

VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ
BRNO UNIVERSITY OF TECHNOLOGY



FAKULTA STAVEBNÍ
ÚSTAV POZEMNÍHO STAVITELSTVÍ

FACULTY OF CIVIL ENGINEERING
INSTITUTE OF BUILDING STRUCTURES

FOLDER A - TEXT PART

EVIDENCE PART

DETACHED LOW ENERGY HOUSE

BAKALÁŘSKÁ PRÁCE
BACHELOR 'S THESIS

AUTOR PRÁCE
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VEDOUCÍ PRÁCE
SUPERVISOR

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BRNO 2015

Annotation

The bachelor's thesis is aimed on the solution of construction of "Detached low energy house" in form of project documentation. The house is intended for one family. It is located on parcel number 693/12, cadastral area Medlov (Brno-venkov) district. The house is without basement and has two stories with no garage.. The object is pre-cast concrete building with flat roof with a slope of 1 °.

Key words

Family house, detached, timber truss system, concrete panels, ytong blocks, cold roof, low energy.

Bibliografická citace VŠKP

RADULESCU, Raul. *Detached low energy house*, Brno, 2015. . Bakalářské práce.
Vysoké učení technické v Brně, Fakulta stavební, Ústav pozemního stavitelství. Vedoucí
práce doc. Ing. Jiří Sedlák.

PROHLÁŠENÍ O SHODĚ LISTINNÉ A ELEKTRONICKÉ FORMY VŠKP

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

V Brně dne 29. 05. 2015

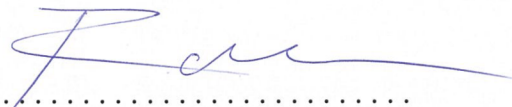


titul jméno a příjmení studenta
Raul Ionut Radulescu

Thanks:

I would like to thank my supervisor doc. ing. Jiří Sedlák, Ph.D. for his guidance and supervision, useful advices and proper leading throughout the preparation of my bachelor project.

V Brně dne 29. 05. 2015
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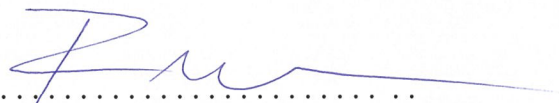
Declaration:

I declare, that I worked out bachelor thesis alone and I stated all used information sources.

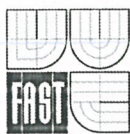
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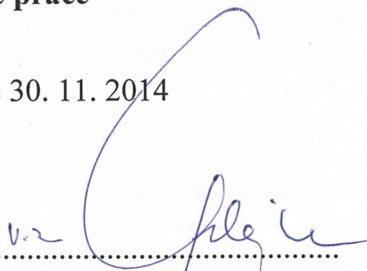
VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ FAKULTA STAVEBNÍ

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

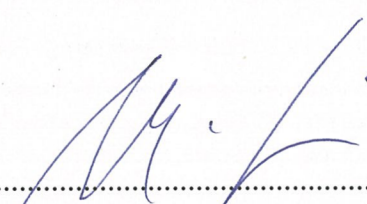
ZADÁNÍ BAKALÁŘSKÉ PRÁCE

Student	Raul-Ionuț Rădulescu
Název	Detached low energy house
Vedoucí bakalářské práce	doc. Ing. Jiří Sedlák, CSc.
Datum zadání bakalářské práce	30. 11. 2014
Datum odevzdání bakalářské práce	29. 5. 2015

V Brně dne 30. 11. 2014


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Podklady a literatura

Studie dispozičního řešení stavby, katalogy a odborná literatura, Zákon č. 183/2006 Sb. ve znění zákona č. 350/2012 Sb., Vyhláška č. 499/2006 Sb. ve znění vyhlášky č. 62/2013 Sb., Vyhláška č. 268/2009 Sb., Vyhláška č. 398/2009 Sb., platné ČSN, Směrnice děkana č. 19/2011 a dodatky.

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

Zadání VŠKP: projektová dokumentace stavební části k provedení novostavby nízkoenergetického rodinného domu.

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

Požadované výstupy dle uvedené Směrnice:

Textová část VŠKP bude obsahovat kromě ostatních položek také položku h) Úvod (popis námětu na zadání VŠKP), položku i) Vlastní text práce (textová část projektové 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 a energetický štítek obálky budovy.

Struktura bakalářské/diplomové práce

VŠKP vypracujte a rozčleňte podle dále uvedené struktury:

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



.....
doc. Ing. Jiří Sedlák, CSc.
Vedoucí bakalářské práce

Content

Introduction

Accompanying report

Summary technical report

Technical report

Conclusion

List of used sources

List of used abbreviations

List of attachments

Introduction

The bachelor's thesis is aimed on the solution of construction of "Detached low energy house" in form of project documentation. The house is intended for one family. It is located on parcel 664/42, cadastral area Medlov (Brno-venkov) district. The house is without basement and has two storyes. The object is made of precast concrete ytong blocks and a flat roof. The family residence is placed on large parcel with beautiful view to the surrounding nature.

TEXT PART OF THE THESIS

- A. Collateral report
- B. Summary technical report
- C. Technical report

VLASTNÍ TEXT PRÁCE

- A. Průvodní zpráva
- B. Souhrnná technická zpráva
- C. Technická zpráva

A.Colateral report

1. Identification data

Identification of the building: Detached low energy house

Place: Medlov (Brno-venkov), parcel number 664/42

Cadastral area: Biskoupky

Type: New building

Degree of PD: Project documentation for the planning permission

2. Characteristic of the location and the construction site

a) The parcels are situated in the village region in the area prepared for the building up in Medlov. Purpose of the parcels is building of the detached low energy house. At present time the parcels are a free place prepared for the building up. The whole area is in the ownership of the submitter.

b) The site will be checked by the probes with the aim to know the radon emissions of the soil and the depth of the underground water level. The connection onto the technical and traffic infrastructure will be provided by a short approach from pre-cast concrete tile segments connected to the present road construction. For the purpose of the building up the parcels are geodetically measured by the designer. On the border of the parcels will be made new connections of the water, electricity, gas pipes and the building will be connected to the public sewerage system by the core drill after the construction. Parking of the personal vehicles is solved by the parking place on the approach.

c) During the investigation of the relations to the properties of the other custodians have not been inquired any violation against their interests. The planned building will be outside all protection zones of the water main, electric lines and the road.

d) Planned building is in accordance with the common building development.
e) Intention of the family house is in the built-up location. Building is in accordance with the Territorial planning documentation (ÚPD).

f) Building of the family house have no time or material connections to the nearby areas.

g) Expected start of the building: 10/2015

h) Expected expenses on building*:

Whole expenses: 1 980 000,-

Whole project expenses: 217 800,-

Executive project: 59 400,-

Permission project: 39 600,-

Performance of the authorial and building supervision: 35 640,-

Built up area of the family house: 81,00 m²

New usable area of the family house: 92,3 m²

Habitable area: 86.4 m²

B. Summary technical report

1. Urban, architectonic and technological solution

a) Building site is situated in Medlov, in the part of the village prepared to the building up. The whole site is arranged to the plane and prepared for the construction. Connections to the electricity, water, communication cables and sewerage are premade for the purposes of construction and connection of the new building.

b) From the urban and architectonic point of view will not be made essential changes in the character of the build-up area. The current street line will be respected and will not be changed. Building will be made with the mono pitched-roof with slope 6,4 % perpendicularly to the street line. Terrain will be arranged to the plane according to the drawing of situation.

c) The technical solution consists of excavation of the soil for the arranging of the site to the plane and construction of foundations from reinforced concrete; load bearing walls will be constructed from the aerated concrete blocks Ytong; floors will be made as the system of reinforced aerated concrete panels with steel exchanges of system Ytong; partitions will be made from Ytong aerated concrete partition blocks; construction of the roof will be done as the mono-pitched rafter roof according to the project drawings. Construction system of the roof will correspond with the system of the cold flat roof. New connections of the networks will be done before the construction itself. Object will have open area of the garden type which will be bordering to the same areas of the nearby objects. The whole building will be placed on the parcels and will be faced to the street as other objects in the street.

d) The connection to the traffic and technical infrastructure will be provided by the approach from concrete tiles to the public road.

e) The building will not be situated on the undermined or sloped area with the steep descend.

f) From the point of view of environment and its protection will not be caused any aggravation in the town because of the noise, air and water pollutions or rubbish, by construction nor by the usage of building.

g) New building solves demands on the barrier-free usage only in the part of the premise. Entrance to the premise will be made as the barrier-free. Doors without doorsills will be used and the steps to the premise have to be provided with the steel ramp for the wheelchair access.

h) By the investigation were not detected any engineering networks that are restraining the building. The radon index in this area is on degree 2 – intermediate level. To this radon index will be designed horizontal insulation under the basement. According to the demands of the legislature for the producers every water-insulation foil can be used to this purpose. Underground water level was detected firstly in the depth of 5m from the intended grade level of the ground. According to this investigation will be done around the building drainage only for the purpose of the rain water drainage from the foundation strip.

i) The building site is localized and lay out in accordance to the situational plan in drawing documentation. For the levelling will be used measuring system BVP (Baltic after adjustment).

j) The building will be made as one building unit that is divided onto two functional

units. First unit consists of the dwelling areas and the second unit consists of one room of the premise with the individual sanitary facility.

k) The building site will be placed on the area owned by the submitter. On other areas (public or private) will not be made any temporary soil or material deposits. After construction the whole site will be cleaned perfectly such that there will not remain any residual debris from the construction.

l) Health and safety precautions will be provided according to the law 309/2006 Coll. About further demands on health and safety precautions during the working process and according to the Government regulation 61/2007 Coll. About health and safety precautions determination with changes 68/2010 Coll. and 93/2012 Coll.; it is mainly aimed to the work in the excavations, in heights, in the protective zones of the heavy machinery; work with the rotating and electric-driven tools and especially on the usage of the protective gear.

2. Mechanical stability and durability

a) Building is designed in construction systems appropriate for this type of building. All parts are designed such that failure, of the building or its part, will not occur. Object is stiffed by the reinforced concrete ring beams around each floor. Construction of the roof is designed as the rafter construction with the rafters perpendicular to the street. Rafters are supported by the wall beams which are anchored by screw rods into the ring beam from reinforced concrete. Every members of the roof construction will be provided with the coating against wood-rotting insects and fungi. Transversal bracing will be provided by the wooden decking. Construction system safely transfers the permanent and variable loading. Deformations greater then allowed strain according ČSN EN will not occur.

b) Construction system is not allowing occurrence of the excessive strain.

c) No part of the object and or any technical equipment will be subjected by the excessive deformation of the construction that can cause damage or destruction.

d) There is not allowed any damage of the construction that is inappropriate to its reason

and constructions are not designed in way that this can happen.

3. Fire safety

a) The whole object consists of one fire sector. All used materials are fulfilling the fire safety precautions about durability of the structure in fire, for the given type of building. All precautions of the ČSN 73 0802 and other regulations for the given type of building are fulfilled. Further information can be found in part F 1.3. - Fire safety report. The whole object will be provided by the device of the independent fire detection and signalization in accordance with the notice 23/2008 Coll. Furthermore is recommended to equip the building with one fire extinguisher with the quenching ability at least 34A. Individually will be provided same fire protection for the premise.

b) Around the object is situated the road approach that can provide the fire patrol intervention. According to the Fire safety report, hydrants for the supply of water for fire fight actions is placed in sufficient distance from the building.

4. Hygiene, protection of the health and environment

The building is fulfilling all the precautions and regulations about the hygiene, protection of the health and environment. Functioning of the premise will not produce any pollutions and will not be harming the health or environment.

5. Safety during the usage

According to the design, there are no places of the unusual risk, connected with the usage of this type of the building or premise.

6. Protection against noise

Object is not situated in the industrial area and all the materials will have sufficient sound-insulating properties, such that the maximal allowed values of the noise from the exterior inside the object will not be exceeded in any way.

7. Saving of energy and heat

By the used materials the sufficient thermal insulation of the object will be provided in accordance with the valid normative CSN 73 0540 - Thermal protection of buildings. See the certificate of the energetic demandingness of the building.

9. Protection against the harmful influences of the outer environment

The site is not located in the undermined area, there are no protective or safety zones, there is not aggressive underground water, and the site is not in the seismic area. The radon index of the site is 2 – intermediate.

10. Protection of the inhabitants

There are no special demands on the protection of the inhabitants for civil protection in case of war state or in case of natural disaster.

11. Engineering buildings (objects)

- a) Waste water and rain water will be drained to the combined public sewerage network.
- b) Supply of water will be provided from the present water-supply network by the new connection.
- c) Supply of electricity will be provided by the connection of the building to the new electric connection. Supply of the nature gas is not demanded.
- d) Parking will be provided on the approach from the concrete tiles.
- e) Area around the building site will stay in the present state, building process will not intervene to the surrounding areas. Ground level of the site will be adjusted to the plane according to the situation drawing.
- f) Electronic communication cables will be connected direct to the house by the connection from the main communication cable that leads on the border of the

parcels according to the situation drawing.

12. Production and non-production technological facilities (if exists)

C. Situation of the building

Situation drawing: see drawing no. 01.

Situation of the wider relations: see drawing no. 02.

D. Evidence part

- a) In bachelor thesis this part is not solved.
- b) Energy label of the building and the thermal design, envelope of the building - see the report.

E. Organization principles of the construction

a) The building site will be placed on the parcels of the owner and occupation of the public areas will not be necessary for the purposes of the construction. Before the establishment of the site will be stumped all the self-seeded trees and bushes. Site will not be fenced, fences will be used only for the purpose of the protection of the site storage of the material. There will be established no permanent repositories of the soil or rubble. Temporary repository of the topsoil will be established at the north part of the parcels next to the entrance to the building site that will be used for the unloading of the trucks with material.

b) Connection of the site to the technical infrastructure will be done by the two entrances, one at south-west part of parcels for the construction purposes from the local asphalt road and one at north-east for the supply of the materials for construction from the local dust road.

c) For the connection of the site to the sources of the electricity and water will be done by the new connections of water and electricity that will serve also as the permanent connections for the family house. Those connections have to be done before the construction of the family house itself. Dewatering of the building site is solved by the natural slope of the parcel and by the natural infiltration of the water to the subsoil.

d) Whole site will be marked by the plastic tape with the warning signs and recommendatory signs. The site is not solving usage by the persons with the wheelchair access or limited orientation ability.

e) The site will be completely on the parcels of the owner and there will not be any endangering of the public interests by any means.

f) On the site will be established temporary storage of the tools, dressing room, and the office of the foreman. For this purpose transportable container cells for the temporary occupation will be used. There will be also established one special container cell with the built-in sanitary facilities.

g) There will be no structures of the site for which building notification is needed.

h) Health and safety precautions will be provided according to the law 309/2006 Coll. About further demands on health and safety precautions during the working process and according to the Regulation 361/2007 Coll. About health and safety precautions

determination with changes 68/2010 Coll. and 93/2012 Coll.; it is mainly aimed to the work in the excavations, in heights, in the protective zones of the heavy machinery; work with the rotating and electric-driven tools and especially on the usage of the protective gear.

i) The construction will not have any significant influence on the environment and the possible influences during the construction will be eliminated as much as possible by the following precautions: protection of the underground water quality; protection of the air against gaseous pollutions and or excessive dustiness; protection of the travel traces and the other areas in the vicinity of the building site against polluting – if such pollution will occur the supplier of the building construction will be obliged to immediate removal of the pollutants and compensate the damage if occurred; keep the site in order and respect the health and safety precautions according to the valid public notices.

j) Expected establishing of the site: 9/2015;
Expected start of the construction: 10/2015;
Expected end of the construction: 3/2015

F. Documentation of the building (object/s)

1. Ground (building) objects

1.1. Architectonical and construction technical solution

1.1.1. Technical report

a) The object of the family house will serve for the dwelling purposes of the owner. Premise in the family house will serve for the purpose of the business aims of the owner.

b) Object appearance is designed in way that it does not have negative influence on the architectonical and urban concept of other objects with respect to the locality. Minimal distances from the neighbouring parcels 3,5 m are fulfilled. The construction system is masonry construction from aerated concrete blocks Ytong with the contact thermal insulation, on the external side of the building, Ytong Multipor, with thickness 120mm.

Urban integration of the object is in accordance with the planed built-up of the locality. Building is following the spatial style of the surrounding built-up area for the family housing. The roof of the object is mono-pitched roof with the sloping to the street with slope 6,4 %. Highest edge of the roof is 7,06 m above the adjusted ground level. The roof cover will be from the titan-zinc in natural colour (silver). Facade of the building will be made in yellow colour. All doors and windows will be made from plastic materials as dark oak imitation with triple glassing, with the dark-brass fittings. All metal plating, eaves and down sprouts of the roof will be in silver colour from the same material as the roof cover (titan-zinc). Window sills will be from the titan-zinc protected by the plastic coating in dark red-brown colour. Approach, used also for parking, is from the pre-casted concrete tile segments. Division of the approach will be provided by the grass strip according to the situation drawing. Around the house will be made the gutter sidewalk from the concrete tiles. Areas around the building (including slopes after the terrain adjustments) will be grassed over and the rest of the

parcels will be used as the recreation garden. The fences between parcels of the owner and the neighbouring parcels will be made as wire fences and fence heading to the street will be made as the low wall with columns of the concrete blocks laid on mortar in combination with the steel fencing from the steel rods – according to the wish of the investor. Steel gate will be placed on the rail and it will be sliding.

From the disposition point of view the building is solved in following way: main entrance to the house (and premise) is from the south west side. Behind the entrance doors there is small entrance hall with built-in cabinet. From this entrance hall there is on the right the door to the premise. On the left side there is door to the hall of the first over-ground floor of the house. From this floor is entrance to the living room, to the kitchen with food store, to the toilet and on the stairs to the second over-ground floor. In the second over-ground floor there are doors to the bedrooms, to the technical room and to the bath room and toilet. From the bedroom no. 2 (according to the numbering in the floor plan of the second over-ground floor) there is possibility to enter dresser. In the bath room there will be checking opening, to the space under the roof construction (which must be also very properly insulated. as the rest of the building construction. Future users are not people with the reduced mobility so there are no demands on the barrier-free usage in the family house. Only demand is for the premise where will be installed steel ramp in the entrance for the purpose of the barrier-free usage. Door bells will be placed on the concrete column next to the gate so there will be no problem for the people with the reduced mobility.

c) According to the land registry the area of the touched parcels is 2006,000 m². 1x Family House 4+1; whole built-up area of the 1st OF 81.2 m². Floor area 69.6 (1st OF) and 76,600 m² (2nd OF). Total volume of the building 803,684 m³.

Height of the upper edge of the roof from $\pm 0,000$: 7,06m

Slope of the mono-pitched roof: 6,4 %

No. of dwellings:

No. of garages: 0

Max. no. of parking places: 4

Orientation of the main entrance: North-west

Lightning and day-lightning: Sufficient area of windows is fulfilled for the all rooms for the purpose of the day-lightning. Rooms are lighted by the sufficient amount of ceiling lamps. In the bathroom there are spotlights above the basin. Spotlights are also in kitchen above the kitchen unit and digester.

d) Project documentation concerns about the new building of the family house with the

premise from the system Xella Ytong. The vertical constructions, both load bearing walls and partitions are made of the Ytong aerated concrete blocks. Horizontal constructions are made of the aerated reinforced concrete panels Ytong. Foundations are made from the reinforced concrete foundation strips. Roof is made as the cold-roof with the ventilated cavity. The first part consists of the insulated panel construction of the ceiling of the second OF and the second part is made of the wooden rafters with the wooden boards decking. Assumed life-time of the building is 70 – 90 years. Supplier documentation have to be controlled especially necessary certificates and declaration of conformity.

e) Composition of all constructions, both horizontal and vertical, and further more all doors and windows are fulfilling the demands of the ČSN 73 0540-2 Thermal protection of the building. More detailed description in the section D, sub-section b) Energy label of the building – reference building comparison.

Compositions of the vertical constructions fulfill the demands of the ČSN 73 0532 Acoustics, for the construction sound insulation $R'_{w,min} = 42$ dB.

f) The object of the family house will be founded on the foundation strips from reinforced concrete with the sub-base from the compacted gravel with thickness 100mm (Note: if the bottom of the excavations will be cleaned and levelled properly, the sub-base is not necessary to do.). The depth of the foundations of external walls will be to the non-freezing depth – 1,2m – below the adjusted ground level; for the depth of the foundations of the internal walls will be sufficient the depth 0,9 m. The foundation soil is semi-permeable soil with the minimal tabular value of the compressive strength 150 kPa and for this value was done the preliminary design of the width of the foundation strips for the most stressed parts of the foundations with the variable load value 3 kN/m². Exact value of the soil compressive strength should be determined by the field measuring. The underground water level is localized firstly in depth of the 4 m below the adjusted terrain level and the annual fluctuation of the water level is at max. ± 1 m and the location is not in the area with the danger of flooding so there will be no necessity to establish the drainage system for the drainage of the underground water away from the foundation construction, but the drainage system will be established for the drainage of the rain water only. On the foundation will be done the blinding concrete with the thickness 150 mm.

g) Project concerns about the new masonry building of the family house that is made from the materials that does not have negative effect on the health or the environment. The heating will be provided by the electric boiler, so that there will be no air pollutions that can be potential threat for the health or environment. In the given locality there are no protection zones of gas or electricity. The locality is not in the protected area or in the area with the characteristics of the national park. The construction will not have any significant influence on the environment and the possible influences during the construction will be eliminated as much as possible by the following precautions: protection of the underground water quality; protection of the air against gaseous pollutions and or excessive dustiness; protection of the travel traces and the other areas in the vicinity of the building site against polluting – if such pollution will occur the supplier of the building construction will be obliged to immediate removal of the pollutants and compensate the damage if occurred; keep the site in order and respect the health and safety precautions according to the valid public notices.

During the earth-works the topsoil will be stored on the given area on the parcels and the rest of the soil will be moved to the temporal repository or to the heap. During the construction the containers for the storage of the waste and rubble will be placed out of the public areas and the rubble will be continuously moved away to the heap of the rubble.

There will be forbidden the polluting by the waste water, surface wash outs on the site, especially on the place that will be polluted by the oils or crude oil products (e.g. from leaking tank of the trucks or the working machines).

The usage of the object of the family house or the usage of the premise will not have any influence on the environment.

h) House and its paved approach with approximately 2 parking places are allowing connection to the public traffic infrastructure. Around the house remains the free space for the grassing. Entrance to the area is designed by the one big sliding gate placed on the right side of the approach, according to the situation drawing, from the local asphalt road of the village Biskoupky. There will be no grown trees or high bushes that can disturb the view. View from the gate is good to the all directions.

i) The building is in accordance with the regulations for the protection against the harmful influences of the outer environment.

The designed constructions, their materials and the mounting are such that there will not be exceeded the noise limits from the outside the building in the hygienic protection zone. Dividing constructions between the individual rooms have to fulfill the hygienic demands of the ČSN 73 0532 – Acoustics.

The construction is the building of the new family house with the premise and so on the locality have been made the radon index testing by the authorized company. Their conclusions and the measured values shows that the degree of the radon index in the area is 2 – intermediate level. On this degree of the radon index was designed the antiradon and waterproof layer from the PVC foil according to the ČSN bedded on the penetration coating on the blinding concrete (According to the ČSN every plastic foil insulation against the underground moisture and water fulfills the protection against the radon penetration.).

j) Designed solution respects every generally technical demands on the built-up.

1.2. Building constructional part

1.2.1. Technical report

a) The foundation strips will be made from the reinforced concrete. Dimensions of the foundations according to the preliminary design – see the drawing of the foundations. As the value of the variable load on each floor was taken into account the value 3 kN/m². The foundations will be thermally insulated by the XPS insulation Styrotrade Perimeter with the thickness 120 mm (Insulation will be done to the height 0,5 m above the adjusted terrain level.).

Floor on the ground (floor of the first over-ground floor) is made on the blinding concrete according to the construction compositions in the section drawings or according to the drawing of the detail C, with the thickness 150 mm. The blinding concrete will be reinforced by the KARI nets 6/100x100mm on the bottom and by the same nets on the top surface of the blinding concrete. Thermal insulation of the floor on the terrain will be made of the EPS floor insulation Extherm EPS 100 with the thickness 200 mm. The thermal insulation is covered by protective PVC foil and on this foil is casted the concrete screed with the thickness 80 mm.

Building is made as the masonry construction of the aerated concrete blocks Ytong bedded on the thin-layer mortar with the thickness of the joint 1mm. External load bearing walls are made of the blocks with the thickness of masonry 375mm with the external mineral thermal-insulating boards Ytong Multipor, fitted on the thin layer cement glue. Internal load bearing walls are made from the blocks with the thickness of masonry 300mm. Load bearing walls that are supporting the staircase are made of the block with the thickness of the masonry 200 mm. Partitions are made of the blocks with the thickness of the masonry 150 mm.

The construction of the staircase is made by the prefabricated stair steps from aerated reinforced concrete of the system Ytong. Individual steps are supported as the simple beam, i.e. on both sides are steps supported by the load bearing wall construction according to the drawings of the floor plans.

Floor constructions are made of the aerated reinforced concrete panels Ytong bedded on the mortar bedding with the thickness 10 mm. Maximum value of the loading on the panels can be found in the tables of the producer. At the level of the floor panels is done, according to the detail B the reinforced concrete ring beam around each floor

with the non-bearing face block on the external side, preferably because of the greater conformity with the rest of the facade for minimal possible problems with the connection of the contact insulation. The construction of the second OF ceiling will be insulated according to the section drawings with the insulation of the thickness 200 mm – Ytong Multipor and Foamglass under the masonry holding the roof construction.

Under the roof construction the wall is ended by the reinforced concrete ring beam around the whole building and on this ring beam is fitted wooden wall plate 200x140 mm, by the screw rods concreted into the ring beam – detail D.

Construction of the roof is made as the mono-pitched roof from the wooden rafters 100x180mm with the axial distances according to the drawing of the roof construction. Rafters are decked and braced in transversal direction by the wooden boards with the cross section 140x25mm. On this layer is placed 5 – 10 mm of non-woven geo-textile for the elimination of the inequalities of the wooden decking. Then is placed the PVC diffusive foil and the roof cover made of the titan-zinc with the natural color. Roof cover will be nailed to the rafters and the nail-heads will be treated by the doublecomponent liquid metal resin, that is waterproof and inert to the UV-radiation. Slope of the roof construction will be 6,4 % to the street, dewatered by the titan-zinc gutters with the titan-zinc down sprouts to the uniform public sewerage system.

b) Designed materials and cross sections can be found in the drawings of details and sections or other drawings, e.g. drawing of the roof construction.

Designed windows and doors are plastic in the imitation of the dark-oak. *Windows* are designed as Vekra TECHNIC with the triple glassing in way that the producer guarantee the values: $U = 0,8 \text{ W/(Km}^2\text{)}$ and the acoustic properties 34 – 41 dB. *Doors* are designed as Verkra PRIMA in way that the producer guarantee the value $U = 0,7 \text{ W/(Km}^2\text{)}$. Parapets of the windows will be made according to the dimension of each of the window.

Further informations can be found in the lists of the doors and windows and in the list of the plumber works.

c) For the preliminary calculation of the width of the foundation strips these values of the loading were used, according to the ČSN 73 0035 Loading of the building constructions:

Uniform variable load 3,0 kN/m² (from the possible choices 1,5 or 3,0 kN/m²).

Climatic loading by the snow 1,05 kN/m².

Static calculation were needed only for the preliminary design of the foundation strips. Other members of the building are designed with respect to the maximal loading and span usage.

d) The whole over-ground construction except the roof construction will be done according to the system guide of the company Xella, for the product Ytong.

e) There is not necessary to solve any complicated construction demands.

f) The construction is new building of family house and is not necessary to do any demolitions, stabilizations or strengthening of the constructions or transmissions.

g) There is demand on the check of the proper mounting of the insulation above the second over-ground floor and the proper placing and dimensions of the wall plates, because after is will be hardly possible to check it properly. There are no other demands on the special check of the constructions before decking.

Conclusion

The project has focused on effective utilization of the large size of the given parcel and on creation of living comfort for future users of the family residents. For the design of the object were used modern and economic materials enabling connection of esthetical and functional requirements of present times. It has been achieved to integrate the house into the surrounding environment by using the flat roof.

Seznam použitých materiálů a zdrojů / List of used sources

Normy(used czech and european standards):

ČSN 73 4301 – Obytné budovy

ČSN 73 4108 – Šatny, umývárny a záchody

ČSN 73 0833 – PBS – Budovy pro bydlení a ubytování

ČSN 73 0802 – PBS – Nevýrobní objekty

ČSN 73 0540-2 – Tepelná ochrana budov

ČSN 01 3420 – Výkresy pozemních staveb

ČSN 73 0810:06/2005 – Požární bezpečnost staveb – Společná ustanovení

ČSN 73 0802:05/2009 – Požární bezpečnost staveb – Nevýrobní objekty

ČSN 73 0833:10/2010 – Požární bezpečnost staveb – Budovy pro bydlení a ubytování

ČSN 73 0873:06/2003 – Požární bezpečnost staveb – Zásobování požární vodou

Právní předpisy (used legislation)

Zákon č. 183/2006 Sb. O územním plánování a stavebním řádu /Stavební zákon/

Vyhláška č. 268/2009 Sb. O technických požadavcích na stavby

Studijní opory (study materials)

Nauka o pozemních stavbách – Modul M01, Ing. Jarmila Klimešová

Webové stránky: (web pages of producers and suppliers)

www.isover.cz

www.ytong.cz

www.nahlizenidokn.czuzk.cz

www.tzb-info.cz

www.kauf.cz

www.mitec.cz

www.fce.vutbr.cz

www.sakret.cz

www.ekostavivo.cz

www.icopal.cz

www.geology.cz

List of used abbreviations and symbols:

IGL	Initial ground level
FGL	Formational ground level
FF	First floor
EPS	expanded polystyrene
U	Overall heat transfer coefficient

Attachments

Folder No.1 - STUDY

Views East,West	S 1:100
Views North, South	S 1:100
Architectural floorplans	S 1:100
Sections	S 1:100
Cadastral information	

Folder No.2 - SITE PLANS

C.1 Coordination site plan	S 1:200
C.2 Site plan of wider relations	S 1:500

Folder No.3 - D.1.1- CONSTRUCTIONAL SOLUTION 1

D.1.1.01- Foundations	S 1:50
D.1.1.02- Floor plan of ground floor	S 1:50
D.1.1.03- Floor plan of first floor	S 1:50
D.1.1.04- Section A-A'	S 1:50
D.1.1.05- Section B-B'	S 1:50
D.1.1.06- Roof floor plan	S 1:50
D.1.1.07- Ceiling structure	S 1:50
D.1.1.08- View South	S 1:50
D.1.1.09- View West	S 1:50
D.1.1.10- View East	S 1:50
D.1.1.11- View North	S 1:50

Folder No.4 - D.1.1- CONSTRUCTIONAL SOLUTION 2

D.1.1.12- Detail A	S 1:10
D.1.1.13- Detail B	S 1:10
D.1.1.14- Detail C	S 1:15
D.1.1.17- List of compositions	
D.1.1.18- List of elements	
D.1.1.19- Technical report	

Folder No.5 - D.1.3- FIRE SAFETY

D.1.3.01- Fire safety site plan	S 1:200
D.1.3.02- Fire safety report	

Folder No.6 - Building physics

EVALUATION FROM THERMAL AND ACOUSTIC RESISTANCE POINT OF VIEW

Apex 1, calculation part

Apex 2, EVALUATION OF GEOMETRICAL THERMAL BRIDGES IN AREA
SOFTWARE

Apex 3, List of compositions

Apex 4, Protocol for the energy performance certificate