) Necessary and critical consumption of media and materials, their security

Before the beginning of the construction there will be build temporary water connections and electricity.

b) Drainage on construction side

Groundwater is located at such a depth that does not affect the progress of construction. Rainwater seeps into the construction site at unpaved areas.

c) Connecting the construction site of the existing transport and technical infrastructure

Construction site will be connected to the existing road. There will be build utility mains water and electricity, which will be connected to the existing technical infrastructure.

d) The effects of construction on surrounding buildings and land

All traffic will take place exclusively on the property builder. Not prejudice surrounding buildings or land. Will Ensuring clean of the adjacent road, which will be contaminated due to travel building.

e) Protection around construction sites and related requirements for decontamination, demolition, tree felling

Surroundings demolition work are needed.

f) The maximum occupation of the construction site (in temporary / permanent)

All the traffic will take place exclusively on the property builder.

g) Balance earthworks requirements for feed or soil dumping ground

Part of depositions in the eastern part of the land will be used for landscaping. The rest of the soil will be dumped. Feed up the soil at the construction site is not needed.

h) Environmental protection during construction

During the construction will be used machinery and equipment in proper condition to avoid environmental damage . During construction, there will not be any air pollution caused by burning for example. All waste will be stored in a landfill .

i) Setting special conditions for the implementation of construction (implementation structures in operation , measures against the effects of external environment during construction , etc.).

Determining special conditions for the implementation of construction is not required .

j) Waste can be sorted into: concrete, plastic, wood, steel, other metals, insulation material, gypsum, soil and rock, mixed building waste

k) Dry toilet will be brought to the construction site.



VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

DETACHED FAMILY RESIDENCE

MAIN TEXT PART OF BACHELOR'S THESIS

B SUMMARY TECHNICAL REPORT

BAKALÁŘSKÁ PRÁCE
BACHELOR'S THESIS

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Ing. FRANTIŠEK VAJKAY, Ph.D.

BRNO 2016

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D1.1 TECHNICAL REPORT

1. SOLUTION OF THE CONSTRUCTION

1.1. Architectonic solution

The parcel with parcel number 444/2 is located in a small town Modřice, 8km far from Brno in South Bohemia and is determined for family house construction. There is a construction of a family house on the parcel. The plot is flat. The parcel has an irregular shape which is the union of three rectangles.

The building has two floors and no basement with vegetation roof. Part of the house is also a garage for two cars. The main entrance is oriented to the north.

The family house has a shape of two rectangles, one bigger, which is the residential part with dimensions 10,03x11,98 m, and one smaller, where are located garage for 2 cars and storage spaces with dimensions 6,95x9,95 m. The residential part, as well as the non-residential one is roofed by green roof. The roof above the residential part as well as of has the non-residential part has the inclination of 3%. This family house is located on flat terrain, without any difficult conditions and the distances between the neighbouring houses are sufficient and fulfilling standards.

1.2 Art solution

The family house has a shape of two rectangles. It has a green roof with attic on both of rectangles. The top layer of the façade is colored by acrylic white paint and at some points especially around windows of doors there are wooden strips. The overall look of the house is created mainly by huge windows located in the front part of the house in the first as well as in the second floor; the other one is located on the side next to staircase.

1.3 Material solution

Materials used for construction of the house are based on current trends in building industry.

1.4 Disposition and operational solutions

The detached family house is a newly constructed structure. The building is meant to be area for living according to decree # 501/2006 Sb. It is to design a detached single-family house suitable for a five-member family by its disposition solution.

The house has two floors and no basement with vegetation roof. The First floors is intended as common space, for familiar meetings. On the other hand, the second floor is a quite zone, where are located all the bedrooms. Part of the house is also a garage for two cars. The access for disabled people is not necessary. The building shape is of two rectangles, one bigger – residential part, and one smaller – garage, technical room and storage

2. BARRIER-FREE USE OF THE BUILDING

The object was not intended to be used by people with reduced mobility and for this reason it is not designed as a barrier-free house. The design is in accordance with §2 of Decree no. 398/2009 Coll., about general technical requirements ensuring barrier-free usage of buildings. During construction of publicly accessible areas, Decree no. 389/2009 Coll, about general technical requirements ensuring barrier-free usage of buildings, will be taken into account.

3. STRUCTURAL AND CONSTRUCTION-TECHNICAL SOLUTION

a) Earthworks

According to the indicative geological appraisal was detected at the level of the foundations soil type F4- Fluvial sandy clays class. These soils are quite suitable for building foundations. Before starting working all the top soil was carry out from the excavation place, according to the drawing of foundations. This soil was stored in a stockpile of maximal height of 1,5 m, located in the Western part of the parcel. During excavation, the foundation base needs to be protected against mechanical damage or unfavourable climate conditions.

b) Foundations

The foundation strips are made of plain concrete of class C20/25, and HELUZ bricks which are below the top soil about 375+375 mm, thickness of those depends of the thickness of the wall above them. In this family house there are three different thickness of foundations. There are external wall which foundation has a thickness of 1000 mm, internal wall made from HELUZ family 25 2in1 has a thickness of its foundation 950 mm

and finally the wall which separate residential part from non-residential one is made from HELUZ family 44 2in1 and its foundation strips have a thickness of 1350mm. These huge thickness of foundation strips is due to soil type which is made from fluvial sandy clays and partially also because of the load transferring by the house itself. All the foundation strips are 1160 mm below the flooring level $\pm 0,000$ (refers to 191 m.a.s.l.). The foundation slab is made of concrete reinforced by KARI net in thickness of 150 mm. The diameters of reinforcement are according to structural design.

c) Hydroinsulation

Hydroinsulations is done underneath the whole structure above foundation slab with the help of hydroinsulation strips GALSTEK 40 Special mineral and ELASTEK 40 Special mineral. Hydroinsulation in form of asphalt felts is also located in the composition of the roof above 1st as well as 2nd floor.

d) Vertical load-bearing structures

All vertical load-bearing structures are from HELUZ blocks walling system. All peripheral walls are from HELUZ family 44 2 in1 masonry blocks with dimensions of 247x440x249 - on is white acrylic exterior paint, and on some parts especiallz around windows in each floor there is a wooden facade. There are two types of internal walls one of them is from HELUZ family 25 2in1 with dimensions of 247x250x249 and the other one is consider to be internal in the first floor and external in the second one, this wall is made from the same material as the peripheral wall.

e) Horizontal load-bearing structures

Ceiling above first as well as second floor is constructed as monolithic reinforced concrete slab. The thickness of the slab structure is– 200 mm and above external walls the thickness is 250 mm due to the HELUZ ring located there. Concrete class and diameter of reinforcement is done according to static calculation.

f) Roof

The roof system used in this family house is a system of green roof. The roof above the garage has an inclination of 3% to just one side and has only one drainage pipe, which is a perforated pipe to divert water into the rain drainage. The roof above the residential part has an inclination of 3% on both sides and has 2 drainage pipes on both sides. The main distributor is DEK.

g) Thermal insulation

Thermal insulation of floor of the first floor is in residential part of the house ISOVER EPS 70S - 140 mm thick, in garage ISOVER PEIMER 120 – 120 mm thick. Thermal insulation of ceiling structure between first and second floor is done by ISOVER EPS T-N - 50 mm. Green roof above the residential part as well as above the non-residential one is insulated by 200 mm ISOLVER.

h) Windows and doors

Aluminum wooden triple-glazing windows VEKRA Alu design Classic were designed. The entrance doors are from the same material as windows, VEKRA Alu design Classic. Aluminum garage doors are made from TRIDO EXCLUSIVE. The entrance doors are from the same material as windows, VEKRA Alu design Classic and for the back doors opening I design the doors from the same distributor as for entrance door, the only thing which differs is from the esthetical design. Aluminum garage doors are made from TRIDO STANDARD. All above-mentioned windows and doors are in the same grey color. For more information, see List of Openings in Annex D.

i) Floor

There are two different types of floor finishes – ceramic tiles and laminated floor. In the kitchen, corridor, bathrooms and technical room there are ceramic tiles placed, the other rooms have laminated flooring. There is also a thermal insulation on the floor the thickness depends on the position of the layer ((see part g) Thermal insulation). For more information, see Compositions in Annex D.

j) Staircase

The structure of the stair flight is constructed from reinforced concrete. Its width is given by the limitation of space to 900 mm. Calculated height is 172,22 mm and width is 260 mm. There are 18 steps designed and the slope of the flight is $31,13^\circ$. The staircase is designed according to standards.

Turned staircase with wing of dimension 18x172,22x260 mm

k) Chimney

There are two chimneys necessary in the house. One is for fireplace on wood made of

HELUZ IZOSTAT system with outer dimensions 400x400mm, and the second one, stainless steel chimneys BOKRA, is for gas boiler, located in the external part of house. It has 130 mm of diameter and 50 of thermal insulation around.

1) Ventilation

Ventilation of the house is ensured by natural ventilation via windows and doors, also forced ventilation in toilet rooms, corridor and kitchen hood is designed.

4. BUILDING PHYSICS

See Building Physics.

3. CONCLUSION

To elaborate this project, I use all necessary standards, regulations, technical lists of different types of materials or elements and others fonts. All the bachelor work was based on previously study project which I have done in the previous semester. The project documentation was worked out in scope of assignment. There is also part Thermal technical assessment of the building, according to which the building is assessed as B class – very economical. Building also meets all fire-safety regulations and decrees. Fire danger area does not extend to surrounding properties. The result of my work is a complete design of a detached family house of two floors which serves for five-member family. Design goes hand by hand with the simplicity and functionality of the building, architectonically it respects the neighbouring buildings since it is located in modern part of Brno.

4. LIST OF USED SOURCES

ČSN 73 0540 - 1,2,3,4 Tepelná ochrana budov.
ČSN 73 0833 Požární bezpečnost staveb – Budovy pro bydlení a ubytování. ČSN 73 0802 Požární bezpečnost staveb – Nevýrobní objekty.
ČSN 73 0810 Požární bezpečnost staveb – Společná ustanovení
ČSN 73 0873 Požární bezpečnost staveb – Zásobování požární vodou ČSN 73 4301 Obytné budovy
ČSN 73 0580 Denní osvětlení budovy
ČSN 73 0532 Akustika, ochrana proti hluku v budovách
ČSN 01 3420 – Výkresy pozemních staveb – kreslení výkresů Zákon č. 183/2006 Sb. o územním plánování a stavebním řádu. Vyhláška č. 268/2009 Sb. o technických požadavcích na stavby Vyhláška č. 62/2013 Sb. o dokumentaci staveb
Vyhláška 499/2006 Sb., o dokumentaci staveb
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

Software used

Microsoft Office 2010
AutoCAD 2015
ArchiCAD 18
Related standards and laws

www-sources

HELUZ available at: www.heluz.cz
VEKRA available at: www.vekra.cz
VAILLANT available at: www.vaillant.cz
GUTTABIT available at: www.guttashop.cz
STAVBA HROU available at: www.stavbahrou.cz
TZB INFO available at: www.tzb-info.cz
RAKO available at: www.rako.cz
BEST available at: www.best.info
CATASTRAL MAP available at: www.cuzk.cz
TECHNICLINIC available at: www.fasadyaterasy.cz
BOKRA available at: www.kominy-bokra.cz
DEK available at: www.dek.cz
MAPEI available at: www.mapei.com
CEMIX available at: www.cemix.cz
LAMETT available at: www.lamett.eu
MIRELON available at: www.mirelon.com

5. LIST OF USED ABBREVIATIONS AND SYMBOLS

Coll.	collocation
ČSN	česká státní norma = Czech state standard
FC	fire compartment
LV	list of ownership
S-JTSK	jednotné trigonometrická síť katastrální = uniform trigonometric cadastral network
VŠKP	vysokoškolská kvalifikační práce = university qualification work
min	minimal
max	maximal
no.	number
par	paragraph
RC	reinforced concrete
mm	milimeter
m	meter
th.	thickness
S	scale

6. LIST OF ANNEXES

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S.6 Section B-B'	S 1:100
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File no. 7 – OTHER CALCULATIONS

Calculation of foundations

Calculation of a staircase

PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ FORMY VŠKP

Prohlášení:

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

V Brně dne 28.4.2016

.....
podpis autora
Janet Klaudie de Ceita

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
FAKULTA STAVEBNÍ



POPISNÝ SOUBOR ZÁVĚREČNÉ PRÁCE

Vedoucí práce

Ing. František Vajkay,
Ph.D.

Autor práce

Janet Klaudie de
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Škola

Vysoké učení
technické v Brně
Stavební

Fakulta

Ústav

Ústav pozemního
stavitelství

Studijní obor

3608R001 Pozemní
stavby

Studijní program

B3607 Civil
Engineering

Název práce

Detached Family
Residence

Název práce v anglickém jazyce

Samostatně stojící
rodinný dům

Typ práce

Bakalářská práce

Přidělovaný titul

Bc.

Jazyk práce

Čeština

Datový formát elektronické verze

Anotace práce

Předmětem této bakalářské práce je návrh samostatně stojícího jednogeneračního rodinného domu. Cílem této práce bylo navržení objektu vyhovujícímu svým dispozičním řešením pětičlenné rodině. Objekt je téměř na rovinatém terénu na vybraném pozemku katastrálního území města Brna, v Modřicích v ulici Polní. Dům má dvě nadzemní podlaží a je nepodsklepený s vegetační střechou. Součástí rodinného domu je taktéž i garáž pro dva osobní automobily. Hlavní vstup je orientován na sever. Obvodové zdivo taktéž i vnitřní je navrženo ze systému Heluz. Strop nad prvním nadzemním podlažím je monolitický železobetonový. Výkresová dokumentace potřebná pro realizaci nového rodinného domu je zpracována včetně pěti konstrukčních detailů. Výkresová část byla zpracována v počítačovém programu Autocad. Součástí práce je také požární a tepelně-technické řešení.

Anotace práce v anglickém jazyce

The subject of this thesis is to design a detached single-family house. The aim was to create an object suitable for a five-member family by its disposition solution. The building is located in almost flat terrain on a specific plot of cadastral area of Brno city, Modřice Street Field. The house has two floors and no basement with vegetation roof. Part of the house is also a garage for two cars. The main entrance is oriented to the north. External as well as internal walls are designed in a technology of Heluz system. Ceiling above first above-ground floor is monolithic reinforced concrete. The project documentation which is needed for a realization of a new detached house is worked up with five structural details including. Drawing part was processed in a computer program AutoCad. The work also includes fire safety and thermos technical solution.

Klíčová slova

Rodinný dům, dvoupodlažní, monolitický železobetonový strop, plochá střecha, vegetační střecha, zděná konstrukce Heluz.

Klíčová slova v anglickém jazyce

Family house, two-storeyed, monolithic reinforced concrete ceiling, flat roof, green roof, brick construction Heluz.