



VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ

FACULTY OF CIVIL ENGINEERING

ÚSTAV POZEMNÍHO STAVITELSTVÍ

INSTITUTE OF BUILDING STRUCTURES

SAMOSTATNÉ RODINNÉ BYDLENÍ

DETACHED FAMILY RESIDENCE

MAIN TEXT PART OF BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

BACHELOR'S THESIS

AUTOR PRÁCE

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BRNO 2018



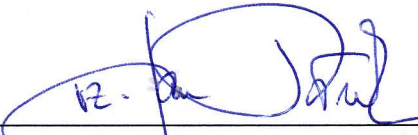
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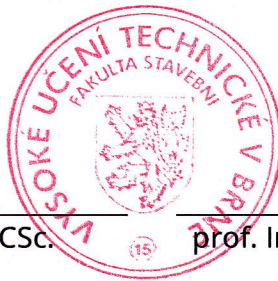
Studijní program	B3607 Civil Engineering
Typ studijního programu	Bakalářský studijní program v anglickém jazyce a prezenční formou studia
Studijní obor	3608R001 Pozemní stavby
Pracoviště	Ústav pozemního stavitelství

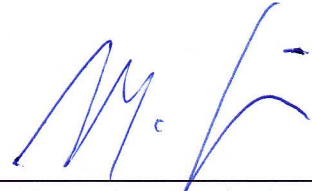
ZADÁNÍ BAKALÁŘSKÉ PRÁCE

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Název	Detached family residence
Vedoucí práce	Ing. František Vajkay, Ph.D.
Datum zadání	30. 11. 2017
Datum odevzdání	25. 5. 2018

V Brně dne 30. 11. 2017


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PODKLADY A LITERATURA

(1) Směrnice děkana č. 19/2011 s dodatky a přílohami; (2) Katalogy odborných firem a odborná literatura; (3) Stavební zákon č. 183/2006 Sb. ve znění pozdějších předpisů; (4) Vyhláška č. 499/2006 Sb. ve znění pozdějších předpisů; (5) Vyhláška č. 268/2009 Sb. ve znění pozdějších předpisů; (6) Vyhláška č. 398/2009 Sb.; (7) Další související vyhlášky, (8) Platné normy ČSN, EN; (9) Vlastní dispoziční a architektonický návrh.

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Zadání: Zpracování určené části projektové dokumentace pro provádění stavby nepodsklepené zadané budovy. **Cíle:** Vyřešení dispozice budovy s návrhem vhodné konstrukční soustavy a nosného systému na základě zvolených materiálů a konstrukčních prvků, včetně vyřešení osazení objektu do terénu s respektováním okolní zástavby. Dokumentace bude v souladu s vyhláškou č. 62/2013 Sb. obsahovat část A, část B, část C a část D v rozsahu části D.1.1 a D.1.3. Dále bude obsahovat studie obsahující předběžné návrhy budovy a jeho dispozičního řešení a přílohou část obsahující předběžné návrhy základů a rozměrů nosných prvků řešené budovy a prostorovou vizualizaci budovy. Výkresová část bude obsahovat výkresy: situací, základů, půdorysů zadaných podlaží, konstrukce zastřešení, svislých řezů, technických pohledů, min. 5 detailů, výkres(y) sestavy dílců, popř. výkres(y) tvaru stropní konstrukce. Součástí dokumentace budou i dokumenty podrobnosti dle D.1.1 bod c), stavebně fyzikální posouzení objektu a vybraných detailů, popř. další specializované části, budou-li zadány vedoucím práce. **Výstupy:** VŠKP bude členěna v souladu se směrnicí děkana č. 19/2011 a jejím dodatkem a přílohami. Jednotlivé části dokumentace budou vloženy do složek s klopami formátu A4 opatřených popisovým polem a uvedením obsahu na vnitřní straně každé složky. Všechny části dokumentace budou zpracovány s využitím PC v textovém a grafickém CAD editoru. Výkresy budou opatřeny popisovým polem. Textová část bude obsahovat i položky 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".

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

Abstrakt

Předmětem této bakalářské práce je vypracování projektové dokumentace pro samostatnou rodinnou rezidenci. Rodinný dům se nachází v Brně-Královo Pole, v katastrálním území Sadová. Rodinný dům se nachází na relativně plochém pozemku a je situován na jižní stranu. Dům má dva nadzemní podlaží, s balkonem ve druhém patře a plochou střechou. Na východní straně se nachází garáž a sklad. Celá stavba rodinné rezidence je ze dřeva, s hlavním zaměřením na stavební materiály firmy Steico. Všechny izolační materiály jsou od společnosti Isover. Projektová dokumentace byla provedena v počítačovém softwaru Revit.

Klíčová slova

Samostatný rodinný dům, steico, isover, dřevo, dřevěná konstrukce, plochá střecha

Abstract

The subject of this bachelor thesis is to elaborate project documentation for a detached family residence. The family house is located in Brno-Královo Pole, the cadastral area of Sadová. The family house is located on relatively flat land and is situated to the south side. The house has two above ground floors, with balconies on the second floor and a flat roof. On the east side there is a garage and storage room. The whole construction of the family residence is from wood, with the main focus on construction materials from the company Steico. The insulation materials are all from the company Isover. Project documentation was done in a computer software Revit.

Keywords

Detached family house, steico, isover, wood, wooden construction, flat roof

Bibliografická citace VŠKP

Dávid Lend'ák Detached family residence. Brno, 2018.43 s., 156 s. při. 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 vypracoval bakalářskou práci samostatně a že jsem uvedl všechny použité informační zdroje.

V Brně dne 15.5.2018

.....
podpis autora

Dávid Lendřák

Acknowledgements

First of all I would like to thank my supervisor of Bachelor's Thesis Ing. František Vajkay Ph.D., for professional help, valuable comments and advice during the elaboration of my thesis.

Special thanks goes to my parents for their continuous support and motivation.

Poděkování

V prvom rade by som chcel poďakovať môjmu vedúcemu bakalárskej práce Ing. Františkovi Vajkayovi Ph.D., za odbornú pomoc, hodnotné pripomienky a rady pri spracovaní mojej bakalárskej práce.

Osobitné poďakovanie patrí mojim rodičom za ich nepretržitú podporu a motiváciu.

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Introduction

The aim of this Bachelor's Thesis is focused on elaboration of project documentation for a detached family residence. The building is designed from wooden construction, mainly focused on the construction materials from the company Steico. The building family house is designed as a frame construction with two above ground floors and a garage. The house has a flat roof and is oriented to the south side. The object is designed according to valid Czech standards.



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A. ACCOMPANYING REPORT

A.1. Identification data

A.1.1. Building data

1. Construction name: Detached family residence

2. Place of construction: Parcel number 251/6

Brno

Cadastral territory: Sadová

3. The subject of project documentation

The aim of the project documentation is the design of the family house including all the necessary drawings for the construction of the house.

A.1.2. Information of the builder

Robert Banič, Družstevná 23, 971 01 Prievidza, Slovakia

A.1.3. Information of the designer of the project documentation

Dávid Lend'ák, Helcmaovce 101, Slovakia

A.2. Division of buildings on objects and technical and technological units

- Detached family house
- New utility connections

A.3. List of input data

- Data from cadastral map- information about the parcel
- Data from cadastral map- information about neighbouring parcels

- Landscaping and altitudinal measuring of the land
- Protocol on the determination of the radon index of the land
- Requirements of the investor



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B. TECHNICAL REPORT

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B. TECHNICAL REPORT

B.1. Description of construction areas

B.1.1. Characteristics of the territory and building plot, constructed and unconstructed territory, the conformity of the proposed building with the character of the territory, the existing utilization and the building of the territory

The aim of the design is a new detached family house including paved areas, utility networks (water connections, sewerage and electricity) and fencing. The detached family house including paved areas, utilities (domestic water supply, sewerage and electricity), retention reservoirs and fencing will be realized on the land parcels No. 251/6 in cadastral area. Sadová (owned by the investor). The walkable concrete pavement and concrete pavement will be realized on this parcel. The land is located in the center of the district, in a location of without neighboring houses. The land is of square shape, its northern and eastern boundary is adjacent to the local road, and other building sites are connected to the east and west. The land is without trees.

B.1.2. Data on compliance with a Territorial Decision or a Regulatory Plan or a Public Law Territorial Decision

This documentation also serves as documentation for the issue of a common consent.

B.1.3. Data on compliance with land-use planning documentation, in the case of building modifications that make a change in the use of the building

Sadová is located partly in the area of family houses, partially in unconstructed area on agricultural, permanent grasslands. In accordance with the conditions of use of these areas, a new family house is proposed. The plan complies with the urban, architectural and aesthetic requirements of the use and spatial arrangement of the area with regard to the current nature of the area. By implementing the project, the conditions in the area are not altered significantly, the plan does not require new demands on the public transport and technical infrastructure and the project is not subject to an environmental impact assessment.

B.1.4. Information on the decisions to grant exemption from general land use requirements

There were no exemptions to the construction. The general requirements for land use have been respected.

B.1.5. Information on whether and in what parts of the dossier the conditions of the binding opinions of the authorities concerned are taken into account

The requirements were respected and are processed in a separate paragraph which is a part of the project documentation.

B.1.6. List and conclusions of conducted surveys and analyzes - geological survey, hydrogeological survey, building historical survey, etc.

- Data from cadastral map- information about the parcel
- Data from cadastral map- information about neighbouring parcels
- Landscaping and altitudinal focus of the land
- Protocol on the determination of the radon index of the land

B.1.7 Territory protection under other legislation

Land parcel number 251/6 in the cadastral area Sadová is not located in a monument reservation or in a monument zone. The construction will be done with on parcel with anticipated archaeological finds. On the parcel there is no settlement area.

The land is not a part of any national park or protected area. The land does not have any protected element according to the law no. 114/1992 Coll. The land is not a part of Natura 2000.

B.1.8. Position relative to the flooded territory, undermined territory, etc.

The land is not located on a flood or mined area.

B.1.9. Effects of the construction on surrounding buildings and land, protection of the environment, impact of the construction on drainage conditions in the territory

The buildings standoff distance will exceed to the neighboring parcel no. 255/2 and 252/7. There are no buildings constructed on the neighboring area. The owners of the neighboring areas and the investor know of this issue. The land does not contain any sources of technological noise or sources of hazardous radiation. The transient noise load during the construction works is generated by the use of the construction machinery and will be minimized. Work will not be performed at night time. There will be no pollution of on this land. The built up area on this land is 171 m². The rainwater will be taken into the sewerage system. The sewage will be drained into the sewage system.

B.1.10. Requirements for decontamination, demolition, felling of trees

The parcel is free of any current buildings or trees so there will be no demolition of current structures on this parcel. There are no trees which are higher than 130 cm and thicker than 80 cm.

B.1.11. Requirements for the maximum temporary and permanent occupation of an agricultural land fund or land intended for the performance of forest functions

The land parcel 251/6 is owned by the investor. Permanent requirement for ZPF occupation:

Built-up area: 171 m²

Paved area: 91 m²

According to the cadastral map, this land type is garden. The whole area of this land is 543 m². The top soil will be excavated to a depth of 35cm (20 + 15cm). The total mass of the removed cover is 59.85 m³. The removed soil will be kept on the land for further use.

B.1.12. Territorial technical conditions - especially the possibility of connection to the existing transport and technical infrastructure, the possibility of barrier-free access to the newly proposed construction

The communication road is adjacent to the south and east side. There will be no changes to the communication road. New paved area will be made on the parcel 251/6 to connect the communication road and garage.

Existing utilities (water, sewage and storm sewers, NN, gas) are adjacent to the south and east part of the site. The new building will be connected with new water and sewerage connections. The electricity connection will be connected from the south communication road.

Law no. 398/2009 Coll., on general requirements ensuring the barrier-free use of the building, does not apply because it is not a building under this paragraph.

B.1.13. Material and temporal links of the construction, conditional, induced, related investments of this paragraph.

None.

B.1.14. A list of the land according to the cadastral map on which the construction is placed and carried out

Parcel number: 251/6, cadastral region Sadová [611565], no. LV. 927, area. 543 m², type of parcel. Land registry parcel, type of the land: garden.

B.1.15. List of land according to the cadastral map, on which a protection or danger zone will arise

The standoff distance extends to the following parcel. 255/2 and 252/7.

B.2. GENERAL DESCRIPTION OF BUILDING

B.2.1. Basic characteristics of the construction and its use

B.2.1.a. New construction or change of completed building; in the case of a change in the construction, the data on their current state, the conclusions of the construction technical, eventually the structural-historical survey and the results of the static assessment of the supporting structures

The aim of the design is a new detached family house including paved areas, utility networks (water connections, sewerage and electricity) and fencing.

B.2.1.b Purpose of building use

Building for living.

B.2.1.c Long-term or short-term building

The building is long-term.

B.2.1.d Information on the decisions to grant an exemption from technical requirements for construction and technical requirements ensuring the barrier-free use of the construction

According to Decree. No. 398/2009 Coll., The general requirements for the barrier-free use of the building do not apply because the building does not belong under this requirements.

B.2.1.e Information on whether and in what parts of the documentation the conditions of the binding opinions of the authorities concerned are taken into account

The requirements of the concerned authorities and connection network are processed in the project documentation.

Before the start of the construction, all the network connection will be marked. In the area of interest there is water, sewerage, gas, electricity of low voltage. When carrying out earth-works or other work that may endanger the distribution line in question, it is necessary to comply with Act 309/2006 Coll. and Government Regulation 591/2006 Coll., to take all measures to avoid damage to equipment, property or the health of persons. Any damage must be reported. The builder agrees to meet the conditions of the affected authorities and owners of the technical and transport infrastructure. The requirements are processed in the paragraph which is a part of the project documentation.

B.2.1.f Protection of construction according to other legal regulations

It's a detached family house that it is not a subject to other building protection regulations

B.2.1.g Proposed parameters of the construction - built-up area, pavement area, usable area, number of functional units and their size, b.

Built up area: 171 m²

Pavement area: 91 m²

Usable area: 271 m²

Number of functional units: 2

Number of users: 5

B.2.1.h The basic balance of the construction - needs and consumption of media and masses, management of rainwater, total product quantity and types of waste and emissions, energy class of buildings, etc.

- Rainwater:

Roof (family house): 141 m ²	141 x 0,030 x 1,00	4,23 l/s
Roof (garage): 35, 60 m ²	35,60 x 0,030 x 1,00	1,07 l/s
Annual water runoff:		81,27 m ³ /year

- Gas:

The family house won't have gas connection

- Water:

Average daily water demand $Q_p = q \times n = 96 \times 5 = 480$ l/day

Maximum daily water demand $Q_m = Q_p \times k_d = 480 \times 1.25 = 600$ l/day

Maximum hourly water demand $Q_h = (Q_m \times K_h) / 12 = (600 \times 1,8) / 12 = 90$ l/h

Annual demand $Q_r = Q_p \times 365 = 0.48 \times 365 = 175,2$ m³/year

- Sewerage:

Average daily drain $Q_p = 1,15$ m³ / day

Maximum daily drain $Q_m = 1.44$ m³ / day

Maximum hourly runoff $Q_h = 0.216$ m³ / h

Annual runoff $Q_r = 419,75$ m³ / year

- Energy class: B
- Waste:

Common waste from the new RD building will be solved by a dustbin, which is situated on the south side of the land.

B.2.1.i Basic building prerequisites - time data on construction realization, division into stages

Assumed date for starting of the construction is 07/2018

Assumed date for finishing of the construction is 07/2019

B.2.1.j Indicative construction costs

2.7 million CZK

B.2.2 Urban and architectural design solution

B.2.2.a Urbanism - spatial regulation, composition of spatial solution

The terrain of the land is relatively flat with almost a square shape. It is situated on the north side on the land and situated to the south and west side. Main entrance is situated on the south side of the house. Entrance hall is connected to the changing room. From the changing room storage and main hall is accessible. Main hall connects living room with kitchen, technical room, toilet and grants access to the staircase which is located on the second floor. Living room and kitchen are connected together and situated on the west side of the house. In the kitchen there an access to a patio outside and also a small pantry is located in kitchen. Toilet is located on the north side. On the second floor, right after going up the stairs, main hall connects all the rooms on this floor. On the south side there is the master bedroom, host room and a bedroom, all have their own balcony situated to the south side. On the west side there is one bedroom with a balcony. On the north-east side we have bathroom and on the north side there is also a bathroom.

The distance of the front facade from the street boundary is 12.9 m. The shortest distance from the common border with the plot parcel 252/7 is 2 m, the shortest distance from the common border with the plot parcel 255/2 is 4,36 m.

From the urban point of view, the building will fit into the neighboring area.

B.2.2.b Architectural solution - composition of shape solution, material and color solutions

The shape of the house is rectangular with the length 14,57 m and width 9,61 m. The house has no basement and a flat roof. On the east side there is a garage and a storage room adjacent to the house with the width 4,19 m and length 9,61 m. The façade will be a ventilated façade with white color cement fiber boards. The openings will have an anthracite frame color. On the west side there is a patio which is connected to the kitchen.

The street part of the fencing will be of plastered mesh. Overall height according to the terrain configuration max. 1800 mm.

The walkable pavement on the land will be from concrete and the pavement that leads to the garage will be from concrete tiles.

B.2.3 Total operational solution, production technology

Disposition solution is made according to the requirements of the investor. The main entrance is on the first floor, which leads to the entrance hall and changing room. Changing room is connected with storage room and main hall from which we can access second floor, technical room and a living room which is connected to kitchen.

On the second floor there is a long wall which connects all the rooms, 2 bed rooms, 1 host room, 1 master bedroom and 2 bathrooms.

B.2.4 Barrier-free use of the building

The family house is not subject to the requirements. no. 398/2009 Coll., On general requirements ensuring the barrier-free use of buildings.

B.2.5 Safety in use of the building

The design documentation is prepared in accordance with the requirements of the regulations and relevant standards. After completion, the construction allows its safe use.

B.2.6 Basic Characteristics of Objects

B.2.6.a Building, construction and material solutions

The aim of the design is a new detached family house including paved areas, utility networks (water connections, sewerage and electricity) and fencing.

Family house: The shape of the house is rectangular with the length 14,57 m and width 9,61 m. The house has no basement and a flat roof with a slope of 2%. On the east side there is a garage and a storage room adjacent to the house with the width 4,19 m and length 9,61 m. The Ventilated façade with white color cement fiber boards and anthracite colored frame of openings. The height of the building from the FGL is 7,22 m.

The building is constructed on foundation strips from plain concrete C20/25 and reinforced concrete slab with thickness of 200 mm. External load-bearing walls are made from load-bearing STEICO joist SW60, which are constructed with the maximum distance of 625 mm and is filled with mineral wool ISOVER WDF plus. The external sheeting is from OSB 15 mm.

Utility network connections: There are 4 connection to the building.

- Connection of water pipes with drinking water that is about 15,4 m long. There is a water meter shaft about 2 m from the fencing.
- Connection of rainwater sewerage is 13 m long, it will transport the water from the flat roof of the family house and garage roof to the rainwater sewage. There is a plastic inspection shaft located 1 m from the fencing
- Connection of sewerage system is 13 m long and it has a sewerage inspection shaft with the diameter 600 mm
- Connection of low voltage powerline is located on the south side of the parcel, the connection is 15 m long and there is electrometer box situated on the south side.

Paved areas: The paved areas will be done by concrete tiles

Fencing: Fencing adjacent to the road will done by wire mesh with green mesh foil and the rest of the fencing will be without the green mesh foil

B.2.6.b Mechanical resistance and stability

The object is designed in accordance with ČSN EN 1990 Principles of designing structures, ČSN EN 1991 Structural load and ČSN EN 1995 Design of wooden constructions.

All used components meet the given requirements and correspond to the values of the utility, climatic and other loads considered in the design of the supporting structure. The structure is designed so that the load acting on it doesn't damage the structure.

The object is designed for the conditions set forth in the above standards. Limiting conditions of the object's location Situation of the object

- Altitude: 292.115 m.a.s.l.
- Snow area: II

No dynamic stress is acting on the structure. The main loadbearing structure is made from certified components from the company STEICO and the construction is processed according to their rules and requirements.

B.2.7 Basic characteristics of technical and technological equipment

B.2.7.a Technical solution

The main heat source will be electric floor heating from the company FENIX. The house will have PV (photovoltaic) panel on the roof as a secondary electricity intake. In the technical room there will be electric boiler with will have the ability to heat the water from the electricity from the PV panels. The will also be recuperation unit located in the technical room.

B.2.7.b List of technical and technological equipment

- Recuperation unit
- Electric boiler

B.2.8 Fire safety solution

The fire protection of the building will be dealt with in accordance with ČSN 730833 Buildings for housing and accommodation and other related standards of the Fire Safety of the Building. For more information see fire safety solution annex of fire safety report.

B.2.9 Energy saving and thermal protection

Energy saving solution is made in accordance with 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 Hygiene requirements for buildings, requirements for work and communal environments

Ventilation: Ventilation of the house is ensured by natural ventilation via windows and doors, and also passive ventilation by recuperation is installed in all the rooms. The recuperation unit (VENTBOX 300 Basic) is located in technical room.

Hot water storage: Electric boiler (Boiler LX ACDC/M+K(W)) will provide the hot water, it will be connected to PV panels and the main electricity circuit.

Day lighting solution: Daily lighting and house lighting are in accordance with hygienic requirements. All living rooms have daylight in accordance with ČSN 73 0580.

Heating solution: The main heat source will be electric heating mats ECOFILM from the company FENIX. The floor temperature of the heated floor in living quarters may be up to 28 ° C according to the hygiene standard. The surface temperature of the heated floor in bathrooms and washrooms is not restricted by the standard and may be above 30 ° C. The designed installing in permanently occupied rooms is 100 W / m² of power and 160 W / m² of power can be installed in other rooms.

Water supply: The building will be connected to the public water main.

Sewerage: The building will be connected to the main sewerage system.

The influence of the building on the surroundings: The building will have no influence on the surrounding building, it won't shade or obstruct the neighboring building in anyway. External noise construction will not be produced and internal solutions and used building materials meet the requirements of the standards.

B.2.11 Principles of building protection against adverse effects of the external environment

B.2.11.a Protection against penetration of radon from the subsoil

The land has a medium radon index according to the map. The building will be protected against radon with bitumen asphalt strips on reinforced concrete.

B.2.11.b Protection against stray currents

This issue was not addresses because negative effects like tram, rail station, trolleybus are not located around the parcel.

B.2.11.c Protection against technical seismicity

This issue was not addressed because negative effects like (blasting, transport, industrial activities, pulsating water, etc.) are not around the vicinity of the proposed building.

B.2.11.d Protection against noise

Around the vicinity of the family house there is no source of noise from the workshop or production. The heating of the family house will be done by electricity and a heat pump is not installed in the house. The nearest main road is located roughly 70 meters away, it will not have negative effect on the proposed building. See Annex building physics for protection against noise.

B.2.11.e Flood protection measures

The parcel is not located in the flood territory.

B.2.11.f Other effects - influence of undermining, occurrence of methane, etc.

There are no mines or methane in the proposed area.

B.3 CONNECTION TO TECHNICAL INFRASTRUCTURE

- Connection to public water supply: The family house will be connected to the public water supply by connection long 15.4 m and DN25.
- Connection of rainwater sewerage is DN 125 and 13 m long, it will collected transport the rain water from the main family house roof and garage roof. There is a plastic inspection shaft located 1 m from the fencing.
- Connection of sewerage system is DN160 and 13 m long and it has a sewerage inspection shaft with the diameter 600 mm.
- Connection of low voltage powerline is located on the south side of the parcel, the connection is 15 m long and there is electrometer box situated on the south side.

B.4 TRANSPORT SOLUTIONS

B.4.a Description of the transport solution including barrier-free accessibility and use of the building by persons with reduced mobility or orientation

Decree No. 398/2009 Coll., On general requirements ensuring the barrier-free use of the building, does not apply because it is not a building under this paragraph. The road connection is adjacent to the south and east side of the parcel.

B.4.b Connection of the territory to the existing transport infrastructure

The main road is adjacent to the south and east side of the parcel, with the entrance to the parcel located on the south side. The entrance to the parcel by car is 4 m wide and is connected to the existing road by lowered curbs. The paved area will be done by concrete tiles.

B.4.c Transport at re

There will be a parking place for 1 car on the east side of the house.

B.4.d Walking and cycling trails

Around the vicinity of the parcel there is a walking trail located adjacent to the main communication road. The cycling trail is non existing in this area.

B.5 SOLUTION OF VEGETATION AND RELATED TERRESTRIAL ADJUSTMENTS

B.5.a Landscaping

Landscaping will only be done by the extraction of the top of the soil and the soil will be stored on site and later used for minor landscaping changes.

B.5.b Used vegetation elements

Vegetation elements are not processed in the documentation.

B.5.c Biotechnical measures

No biotechnical measures will be done.

B.6 DESCRIPTION OF THE ENVIRONMENTAL CONDITION AND ITS PROTECTION

B.6.a Effects on the environment - air, noise, water, waste and soil

- Air

Main heat source are electric mats. Secondary heat source is a recuperation unit. It will have no negative effect on the environment.

- Noise

No technological units are installed on the parcel. The building will have no negative effect on the environment.

- Water

Around the vicinity of the area there is no water stream or river. The building will be connected to the main water source. The runoff water from the roof will be connected to the rainwater sewerage system.

- Waste

The building is connected to the public sewerage system. It will cause no effect negative on the environment.

- Soil

The topsoil gathered from the parcel will be stored and later used on the parcel.

B.6.b Influence on nature and landscape - tree conservation, protection of memorable trees, protection of plants and animals, preservation of ecological functions and landscapes, etc.

- Trees conservation

There are no trees existing on parcel, no conservation is necessary.

- Protection of memorable trees

There are no trees existing on parcel, no protection is necessary.

- Protection of plants and animals

There are no animals or protected plants around the vicinity of the parcel.

- Preservation of ecological functions and landscapes

The family house will not affect ecological functions and boundaries in the landscape.

B.6.c Impact on the Natura 2000 system of protected areas

The family house is not located in a Natura 2000 protected area.

B.6.d The way to take into account the conditions of the binding opinion of the Environmental Impact Assessment when it is the basis

This condition is not assessed.

B.6.e In the case of projects falling under the Integrated Prevention Act, the basic parameters of the way to conclude on the best available techniques or the integrated permit, if issued

The proposed building does not fall under the Integrated Prevention Act.

B.6.f Proposed protection and safety zones, extent of restrictions and conditions of protection under other legislation

The assessment of new safety and security zone is not required.

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 CONSTRUCTION ORGANIZATION PRINCIPLES

B.8.a Consumption of media and materials, and their securing

The main heating system for the building will be electric heating mats. No media or materials will be consumed on the parcel.

B.8.b Site drainage

Rainwater from the roofs will be connected to the main rainwater sewerage system.

B.8.c Linking the site to the existing transport and technical infrastructure

The family house will be connected to the existing road on the south side. New connection will be made (water mains, sewerage, rainwater sewerage and electricity), which will be connected to the existing technical infrastructure.

B.8.d Effect of construction on surrounding buildings and land

The family house will be built on a parcel that is owned by the investor.

B.8.e Protection of the surrounding site and requirements for related decontamination, demolition and felling of trees

The building site will be inaccessible to third parties. This will be ensured by fencing the confined space, the fencing will be safe for people with reduced mobility and orientation. There are no trees on the parcel.

B.8.f Maximum temporary and permanent construction occupation for the site

The length of the occupation will be as short as possible.

B.8.g Maximum quantities produced and types of waste and emissions during construction, their disposal

Construction waste will be sorted according to the law. Waste can be sorted into: concrete, other metals, insulation material, plastic, wood, steel, gypsum, soil and rock, mixed building waste. Soil and rock will be stored on site.

B.8.h Balance of earthworks, supply requirements or soil deposition

During the construction, 35 cm of soil layer will be taken and stored on the parcel, it will later be used for landscaping. Excavation soil will also be stored and later used on site.

B.8.i Environmental protection during construction

The family house is from wooden construction, there won't be any environmental risks during the construction.

B.8.j Safety and health at work on site

During construction and preparation of the building it is necessary fulfill all the necessary laws.

B.8.k Modifications for barrier-free use by the construction of the buildings concerned

Due to the extent of the construction it is not solved.

B.8.l Principles for transport engineering measures

Due to the extent of the construction it is not solved.

B.8.m Determination of special conditions for the execution of the construction - execution of the construction during operation, measures against the effects of the external environment during construction etc.

Due to the extent of the construction it is not solved.

B.8.n Construction process, decisive partial deadlines

Expected start date of construction: 06/2018

Expected completion date of construction: 06/2019 the construction will take place in one stage

D. Documentation of objects and technical and technological equipment

D.1 Documentation of a building or engineering building

D.1.1 Architectural and construction solutions

1.1. Technical report

Purpose of the object, functionality, capacity

The design of the family house is for permanent residence of 5 family members. The building is designed from wooden construction. The building is located on a land with area of 543 m², it is the only building on this land. The Building is situated on the north side of the land and with entrance situated to the south side. On the east side of the building there is a garage and a storage room.

Architectural, art, material and layout solutions

Main entrance is situated on the south side of the house. Entrance hall is connected to the changing room. From the changing room storage and main hall is accessible. Main hall connects living room with kitchen, technical room, toilet and grants access to the staircase which is located on the second floor. Living room and kitchen are connected together and situated on the west side of the house. In the kitchen there an access to a patio outside and also a small pantry is located in kitchen. Toilet is located on the north side. On the second floor, right after going up the stairs, main hall connects all the rooms on this floor. On the south side there is the master bedroom, host room and a bedroom, all have their own balcony situated to the south side. On the west side there is one bedroom with a balcony. On the north-east side we have bathroom and on the north side there is also a bathroom.

The building is designed from wooden construction, the loadbearing elements are STEICO columns with maximum distance of 625 mm. The construction is filled with mineral wool ISOVER WDF plus and covered with OSB thickness 15 mm. On the internal side there is 60 mm of ISOVER UNI which is covered by gypsum board. The external side is made of ventilated façade, the finish elements are cement fiber boards EQUITONE. The load bearing walls are constructed on foundation strips. The house has a flat roof. The entrance is oriented on the South side.

Barrier-free use

The building is not meant for barrier free use.

Overall operational solution

The main heat source will be electric floor heating from the company FENIX. The house will have PV (photovoltaic) panel on the roof as a secondary electricity intake. In the technical room there will be electric boiler with will have the ability to heat the water from the electricity from the PV panels. The will also be recuperation unit located in the technical room.

Design and construction technical solutions and technical characteristics of the building

The building is constructed on foundation strips from plain concrete C20/25 and reinforced concrete slab with thickness of 200 mm. Foundation strips will be concreted into already prepared and dug out strips. The depth of the strip is 1050 mm. On the foundation strips will be placed a reinforced concrete slab with thickness 200 mm. Reinforcement will be carried out by welded wire mesh from steel B500B. Hydro insulation will made from waterproofing bitumen strip elastek 40 special mineral. This hydro insulation will cover the whole reinforce concrete slab.

Sole plate, STEICO LVL R thickness 45mm, will be assembled on the perimeter of the reinforced concrete slab. On this STEICO SW 60 column joist will be assembled, the maximum axis distance will be 625 mm. Bracing must be done during the construction of these columns. Another sole plate will be assembled on top of the joists, and the same construction process will be done on the second floor. To reach the top height we must use scaffolding. Sheeting will be assembled on the exterior side with oriented strand board (OSB) 15 mm. Insulation will be stuffed between the joists and the interior side will be closed by another OSB 15mm. OSB will be connected to the joists by steel clips, which must be placed every 150 mm. On the exterior side wooden battens will be assembled in horizontal direction every 625 mm in which mineral wool naturboard will be placed in. Battens 30 x 60 with vertical direction will be assembled on these battens and on which EQUITONE cement fiber board will be assembled. The exterior side will be a ventilated façade.

Load-bearing columns will be assembled on the anchors which must be concrete into the foundation of the column. On these columns, wooden girder, glue laminated timbers, will be assembled. On these girders, STEICO joists will be assembled. On the joists, OSB will be assembled and connected with steel clips. Impact sound insulation will be placed and connected to the OSB with PU adhesive, then it will be covered with 25 mm OSB and mechanically connected with a screw. Floor finish will be done according to the type of room, either laminated flooring or ceramic floor.

Internal non load-bearing partition walls will be made from wooden studs 60 x 100 with maximal axial distance of 625 mm. Acoustic insulation ISOVER will be placed inside the space and it will be sheeted by gypsum boards th. 12,5mm.

The load-bearing element of flat roof are STEICO joists SJ45-90, depending on the placement of the joists, with maximum distance of 625 mm. ISOVER uniroll plus is placed between the joists and is sheeted with OSB th. 12,5 mm from the bottom and top side. Thermal insulation ISOVER EPS 100S is placed on top and the gradient layer is formed by polystyrene styro EPS 150S.

The staircase is made from wood with stringers attached to the wall and partition, the thickness of the stringer is 50 mm.

Building safety

The safety of using the building will be governed by the Decree No. 324/1990 Coll., On Safety work and technical equipment for construction work, as amended.

Building physics

This part is solved in the appendix Building physics.

Fire safety

This part is solved in the appendix Fire safety.

Data on the required quality of the proposed materials and the performance.

The materials used for the construction must have the characteristics required by the standard and designed in the design documentation. The processing of the materials must be in accordance with the technological procedures specified by the manufacturers.

Description of non-traditional technological procedures and special requirements for realization and quality of designed structures

All the procedures are according to the manufacturer.

Requirements for the preparation of documentation provided by the contractor - content and extent of the production and works documentation by the contractor

All the necessary documents and drawings are assessed in the project documentation.

List of standards used

ISO 128 - 23 - Technical drawings - Display rules

ČSN 01 3420 - Drawings of building structures - drawings of building parts

ČSN 73 0600 - Waterproofing of Buildings - Basic Provisions

ČSN 73 4130 - Stairs and inclined ramps - Basic requirements

ČSN 73 0802 - Fire safety - Non-production object

ČSN 73 0580 - Daylight building lighting

CSN 73 0810 - Fire Safety of Buildings - Fire Resistance Requirements

CSN 73 0821 - Fire Safety - Resistance of Building Structures

CSN 73 0833 - Fire safety - Buildings for housing and accommodation

ČSN 73 0540 - Thermal protection of buildings

ČSN 73 0532 - Acoustics - noise protection in buildings and acoustic assessment properties of construction products – Requirements

Drawings

D.1.1.1 1.F PLAN

D.1.1.2 2.F PLAN

D.1.1.3 SOUTH AND EAST VIEW

D.1.1.4 NORTH AND WEST VIEW

D.1.1.5 SECTION A-A'

D.1.1.6 SECTION B-B'

D.1.2 Building structural solution

1.1 Technical Report

Foundations

The building is constructed on foundation strips from plain concrete C20/25 and reinforced concrete slab with thickness of 200 mm. Foundation strips will be concreted into already prepared and dug out strips. The depth of the strip is 1050 mm. On the foundation strips will be placed a reinforced concrete slab with thickness 200 mm. Reinforcement will be carried out by welded wire mesh from steel B500B. Hydro insulation will be made from waterproofing bitumen strip elastek 40 special mineral. This hydro insulation will cover the whole reinforced concrete slab.

Peripheral walls

Sole plate, STEICO LVL R thickness 45mm, will be assembled on the perimeter of the reinforced concrete slab. On this STEICO SW 60 column joist will be assembled, the maximum axis distance will be 625 mm. Bracing must be done during the construction of these columns. Another sole plate will be assembled on top of the joists, and the same construction process will be done on the second floor. To reach the top height we must use scaffolding. Sheeting will be assembled on the exterior side with oriented strand board (OSB) 15 mm. Insulation will be stuffed between the joists and the interior side will be closed by another OSB 15mm. OSB will be connected to the joists by steel clips, which must be placed every 150 mm. On the exterior side wooden battens will be assembled in horizontal direction every 625 mm in which mineral wool naturboard will be placed in. Battens 30 x 60 with vertical direction will be assembled on these battens and on which EQUITONE cement fiber board will be assembled. The exterior side will be a ventilated façade.

Columns

Columns will be made from GLULAM wood GL24c with dimension 160 x 160 mm. Columns will be assembled on the anchors which must be concrete into the foundation of the column. On these columns, wooden girder, glue laminated timbers, will be assembled. Internal columns will be sheeted by RIGIPS gypsum board for better fire protection.

Floor

On these girders, STEICO joists will be assembled with maximum distance of 625 mm. The type of joist varies on the placement three types of joists will be used, SJ45, SJ60, SJ90. The joists will be assembled into the joist hangers. On the joists, OSB will be assembled and connected with steel clips. Impact sound insulation will be placed and connected to the OSB with PU adhesive, then it will be covered with 25 mm OSB and mechanically connected with a screw. Floor finish will be done according to the type of room, either laminated flooring or ceramic floor.

Roof

The load-bearing element of flat roof are STEICO joists SJ45, SJ60, SJ90, depending on the position of the joists, with maximum axial distance from each other 625 mm. ISOVER uniroll plus is placed between the joists and is sheeted with OSB th. 12,5 mm from the bottom and top side. Thermal insulation ISOVER EPS 100S is placed on top and the gradient layer is formed by polystyrene styro EPS 150S. The gradient of the roof is 2%. Finish material is FATRAFOL foil.

Drawings

D.1.2.1 STRUCTURAL PLAN OF 1.st FLOOR

D.1.2.2 STRUCTURAL PLAN OF 2.nd FLOOR

D.1.2.3 DETAIL A

D.1.2.4 DETAIL B

D.1.2.5 DETAIL C

D.1.2.6 DETAIL D

D.1.2.7 DETAIL E

D.1.2.8 PLAN OF FLAT ROOF

D.1.2.9 FLOOR PLAN OF WOODEN ELEMENTS OF 1.st FLOOR

D.1.2.10 FLOOR PLAN OF WOODEN ELEMENTS OF 2.nd FLOOR

D.1.2.11 ELEVATIONS OF WOODEN ELEMENT DRAWING

D.1.2.12 FOUNDATIONS

CONCLUSION

The aim of my bachelor's thesis was to create and design a family house from wooden construction for a family of 5 members. I worked out this bachelor's thesis from my own experience and knowledge of wooden construction houses I have gathered during my work at a company LeCon and my studies. The bachelor thesis complies with the latest Czech norms.

During the elaboration of this bachelor thesis, I received a lot of new information in the field of project documentation and working procedures in the realization of the construction.

LIST OF USED SOURCES

KOLB, Josef. Dřevostavby - Systém nosných konstrukcí, obvodové pláště - 3. Vydání
ISBN 978-80-247-4071-3

RUSINOVÁ, M.; JURÁKOVÁ, T.; SEDLÁKOVÁ, M. Požární bezpečnost staveb. Brno:
VUT Brno, 2006.

BORGSTRÖM, Eric. Design of timber structures- Rules and formulas according to
Eurocode 5 – Volume 2, Edition 2:2016, ISBN 978-91-980304-3-3

WEB PAGES

ISOVER available at: www.isover.cz

STEICO available at: www.steico.com

DEK available at: www.dek.cz

KNAUF INSULATION available at: www.knaufinsulation.cz

EQUITONE available at: www.equitone.com

MIRELON available at: www.mirelon.com

CADASTRAL MAP available at: www.cuzk.cz

TZB-INFO available at: www.tzb-info.cz

ČSN REGULATIONS, LAWS, DECREE

ČSN 73 0833 Požární bezpečnost staveb – Budovy pro bydlení a ubytování.

ČSN 73 0580 Denní osvětlení budovy.

ČSN 73 0532 Akustika, ochrana proti hluku v budovách ČSN 73 0540 - 1,2,3,4 Tepelná
ochrana budov.

ČSN 73 0873 Požární bezpečnost staveb – Zásobování požární vodou

ČSN 73 4301 Obytné budovy

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 246/2001 Sb., o požární prevenci Vyhláška č. 501/2006 Sb., o obecných požadavcích na výstavbu

Vyhláška 23/2008 Sb., o technických podmínkách požární ochrany staveb

LIST OF USED ABBREVIATIONS AND SYMBOLS

FC	fire compartment
th.	thickness
Coll.	collocation
no.	number
min	minimal
max	maximal
km	kilometer
m	meter
cm	centimeter
mm	millimeter
SJ	steico joist
RC	reinforced concrete

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S.02	Floor plan level 2	SC. 1:100
S.03	Site plan	SC. 1:200
S.04	North and west elevation	SC. 1:100
S.05	South and east elevation	SC. 1:100
S.06	Section	SC. 1:100
S.07	Architectural floor plan level 1	SC. 1:100
S.08	Architectural floor plan level 2	SC. 1:100

File no.2 – Situation drawings

C.1	Situation of further relations	SC. 1:1000
C.2	Cadastral map	SC. 1:1000
C.3	Coordinating situational drawing	SC. 1:200
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File no.3 - Architectural-structural solution

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File no.6-Building physics

Building physics solution

File no.7-Other calculations

Calculation of foundations

Calculation of staircase



VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ

FACULTY OF CIVIL ENGINEERING

ÚSTAV POZEMNÍHO STAVITELSTVÍ

INSTITUTE OF BUILDING STRUCTURES

SAMOSTATNÉ RODINNÉ BYDLENÍ

DETACHED FAMILY RESIDENCE

ATTACHMENTS

SEE SEPARATE FOLDERS OF BACHELOR'S THESIS

FOLDER NO.1

FOLDER NO.2

FOLDER NO.3

FOLDER NO.4

FOLDER NO.5

FOLDER NO.6

FOLDER NO.7

BAKALÁŘSKÁ PRÁCE

BACHELOR'S THESIS

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BRNO 2018

POPISNÝ SOUBOR ZÁVĚREČNÉ PRÁCE

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Studijní obor	3608R001 Pozemní stavby
Studijní program	B3607 Civil Engineering
Název práce	Detached family residence
Název práce v anglickém jazyce	Rodinný dům
Typ práce	Bakalářská práce
Přidělovaný titul	Bc.
Jazyk práce	Čeština
Datový formát elektronické verze	PDF
Abstrakt práce	<p>Předmětem této bakalářské práce je vypracování projektové dokumentace pro samostatnou rodinnou rezidenci. Rodinný dům se nachází v Brně-Královo Pole, v katastrálním území Sadová. Rodinný dům se nachází na relativně plochém pozemku a je situován na jižní stranu. Dům má dva nadzemní podlaží, s balkonem ve druhém patře a plochou střechou. Na východní straně se nachází garáž a sklad. Celá stavba rodinné rezidence je ze dřeva, s hlavním zaměřením na stavební materiály firmy Steico. Všechny izolační materiály jsou od společnosti Isover. Projektová dokumentace byla provedena v počítačovém softwaru Revit.</p>

**Abstrakt práce
v anglickém
jazyce**

The subject of this bachelor thesis is to elaborate project documentation for a detached family residence. The family house is located in Brno-Královo Pole, the cadastral area of Sadová. The family house is located on relatively flat land and is situated to the south side. The house has two above ground floors, with balconies on the second floor and a flat roof. On the east side there is a garage and storage room. The whole construction of the family residence is from wood, with the main focus on construction materials from the company Steico. The insulation materials are all from the company Isover. Project documentation was done in a computer software Revit.

Klíčová slova

Samostatný rodinný dům, steico, isover, dřevo, dřevěná konstrukce, plochá střecha

**Klíčová slova
v anglickém
jazyce**

Detached family house, steico, isover, wood, wooden construction, flat roof