



VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

BRNO UNIVERSITY OF TECHNOLOGY

FAKULTA STAVEBNÍ

FACULTY OF CIVIL ENGINEERING

ÚSTAV POZEMNÍHO STAVITELSTVÍ

INSTITUTE OF BUILDING STRUCTURES

SAMOSTATNÉ RODINNÉ BYDLENÍ

DETACHED FAMILY RESIDENCE

FIRE SAFETY REPORT

BAKALÁŘSKÁ PRÁCE

BACHELOR'S THESIS

AUTOR PRÁCE

AUTHOR

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VEDOUCÍ PRÁCE

SUPERVISOR

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BRNO 2018

1. Identification data

Name of the building:	Detached family residence
Location of the building:	Brno Sadová 333 St. Miry Figarové Parcel number: 251/6
Investor:	Robert Banič, Družstevná 23, 971 01 Prievidza, Slovakia
Designer:	Dávid Lend'ák, Helcmaovce 101, Slovakia

The design of the family house is for permanent residence of 5 family members. The building is designed from wooden construction, the loadbearing elements are STEICO columns with maximum distance of 625 mm. The construction is filled with mineral wool ISOVER WDF plus and covered with OSB thickness 15 mm. On the internal side there is 60 mm of ISOVER UNI which is covered by gypsum board. The external side is made of ventilated façade, the finish elements are cement fiber boards EQUITONE. The load bearing walls are constructed on foundation strips. The house has a flat roof. The entrance is oriented on the South side.

2. Materials used for processing

2.1 Project documentation

- Drawings of building structural solutions
- Technical parameters from manufacturers
- ČSN 730833 – Fire safety of buildings, Residential buildings
- ČSN 730873 – Fire safety of buildings, Water supply for fire systems

- Czech National Standards o ČSN 730810 – Fire safety of buildings, Common provisions
- ČSN 730802 – Fire safety of buildings, Non-production buildings

2.1 Public notices

- No. 23/2008 Coll., about technical conditions for fire safety of buildings
- No. 268/2011 Coll., about technical requirements for buildings
- No. 246/2001 Coll., about assessment of conditions for fire safety

3. Situational, layout and construction solution of the building

3.1 Situational solution

The building is located on a land with area of 543 m², it is the only building on this land. The Building is situated on the north side of the land and with entrance situated to the south side. On the east side of the building there is a garage and a storage room.

3.2 Disposition

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

3.3 Construction solution of the building

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

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

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

4. Fire safety assessment

4.1 Fire technical characteristics of the building

Building is assessed by ČSN 730802 – Fire safety of buildings
ČSN 730833 – Fire safety of buildings, Residential buildings

Group: OB1
Construction system: Flammable, DP3
Fire height: 3,070 m

4.2 Fire compartments

1st Floor	No.	Room description	Area [m ²]	Floor
	1.01	Kitchen	26	Tiles
	1.02	Living room	31	Laminate Flooring
	1.03	Pantry	2	Tiles
	1.04	Hall	8	Laminate Flooring
	1.05	Toilet	3	Tiles
	1.06	Technical room	11	Tiles
	1.07	Changing room	8	Tiles
	1.08	Entry hall	7	Tiles
	1.09	Storage	5	Tiles
	Total		101	

2nd Floor	No.	Room description	Area [m ²]	Floor
	2.01	Bedroom	15	Laminate Flooring
	2.02	Bedroom	15	Laminate Flooring
	2.03	Guest room	13	Laminate Flooring
	2.04	Master bedroom	26	Laminate Flooring
	2.05	Hall	20	Laminate Flooring
	2.06	Bathroom	10	Tiles
	2.07	Bathroom	5	Tiles
	Total		104	

4.3 Calculation of fire risk, grade of fire safety, limit dimensions

According to ČSN 730833/2010 – paragraph 4.1.1, the family house creates one fire compartment such that the floor area of the building is up to 600 m².

Fire compartments are assessed into the group OB1, where variable fire load $p_v = 40 + 15 = 55 \text{ kg/m}^2$ with coefficient $a_n = 1,0$ according to ČSN 730833.

Object is sorted to II. SPB

4.4 Requirements for fire resistance of building constructions

Fire requirements are assessed according to ČSN 730802, real values taken from manufacturer's technical sheets.

Construction	Material	Requirements	Reality	Assessment
Peripheral wall	Above ground floor (A.G.F.) Rigips Rigistabil total th. (560 mm)	REI 30	REI 30 DP3	Comply
	Last A.G.F. Rigips Rigistabil total th. 560 mm	REI 15	REI 30 DP3	Comply
Load bearing construction of roof	Wooden STEICO joists	RE 15	REI 30 DP3	Comply
Load bearing construction of floor	Wooden STEICO joists	R 15	REI 30 DP3	Comply
Load-bearing element ensuring stability	Column 160x160 with Rigips Rigistabil	R 15	R30	Comply
Staircase inside FC	Wooden staircase	RE 15 DP3	REI 15 DP3	Comply

4.5 Assessment of fire escape way

According to ČSN 730833, in residential units of building group OB1 is unprotected escape way sufficient for evacuation of people. The width of such unprotected escape way has to be at least 0,9 m with min. width of doors on escape way 0,8 m. In our case, the width of the hall is 2425 mm and width of the door is 900 mm.

4.6 Standoff distance

Standoff distance are calculated according to annex F ČSN 730802.

Fire Compartment	p_v (kg/m ²)	l (m)	h_u (m)	S_u (m ²)	S_o (m ²)	P_o (%)	d (m)
West	55	2,4	5,57	13,37	12	89	6,5
North (02/w)	55	1,5	0,7	1,05	1,05	100	4,75
North (04/w)	55	0,6	0,9	0,54	0,54	100	4,75
South	55	12,2	5,57	67,95	39,45	58	8,4
East	55	5,555	5,57	30,94	5,75	18=40	5,15

4.6.1 Review of fire open areas

The façade is made up of EQUITONE cement-fibre board. According to the manufacturer, the class of reaction to fire is A2 and are non-combustible and don't spread flame. Therefore it is not considered as fire open area.

The roof is not considered as fire open area according to the no.8.12.4b1) ČSN 730802

4.7 Equipment for fire fighting

4.7.1 Outside off take points

In the distance of 14 m from the object a fire hydrant is located on the public water main DN80 mm.

4.7.2 Inside off take points

Not necessary according to the requirements ČSN 73 0873

4.7.3 Portable fire extinguishers

According to the Coll. 23/2008, the family house must be equipped with at least one fire extinguisher. In the family there will be one fire extinguisher located in the technical room.

4.7.4 Driveway and access roads

According to the ČSN 73 0802 there must be an access road with the minimal width of 3,0 m accessed to the house with minimal distance of 50 m. No special areas for access of fire brigaded is necessary to be done. The roads meet the requirements with the width of 4 m.

4.8 Fire safety equipment

The object will be equipped with one autonomous detection and signaling device. It will be located in the hall.

4.9 Review of technical equipment

4.9.1 Ventilation

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

4.9.2 Heating

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

4.9.3 Flue path

The house is not equipped with chimney.

4.9.4 Installation passes

Installation passes (e.g. water mains, electricity, sewerage), technical and technological equipment, electrical wiring (conductors, cables), etc., should be designed to minimize fire-breaks. There are no fire partitions in the object, so there are no requirements for their placement or execution.

5. Conclusion

The fire safety is assessing the family house with two floors and one fire compartment. The fire escape ways are according to the fire safety requirements ČSN 73 0802. The length of standoff distance reaches the following parcels, parcel no. 252/7 and parcel no. 255/2. No changes will be made to the building, as no buildings are located on these parcels and the minimal distance from the border to the house is according to the requirements. The owners and the investor will be informed about this information. The family house is equipped with one portable fire extinguisher.

Annexes

Situation of standoff distance.