VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

FAMILY RESIDENCE

Rodinný dům

BACHELOR'S THESIS
Bakalářská práce

AUTHOR
AUTOR PRÁCE

DANIEL ŠMEJKAL

SUPERVISOR
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Ing. FRANTIŠEK VAJKAY, Ph.D.

BRNO 2015

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

ZADÁNÍ BAKALÁŘSKÉ PRÁCE

Student	Daniel Šmejkal
Název	Family Residence
Vedoucí bakalářské práce	Ing. František Vajkay, Ph.D.
Datum zadání bakalářské práce	30. 9. 2014
Datum odevzdání bakalářské práce	29. 5. 2015

V Brně dne 30. 9. 2014

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prof. Ing. Miloslav Novotný, CSc. Vedoucí ústavu	prof. Ing. Rostislav Drochytka, CSc., MBA Děkan Fakulty stavební VUT

Podklady a literatura

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

Zásady pro vypracování

Zadání VŠKP: Projektová dokumentace stavební části k provedení novostavby rodinného domu vedený pod názvem "Detached Family Residence".
Cíl práce: vyřešení dispozice pro daný účel, návrh vhodné konstrukční soustavy, nosného systému a vypracování výkresové dokumentace včetně textové části a příloh podle pokynů vedoucího práce. Textová i výkresová část bude zpracována s využitím výpočetní techniky. Výkresy budou opatřeny jednotným popisovým polem a k obhajobě budou předloženy složené do desek z tvrdého papíru potažených černým plátnem s předepsaným popisem se zlatým písmem. Dílčí složky formátu A4 budou opatřeny popisovým polem s uvedením seznamu příloh na vnitřní straně složky.
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Textová část VŠKP bude obsahovat kromě ostatních položek také položku h) Úvod (popis námětu na zadání VŠKP), položku i) Vlastní text práce (projektová dokumentace dle vyhlášky č. 499/2006 Sb.) a položku j) Závěr (zhodnocení obsahu VŠKP, soulad se zadáním, změny oproti původní studii).
Příloha textové části VŠKP v případě, že bakalářskou práci tvoří konstruktivní projekt, bude povinná a bude obsahovat výkresy pro provedení stavby (technická situace, základy, půdorysy řešených podlaží, konstrukce zastřešení, svislé řezy, pohledy, detaily, výkresy sestavy dílců popř. výkresy tvaru stropní konstrukce, specifikace, tabulky skladeb konstrukcí – rozsah určí vedoucí práce), zprávu požární bezpečnosti, stavebně fyzikální posouzení stavebních konstrukcí.

Struktura bakalářské/diplomové práce

VŠKP vypracujte a rozčleňte podle dále uvedené struktury:

1. Textová část VŠKP zpracovaná podle Směrnice rektora "Úprava, odevzdávání, zveřejňování a 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

PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ FORMY VŠKP

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

V Brně dne 29. 5. 2015

Daniel Šmejkal

Declaration:

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication and that I have listed all the information resources.

Prohlášení:

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

V Brně dne 27.5.2015

podpis autora
Daniel Šmejkal

Abstract

The subject of this thesis is a structural solution of a two-storey single-family detached house located on parcel no. 149 in the cadaster area of Hodkovičky. The house is situated in a moderately sloped terrain in a residential area where most of the surrounding objects are also detached houses and it is primarily designed as a timber structure. Other construction materials such as concrete or sand-lime masonry are also used within the project at those parts of the building where we can benefit from their different structural and physical properties. The project documentation was completely developed using Building Information Modeling method (BIM).

Keywords

detached house, timber structure, sloped terrain, BIM

Abstrakt

Předmětem této bakalářské práce je stavební řešení dvoupodlažního rodinného domu v Praze 4 na parcele číslo 149 v katastrálním území Hodkovičky. Dům je umístěn ve svažitém terénu v rezidenční oblasti zastavěné především samostatně stojícími rodinými domy a je převážně koncipován jako dřevostavba. Kromě dřevěných konstrukcí jsou v rámci projektu využity i konstrukce jako železobeton nebo vápenopískové zdivo, tam kde lze s výhodou využít jejich odlišných stavebně fyzikálních a statických vlastností. Projetová dokumentace je kompletně zpracována metodou BIM (Building Information Modeling)

Klíčová slova

rodinný dům, dřevostavba, svažitý terén, BIM

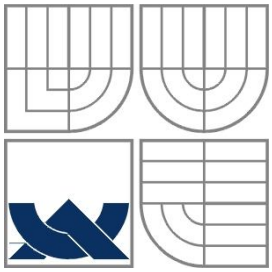
Bibliografická citace VŠKP

ŠMEJKAL, Daniel. *Rodinný dům* Brno, 2014. 33 s., 86 s. příl. Bakalářská práce. Vysoké učení technické v Brně, Fakulta stavební, Ústav pozemního stavitelství. Vedoucí práce Ing. František Vajkay, Ph.D.

CONTENT

Introduction

This bachelor's thesis deals with the design and creation of project documentation of a two-storey detached single-family home. As the location for this project a plot in a residential quarter Hodkovičky in Prague was chosen for its perfect south-north orientation and sloped terrain surface. The house is designed as a composite structure in which timber load bearing structures predominate but are combined with other materials such as concrete or masonry in those places where their different physical and mechanical characteristics are more suitable than those of timber. The object will be designed with special emphasis on low energy losses and the project documentation will be entirely developed using building information modeling method.



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A – ACCOMPANYING REPORT

BACHELOR'S THESIS
Bakalářská práce

AUTHOR
AUTOR PRÁCE
DANIEL ŠMEJKAL

SUPERVISOR
VEDOUCÍ PRÁCE
Ing. FRANTIŠEK VAJKAY, Ph.D.

BRNO 2015

A.1 Identification data

A.1.1 Information about the object

A.1.1 Information about the object

a. Name: Family residence
b. Location: Na Lysinách 35, Praha 4, Hodkovičky
c. Subject of documentation: construction of a new detached house object

A.1.2 Investor details

a. Name: Raíra Magalhães
b. Address: Veveří 96, Brno
c. Contact Phone: +420 444 555 666

A.1.3 Supplier details

a. Name of Company: FAST VUT Brno, Veveří 95, 602 00 Brno
b. Designer: Daniel Šmejkal

A.2 Input documentation list

cadastral maps of construction location, municipal land use plan, valid legislation and standards ČSN for project documentation, utility network plan

A.3 Information about the plot

a. The plot no. 149 in the cadastral area of Hodkovičky, Praha 4 is located in a built-up residential are of the town. The plot area is 1,226 m^2.
b. There is no existing utilization of the plot. Surrounding plots are already built-up.

c. The plot is intended as a residential building plot according to the municipal land use plan and is not located in any reservation or protected area
d. The plot is sloped from north to south. Rainfall water drainage of the area is solved within the project documentation.
e. Municipal land use plan of Prague is valid in the subject location. The building project is in accordance with this plan.
f. All the general requirements according to decree no. 501/2006 coll. are followed.
g. There is no effect on surrounding plots.

A.4 Object details

a. Proposed object is a two-storey house with no basement.
b. The building is intended to be an area for living according to 501/2006 coll.
c. The building is a permanent structure.
d. According to law the building is not subject to cultural monument protection atc.
e. Design and project documentation follow the general technical rules for construction according to existing decrees and standards.
f. Project documentation of the building meets all the requirements of concerned authorities and follow the existing decrees and standards.
g. There is no need for any special exemptions.
h. Built area: 105.9 m
   Paved areas: 95 m^2
   Floor area: 149.9 m^2

i. The object is designed as a single housing unit for a four-member family.
j. Estimated date of construction start is March 2016
k. Estimated construction price is 4,300,000 CZK

A.5 Division of construction into building objects and technical and technology parts

BO-01 Detached house

BO-02	Parking porch
BO-03	Paved arrea
BO-04	Retaining wall
BO-05	Retaining wall

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B – SUMMARY TECHNICAL REPORT

BACHELOR'S THESIS
BAKALÁŘSKÁ PRÁCE

AUTHOR
AUTOR PRÁCE
DANIEL ŠMEJKAL

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BRNO 2015

B.1 Description of the Site Location

a. The construction site is located in a residential neighborhood Hodkovičky in Prague 4. All the surrounding plots are already built-up. The terrain of the site is moderately sloped and accessible from the public communication in its southern part.
b. According to the geological survey the subsoil of the site mostly consists of non-cohesive sand-gravel soils. The groundwater level is over 3 m below the proposed foundation structure. The radon occurrence risk is considered medium.
c. The building is not located in any zone subject to any kind of protection.
d. The site is not located in inundation or undermined area.
e. The object does not affect the surrounding plots.
f. Several trees will need to be felled on the construction site in order to execute the construction.
g. The location is considered a residential construction area in accordance with the municipal land use plan and there are no requirements for agricultural land fund.
h. All the public networks such as roads, sewerage network, gas pipelines, water pipelines, low-voltage electricity wiring and communication network are situated on the southern side of the plot and all connections ae prepared at the plot boundary. No surrounding plots or constructions are affected by the connections. Plot access road must be constructed.
i. The object is not limited by any special investment or time schedules.

B.2 Overall Description of the Object

B.2.1 Purpose of the object

Built area: 105.9 m^2

Paved area: 95 m^2

Floor area: 149.9 m^2

The object is intended as a single housing unit for a four-member family.

B.2.2 Urban and Architectural Solution

a. The detached house building is located in a residential area Hodkovičky. The existing constructions in the surrounding neighborhood are mostly houses of a similar character. The house will be placed in accordance with the requirements on distances from neighboring objects.
b. The object is a two-storey single family home with an outside terrace and a parking porch. The house itself is divided into two zones. The ground floor is intended as a day zone with living areas such as living room and kitchen and all the necessary utilities while the first floor mostly consists of bedrooms. The living areas of the house are oriented to south in order to meet the natural illumination requirements and also provide solar heat gains during the winter. The utility rooms such as bathroom are located on the northern side of the building. The shape of the building is a simple prism with duo-pitched roof.

B.2.3 Spatial arrangement and technology prescription

The entrance is situated on the western side of the building and the main door leads to the entrance hall after which follows a hall with staircase together with living room and kitchen. The ground floor is solved as an open space arrangement where only the utility rooms and entrance hall are divided by doors. The upper storey consists of a staircase hall, bathroom, three bedrooms and a working room all accessible from the hall.

B.2.4 Usage by handicapped people

The house has no special requirements regarding the usage by physically challenged persons therefore the design does not take such usage into account.

B.2.5 Safety during serviceability of the construction

The building is designed in accordance with the valid standards and decrees for safe usage, mechanical resistance and stability, health and safety of persons, environmental impact, protection against noise and energy savings. There are no further special requirements.

B.2.6 Basic technical description of structures

Foundations are designed as reinforced concrete strips below a reinforced concrete slab. The strips will be casted into excavated construction pit in a below the frost line 800 mm bellow terrain surface. Concrete grade C16/20 will be used for the strips and slab.

Vertical structures are peripheral wooden walls, glued laminated timber columns, internal masonry and plasterboard partitions, and a concrete retaining wall which creates the peripheral wall of the underground part of the ground floor. The building envelope is designed as diffusion open therefore there is no vapor barrier in the compositions of peripheral structures. The peripheral wooden walls are prefabricated frame panels with 60 x 160 mm KVH studs (two-by-four system) equipped with statically active one strand boards decking on the internal side. The OSB decking also acts as a vapor retarding layer. At the construction site the wall panels will be filled with cellulose thermal insulation and equipped with additional finishing layers and façade cladding made of Siberian larch planks with a ventilated air cavity. The total thickness of peripheral walls is 400 mm. The concrete retaining wall is monolithically connected to the foundations and thermally insulated from the exterior side with extruded polystyrene and protected against ground water by bitumen felts. A structural engineer will design reinforcement for the retaining wall.

Horizontal structures are the floor structure above ground floor and roof. The floor structure consists of primary glued laminated beams (GL24c) and I-section STEICO floor joists (h = 240 mm) which are connected to the primary beams by steel connecting elements. OSB decking of the upper side of the structure provides stiffness in horizontal direction. The load-bearing roof structure is provided by duo-pitched glued laminated timer beams connected with purlins and OSB decking on the upper side.

Windows are triple-glazed with aluminum frame with a thermal break for better thermal protection. The doors are wooden with wooden jambs.

B.2.7 Basic characteristics of building services

Heating of the house is provided by low-temperature water underfloor heating system powered by a water-water heat pump which will be placed in a technology room. Hot

domestic water will be heated by solar collector panels placed on the south-sloping pitch of the roof.

The water supply connection is a DN32 pipe with consumption meter placed I the technology room. Estimated daily usage of water is 125l/person/day. In the house are situated two toilets, one bidet, 2 showers, 1 bath and 5 basins. Sewerage system will be connected by PP pipe DN 150 to public sewerage network. Entrance shaft is situated on the plot.

The object will be connected to low voltage electrical network by connection wire and electric consumption meter will be placed in a box in a masonry post on the boundary of the plot. Electrical installations will be supplied from electrical switchboard placed in the technology room.

B.2.8 Fire safety solution

The object was designed to meet all the fire safety requirements according to existing standards and decrees. For more detailed information on fire safety see attachment D.1.3 – Fire Safety.

B.2.9 Energy saving principles

Energy saving solution is made in accordance to ČSN 73 0540 - 2.

B.2.10 Hygienic, working and communal environment requirements

The ventilation of the object is solved naturally by windows. The kitchen hood is placed above the cooker.

The supply of potable water is provided by connection to local water network.
Waste water and also rain water is drained to local waste water network.

B.2.11 Protection of the building against negative effects

There is no danger of any external negative effects such as high seismicity or possibility of floods. The radon occurrence risk is medium and the protection against radon is provided by damp proof layer on the foundation slab.

B.3 Connection to technical infrastructure

All the necessary connections to public networks are designed within the project. Sewer connection is DN150 and 22 m long and the inspection shaft is placed on the plot area. Water supply connection is DN 32 with length of 17. CO.05 electrical connection is solved by low voltage cables of length 20.2 m.

B.4 Transportation solution

The plot is connected directly to a public communication at its southern side in the street Na Lysinách. The connection to the public communication will be created wihin the construction works. The plot provides parking space for two cars.

B.5 Vegetation and landscaping

Large earthworks need to be carried out before the construction itself can be started. Part of the slope needs to be excavated in order to create the construction pit and for the retaining wall construction. Most of the excavated soil will be used again within the construction site to flatten the southern part of the site in order to increase its usability. Several trees also need to be removed to enable the construction.

B.6 Environmental impact description

The object has only minimal impact of the environment which is solved by sewerage system which is connected to public sewerage network. The object meets all the requirements according to existing decrees and standards. During the construction process there will be reduced the impact on the surrounded environment. The waste materials will be treated according to act n. 185/2001 about the waste materials. Next according to decree 383/2001 Sb. about details of waste material treatment and the attachment n. 1 to decree 381/2001 Sb. Catalog of waste materials. Materials will be separated into given containers and driven to waste dump. Waste water will be piped into sewerage system.

Code of waste type	Name of waste material type	Category of waste	Treatment
17 01 01	Concrete	O	Transportation to waste dump
17 01 06	Mixtures of concrete, bricks, tiles and ceramic products containing dangerous substances	N	Transportation to dump of dangerous substances
17 02 01	Timber	O	Transportation to timber dump
17 02 03	Plastics	O	Transportation to plastics dump
17 02 04	Glass, plastic and wood containing hazardous substances or contaminated by hazardous substances	N	Transportation to dump of dangerous substances
17 04 05	Iron and steel	O	Transportation to iron dump
20 01 01	Paper and cardboards	O	Transportation to paper dump
20 03 01	Mixed waste	O	Transportation to municipal waste dump

B.7 Protection of population

All the necessary requirements are fulfilled.

B.8 Organizational principles during the construction

The object is connected to public communication on the southern side of the plot. The electric and water connection must be built before the start of construction of building.

All the prescriptions and health and safety rules will be obeyed. Before the earthworks are started the tillage to the depth of 2 cm must be removed and kept for further usage. There is no need of transportation of soil. The soil will be distributed on the plot according to project documentation. The excess excavation soil which cannot be distributed within the plot will be transported to a local landfill.

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D.1.1 – ARCHITECTURAL SOLUTION

D.1.1.a – TECHNICAL REPORT

BACHELOR'S THESIS
BAKALÁŘSKÁ PRÁCE

AUTHOR DANIEL ŠMEJKAL
AUTOR PRÁCE

SUPERVISOR Ing. FRANTIŠEK VAJKAY, Ph.D.
VEDOUCÍ PRÁCE

BRNO 2015

CONTENT

D.1.1a.1 General information about the project

D.1.1.a.1.1 Object information and parameters

- Title: Family residence
- Location: Na Lysinách, Praha 4 (parcel. No. 149)
- Investor: Raíra Magalhães
- General contractor: FCE VUT Brno
- Designer: Daniel Šmejkal
- Built area: 105.9 m^2
- Floor area: 149.9 m^2
- Built-in volume: 633.0 m^2
- Paved areas: 95 m^2
- Number of storeys: 2

D.1.1.a.1.2 Space arrangement and architectural solution

The object is a two-storey single family home with an outside terrace and a parking porch. The house itself is divided into two zones. The ground floor is intended as a day zone with living areas such as living room and kitchen and all the necessary utilities while the first floor mostly consists of bedrooms. The living areas of the house are oriented to south in order to meet the natural illumination requirements and also provide solar heat gains during the winter. The utility rooms such as bathroom are located on the northern side of the building. The shape of the building is a simple prism with duo-pitched roof.

D.1.1.a.1.2 Basic characteristics of the object

The investor has ordered a new realization project for a detached house. The project was made in accordance with urban regulations of Prague. It is a house of a rectangular floor plan with flat roof.

The main structural material is timber where most of the outer walls and also the horizontal structures are designed as a timber frame structure (two by four) combined

with a reinforced concrere and masonry structure in the underground part of the building. The construction site will have its own site diary with a regular construction supervision. All construction workers will be educated in most recent safety regulations.

All waste produced during construction process will be moved to a legal landfill. No environmental harm will be done. Layout, location, size of windows and cladding are designed in order to ensure the lowest possible heat losses of the object.

D.1.1a.2 Area setup and excavation works

At the beginning of construction surface treatment must be done at the site such as felling several trees and removal of at least 200 mm of topsoil. The topsoil will be stored for further usage within the site. A surveyor will be called for building lay and afterwards must be set the project zero point by benches and ropes. Part of the slope needs to be excavated in order to create the construction pit for the retaining underground wall of the object. The floor level of the ground floor height +228.551 mamsl. Excavations for footing strips are done with JCB excavator in the depth of 1.170 mm from the project zero. Before starting of foundation work a structural engineer must be called and building supervisor to review the load bearing capacity of the soil in the foundation pit. Most of the excavated soil will be spread on the site to create a more even surface more suitable for living. The excess of soil which cannot be used within the site will be transported to a local landfill.

D.1.1a.3 Foundations

The foundations are designed as reinforced concrete strips below a reinforced concrete slab. The strips will be casted into excavated construction pit in a below the frost line 800 mm bellow terrain surface. Concrete grade C16/20 will be used for the strips and slab. The foundation pit will be drained by a system of pipes to ensure slope stability. Extruded polystyrene thermal insulation will be applied on the outer perimeter of the strips in order to disable thermal bridges in the plinth area.

D.1.1a.4 Vertical structures

Vertical structures are peripheral wooden walls, glued laminated timber columns, internal masonry and plasterboard partitions, and a concrete retaining wall which creates the peripheral wall of the underground part of the ground floor. The building envelope is designed as diffusion open therefore there is no vapor barrier in the compositions of peripheral structures. The peripheral wooden walls are prefabricated frame panels with 60 x 160 mm KVH studs, sills and (two-by-four system) equipped with statically active one strand boards decking on the internal side. The OSB decking also acts as a vapor retarding layer. At the construction site the wall panels will be filled with cellulose thermal insulation and equipped with additional finishing layers and façade cladding made of Siberian larch planks with a ventilated air cavity. The total thickness of peripheral walls is 400 mm. The concrete retaining wall is monolithically connected to the foundations and thermally insulated from the exterior side with extruded polystyrene and protected against ground water by bitumen felts. A structural engineer will design reinforcement for the retaining wall.

D.1.1a.5 Horizontal structures

Horizontal structures are the floor structure above ground floor and roof. The floor structure consists of primary glued laminated beams (GL24c) and I-section STEICO floor joists (h = 240 mm) which are connected to the primary beams by steel connecting elements. OSB decking of the upper side of the structure provides stiffness in horizontal direction. The load-bearing roof structure is provided by duo-pitched glued laminated timer beams connected with purlins and OSB decking on the upper side.

D.1.1a.6 Finish floors

D.1.1a.6.1 Ground floor finish floors

Within the ground floor there are two typse of finish floors designed. Oak parquet and most of the living areas and ceramic tiles in the bathroom, technology room and and the entrance hall. Below the finish layer there is an anhydride screed of thickness 50 mm with underfloor heating piping built-in. The anhydrite is layer is separated from the base

concrete slab with 50 mm of expandable polystyren designed to prevent heat losses from the heating systém to the slab. The sab itself is thermally isulated from the bottom by a 300 mm thick layer of compacted granulate foamglas.

D.1.1a.6.2 First floor finish floors

The finish layers of the floors are designeed the same as on the ground floor. The floor structure is subject to noise protection requirements therefore there is a 50 mm layer of concrete screed designed below the finish layer and it is separated from the load bearing structure by a sound impact insulation provided by expandable polystyrene and the cavity between floor joists is partly filled with airborne sound insulation ISOVER.

D.1.1a.7 Staircase

The stair is designed as a steel stringer structure with treads made of toughened glass. The steel structure is anchored in the base concrete slab, the upper part in the primary floor beam and the landing hanged from the floor beam with use of steel wire ropes anchored to the beam with special connecting elements.

D.1.1a.8 Openings

Windows are triple-glazed with aluminum frame with a thermal break for better thermal protection. The doors are wooden with wooden jambs.

Conclusion

As the topic of my thesis I chose a wooden home design because the area of timber structures is nowadays rapidly growing in the building industry and timber as a construction material turns out to be very efficient at meeting the demanding requirements on sustainable construction. The utilization of wood at construction enables the designer to create high quality buildings for living with relatively low environmental impact and very good characteristics in terms of building physics.
Since the area of timber homes is rather non-existing in the curriculum of the Building Constructions bachelor's program at our faculty I had to gather all the information necessary for creation of this work by self-studying. The acquisition of this knowledge I consider one of the greatest benefits of creating this thesis.

My personal challenge also was to develop the project documentation solely using Building Information Modeling (BIM) which I believe is the future of computer aided building design. Within this method the traditional creation of independent 2D plans and drawings is replaced by creating a digital 3D model and all the documentation including drawings, schedules, material bills, etc. is then automatically generated directly from the model. This comes with a number of benefits, for which I can mention avoiding mistakes, easier collaboration, fast documentation creation or automatic collision detection. Moreover, various analysis such as structural or thermal can be carried out on the construction model which leads to higher quality design.

For creating the building information model of the subject house of this thesis I used the program ArchiCAD by Graphisoft. I modelled all the structures of the house including the site terrain and landscaping so only a minimum number of items needed to be added to the documentation by the conventional 2D CAD drawing. This method turned out to be very effective for the further creation of 2D plans and schedules. In order to use BIM in a proper way, a number of very time consuming settings must be done and a set of workflow rules needs to be developed and strictly followed but in the future it will pay back with faster and more effective design. As a negative I could mention that although the software allows a very high level of personalization in terms of appearance of the generated drawings, not everything is under the user's control and sometimes the structures are not displayed in accordance with the national standards of drawings. However, compared to the amount of benefits Building Information Modeling brings, I see this problem as minor and it would be a shame to lose all the benefits BIM brings only to stick with the standards.

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Standards

ČSN 01 3420 - Výkresy pozemních staveb - kreslení výkresů

ČSN 73 4301 - Obytné budovy

ČSN 73 0540 - Tepelná ochrana budov

ČSN 73 0580 - Denní osvětlení budov

ČSN 73 0532 - Akustika, ochrana proti hluku v budovách

ČSN 73 0802 - Požární bezpečnost staveb - Požadavky na požární odolnost stavebních konstrukcí

ČSN 73 0810 - Požární bezpečnost staveb - Společná ustanovení

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

ČSN 73 0873 - Požární bezpečnost staveb. Zásobování požární vodou

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Software used

Graphisoft ArchiCAD 18

Microsoft Office 2010

Svoboda Software Teplo 2010

List of abbreviations

VŠKP – vysokoškolská kvalifikačná práca

ETDs – electronic thesis and dissertation

ČSN – česká štátna norma

mm – millimetre

m – metre

no. – number

th. – thickness

BIM – Building Information Modeling

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