BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH DENTAL CLINIC

RODINNÝ DŮM SE ZUBNÍ ORDINACÍ

BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

AUTHOR

AUTOR PRÁCE

Barbora Husárová

SUPERVISOR

VEDOUCÍ PRÁCE

prof. Ing. Jitka Mohelníková, Ph.D.

BRNO 2023

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
FAKULTA STAVEBNÍ

Zadání bakalářské práce

Ústav:	Ústav pozemního stavitelství
Studentka:	**Barbora Husárová**
Vedoucí práce:	**prof. Ing. Jitka Mohelníková, Ph.D.**
Akademický rok:	2022/23
Studijní program:	B3607 Stavební inženýrství
Studijní obor:	Pozemní stavby

Děkan Fakulty Vám v souladu se zákonem č.111/1998 o vysokých školách a se Studijním a zkušebním řádem VUT v Brně určuje následující téma bakalářské práce:

House with dental clinic

Stručná charakteristika problematiky úkolu:

Vytvoření části projektové dokumentace pro provádění stavby zadané budovy s téměř nulovou spotřebou energie, částečně nebo plně podsklepené. 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.

Cíle a výstupy bakalářské práce:

Návrh 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 vytvořena v souladu s vyhláškou č. 499/2006 Sb. v platném a účinném znění a bude obsahovat část A, část B, část C a část D v celém rozsahu části D.1.1 a D.1.3. a v částečném rozsahu části D.1.2. Výkresová část bude obsahovat výkresy situací, základů, výkopů, půdorysů podlaží, konstrukce zastřešení, svislých řezů, technických pohledů, min. 5 konstrukčních detailů, výkres(y) sestavy dílců, popř. výkres(y) tvaru stropní konstrukce všech podlaží. Součástí dokumentace budou i dokumenty podrobností dle D.1.1. bod c), stavebně fyzikální posouzení objektu a vybraných detailů, popř. další specializované části, budou-li zadány vedoucím práce. V rámci stavebně fyzikálního posouzení objektu budou uvedeny údaje o splnění požadavků stavebního řešení pro budovy s téměř nulovou spotřebou energie. Dokumentace bude dále obsahovat koncepci větrání, vytápění a ohřevu vody. Dále bude dokumentace obsahovat studie obsahující předběžné návrhy budovy, návrhy dispozičního řešení a přílohovou část obsahující předběžné návrhy základů a rozměrů nosných prvků a prostorovou vizualizaci budovy obsahující i modulové schéma budovy.
Závěrečná práce bude členěna v souladu se směrnicí děkana č. 4/2019 a jejím dodatkem a přílohami. Jednotlivé části dokumentace budou vloženy do složek s klopami formátu A4 opatřených popisovým polem a s 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. v platném a účinném znění a j) "Závěr". V souhrnné technické zprávě a ve stavebně fyzikálním posouzení objektu budou uvedeny použité zásady návrhu budovy s téměř nulovou spotřebou energie. Součástí elektronické verze závěrečné práce bude i poster formátu B1 s údaji o objektu a jeho grafickou vizualizací. Všechny zdroje použité při zpracování diplomové práce musí být řádně citovány podle ČSN ISO 690 (např. pomocí www.citace.com).

Seznam doporučené literatury a podklady:

1) Směrnice děkana č. 19/2011 s dodatky a přílohami; (2) Stavební zákon č. 183/2006 Sb. v platném a účinném znění; (3) Vyhláška č. 499/2006 Sb. v platném a účinném znění; (4) Vyhláška č. 268/2009 Sb. v platném a účinném znění; (5) Vyhláška č. 398/2009 Sb.; (6) Platné normy ČSN, EN; (7) Katalogy stavebních materiálů, konstrukčních systémů, stavebních výrobků; (8) Odborná literatura; (9) Vlastní dispoziční řešení budovy, (10) Vlastní architektonický návrh budovy a (11) ČSN ISO 690.

Termín odevzdání bakalářské práce je stanoven časovým plánem akademického roku.

V Brně, dne 25. 10. 2022

L. S.

prof. Ing. Miloslav Novotný, CSc.
vedoucí ústavu

prof. Ing. Jitka Mohelníková, Ph.D.
vedoucí práce

prof. Ing. Rostislav Drochytka, CSc., MBA, dr. h. c.
děkan

ABSTRACT

The bachelor's thesis main purpose is to prepare project documentation for a new nearly zero energy family house. The house is designed for a family of four with a dental clinic for one of the family members. The object is built as two functionally separate units, that share a common wall, through which it is possible to pass. This gives family a privacy, with an easy access to the dental clinic. The structure is located in quite modern municipality Kanianka, Trenčín region, Slovakia. The building lays on slopped terrain and its main orientation is towards the south side. The house is detached, it has partial basement with a garage for two cars and two above-ground floors with flat green roofs. The roofs are insulated by ISOVER EPS polystyrene. The vertical load bearing structure of the house is masonry made of ceramic blocks Porotherm insulated by hydrophobised mineral wool, so there is no need for additional thermal insulation. The horizontal load bearing structure is made of reinforced concrete slabs C20/25. The building is constructed on concrete strip foundations.

The drawing documentation necessary for the project realization was made in AutoCAD software. The project documentation includes fire safety report, foundation and loading calculations, technical, thermal and heat loss assessment and an assessment of acoustics and daylighting.

KEYWORDS

Detached family house, sloped terrain, partial basement, flat green roof, masonry Porotherm, reinforced concrete ceiling, foundation strips

ABSTRAKT

Hlavným cieľom tejto bakalárskej práce je príprava projektovej dokumentácie pre nový rodinný dom s takmer nulovou spotrebou energie. Dom je navrhnutý pre štvorčlennú rodinu so zubnou ambulanciou pre jedného z členov rodiny. Objekt je postavený ako dva funkčne oddelené celky, ktoré zdieľajú spoločnú stenu, cez ktorú sa dá prechádzať. Toto riešenie dáva rodine súkromie, s jednoduchým prístupom do kliniky. Dom je situovaný v celkom modernej obci Kanianka, v Trenčianskom kraji na Slovenku. Leží na svahovitom teréne a je orientovaný na juh. Jedná sa o samostatne stojaci, čiastočne podpivničený dom s garážou pre dve autá, s dvoma nadzemnými poschodiami so zelenou strechou. Strechy sú zateplené ISOVER EPS polystyrénom. Zvislá nosná konštrukcia domu je murovaná z keramických tehál Porotherm vyplnených hydrofobizovanou minerálnou vlnou, preto nie je potrebná dodatočná tepelná izolácia. Vodorovná nosná konštrukcia je vyrobená zo železobetónu C20/25. Budova je postavená na betónových základových pásoch.

Projektová dokumentácia potrebná na realizáciu projektu bola vytvorená v počítačovom programe AutoCAD. V projektovej dokumentácii je zahrnuté aj posúdenie požiarnej bezpečnosti, výpočty základov a zaťažení, tepelno-technické posúdenie a posúdenie na akustiku a denné osvetlenie.

KĽÚČOVÉ SLOVÁ

Samostatne stojaci rodinný dom, svahovitý terén, čiastočné podpivničenie, plochá zelená strecha, murivo Porotherm, železobetónový strop, základové pásy

BIBLIOGRAPHIC CITATION

HUSÁROVÁ, Barbora. *Rodinný dům se zubní ordinací*. Brno, 2023. Bachelor's Thesis. Brno University of Technology, Fakulta stavební, Ústav pozemního stavitelství. Supervisor prof. Ing. Jitka Mohelníková, Ph.D.

DECLARATION OF AUTHORSHIP OF THE FINAL THESIS

I, Barbora Husárová, declare that this Bachelor's Thesis titled *Rodinný dům se zubní ordinací* is my own work and the result of my own original research. I have clearly indicated the presence of quoted or paraphrased materialsň and provided references for all sources.

Brno, 25. 01. 2023

Barbora Husárová

author

Acknowledgements

First of all, I would like to thank my supervisor, prof. Ing. Jitka Mohelníková, Ph.D., for her brilliant tutoring, professionalism, valuable advice, explanations and information she has given me during my work on bachelor's thesis. She was really helpful; she answered all my questions and she made time whenever she could.

Secondly, I would like to thank my family and boyfriend for supporting me throughout the whole study. I really appreciate their help and patience. I am truly grateful to have them.

Content

1. INTRODUCTION

Main aim of this bachelor's thesis is to elaborate project documentation for a new nearly-zero energy family house. The house is designed for a family of four with a dental clinic for one of the family members.

The house is located in quite modern municipality Kanianka, Trenčín region, Slovakia. This part of the municipality is built-up area with family houses and a kindergarten. The building lays on slopped terrain and its primarily oriented towards the south side. The placement of the building was chosen to minimize excavation works and to effectively backfill all the necessary parts. It is located on 3 parcels with total area of 768 m2, while house with a clinic occupies 247 m2. The plot is surrounded by house gardens on one side and by road from all the other sides. Due to the plot´s long and narrow shape, it is important to design proper spacing and distances.

The house is detached, it has partial basement with garage for 2 cars and 2 above-ground floors with green roofs. The clinic is a separate area, that shares one wall with a living part. It has a separate entrance and parking for the clients, while the dentist/owner can easily access the clinic from the house, providing the family with some privacy. The clinic is designed with respect to the needs of disabled people. It complies with standards for medical facilities.

The building features green flat roofs with rainwater outlets and is insulated with ISOVER EPS polystyrene. The vertical load-bearing structure of the house is masonry made of insulated ceramic blocks Porotherm, which eliminates the need for additional thermal insulation. The horizontal load bearing structure is made of reinforced concrete C20/25. The building is constructed on concrete strip foundations.

The drawing documentation necessary for the project realization was made in AutoCAD and ArchiCAD computer software. Microsoft Word and Excel were also used. The project documentation is divided into nine parts: main text work, preparatory and study work, situation drawings, architectural building solution, building structural solution, fire safety solution, building physics, calculations, and other.

All Czech standards, laws, decrees, and regulations were followed in the design of this family house.

BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH DENTAL CLINIC

RODINNÝ DŮM SE ZUBNÍ ORDINACÍ

A. ACCOMPANYING REPOT

BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

AUTHOR

AUTOR PRÁCE

Barbora Husárová

SUPERVISOR

VEDOUCÍ PRÁCE

prof. Ing. Jitka Mohelníková, Ph.D.

BRNO 2023

Content

2. MAIN TEXT PART

A. ACCOMPANYIG REPORT

A.1. Identification data

Name of the construction: House with dental clinic

Place of the construction: Address: Pionierov, Kanianka 97217, Slovakia

Cadastral area: 823520 Kanianka

Parcel numbers: 1674/732, 129/2, 128/10

Subject of the project documentation:

This project documentation focuses on a new detached family house with a dental clinic, comprising of partial basement and 2 above-ground floors. It displays all the required drawings and calculations required for obtaining a building permit.

Details of the builder:

Name: Barbora Husárová

Address: Bojnická cesta 594/32, Kanianka, 97217

Details of the designer of the project documentation:

Name: Barbora Husárová

Address: Bojnická cesta 594/32, Kanianka, 97217

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

- Building object, BO 01
- New utility lines

A.3. List of input documents

- Google map
- ZBGIS map
- Cadastral map of the parcels and its surroundings

BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH DENTAL CLINIC

RODINNÝ DŮM SE ZUBNÍ ORDINACÍ

B. TECHNICAL REPORT

BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

AUTHOR

AUTOR PRÁCE

Barbora Husárová

SUPERVISOR

VEDOUCÍ PRÁCE

prof. Ing. Jitka Mohelníková, Ph.D.

BRNO 2023

Content

B. TECHNICAL REPORT

B.1 Description of the construction site

a) Attributes of the locality and building plot, developed and un-developed areas, adherence of the proposed building with the character of the locality, previous usage and built-up area

The house is situated in modern municipality Kanianka, Trenčín region, Slovakia. In this part of the municipality are detached family houses with small enterprises such as hair salons and bakeries. In close vicinity is a kindergarten. The object is built on 3 parcels with total area of 768m^2, from which 247 m^2 is a built-up area. The building site is a corner plot, so it has neighboring houses just on the north side and on all the other sides is a road. The road on the south is used for kindergarten deliveries, so it is not used so often, and it is the dead-end road. In this part of the village, the roads serve as connections to the houses, resulting in low traffic.

The designed house is placed on a slightly sloped terrain. It is built so that no unnecessary excavations were required, and so that the excavated soil was used on the plot. Because of the terrain in slope, terraces from gabion walls were created, so the family can have flat surfaces. Due to the plot´s long and narrow shape, house had to be adapted accordingly. Its main orientation is towards the south side, with all the residential rooms facing this direction. Required distances from neighboring buildings and roads were maintained.

The planned building is composed of 2 functionally separate units sharing a common wall: the residential area and the family house. Each unit has a separate entrance. The clinic has an entrance from the road on west side, at the top of the parcel. The residential area has an entrance from the road on east side, where the slope is lowest. The entire site is fenced, except for the parking places designed for the clients.

The structure is connected to the utility networks from the east side, even though it could also be connected from the west side. This decision was made to align with the natural down flow of the plot, as it slopes from west to east.

b) Adherence with the zoning or regulatory plan and public contract by zoning decision replacing or zoning consent

This plot is currently conducted as a garden, but in the urban plan of the municipality is the area classified as a built-up area. The surrounding parcels are conducted as gardens and built-up areas with courtyards. Changing the purpose of the parcel to align with the urban plan should not pose any issues.

c) Compliance with the land-use planning documentation, in the case of construction modifications conditional on a change in the use of the construction

The designed construction respects the urban, architectural, land-use and zoning requirements. It complies with purpose, visual and aesthetic criteria, while minimizing significant alterations to the surrounding conditions and environment. No new traffic network or infrastructure has to be created. Since the urban plan classifies this area as built-up area, there should be no problem in accordance with these provisions.

d) Decisions taken to grant exception from the general land use requirements

No exception had to be granted. The land use requirements were satisfied.

e) Data on whether and in what parts of the dossier the criteria of the binding opinions of the concerned authorities are taken into consideration

The criteria were fulfilled and are outlined in a separate paragraph within the project documentation.

f) Lists and results of undertaken surveys and analyzes - geological survey, hydrogeological survey, historical building survey, etc.

For the purpose of the bachelor's thesis, no actual survey was undertaken. The soil conditions were assumed as coarse-grained sandy gravel, Rd=250 kPa. Information regarding the plot and neighboring parcels were obtained from ZBGIS. Altitudes and distances were also measured using the map in ZBGIS.

g) Land protection under other legal restrictions

There are no legal restrictions in the area. The parcels are not situated in the mining area, historical/monument area, archeological area nor protected area or national park. According to the law no. 114/1992 Coll., there are not any protected elements present.

h) Location with respect to the flood plan, undermined area, etc.

The object is not situated in areas with potential dangers such as mines or flooded areas.

i) Impact of the structure on surrounding constructions and territory, environment protection, effect of the structure on dewatering conditions in the area

The object will comply with all the requirements. Stand-off distances from other objects will be fulfilled. Dewatering of the roof will be provided by roof outlets that will be connected to the retention tank and then to the rain drainage system. Wastewater will be drained into wastewater drainage system. Dewatering around the house will be achieved by sloped pavement. No sources of technological noise will be present within the object. During the construction process, efforts will be made to minimize noise levels from machinery whenever possible. Construction works will not take place after 6 p.m. to avoid unnecessary noise disturbances. Waste from the construction site will be appropriately managed and recycled. The area does not exhibit significant levels of radiation.

j) Demands for sanitation, demolition, tree cutting

There are no existing buildings or structures on the site that require demolition. The area is primarily covered with shrubs, which have a height of less than 130cm and a trunk perimeter of less than 80cm. Therefore, no sanitation activities are necessary.

k) Demands for maximal temporary and permanent occupation of agricultural land or land intended for forest function

The building site is owned by the investor. The parcel is conducted as a garden in the built-up area of the municipality. The total area of the plot is 768m^2, from which 247m^2 is built-up area and 275m^2 is paved area. Excavation of the topsoil will be done to a depth of 300mm, and the excavated

soil will be reused on the site.

l) Territorial technical requirements - the potential of connection to the existing technical and transport infrastructure, the potential of barrier-less access to the designed structure

The designed house will be connected to the engineering pipelines from the east side. It will be connected to the water, rainwater and wastewater connection, to the electricity, to the low-pressure gas system and to the optic cable and communication.

The clinic, in compliance with Law no. 398/2009 Coll., will be connected to the road from the west side through designated parking spaces and a paved area. It will be built as a barrier-free structure, ensuring accessibility for all individuals.

The family house will be connected to the road from the east side through a pavement and a paved area leading to the garage.

m) Material and time links of the construction, conditional, induced, related investments

There are no further investments.

n) A list of the land according to the cadastral map on which is the structure situated and executed

Parcel numbers: 1674/732, 129/2, 128/10,

Cadastral area: 823520 Kanianka,

Type of parcel: Land registry parcel,

Type of the land: Garden

o) List of land according to the cadastral map, on which a security or protection zone is set up.

The standoff distances apply only to the specific parcels and do not extend to neighboring parcels except for one case. The standoff distance from the windows in the living room slightly extends beyond the parcel borders, there is a strip of vegetation located near the road, mitigating any potential risks or concerns, so there is no danger associated with this setup.

B.2 General description of the building

B.2.1 General characteristics of the structure and its use

a) New structure or alteration of completed structure; in the case of alteration in the structure, the information on their existing state, the results of the structural-technical and structural-historical survey and the outcome of the static analysis of the load-bearing structures

New detached family house with dental clinic, paved areas, fencing and connections to engineering networks.

b) The objective of structure usage

The family house with dental clinic is intended for living and working as well.

c) Permanent or temporary structure

The building is designed as a permanent structure.

d) Data on issued resolutions granting exception from technical requirements for construction works and technical requirements guaranteeing barrier-less use of the structure

The criteria for barrier-less access will apply to the building according to the decree. No. 398/2009 Coll.

e) Data on whether and in what parts of the documentation the conditions of binding judgements of the concerned authorities are taken into consideration

Even though this is not part of the bachelor's thesis, prior to the start of construction works, it is essential to properly locate and mark all engineering networks. In compliance with Act No. 309/2006 Coll., and Regulation No. 591/2006 Coll., necessary precautions must be taken to prevent any damage to property, equipment, engineering networks, and the well-being of individuals. In the event of any damage, it is mandatory to report such incidents to the relevant authorities, including the owners of transportation and technical infrastructure.

f) Protection of the structure according to the other legal regulations

The structure is not assessed according to other legal regulations since it is not part of any dangerous area.

g) Suggested parameters of the structure, built-up area, enclosed space, usable area, number of functional units and their size, etc.

Total area of the plot is 768 m^2, from which 247 m^2 is built-up area and 275 m^2 is paved area. The structure is composed of two functional units that are interconnected. It is designed for a family of four.

h) The basic balance of the construction - consumption of media and masses, management of rainwater, total quantity and types of wastes and emissions, energy class of buildings, etc.

Water balance:

Specific water demand Qs for the house

Qs = qr / d = 35/350 = 0,1 m3/ person × day = 100 l / person × day

qr - indicative number of annual water demand according to Decree No.120/2011 Coll. For living unit per inhabitant of the house with running hot water is 35 m3 per year.

d - number of operating days per year (365 days - 15 days of holiday)

After consulting with my supervisor, we have reached an agreement that the clinic will be accounted for as an additional consumption for 2 people, considering that the demand for resources will not be significantly high.

Average daily water demand Qd

Qd = Qs × n

n – number of inhabitants

Qd1 = 0,1 × 4 = 0,4 m3/ day = 400 l/ day

Qd2 = 0,1 x 2 = 0,2 m3/day = 200 l/day

Qd= 400 + 200 = 600 l/day

Maximum daily water demand Qm

Qm = Qd × kd = 0,6 × 1,5 = 0,9 m3/ day = 900 l / day

kd - daily unevenness coefficient (kd = 1,25 - 1,5)

Maximum hourly water demand Qh

Qh = (Qm/24) × kh = (0,9/24) × 2,3 = 0,08625 m3/ h = 86,25 l / h

kh - coefficient of hourly unevenness (kh = 1,8 - 2,3)

Annual water demand Qr

Qr = Qd × d = 0,6 × 350 = 210 m3/ year =210 000 l/year

d - number of operating days per year (365 days - 15 days of holiday)

Balance of hot water needs

Average hot water demand Qt

Qt = qt × n = 40 × 6 = 240 l / day = 0,24 m3/ day

qt - specific daily hot water demand (qt = 40 l / person × day)

Sewage outflow balance

Average daily wastewater runoff Qds

Qds = qs × n = 100 × 6 = 600 l /day = 0,6 m3/ day

qs - specific wastewater production according to ČSN 75 6402

(qs = 100 l/ person × day)

Maximum daily wastewater runoff Qms

Qms = Qds × kd = 0,6 × 1,5 = 0,9 m3/ day = 900 l / day

kd - daily unevenness coefficient (kd = 1,25 - 1,5)

Maximum hourly wastewater runoff Qhs

Qh= (Qms / t) × kh = (0,9/24) × 8 = 0,3 m3/ h = 300 l / h

kh - coefficient of hourly unevenness (kh for 6 persons = 8)

Annual wastewater runoff Qrs

Qrs = Qds × d = 0,6 × 350 = 210 m3/ year

d - number of operating days per year (365 days - 15 days of holiday)

Rainwater runoff balance

Roof above 1GF, A =102,2 m2

Roof above 2GF, A =105,3 m2

Roofs above entrance, A =3,47m2 and A=1,80m2

$Q=A_{total}$ x c x h= (102,2+105,3+3,47+1,8)x1x0,65=138 m3/year

h - long-term rainfall for municipality Kanianka (h = 650 mm)

Heat loss calculation – using envelope method

This calculation is provided in the folder No.6 – calculations and building physics.

The building is classified as class B-economical.

It has one gas condensing boiler VAILLANT VU 246/5-3 EcoTEC Pro with maximal power of 23kW and water tank 120 liters, with maximum power 10 - 19,9 kW.

Gas will be connected only to the boiler, the stove is electrical.

Quantity and types of waste

The waste generated will primarily consist of household waste and waste from the clinic. Separation of the waste will be done using municipality containers, that are in close proximity to the plot. Normal unseparated communal waste will be stored in a container on the plot on specially designed area. Each week will come garbage car and take it away.

Municipal waste: 4 persons × 5 l/person/day = 20 liter/day= 140 l/week.

Regarding the clinic, there will be more types of waste. Communal waste from patients will be disposed together with the waste from the household. Sharp objects, like injections, must be stored in a thick-walled container with safety cap. Biological waste will be stored in thick-walled bags and placed in closable containers. Those will be near the dentist chair, so the dentist can dispose it immediately. Expired or unusable drugs should be stored in a collection container, such as an ordinary paper box. The clinic will be provided with amalgam separator to minimize the release of amalgam waste into the wastewater. However, a small amount of leakage

may still occur, and as a result, the dental office is required to obtain permits from the relevant water management administrator and the local municipality's environmental branch. The permits are typically issued for a period of 4 years, provided that all conditions are met. It is recommended to store amalgam waste in a thick-walled container with a tight lid, made of glass or plastic. A contract will be established with a company that holds a special permit for the collection of hazardous waste. Hazardous waste identification sheets (ILNO sheets) must be prominently displayed in the vicinity of the storage area for specific waste types.

i) General presumptions of construction - time data of construction realization, division into stages

It is not necessary to divide construction into stages.

Estimated start date of construction: 02/2023

Estimated end date: 03/2024

j) Illustrative construction costs

Estimated costs are 350 000€.

B.2.2 Urban and architectural design solution

a) Urban planning - land regulation, composition of spatial solution

The new family house with dental clinic is situated in municipality Kanianka, Trenčín region, Slovakia. It is located on 3 parcels. The terrain slopes from west to east and also declines from north to south. The highest point of the plot is in the northwest corner, lowest in the southeast corner. In order to achieve flat surfaces, terraces from gabion walls were created, resulting in a height difference of 600mm. The plot has an irregular shape, with the longest side facing south.

The object is placed almost in the center of the plot, slightly shifted towards the north side to allow for a larger garden area facing the south. The distance between the building and the neighboring plot on the north side is 2035mm, which meets the requirement of being greater than 2000mm. On the south side, the house is surrounded by a road. The distance between the windows of the residential rooms and the road is designed to be 4410mm, exceeding the requirement of being greater than 3000mm. This distance complies with the regulations.

The house is divided into two functionally separate units, connected by a common wall. The residential part has a separate entrance from the east side, situated 10,87m from the road. The garage entrance is also situated on the east side, below ground level. The main orientation of the house is towards the south side, with all residential rooms facing it. Rooms facing the north side are toilets, bathrooms, storages, pantry, halls and boiler room. The clinic has an entrance from the west side. In front of the entrance, there is a paved area with a parking lot, allowing convenient parking just off the road. The clinic is designed as a barrier-free, so there is a ramp leading to the entrance. The dentist´s office faces the garden, but privacy will be maintained by planting bushes.

b) Architectural design - composition of shape, material and color design

The structure has almost rectangular shape with a few protrusions from the sides. It is divided into 2 functionally separate parts, dental clinic, and residential part, that are connected by a door for an easy access. From the side view, the house can be visualized as two connected rectangles. The smaller rectangle represents the clinic, that has just one floor and no basement. The bigger rectangle represents the family part, that has 2 floors and partial basement.

The structure is built from Porotherm insulated blocks with no additional thermal insulation. Only the basement is built from the Prefa formwork blocks filled with reinforced concrete. The façade has thermo plaster of whitish color. The ceilings are made of reinforced concrete slabs. The roofs are designed as flat, green-extensive roofs, dewatered by roof outlets passing through the house. Access to the bottom roof is facilitated by portable ladder and to the upper roof by attached wall ladder.

Peripheral windows and doors have triple glazing. The doors are made from wooden-aluminum and the windows are plastic. Garage doors are made of aluminum. All of them have anthracite color. Inside doors are wooden in birch veneer color. All the railings are made from aluminum in anthracite color. The light-weight entrance roof construction is also made from aluminum in anthracite color. For more specifications see the list of doors and windows and the list of elements.

B.2.3 General operating solution, production technology

The layout of the structure is divided into two distinct parts with separate entrances but interconnected by a common wall with a door. The family part has an entrance door and a garage door from the east side. The garage is in the underground level, together with a storage room, laundry room, toilet and a boiler room. It is connected to the rest of the house by a staircase. To access the main entrance of the house you will have to overcome a few steps. Though the entrance door you will enter a small entrance hall leading to a corridor. On the left side of the corridor is situated a living room connected to the kitchen, providing access to the garden. Adjacent to the living room is located a guest room also facing the garden. Opposite to the guest room is a small toilet and a bathroom facing the north. On the right side from the corridor is pantry and staircase that leads either to the second floor or to the basement.

The staircase of the second floor leads to a hall, which features an open space with a sofa and few shelves. On this floor, there three rooms, two for kids and one master bedroom, all of them facing the south side. On the right from the staircase is a toilet and a bathroom.

The corridor on the first floor leads to a changing room, which serves as a passage to the dentist office. Adjacent to the changing room is a storage room and a corridor with an observation and an x-ray room. The X-ray room is protected against the radiation. Next to the dentist office is the waiting room, which provides immediate access upon arrival. From the waiting room there is an access to the shared bathroom area, which includes three separate toilets: one for men, one for women, and one for disabled.

B.2.4 Barrierless usage of the building

According to the requirements No. 398/2009 Coll., on basic requirements ensuring the barrierless usage of buildings, the assessment focuses on the dental clinic rather than the residential area. The clinic has a designated parking space located near the entrance for wheelchair-bound individuals. The entrance to the clinic is equipped with a ramp that has an anti-slip surface, a slope of 8.3%, and railings at heights of 900mm, 750mm, and 150mm from the flooring. All doors in the clinic have a width

of 900mm and are designed without thresholds. Additionally, the toilet in the clinic is specifically designed to accommodate individuals in wheelchairs.

B.2.5 Safety during the usage of the construction

According to decree No. 591/2006 Coll. and 362/2005 Coll., on work safety and technical equipment during construction works, the construction will comply. It will provide a safe usage after the construction is completed. The structure will satisfy all the standards, norms and requirements.

B.2.6 Basic characteristics of structures

a) Building solutions

The peripheral load-bearing walls are made of Porotherm 50 T profi dryfix, with hydrophobised mineral wool inside of them, covered by thermo plaster. Peripheral load-bearing walls of basement are made of formwork blocks Prefa filled with reinforced concrete, covered by XPS-extruded polystyrene, and nopp's foil. Internal load-bearing walls are made of Porotherm 30 profi dryfix and partitions are made of Porotherm 14 P+D.

Horizontal load-bearing structures are made of reinforced concrete C20/25 slabs with thickness 200mm, and flat, green roof insulated by EPS 100 - expanded polystyrene.

The structure has strip foundation from plain concrete C12/15, reinforced by kari meshes below partitions. The foundation is in frost heave depth.

Earthworks

Before the excavation works will start, the topsoil has to be removed to a depth of 300mm. Subsequently, the excavations will be dig out mechanically using the bulldozer. In areas near engineering networks, which will be clearly marked, manual excavation using shovels will be performed. In case of bad weather, excavation works will be protected. The topsoil will be stored on the site for further use.

Foundations and insulation

The precise calculation for the foundation strip design is in the folder 7, Calculations. Foundation strips are made of plain concrete C12/15, with kari meshes under partitions. The foundation strip has thickness of 150mm. Strips are protected by 2 modified SBS asphalt felts with glass fiber, that serve as waterproofing and radon protection. Waterproofing has to be penetrated and melted. Underground vertical structures in contact with soil are insulated by XPS - extruded polystyrene with thickness of 100mm, that has lower absorption of water. On top will be nopp´s foil. The XPS insulation will be at least 300mm above ground level.

b) Structural and material solutions

The peripheral load-bearing walls are made of ceramic bricks Porotherm 50 T profi dryfix, THK 500mm, with hydrophobised mineral wool inside of them. They are connected by masonry foam applied in 4 thins strips. The first layer of bricks will be placed into lime-cement mortar bed, and it will be composed of bricks Porotherm 38 TS profi, that are water resistant. The peripheral walls will be covered by thermo plaster and façade plaster. The peripheral load-bearing walls of basement are made of formwork blocks Prefa 40/25/25 (P+D) filled with reinforced concrete, protected by 2 SBS modified asphalt felts, covered by XPS - extruded polystyrene, THK=100mm, and nopp´s foil. Internal load-bearing walls are made of Porotherm 30 profi dryfix, THK=300mm, and partitions are made of Porotherm 14 P+D, THK=140mm.

The horizontal load-bearing structures are reinforced concrete C20/25 slabs with thickness of 200mm and flat, green roof insulated by EPS 100 expanded polystyrene, protected by SBS modified asphalt felts. The EPS is in the form of roof keys, providing slope of 3%. The roof composition is stated in the folder 3, D1.1 – Architectural building solution, D1.1.09 List of compositions. The roofs are drained by roof outlets, that are connected to the retention tank and then to the rain sewage system. The lower roof is accessed by the portable ladder and the higher roof is accessed by the permanent ladder anchored to the wall from the bottom roof. The roofs are provided with the lighting conductor, safety hooks and 300mm gravel strips around chimneys and all around the attics.

The small roof above the entrance is connected to the structure by

Isokorb, hence there will not be thermal bridges, since the roof is not insulated, only covered by asphalt felts and drained by gutters.

The structure has strip foundation from the plain concrete C12/15 reinforced by kari meshes below partitions. The foundation is in frost heave depth. As it was described before precise calculation for the foundation strip design is in the folder 7, Calculations.

The inside staircase is U shaped with one half-landing and two arms. It is made of reinforced concrete with thickness of 160mm. It is provided with a railing. The entrance staircase into the house and also the staircases around the house are made of reinforced concrete and they have a strip foundation in frost heave depth. The entrance staircase is connected to the house, it has foundation in sandy-gravel infill so it can settle with the house settlement movement. The calculation for the staircase designs is in the folder 7, Calculations. The entrance ramp into the clinic has slope 8,3%, it has anti-slip surface, width of 1800mm and it is constructed on 300mm concrete and 600mm compacted sandy-gravel infill.

Peripheral windows and doors have triple glazing. The doors are made from wooden-aluminum and the windows are plastic. Garage doors are from aluminum. Inside doors are wooden. For more specifications see the list of doors and windows and the list of elements in folder D1.1 Architectural building solution.

Floors are mostly laminate floorings and ceramic tiles. Outside are used stone tiles, for more specifications see the folder D1.1 Architectural building solution, the list of compositions.

c) Mechanical resistance and stability

The object is constructed to resist all the applied loads, in compliance with ČSN EN 1990 - Principles of designing structures, ČSN EN 1991 - Structural load. The foundations strips of all structures are in frost heave depth. The structure is stable, can withstand loads and do not endanger life. It complies with SLS and ULS standards, other norms and requirements.

B.2.7 General characteristics of technological and technical equipment

a) Technical solution

Water supply

The house will be connected to the existing public water system by a new connection. This connection will lead through the water meter shaft situated in the garden to the technical room, where it will be stored, heated and redistributed throughout the whole construction. All the connections will go under foundations and will be in frost heave depth.

Wastewater drainage system

The house will be connected to the public wastewater drainage system. The connection will be passing though wastewater drainage shaft located on the plot. All the wastewater connection in the house will be leading to the main shaft, from where it will go out of the house. Since some parts of the connections are in the basement, pump will be designed. All the connections will go under foundations and will be in frost heave depth.

Rain drainage system

Flat roofs are dewatered by the help of vertical roof outlets that lead through the house and then they are led below foundations to the retention tank. From there it will pass through rainwater shaft to the public rain drainage system.

Heating

It the technical room there is one gas condensing boiler VAILLANT VU 246/5-3 EcoTEC Pro with maximal power of 23kW connected to the chimney SCHIEDEL ABSOLUT 380x380mm. For heating are used classical plate radiators KORADO. The heating expert will design all given appliances and structures.

Gas distribution

The low-pressure gas connection is provided. Only appliance connected to it is gas boiler. Connection is passing through the gas meter with main

gas closing valve situated in the fence perimeter from the east side.

Ventilation

The structure is ventilated naturally. The only air conductor is placed in the kitchen because of the stove. It is passing through the peripheral wall to the outside.

Electrical energy

The structure is connected to the public electrical system with a low voltage. It is passing through the main house electrical box with the electrometer located in the perimeter of the fence on the east.

Lightning conductor
Will be provided according to the ČSN EN 62305-1,2,3,4,5.

b) List of technical and technological equipment

This is not part of bachelor´s thesis.

B.2.8 Principles of fire safety solution

The fire safety report is provided in the folder 5, D1.3 Fire safety. The object is divided into two functionally separate structures that are interconnected. There are two fire compartments in the building, FC N1.01/N2-II -Living quarter with garage, and FC N1.02-I- Dental clinic. The fire resistance of the structures fulfills the requirements. Escape ways are sufficient. There will be two portable fire extinguishers in the house and two more in the dental clinic. The fire dangerous area does not endanger neighboring buildings and does not extend to neighboring properties except for one case. The standoff distance from the windows in the living room is going slightly beside parcel borders, but there is a strip of vegetation that is near the road, so there is no danger. All in all, the building satisfies the standards and given requirements.

B.2.9 Energy saving and thermal protection

The thermal protection of the building is provided in the folder 6, Building physics. The house is classified as class B-economical. It complies with ČSN 73 0540-2: 2010, and other norms and regulations.

B.2.10 Hygiene requirements for constructions, requirements for work and communal environments

Water supply, Wastewater drainage system, Rain drainage system, Heating, Gas distribution, Ventilation, Electrical energy, and Lighting conductor are described in B.2.7 General characteristics of technological and technical equipment a) Technical solution.

Waste

The residential part has special area for the bins. There will be just one 120l bin that will be emptied by the waste disposal company provided by the municipality. Big municipality recycling containers are in close proximity of the building. Separating will be done using those.

In the clinic will be biological waste so the specialized company will dispose it once a week, if necessary, more often. More information on the waste is included in the paragraph B.2.1 General characteristics of the structure and its use, h) quantity and type of waste.

Vibration and dustiness

The assessment of acoustics is provided in the folder 6, Building physics. The house is protected against vibration and noise, and at the same time it does not cause any noise, vibration or dustiness.

Lighting solution

The assessment of daylighting is provided in the folder 6, Building physics. The house is properly daylighted, it complies with ČSN 73 0580 and hygiene.

Impact of the structure on the surroundings

The influence on the surrounding is minimal. There is not increased noise nor vibrations. The object is not shading nor obstructing other buildings. Harmful emissions will not be produced. Building structures, solutions, equipment and materials fulfil given requirements.

B.2.11 Principles of building protection against unfavorable effects of the outdoor environment

a) Protection against penetration of radon from the subsoil

The radon index is very low in this part of Slovakia. The foundation strips are protected against moisture as well as against radon by the asphalt felts.

b) Protection against stray currents

The building is not situated in an electrically dangerous area. There is no metro, trolley buses, trams nor railways in this municipality.

c) Protection against technical seismic action

The house is not in a seismic zone. There are no vibrations or other effects from structures in the surrounding.

d) Noise protection

Sources of the noise are not in the proximity. The building does not have to be protected against noise, because there is not above-limit noise.

e) Flood control actions

There are no rivers, ponds, water streams nor underground water or heavy rains in the area. The house does not have to be protected against floods.

f) Other effects - undermining effects, methane occurrence, etc.

No other adverse effects are found in the area.

B.3 Connection to technical infrastructure

a) Connection points of technical infrastructure

The house will be connected to the existing public water system by a new connection. This connection will lead through the water meter shaft situated in the garden to the technical room, where it will be stored, heated and redistributed throughout the whole construction. All the connections will go under foundations and will be in the frost heave depth.

The structure will be also connected to the public wastewater drainage system. The connection will be passing though the wastewater drainage shaft located on the plot. All the wastewater connections in the house will be leading to the main shaft, from where it will go out of the house. Since some parts of the connections are in the basement, pump will be needed. All the connections will go under foundations and will be in frost heave depth.

Flat roofs are dewatered by the help of 4 vertical roof outlets that pass through the house and then they are led below foundations to the retention tank. From there it will pass through the rainwater shaft to the public rain drainage system.

The low-pressure gas connection is provided. The only appliance connected to it is gas boiler. The connection is passing through the gas meter with main gas closing valve situated in the fence perimeter from the east side.

The structure is connected to the public electrical system with low voltage. It is passing through the main house electrical box with the electrometer located in the perimeter of the fence on the east.

The house is also connected to the TV and internet.

b) connection dimensions, power capacities and lengths

This will not be mentioned because it is not the subject of this bachelor's thesis.

B.4 Transport methods

a) Description of the transport method, including barrier-less access and use of the building by persons with reduced mobility

Since the building is divided into 2 functionally separate units, it has 2 access roads. The first one is from the east side and it leads to the living part. The access is from the municipality road. The site is fenced, so you will have to pass through the gate and then continue by a pavement around 13m till you reach the stairs to the house leeward. From this side is also garage entrance that is sloped right from the road by 16%.

The access road into the clinic is from the west side. It is also from the municipality road. The area in front of the clinic is not fenced, but it is paved because there is a parking lot for 4 cars. The parking place close to the entrance is designed for a wheel-bound people. The entrance to the clinic has a ramp with an anti-slip surface, slope of 8,3% and railings in heights 900mm, 750mm, and 150mm from the flooring. All the doors have width of 900mm, and they are without thresholds. The toilet is also designed for the wheel-chaired people use. The clinic satisfies Decree No. 398/2009 Coll., On general requirements ensuring the barrier-free use of the building.

b) Connecting the area to the present transport infrastructure

The site plan is surrounded by a road from 3 sides. From the south side is just delivery road to the kindergarten. From the east side is dead end road, ending with our parcel. The access to the building is from 2 sides. One is from the east from the main road by pavement into the leeward. There is also paved sloped garage entrance 5m wide. From the west side is access to the clinic from the main road trough the paved parking lot designed for the clinic.

c) Traffic at rest

There will be designed garage for 2 cars. For the clinic is designed parking lot for 4 cars, from which one is designed for a wheelchair people.

d) Walking and cycling tracks

There is no cycling trail. The pavement is just from the opposite side of the main road as is our parcel. This is the case for the main road on the west and also on the east side.

B.5 Solution of vegetation and related landscaping

a) Landscaping

First of all, 300mm of topsoil will be removed and stored on the site. Because the site is in slope, excavated volume of the soil will be used for terrain adjustments. Terraces from gabion walls will be created with the height difference of 600mm. To gain flat surfaces, and to use excavated

soil 2 terrain levels will be created, -0,150m and -0,750m around the plot. The garage entrance will be -2,950m below ground level.

b) Used greenery

The site will be covered by a lawn. Bushes will be used as green barriers, so the people from the clinic will not see to the garden. On the gabion walls will be pots with flower serving as a railing, so none will fall.

c) Biotechnical measures

There is no need to provide biotechnical measures.

B.6 Characteristics of the environmental influence of the structure and its protection

a) Environmental influence - air, noise, water, waste and soil

The building will not have negative effect on the environment. No unreasonable amounts of noise, vibrations, waste nor exhaust gases will be created. Exhaust gases will be just from the gas boiler, that will comply with all the norms and regulations. The noisy equipment is not on the site. The waste will be collected and separated properly. Topsoil will be removed, stored and reused on the site according to the given standards.

b) Effect on nature and landscape - protection of tree specimens, protection of memorial trees, preservation of plants and animals, preservation of ecological performance and links in the landscape, etc...

No protected zone is on the parcel. There will not be found memorial trees, nor protected species of plants or animals. There are just small shrubs and grass, no trees. The building will not affect ecological functions and links.

c) Impact on the Natura 2000 network of protected areas

The building is not part of the Natura 2000 network.

d) The method of considering the conditions of the binding opinion of the environmental impact assessment of the project if it is the basis.

The assessment is not part of bachelor´s thesis.

e) In the case of projects belonging to the Integrated Prevention Act, the general criteria of the approach satisfying conclusion on the best available techniques or the integrated permit, if issued

Our building is not part of the Integrated prevention act.

f) Suggested protection and safety zones, scope of restrictions and conditions of protection under other legislation

The construction does not contain any protection or safety zones. The assessment is not necessary.

B.7 Population protection

According to Decree no. 380/2002 Coll., civic protection is satisfied. The project documentation fulfills all the requirements.

B.8 Principles of construction organization

a) Consumption of materials and critical media, their provision

The site will be provided with electrical current, water and wastewater connections from the municipality networks. Those connections will be provided before the construction starts. During the construction process, supply of materials will be sufficient, storage of materials will be on the site.

The house will be heated by a gas condensing boiler connected to the chimney, so the gas connection will be provided. It will be also connected to the internet and TV. No other media or materials will be spent on the site.

b) Construction site runoff

Rainwater from the roofs will be discharged to rainwater municipality

drainage. Rainwater will be led away from the house by sloped pavement 2%, into the terrain, where it will be soaked. On the west side that is sloped down will be a drainage gutter with an oil separator, the same will also be in front of the garage entrance. Both gutters will be connected to the municipality utility networks. Cellar skylights MEA will be dewatered just into the terrain.

c) Connection of the plot to the present transport and technical infrastructure

The object will be connected to the existing roads and utility networks. A new connection to the utility networks will be from the east side. Connections to the roads will be from the east and west side. The site will be fenced and protected by an alarm.

d) Impact of the structure on neighboring buildings and land

The construction plot is owned by the investor. All hygienic and working conditions will be considered. No toxic or chemical substances will be produced. The noise, vibration, and dustiness will be lowered.

e) Protection of the site surroundings and requirements for related sanitation, demolition and trees felling

No trees must be cut. The waste disposal will be done properly. The site will be fenced so no trespassing will occur. The fence will be provided with safety signs. This lowers risks of injuries and stealing.

f) Maximal short-term and long-term occupations of the construction site

No long-term occupations are considered. The storage of materials and equipment will be as short as possible.

g) Conditions for barrier-less bypass routes

Bypass routes are not considered. The barrier-less access to the clinic was discussed before in paragraph B.2.4 Barrierless usage of the building.

h) Maximal volumes and types of waste and emissions produced during construction and their disposal

According to the Act No. 185/2001 Coll., the waste will be sorted into different categories: concrete, insulation material, other metals, wood, plastic, steel, soil and rock, gypsum ,mixed building waste.

i) Earthwork equilibrium, soil input or storage requirements

After the removal of 300mm of topsoil, that will be stored and later used on the site, excavations will take place. The excavated soil will be used for landscaping of the construction site.

j) Environment protection during the construction

No environmental risk is established. Waste Act No. 185/2001 Coll., and public notice 93/2016, waste catalogue, are considered. ČSN 83 9011 - Work with soil and ČSN 83 9061 - Protection of trees are taken into account too. No increased dust, noise or vibrations are detected.

k) The basics of occupational safety and health at the construction site

The environment will not be at risk during the construction. Public notice No. 591/2006 Coll., on minimum requirements for occupational and health safety at the construction site, Act No.309/2006 about health and safety, Act No.378/2001 Coll. 30, safety of operated machinery and also Act No. 362/2005 Coll., on more detailed health and safety requirements at workplaces will be considered.

l) Adjustments for barrier-less usage by construction of the constructions involved

The barrier-less access to the clinic was discussed before in the paragraph B.2.4 Barrierless usage of the building.

m) Basics for traffic engineering measures

This part is not solved in bachelor´s thesis.

n) Resolution of special factors for the execution of the construction - execution of construction during operation, measures against the effects of the outdoor environment during construction, etc.

There are not special factor influencing the construction. The works will

not be provided during the night.

o) Evolution of construction, decisive partial due dates

Approximate start date of the construction: 02/2023

Approximate end date of the construction: 03/2024

Due dates:
1. Handing over the construction site
2. Construction of foundations
3. Construction of peripheral walls
4. Construction of ceilings
5. Construction of roof
6. Final check and handover to the investor

BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH DENTAL CLINIC

RODINNÝ DŮM SE ZUBNÍ ORDINACÍ

C. SITUATION DRAWINGS

BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

AUTHOR

AUTOR PRÁCE

Barbora Husárová

SUPERVISOR

VEDOUCÍ PRÁCE

prof. Ing. Jitka Mohelníková, Ph.D.

BRNO 2023

C. SITUATION DRAWINGS

C.1 Block plan

a) Scale 1:4000, 1:2000

b) Building connections to the transport and technical infrastructure

c) Present and proposed protection and safety zones

d) Proposed borders of the concerned plot

C.2 Cadastral plan

a) Scale 1:200

b) Plan of the designed building

c) Suggestion of the links and impact on the environment

C.3 Coordination situation drawing

a) Scale 1: 200

b) Present buildings, transport, and technical networks

c) Territory boundaries, parcel numbers

d) The boundaries of the concerned plot

e) Present altitude and geometric measurements

f) Identification of designed and removed buildings and technical infrastructure

g) Determination of the above-ground level for buildings (± 0,00) and the height of the terrain in the plot; maximum height of the building

h) Designed roads and paved areas, connection to transport network

i) Vegetation control

j) Distances of other buildings

k) Plan of new utility networks, connection of the structure to technical network

l) Present and designed protection and security zones, conservation areas, etc.

m) Maximum long-term and short-term occupations

n) Designation of geotechnical probes

o) Geodetical data, identification of the setting grid coordinates

p) Equipment on the construction site

q) Partitioning distances, including areas of fire hazard, access roads etc.

BRNO UNIVERSITY OF TECHNOLOGY

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

FACULTY OF CIVIL ENGINEERING

FAKULTA STAVEBNÍ

INSTITUTE OF BUILDING STRUCTURES

ÚSTAV POZEMNÍHO STAVITELSTVÍ

HOUSE WITH DENTAL CLINIC

RODINNÝ DŮM SE ZUBNÍ ORDINACÍ

D. DOCUMENTATION OF OBJECTS AND TECHNICAL AND TECHNOLOGICAL EQUIPMENTS

BACHELOR'S THESIS

BAKALÁŘSKÁ PRÁCE

AUTHOR

AUTOR PRÁCE

Barbora Husárová

SUPERVISOR

VEDOUCÍ PRÁCE

prof. Ing. Jitka Mohelníková, Ph.D.

BRNO 2023

Content

D. DOCUMENTATION OF OBJECTS AND TECHNICAL AND TECHNOLOGICAL EQUIPMENTS

D.1 Documentation of building or engineering object

D.1.1 Architectural and construction solutions

a) Technical report

Purpose of the object, function, capacity data

The structure is designed as a permanent family house with a dental clinic for one of the family members. House is made of masonry; it has flat roofs. It is built in sloped terrain. It has 2 floors and partial basement with garage.

Total area: 768 m2

Built-up area: 247 m2

Paved area: 275 m2

Volume: 3126 m3

Number of functional units: 2

Number of house users: 4

Number of business users: 1

Architectural, aesthetic and material solutions

The structure has almost rectangular shape with a few protrusions from the sides. It is divided into 2 functionally separate parts: the dental clinic and the residential part, that are connected by a door for an easy access. From the side view it looks like small and big rectangle connected together. The smaller rectangle is the clinic, that has just one floor and no basement. The bigger rectangle is a family part, that has 2 floors and a partial basement.

The structure is built from Porotherm insulated blocks with no additional insulation. Only the basement is built from Prefa formwork blocks filled with

reinforced concrete. The façade has thermo plaster of whitish color. The ceilings are made of reinforced concrete slabs. The roofs are flat and green-extensive, dewatered by roof outlets passing through the house. The access to the bottom roof is by the portable ladder and to the upper roof by the attached wall ladder.

Peripheral windows and doors have triple glazing. The doors are made from wooden-aluminum and the windows are plastic. Garage doors are from aluminum. All of them have anthracite color. Inside doors are wooden in birch veneer color. All the railings are made from aluminum in anthracite color. The light-weight entrance roof construction is also made from aluminum in anthracite color. For more specifications see list of doors and windows and list of elements.

Layout solution

The disposition of the structure is divided into 2 parts with separate entrances but interconnected by a common wall with a door. The part for a family has entrance door and garage door from the east side. The garage is in the underground level, together with a storage room, laundry room, toilet, and a boiler room. It is connected to the rest of the house by a staircase. To access the main entrance of the house you have overcome a few steps. Though the entrance door you will enter small entrance hall and from there a corridor. From the left side of the corridor is situated living room connected to the kitchen, through which it is possible to enter the garden. Adjacent to the living room is guest room also facing the garden. Opposite to the guest room is a small toilet and a bathroom facing the north. On the right side from the corridor is a pantry and a staircase that leads either to the second floor or to the basement.

The staircase of the second floor leads to an open hall, where is a place with a sofa and few shelves. There 3 rooms, 2 for kids and 1 master bedroom, all of them facing the south side. On the right side from the staircase is toilet and bathroom.

The corridor on the first floor leads to a changing room, through which one goes to the dentist office. Right next to the changing room is a storage room and a corridor with an observation and an x-ray room. The X-ray room is protected from the radiation. Right next to the dentist office is a waiting room, which you enter right away as you will come. From the waiting room there is an access to the common bathroom area, where are 3 toilets, 1 for men, 1 for women and 1 for disabled.

Barrier-less access

According to the requirements no. 398/2009 Coll., on basic requirements ensuring the barrierless usage of buildings, the residential area is not part of the assessment, but dental clinic is. There is a parking place close to the entrance for wheel-bound people. The entrance to the clinic has a ramp with anti-slip surface, slope of 8,3% and railings in heights 900mm, 750mm, and 150mm from the flooring. All the doors have width of 900mm, and they are without thresholds. The toilet is also designed for the wheel-chaired people use.

Design and construction technical solutions and technical characteristics of the construction

Peripheral load-bearing walls are made of Porotherm 50 T profi dryfix, with hydrophobised mineral wool inside of them, covered by thermo plaster. Peripheral load-bearing walls of basement are made of formwork blocks Prefa filled with reinforced concrete, covered by XPS - extruded polystyrene and nopp´s foil. Internal load-bearing walls are made of Porotherm 30 profi dryfix and partitions are made of Porotherm 14 P+D.

Horizontal load-bearing structures are reinforced concrete C20/25 slabs with thickness 200mm, and flat, green roof insulated by EPS 100 - expanded polystyrene.

The structure has strip foundation from plain concrete C12/15 reinforced by kari meshes below partitions. The foundation is in the frost heave depth.

Building safety

According to decree No. 591/2006 Coll. and 362/2005 Coll., on work safety and technical equipment during construction works, the construction will comply. It will provide safe usage after the construction is completed. The structure will satisfy all the standards, norms, and requirements.

Building physics

Calculations are provided in the folder No.6 – Building physics. There are assessments for Lighting solutions, vibrations and dustiness, thermal protection, and heat losses.

b) Drawing part

It’s provided in the folder No.3 - Architectural building solution and in the folder No.4 - Building structural solution.

D.1.2 Structural solution

a) Technical report

Earthworks

Before excavation works will start, the topsoil has to be removed in a depth of 300mm. After that excavations will be dig out mechanically by the use of bulldozer. In close proximity of engineering networks, that will be marked, it will be done manually, by shovels. If the weather is not good, excavation works will be protected. The topsoil will be stored on the site for further use.

Foundations and insulation

The precise calculation for the foundation strip design is in the folder 7, Calculations. Foundation strips are made of plain concrete C12/15, with kari meshes under partitions. The foundation strip has thickness 150mm. Strips are protected by 2 modified SBS asphalt felts with glass fiber, that serve as waterproofing and radon protection. The oversite concrete must be penetrated by primer with asphalt emulsion and dried. Then the first asphalt felt is melted in points. The second one is attached using surface melting. Felts are applied not only on the horizontal surfaces but also on the vertical surfaces that are in the contact with the soil. Vertical underground peripheral walls are insulated by XPS - extruded polystyrene with thickness 100mm, that has lower absorption of water. On top will be nopp´s foil. The XPS insulation will be at least 300mm above the ground level.

Vertical structures

Peripheral load-bearing walls are made of ceramic brickc Porotherm 50 T profi dryfix, THK 500mm, with hydrophobised mineral wool inside of them. They are connected by a masonry foam applied in 4 thins strips. The first layer of bricks will be placed into lime-cement mortar bed and it will be composed of bricks Porotherm 38 TS profi, that are water resistant. Peripheral walls will be covered by a thermo plaster and a façade plaster. Peripheral load-bearing

walls of basement are made of formwork blocks Prefa 40/25/25 (P+D) filled with reinforced concrete, protected by 2 SBS modified asphalt felts, covered by XPS - extruded polystyrene THK=100mm, and nopp´s foil. Internal load-bearing walls are made of Porotherm 30 profi dryfix, THK=300mm, and partitions are made of Porotherm 14 P+D, THK=140mm.

Horizontal structures

The load-bearing structures are reinforced concrete C20/25 slabs with thickness of 200mm. In the first and the second floor are located hidden girders in the staircase area, that are in the plane of the ceiling - 2 steel I profiles, IPE 200. Slabs and girders are described in the drawings of ceilings in the folder No.4 Building structural solution.

The house has flat, green roofs insulated by EPS 100 - expanded polystyrene, protected by SBS modified asphalt felts. The EPS is in the form of roof keys, providing slope of 3%. The roof composition is stated in the folder 3, D1.1 – Architectural building solution, D1.1.09 List of compositions. Roofs are drained by roof outlets, that are connected to the retention tank and then to the rain sewage system. The lower roof is accessed by a portable ladder and the higher roof is accessed by a permanent ladder anchored to the wall from the bottom roof. The roofs are provided with lighting conductor, safety hooks and 300mm gravel strips around chimneys and all around the attics.

The small roof above the entrance is connected to the structure by Isokorb, so there will not be thermal bridges since the roof is not insulated, just covered by the asphalt felts and drained by the gutters.

Staircases

The inside staircase is U shaped with one half-landing and two arms. It is made of reinforced concrete with thickness of 160mm. It is provided with railing. The entrance staircase into the house and also the staircases around the house are made of reinforced concrete and they have strip foundation in the frost heave depth. The entrance staircase is connected to the house, it has foundation in sandy-gravel infill so it can settle with the house settlement movement. The calculation for the staircase designs is in the folder 7, Calculations. The entrance ramp into the clinic has slope 8,3%, it has anti-slip surface, width of 1800mm and it is constructed on 300mm concrete and

600mm compacted sandy-gravel infill.

Lintels

Above all openings will be used ceramic reinforced lintels from Porotherm, KP7. In the peripheral walls they will be insulated. Above garage will be used 3 steel I profiles IPE 200, that will be also insulated.

Rings

Rings will be made of reinforced concrete C20/25, with steel B500B and minimal cover of 35mm. Concerning peripheral walls in the basement, rings will be fully placed on formwork blocks. In the first and in the second floor they will be placed on 260mm, then there will be 160mm of EPS insulation and ceramic rim with thickness 80mm.

Windows and doors

Peripheral windows and doors have triple glazing. The doors are made from wooden-aluminum and the windows are plastic. Garage doors are automatic, and they are from aluminum. Most of the inside doors are double hinged and wooden. Doors into the living room and into the staircase hall on the first floor are sliding pocket doors. Doors in the changing room and in the storage room in the clinic are plastic folding doors. The only steel frame doors are in the X-ray room because of the safety. There is also a window with the anti-radon protection. Between the residential part and the clinic is a fire door. For more specifications see the list of doors and windows and the list of elements in the folder D1.1 Architectural building solution.

Floors

Floors are mostly laminate floorings and ceramic tiles. Outside are used stone tiles, placed into gravel for more specifications see folder D1.1 Architectural building solution, list of compositions.

Inner plaster

Internal walls are firstly penetrated and reinforced with meshes and adhesive in the corners, edges, above openings, or parts where it is needed. On top of it will be applied lime-cement core plaster. After drying, fine stucco plaster will be used. The last layer will be applied after penetration, and it will be white

lime-based paint. Only in the X-ray room will be used baryta plaster that has anti-radon properties. Ceramic tiles will be used into certain heights in toilets, bathrooms and kitchen, more is specified in the plans.

Outer plaster

The building does not use any additional thermal insulation since the ceramic blocks are insulated itself. After penetration, binding layer Baumit Thermo plaster with polystyrene is used. Reinforcing layer Baumit procontact with glass fiber mesh is used for leveling and adhesion. Penetration primer is used and then pasty façade plaster with multifunctional drypor effect is applied.

Flashing products

Most of the flashing products are made of galvanized steel, but more information is provided in the list of elements in the folder D1.1 Architectural building solution.

Other products

Staircase railings are made of aluminum. More details are described in the list of elements in the folder D1.1 Architectural building solution.

The attached chimney is Shiedel absolut 380x380mm, single ventilation D=200mm, dilated by 30 mm of mineral wool. Above the roof it will be protected by a steel plating placed on top of the asphalt felts. It will go on chimney walls min 150mm. The chimney will be insulated by special mineral wool boards thick 5-6 cm, on top of which plaster will be applied. On top of the chimney will be placed cover plate with an overlap, so the rainwater can be led away.

Air extractor that is in the kitchen is connected to the ventilation pipe DN150mm.

b) Drawing part

Drawings are in the folder No.3 - Architectural building solution and in the folder No.4 - Building structural solution.

c) Static assessment

Calculations of loads, foundation strips and staircases are in the folder No.7 – calculations.

D.1.3. Fire safety solutions

The fire safety assessment of the building is in the folder No.5 - Fire safety.

3. CONCLUSION

Main aim of this bachelor's thesis is to elaborate project documentation for a new nearly-zero energy family house. The house is designed for a family of four with a dental clinic for one of the family members. It is located in quite modern municipality Kanianka, Trenčín region, Slovakia. The building is designed to satisfy all the norms, standards, regulations, laws, decrees and manufacturers sheets.

The building is designed in respect to the cardinal directions, shape of the plot, slope of the parcels and distances from other objects. It is ensured that the house will have good thermal, acoustic and daylighting performance. Thermal bridges will be eliminated and there will be no shading. It will withstand applied loads and it will fulfill ULS and SLS limits.

The work was elaborated by using softwares such as Autocad, ZBGIS, Velux daylight vizualiser 3, Microsoft word, and Excel. Project documentation was realized with the help from my supervisor. The real final design is bit different from preparation and study works. The changes were necessary so the design would be efficient.

To conclude, this work has given me an overview that project documentation is elaborate process, which requires many steps. That the final design may be different from the original one and above all, that norms and regulations are alfa and omega of the building projects.

4. LIST OF USED SOURCES

a) Literature

KLIMEŠOVÁ, Jarmila, Ing. *Nauka o pozemních stavbách: Modul M01*. Brno: Akademické nakladatelství CERM, 2007. ISBN 978-80-7204-530-3.

REMEŠ, Josef, Ing. a kolektiv. *Stavební príručka: To nejdůležizejší z norem, vyhlášek a zákonů*. 2., aktualizované vydání. Praha: Grada Publishing, 2014. ISBN 978-80-247-5142-9.

BENEŠ, Petr, Markéta SEDLÁKOVÁ, Marie RUSINOVÁ, Romana BENEŠOVÁ a Táňa ŠVECOVÁ. *Požární bezpečnost staveb*: Modul M01. Brno: Akademické nakladatelství CERM, 2016. ISBN 978-80-7204-943-1.

ZOUFAL, Roman. *Hodnoty požární odolnosti stavebních konstrukcí podle Eurokódu*. Praha: Pavus, 2009. ISBN 978-80-904481-0-0.

b) Websites

https://www.isover.cz/
https://www.wienerberger.sk/
https://www.prefa.cz/
https://www.schiedel.com/sk
https://www.topwet.cz/
https://baumit.sk/
https://www.velux.sk/
https://www.tzb-info.cz/
https://www.quick-step.cz/
https://www.vekra.cz/
https://alu-design.sk/
https://www.eclisse.sk/
https://www.hormann.sk/
https://mea.sk/
https://allimpex.sk/

https://www.sapeli.cz/

https://dek.sk/

https://www.schoeck.com/

https://www.buildex.sk/

https://www.rstudio-ambulancie.sk/

https://www.carestreamdental.com/

https://diplomat-dental.com/sk/

https://www.azstavba.sk/

https://www.e-klempir.cz/

https://www.vse-pro-strechu.cz/

c) Legislations and standards

Norms ČSN

ČSN 01 3420. Výkresy pozemních staveb: Kreslení výkresů stavební části. Praha: Český normalizační institut, 2004.

ČSN 73 4301. Obytné budovy. Praha: Český normalizační institut, 2004.

ČSN 73 0540. Tepelná ochrana budov: Část 1: Terminologie. Praha: Český normalizační institut, 2005.

ČSN 73 0540. Tepelná ochrana budov: Část 2: Požadavky. Praha: Český normalizační institut, 2011 Z1(2012).

ČSN 73 0540. Tepelná ochrana budov: Část 3: Návrhové hodnoty veličin. Praha: Český normalizační institut, 2005.

ČSN 73 0540. Tepelná ochrana budov: Část 4: Výpočtové metody. Praha: Český normalizační institut, 2005.

ČSN 73 1901. Navrhování střech: Základní ustanovení. Praha: pro technickou normalizaci, metrologii a státní zkušebnictví, 2011.

ČSN 73 4130. Schodiště a šikmé rampy: Základní požadavky. Praha: pro technickou normalizaci, metrologii a státní zkušebnictví, 2010.

ČSN 73 0802. Požární bezpečnost staveb: Nevýrobní objekty. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2009.

ČSN 73 0810. Požární bezpečnost staveb: Společná ustanovení. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2009.

ČSN 73 0833. Požární bezpečnost staveb: Budovy pro bydlení a ubytování. Praha: Úřad pro technickou normalizaci, metrologii a státní zkušebnictví, 2010.

ČSN 73 0532. Akustika: Ochrana proti hluku v budovách a posuzování akustických vlastností stavebních výrobků - Požadavky. Praha: pro technickou normalizaci, metrologii a státní zkušebnictví, 2010.

Laws and decrees

Zákon č. 183/2006 Sb., ve znění zákona č. 350/2012 Sb., o územním plánování a stavebním řádu (stavební zákon)

Zákon č. 185/2001 Sb., o odpadech

Zákon 133/1998 Sb., o technických podmínkách požární ochrany staveb

Zákon č. 309/2006 Sb., o zajištění dalších podmínek bezpečnosti a ochrany zdraví při práci

Nařízení vlády č. 591/2006 Sb., o bližších minimálních požadavcích na bezpečnost a ochranu zdraví při práci na staveništích

Vyhláška č. 499/2006 Sb., o dokumentaci staveb ve znění vyhlášky 62/2013 Sb.

Vyhláška č. 268/2009 Sb., o technických požadavcích na stavby

Vyhláška č. 376/2001 Sb., o hodnocení nebezpečných vlastností odpadů

Vyhláška č. 381/2001 Sb., kterou se stanoví katalog odpadů

Vyhláška č. 383/2001 Sb., o podrobnostech nakládání s odpady

Vyhláška č. 23/2008 Sb., o technických podmínkách požární ochrany staveb ve znění vyhlášky č. 268/2011 Sb. 31

Vyhláška 23/2008 Sb. změna Z1: 268/2011 o technických podmínkách požární ochrany staveb

Vyhláška č. 272/2011 Sb., o ochraně zdraví před nepříznivými účinky hluku a vibrací

5. LIST OF SYMBOLS AND ABBREVIATIONS

FGL	Formation ground level
IGL	Initial ground level
m.a.s.l.	Meter above sea level
FC	Fire compartment
RC	Reinforced concrete
PE	Polyethylene
PU	Polyurethane
XPS	Extruded polystyrene
EPS	Expanded polystyrene

THK	Thickness
RT	Retention tank
WMS	Water meter shaft
SBS	Styrene Butadiene Styrene
PVC	Polyvinylchloride
MGC	Main gas closing valve
WWS	Wastewater shaft
HBE	House box with electrometer
RWS	Rainwater shaft
DN	Diameter
ČSN	Czechoslovak standards
Coll.	Collineation
NTL	Low gas pressure
PHP	Práškový hasiaci prístroj
R	Thermal resistance of the structure
HT	Specific heat loss by heat penetration
U	Heat transfer coefficient
Uem	Average heat transfer coefficient
λ	Coefficient of thermal conductivity
H	Height
W	Width
L	Length
No.	Number
Etc.	Et cetera
μ	Diffusion factor
m	meter
mm	millimeter
km	kilometer
kg	kilogram
l	liter
dm	decimeter
cm	centimeter
s	second
h	hour
min	minute
max	maximum
min	minimum

6. LIST OF ATTACHMENTS

Folder No.1- PREPARATION AND STUDY WORKS

S.01 STUDY OF UNDERGROUND FLOOR PLAN	1:100	2xA4
S.02 STUDY OF THE FIRST FLOOR PLAN	1:100	2xA4
S.03 STUDY OF THE SECOND FLOOR PLAN	1:100	2xA4
S.04 STUDY OF SECTIONS	1:100	2xA4
S.05 STUDY OF NORTH AND SOUTH VIEW	1:100	2xA4
S.06 STUDY OF EAST AND WEST VIEW	1:100	2xA4
S.07 STUDY OF SITUATION	1:200	2xA4
S.08 STUDY OF FOUNDATION	1:50	8xA4
S.09 STUDY OF HEATING UNDERGROUND PLAN	1:100	2xA4
S.10 STUDY OF HEATING FIRST FLOOR PLAN	1:100	2xA4
S.11 STUDY OF HEATING SECOND FLOOR PLAN	1:100	2xA4
S.12 STUDY OF DRAINAGE SECOND FLOOR PLAN	1:100	2xA4
S.13 STUDY OF DRAINAGE FIRST FLOOR PLAN	1:100	2xA4
S.14 STUDY OF GAS SUPPLY CONNECTION	1:100	2xA4

Folder No.2 – C SITE PLANS

C.01 BLOCK PLAN	-	2xA4
C.02 CADASTRAL PLAN	1:200	2xA4
C.03 COORDINATION SITUATION	1:200	2xA4

Folder No.3 – D.1.1 ARCHITECTURAL BUILDING SOLUTIONS

D.1.1.01 UNDERGROUND FLOOR PLAN	1:50	8xA4
D.1.1.02 FIRST GROUND FLOOR PLAN	1:50	8xA4
D.1.1.03 SECOND GROUND FLOOR PLAN	1:50	8xA4
D.1.1.04 SECTION A-A´	1:50	8xA4
D.1.1.05 SECTION B-B´	1:50	8xA4
D.1.1.06 EAST AND WEST VIEW	1:50	8xA4
D.1.1.07 SOUTH AND NORTH VIEW	1:50	8xA4
D.1.1.08 LIST OF DOORS AND WINDOWS		
D.1.1.09 LIST OF COMPOSITIONS		
D.1.1.10 LIST OF ELEMENTS		

Folder No.4 – D.1.2 BUILDING STRUCTURAL SOLUTION

D.1.2.01 FOUNDATIONS	1:50	8xA4
D.1.2.02 SLAB ABOVE THE BASEMENT	1:50	8xA4
D.1.2.03 SLAB ABOVE THE FIRST GORUND FLOOR	1:50	8xA4
D.1.2.04 SLAB ABOVE THE SECOND GORUND FLOOR	1:50	8xA4
D.1.2.05 FLAT ROOF	1:50	8xA4
D.1.2.06 DETAIL A - ROOF ATTIC	1:10	4xA4
D.1.2.07 DETAIL B – LONG ROOF ATTIC	1:10	4xA4
D.1.2.08 DETAIL C - ROOF OUTLET	1:10	4xA4
D.1.2.09 DETAIL D – PLINTH	1:10	4xA4
D.1.2.10 DETAIL E - ROOF ABOVE ENTRANCE	1:10	4xA4

Folder No.5 – D.1.3 FIRE SAFETY

D.1.3.01 FIRE SAFETY REPORT		
D.1.3.02 SITE PLAN	1:200	2xA4
D.1.3.03 UNDERGROUND FLOOR PLAN	1:100	2xA4
D.1.3.04 FIRST GROUND FLOOR PLAN	1:100	2xA4
D.1.3.05 SECOND GROUND FLOOR PLAN	1:100	2xA4

Folder No.6 – BUILDING PHYSICS

THERMAL ASSESSMENT

ACOUSTICS ASSESSMENT

DAYLIGHT FACTOR ASSESSMENT

Folder No.7 – CALCULATIONS

STAIRCASE CALCULATION

FOUNDATION CALCULATION

PRELIMINARY RF CONCRETE SLAB CALCULATION

DRAINAGE CALCULATION

Folder No.8 – OTHER

DECREE OF THE MINISTRY OF HEALTH

INSTRUCTIONS FOR THE USE OF DENTAL KIT

SEMINARY WORK – NEARLY ZERO ENERGY BUILDINGS

POSTER