

# **Building services systems design**

Diploma Project  
Luxurious Villa

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### Basic Information:

The proposal and target is to design and find solution of a new luxurious arabic-styled villa with the comprehensive solutions of the static and thermal system in accordance with the applicable Czech standards.

The building is located in Prague – Průhonice, Růžová street. The building has two floors. Ground floor, first floor and the walkable roof. The length of the building is 22.3m, width is 30.4m and the height is 9.3m. Parking space is located outside of the building.

Ground floor – in the ground floor are two visitor halls, one for man and one for women, one dining room, four visitor bedrooms, one balcony connecting dining room and one of the visitors halls, three fully equipped bathrooms and one bathroom with washing basins only. In the middle of the house is a big family hall including open staircase to the next floor. Total used area is 510,51 m<sup>2</sup>

First floor – consists of nine bedrooms, two balconies, three bathrooms, two cloths rooms, corridor and technical room. Total used area is 464,48 m<sup>2</sup>.

Roof – the roof if walkable so it can be reached and used as per need. There is air handling unit of the ventilation.

### Codes used:

Water: CSN 736660 & CSN 736005

Gas: TPG 70401 & CSN 736660

Drainage: CSN 756114 & CSN 756760

### 1 Water supply

#### 1.1. Water source

Water source is the public water supply.

#### 1.2. Water supply connection

Water is supplied to the north side of the limit of the land. Supply pipes are from steel DN50. Main water meter assembly is located in the shaft outside the object. Shaft is located 2 m from the façade of the object. It is circular shaft with diameter 1200 mm.



### 1.3. Inner piping

Cold water piping is from plastic pipelines PPR. Pipelines are going to be put under the ceiling of the first floor. Connection to each bathroom are going to be directed through the installation shafts. Piping in the bathrooms is done in the plasterboard walls. There is a water valve is located in every shaft. Cold water piping is connected to the boiler in the technical room in the first floor. Hot water will be heated in the boiler in the technical room located in the first floor. Heated water will be directed next to the cold water under the ceiling of the first floor and through vertical shafts to each bathroom. There will be as well water valve. Not used hot water will go back in the circulated piping to the hot water storage tank. Circulated piping will be always between piping of hot and cold water.

### 1.4. Hot water preparation

Hot water preparation will be solved as central system for the whole building located in the technical room in the first floor. Technical room will be equipped with the gas boiler and hot water reservoir.

### 1.5. Materials

Inner piping will be from plastic PPP. Water supply connection, part of the piping from water supply connection to main water meter assembly. All the water piping will be thermally insulated.

## 2. Gas supply

### 2.1. Gas supply

Gas piping is connected to the low-pressure gas piping under the street ??? in the distance of 15m. The connection is done through `T` element. Connection is from steel material. The connection piping is in the sand bedding. From the main closing gas valve, the piping in in the angle of 0.5% to the connection. Main gas closing valve is located at the facade. Horizontal piping is from steel. Piping is directed under the foundation then vertically to the technical room in the first floor. Piping must be gas tight. Gas is used only for boiler to heat the water.

### 2.2. Horizontal piping

Horizontal piping is from steel. Its angle is 0.2% directed to the vertical piping. Piping is directed mainly under the foundation.



### 3. Drainage

#### 3.1. Main drainage connection

Building is connected to the drainage network, it has separated rain water drainage from common drainage. Drainage is located -2.45 m under the pavement. Drainage piping is from PVC and is DN 150

13.3.2. Drainage elements Connection It connects main drainage network with inner drainage. It is located in the revision shaft. Connecting piping is bedded in the sand gravel rigol, 1.4 m below ground in the angle of 21%.

Revision shaft is located inside the object. Cleaning element is placed in this shaft. There is one cleaning shafts in the object. Other revision shafts are located outside the building due to the limit of 20 m per revision shaft.

Inner drainage drains all water from all fittings and ends outside the building into main drainage network.

Drainage Piping is equipped with security box in the place of going through foundation. Piping is directed under the floor of the ground floor and has angle 2%. It is DN100 and DN125.

Vertical drainage Every bathroom has its vertical drainage located in the installation shaft. Cleaning elements are located in every floor, 1m above floor level. Connection from vertical to horizontal drainage is done by two 45° elements. All the vertical drainage has ventilation piping exiting to the roof.

Rain drainage Building has a flat roof of area 536 m<sup>2</sup>. Rain water is drained by four inner piping by PVC DN 100. It is directed in the ground next to drainage and goes to the rain drainage network.

### 4. Heating

#### 4.1. Heating source

There is a gas boiler with hot water reservoir located in the technical room on the first floor.

The heating is used the pipes under the ceiling.

#### 4.2. Technical room

Technical room is located in the first floor. It is equipped with boiler, hot water reservoir, expansion vessel, water meter assembly, ventilated directly to the roof.



#### 4.3. Piping

All the piping needed for heating the object is from copper. There are several vertical piping. All the heating piping for hot water is from PPR.

#### 4.4. Heating devices

In all the apartments this type of heating devices is installed.

#### 5. Cooling

On the roof a chiller for a water cooling system

#### 6. Ventilation

The ventilation is used Air Handling Unit on the roof with vertical two ducts and conceding to the horizontal ducts through all the building in both floors, one for the waste air from the bathroom and kitchen and another for the fresh air supply to the bedrooms and halls. The ducts are rectangular, for the waste air is 300x500mm and for fresh air is 300x600mm.

