FINAL PROJECT:
SINGLE FAMILY HOUSE

AUTHOR: CAROLINA CABALLERO ROIG
CZECH TECHNICAL UNIVERSITY IN PRAGUE - UNIVERSIDAD POLITÉCNICA DE VALENCIA
FRANTIŠEK KULHÁNEK - MILAGRO IBORRA

Year 2012/2013
10. A-A’ Section
11. B-B’ Section
12. C-C’ Section
13. Types of walls
14. Layout: Basement
15. Layout: Ground Floor
16. Layout: First Floor
17. Layout: Flat rooftop
18. Areas: Basement
19. Areas: Ground Floor
20. Areas: First Floor
21. Areas: Flat Rooftop
22. Rainwater drainpipes: Flat Rooftop
23. Rainwater drainpipes: Flat Rooftop II
24. Rainwater and waste water drainpipes First Floor
25. Rainwater and waste water drainpipes Ground Floor
26. Waste water drainpipes Basement
27. Water supply Basement
28. Water supply Ground Floor
29. Water supply First Floor
30. Water supply Flat Rooftop
31. Electricity Basement
32. Electricity Ground Floor
33. Electricity First Floor
34. Electricity Flat Rooftop

DETAILS
35. Lift pit
36. Change in slab direction with pillar joint
37. Landscaped flat rooftop: Siphonic drain
38. Landscaped flat rooftop: Parapet joint
39. Landscaped flat rooftop: Panels joint
40. Landscaped flat rooftop: Valley
41. Landscaped flat rooftop: Vertical garden
42. Non-passable flat rooftop: Siphonic drain
43. Non-passable flat rooftop: Parapet joint
44. Non-passable flat rooftop: Parapet joint II
45. Non-passable flat rooftop: Valley
46. Types of walls (A2)
47. Lift enclosure
48. Facade footing
49. Wall section by flat slab
50. Wall section by flat slab with pillar
51. Door section (horiz y vert)
52. Casement and fixed window
53. Sliding Windows (two and three moving panels)
1. DESCRIPTIVE MEMORY

1.1 Characteristics of the site

The single family house is located in a residential area (11 U Hadovky) in Prague, Hlavní město Praha, Czech Republic as in the corresponding graphy site plan.
1.2 Composition and program of requirements

The implantation of the house on the parcel is placed perpendicular to the street, separating the main facade 29.87 m from the street, and 6 m and 6.75 m from side limits.

The program fits the necessities for be considered as a primary residence or an habitual one. The house is organized in two main floors. The ground floor which has the common areas as kitchen, living room and study, and the second floor were the private rooms are situated. In the ground floor there is the garage with capacity for two cars and a motorbike, also a gym and two versatile little rooms. On the flat rooftop there is another living room and a box room or services room.

From the entrance, the stairway acts like a vertical connection for the different areas. The house is composed by three bedrooms which share a common bathroom and a master bedroom that has its own bathroom.

The landscaped flat rooftop gives the house a very green and fresh atmosphere. A vertical garden is built in the vertical wall situated at the rooftop. The garage is located on the basement and has both pedestrian and vehicles access by a straight ramp.

1.3 Urban atmosphere and functional study

The plot has electricity services, water supply, sewerage, sidewalks and vehicle access by paved road.

The functions to be performed are those for a first residence house.

1.4 Useful and built surfaces

<table>
<thead>
<tr>
<th>LEVEL</th>
<th>BUILT AREA (m²)</th>
<th>USEFUL AREA (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basement</td>
<td>229.19</td>
<td>194.72</td>
</tr>
<tr>
<td>Ground floor</td>
<td>220.15</td>
<td>194.84</td>
</tr>
<tr>
<td>First floor</td>
<td>220.15</td>
<td>215.37</td>
</tr>
<tr>
<td>Flat rooftop</td>
<td>72.66</td>
<td>66.49</td>
</tr>
<tr>
<td>TOTAL</td>
<td>742.15</td>
<td>671.42</td>
</tr>
</tbody>
</table>
### BASEMENT

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Useful Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garage</td>
<td>53,68</td>
</tr>
<tr>
<td>Box room</td>
<td>17,30</td>
</tr>
<tr>
<td>Wine cellar</td>
<td>9,83</td>
</tr>
<tr>
<td>Bathroom</td>
<td>3,30</td>
</tr>
<tr>
<td>Gym</td>
<td>104,07</td>
</tr>
<tr>
<td>Staircase</td>
<td>6,54</td>
</tr>
<tr>
<td><strong>Total Useful Area</strong></td>
<td><strong>194,72</strong></td>
</tr>
<tr>
<td><strong>Total Built Area</strong></td>
<td><strong>229,19</strong></td>
</tr>
</tbody>
</table>

### GROUND FLOOR

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Useful Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hall</td>
<td>21,27</td>
</tr>
<tr>
<td>Corridor</td>
<td>41,97</td>
</tr>
<tr>
<td>Study</td>
<td>40,00</td>
</tr>
<tr>
<td>Kitchen</td>
<td>22,71</td>
</tr>
<tr>
<td>Living room</td>
<td>58,57</td>
</tr>
<tr>
<td>Bathroom</td>
<td>3,78</td>
</tr>
<tr>
<td>Staircase</td>
<td>6,54</td>
</tr>
<tr>
<td><strong>Total Useful Area</strong></td>
<td><strong>194,84</strong></td>
</tr>
<tr>
<td><strong>Total Built Area</strong></td>
<td><strong>220,15</strong></td>
</tr>
</tbody>
</table>

### FIRST FLOOR

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Useful Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridor</td>
<td>60,26</td>
</tr>
<tr>
<td>Main bedroom</td>
<td>31,52</td>
</tr>
<tr>
<td>Bathroom 1</td>
<td>11,36</td>
</tr>
<tr>
<td>Bathroom 2</td>
<td>5,74</td>
</tr>
<tr>
<td>Bathroom 3</td>
<td>5,33</td>
</tr>
<tr>
<td>Bedroom 1</td>
<td>16,22</td>
</tr>
<tr>
<td>Bedroom 2</td>
<td>17,02</td>
</tr>
<tr>
<td>Bedroom 3</td>
<td>21,89</td>
</tr>
<tr>
<td>Playroom</td>
<td>24,14</td>
</tr>
<tr>
<td>Staircase</td>
<td>6,54</td>
</tr>
<tr>
<td><strong>Total Useful Area</strong></td>
<td><strong>200,02</strong></td>
</tr>
<tr>
<td><strong>Total Built Area</strong></td>
<td><strong>220,15</strong></td>
</tr>
</tbody>
</table>
2. **CONSTRUCTIVE MEMORY**

2.1 Foundations

The foundation consists of a reinforced solid slab with a 35-centimetre edge and containment walls with 45-centimetres thickness. To avoid humidity foundation is protected by the face on contact with ground with a waterproofing membrane and a drainage system.

2.2 Structure

Reinforced concrete structure of slabs and pillars. Unidirectional slabs with 35-centimetres edge, auto-resistant small beams and concrete filler blocks. Tension reinforcements and anti-fissure reinforcement. Pillars with a section of 30x30 centimetres, 4 longitudinal reinforcements. Beams with a section of 30 cm wide x 35 cm height

2.3 Enclosures

Facade

Outer sheet: drilled face brick (24x11.5x5) continuous from start to coronation. Backing reinforcements embebbed in slabs that allow horizontal and vertical movement while preventing tipping movement. There will also be armor reinforcement in certain courses so that the bending stresses in the horizontal plane is transferred to the building structure through the anchors.
Inner sheet: ceramic hollow brick 24x11.5x7 with gypsum plaster and paint finish.

Intermediate sheets from exterior to interior: cement mortar and thermic-acoustic insulation of extruded polystyrene foam (3cm)

**Roofs**

1. Landscaped roof formed by the following layers: (slab), primer layer, vapour barried adhered with blowlamp, cellular concrete for thermic insulation and slope formation, regularization layer (cement mortar M40-a 1:6), thermic insulation, intermediate layer (synthetic geotextil felt 100g/m2), protection mat SSM 45, drainage system, polypropylene filter sheet, against fall protection, special formation underlayer, plants chosen depending on the zone. There will also be a paved area which will be formed with stone slabs on a gravel bed.

2. Inverted non-passable flat roof, gravel finish formed by the following layers: (slab), primer layer, vapour barrier adhered with blowlamp, cellular concrete for thermic insulation and slope formation, regularization layer: cement mortar M40-a (1:6), primer layer, waterproofing layer, synthetic geotextil 100g/m2, thermic insulation, synthetic geotextil 100g/m2, gravel (2-4cm)

**2.4 Partitions**

1. Interior partition between dry zones: ceramic hollow brick (24x11.5x7) with gypsum plaster and paint finish. Total thickness = 10cm

2. Interior partition between humid and dry zones: ceramic hollow brick (24x11.5x7) with gypsum plaster and paint finish at the dry zone and cement and lime mortar with stoneware tiles (20x20cm) finish at the humid zone. Total thickness = 11.2cm

3. Interior partition between humid zones: ceramic hollow brick (24x11.5x7) with cement and lime mortar with stoneware tiles (20x20cm) finish. Total thickness = 12.4cm

4. Lift enclosure: mineral wool acoustic insulation, ceramic hollow brick (24x11.5x7) with gypsum plaster and paint finish. Total thickness = 11cm.
All partitions will be provided with a layer of elastic mortar on their last row to absorb possible movements.

2.5 Pavements, Ceilings and Finishes

1. Bathrooms: on the slab there will be an acoustic insulating sheet, concrete layer, concrete-glue layer and ceramic tiles. The walls will be covered with stoneware tiles over a layer of primer+concrete glue.
2. Kitchen: ceramic pavement and tiles
3. Rest of the house: terrazzo tiles for pavement supported on mortar and a acoustic insulating sheet. Paint finish for walls
4. Basement: polished concrete flooring and paint finish for walls

False ceiling throughout the house

2.6 Sanitaryware


2.7 Carpentry

Doors:

Interior doors: Pearl walnut doors.
Main door: security cedar wooden door.
Garage door: light ribbed steel doors, thermally-broken, polyurethane insulated. Door Construction:
- Panels: Foamed in place Polyurethane core construction between exterior and interior steel skins.
- Steel Skins: Formed from roll formed commercial or drawing quality steel sheet, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M, pre-painted with primer and baked-on polyester topcoat; sections formed to 08360-3 create weather tight tongue-in-groove meeting joint.
- Reinforcing: Galvanized and primed steel reinforcement located under each hinge location, pre-punched for hinge attachment.
- Handle: High impact polymer step plate/lift handle on bottom panel section.

Windows:

Schueco thermally insulated aluminium windows

- Casement windows
- Sliding windows (2 and 3 moving panels)
- Fixed windows

2.8 Elevator

Machine-Room Less Holeless Hydraulic Elevator. Prepared according to Construction Specifications Institute (CSI)

A. Provide machine-roomless holeless hydraulic elevators from Otis Elevator Company. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:

1. The entire hydraulic system and the controller shall be located inside the hoistway. No extra machine room or control closet space is required.

2. Sleep mode operation for LED ceiling lights and car fan.

3. LED lighting standard in ceiling lights and elevator fixtures.

4. Sleep mode operation for LED ceiling lights and car fan.

B. Approved Installer: Otis Elevator
2.9 Occupation

According to the data table 2.1 of DB SI the occupation it is set by relating the useful area with the following density values:

<table>
<thead>
<tr>
<th></th>
<th>HOUSE (1person/20m²)</th>
<th>GARAGE (1person/40m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square metres</td>
<td>617,74</td>
<td>53,68</td>
</tr>
<tr>
<td>Nº of persons</td>
<td>31</td>
<td>2</td>
</tr>
</tbody>
</table>

2.10 Evacuation

According to the data table 3.2 of DB SI the house needs only 1 main exit door as the occupation is 31 persons, less than 100 as the regulation sets.

The beginning of the house it is set in the main door access at the ground floor, so the way length for evacuate the house is considered as zero; the same way is considered the evacuation height, due to that the height to need just 1 exit is 28 meters. In the garage, as it is considered as a low risk local, the beginning will be set at any place.

The furthest point from the door is 24 meters, less than 35 meters as the law establishes.

The evacuation height or difference between basement floor and ground floor its 3,35 m.

The width of the doors will be always more than 0,80 m. In this case;
- House door; 1,63 m > 0,80 m.
- Garage door; 1,56m > 0,80 m.

The doors of the house do not open in the evacuation direction due to that the occupation is less than 100 persons and it is not necessary.
2.11 Elements strength against fire (date table 3.1 of DB SI)

- Main structure elements over the evacuation level; R 30
- Main structure elements in basement (garage use), considered as a low risk local; R90

2.12 System against fire

The efficiency of the portable fire extinguisher will be 21A-113B. It will be set at the garage so that the distance will be no longer than 15 meters from the main evacuation exit at the ground floor.

3. SERVICES

3.1. WATER SUPPLY SERVICE

The urbanization has infrastructure for water supply. At the edge of the parcel is the locker for the general water meter.

The vertical tube, tube that joins the output of the water meter with the indoor particular installation, will be underground in a protected waterway and easily registrable over a layer of sand.

Inside the house is distributed through the roof, in order to make more difficult the return of water, and therefore always above the height of any of the devices. Over the vertical pipe and at a height easy for the user will be located a cut key, which cut all the internal supply.
Minimum flows in home appliances. (DB HS4; Water Supply) Table 2.1. Each of them should receive, independently of the state of others, a minimum instantaneous flow for a proper use:

<table>
<thead>
<tr>
<th>Tipo de aparato</th>
<th>Caudal instantáneo mínimo de agua fría [dm³/s]</th>
<th>Caudal instantáneo mínimo de ACS [dm³/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lavamanos</td>
<td>0.05</td>
<td>0.03</td>
</tr>
<tr>
<td>Lavabo</td>
<td>0.10</td>
<td>0.065</td>
</tr>
<tr>
<td>Ducha</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>Bañera de 1,40 m o más</td>
<td>0.30</td>
<td>0.20</td>
</tr>
<tr>
<td>Bañera de menos de 1,40 m</td>
<td>0.20</td>
<td>0.15</td>
</tr>
<tr>
<td>Bidé</td>
<td>0.10</td>
<td>0.065</td>
</tr>
<tr>
<td>Inodoro con cisterna</td>
<td>0.10</td>
<td>-</td>
</tr>
<tr>
<td>Inodoro con flúor</td>
<td>1.25</td>
<td>-</td>
</tr>
<tr>
<td>Urinarios con grifo temporizado</td>
<td>0.15</td>
<td>-</td>
</tr>
<tr>
<td>Urinarios con cisterna (u)</td>
<td>0.04</td>
<td>-</td>
</tr>
<tr>
<td>Fregadero doméstico</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>Fregadero no doméstico</td>
<td>0.30</td>
<td>0.20</td>
</tr>
<tr>
<td>Lavavajillas doméstico</td>
<td>0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>Lavavajillas industrial (20 servicios)</td>
<td>0.25</td>
<td>0.20</td>
</tr>
<tr>
<td>Lavadero</td>
<td>0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>Lavadora doméstica</td>
<td>0.20</td>
<td>0.15</td>
</tr>
<tr>
<td>Lavadora industrial (8 kg)</td>
<td>0.60</td>
<td>0.40</td>
</tr>
<tr>
<td>Grifo aislado</td>
<td>0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>Grifo garaje</td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td>Vertedero</td>
<td>0.20</td>
<td>-</td>
</tr>
</tbody>
</table>

Minimum diameters derivations to the appliances. (DB HS4; Water Supply) Table 4.2

<table>
<thead>
<tr>
<th>Aparato o punto de consumo</th>
<th>Diámetro nominal del ramal de enlace (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tubo de acero</td>
</tr>
<tr>
<td>Lavamanos</td>
<td>½</td>
</tr>
<tr>
<td>Lavabo, bidé</td>
<td>¾</td>
</tr>
<tr>
<td>Ducha</td>
<td>¾</td>
</tr>
<tr>
<td>Bañera &lt;1,40 m</td>
<td>¾</td>
</tr>
<tr>
<td>Bañera &gt;1,40 m</td>
<td>¾</td>
</tr>
<tr>
<td>Inodoro con cisterna</td>
<td>½</td>
</tr>
<tr>
<td>Inodoro con flúor</td>
<td>1-1 ½</td>
</tr>
<tr>
<td>Urinario con grifo temporizado</td>
<td>½</td>
</tr>
<tr>
<td>Urinario con cisterna</td>
<td>½</td>
</tr>
<tr>
<td>Fregadero doméstico</td>
<td>½</td>
</tr>
<tr>
<td>Fregadero industrial</td>
<td>¾</td>
</tr>
<tr>
<td>Lavavajillas doméstico</td>
<td>¾</td>
</tr>
<tr>
<td>Lavavajillas industrial</td>
<td>¾</td>
</tr>
<tr>
<td>Lavadora doméstica</td>
<td>¼</td>
</tr>
<tr>
<td>Lavadora industrial</td>
<td>1</td>
</tr>
<tr>
<td>Vertedero</td>
<td>¾</td>
</tr>
</tbody>
</table>
Protection against returns

Backstop systems shall be provided to prevent the reversal of flow in the points listed below and elsewhere as necessary:

- After the water meter
- At the base of the vertical pipes
- Before the water treatment equipment
- Supply tubes not intended for domestic purposes
- Before refrigeration or air conditioning

Municipal Connection

The Municipal connection must have at least the following elements:

a) a key or a collar of for the connection to the outside distribution pipe network supply to open the waterway from the municipal connection.

b) a tube that links the cut key in the municipal connection with the general cut key.

c) a cut key outside of the property.

General cut key

The general cut key will interrupt the supply to the building and will be located within the property in an area commonly accessible for handling and properly indicated to allow its identification. If a locker or water meter exists, should generally stay inside the property.

Main distributor

The route of the main distribution must be made in common areas. In case of being embedded should be available for inspection registers and leakage tests, at least in its extreme and changes direction. Cut keys should be disposed in all derivations, such a way that in case of failure at any point can’t be interrupted all the supply.

Separations regarding other installations

The route of the cold water pipes should be such that will be not affected by heat sources and therefore must take part always separated from the hot water pipes (or heating ACS) at a distance of 4 cm, at least. When the two pipes are in a same vertical plane, the cold water should always be under the hot water.

The pipes must go below any drains or item containing electrical or electronic devices, and any telecommunications network, in parallel at a distance of at least 30 cm. Regarding the gas pipes, these will be stored at least at a distance of 3 cm.
Testing of indoor installations

1. The installer is required to perform a test of strength and watertightness of all piping, elements and accessories that integrate the installation being all components seen and accessible for control.

2. To start the test, the entire installation will be filled with water, keeping the end taps open until there is assurance that the drain has been completed and there is no air. Then close the taps that have served to the purge and also the power source. Then the bomb is used, which is already connected and maintain its operation up to the test pressure. Once fitted, the procedure according to the type of material as follows:

   a) for metal pipes shall be considered valid tests as described in the standard UNE100 151:1988;
   b) for multilayer thermoplastic pipes shall be considered valid testing according to Method A of the Standard UNE ENV 12 108:2002.

3. After a previous test, the installation you will connected taps and consumer devices, submitting again to the previous test.

4. The manometer is used in this test should be appreciated intervals least 0.1 bar pressure.

5. Pressures alluded previously relate to the level of the roadway.

Particular tests on the hot water installations (ACS)

a) measurement of flow rate and temperature at points of water;
b) obtain the required flow at the set temperature after opening the estimated number of taps in simultaneity;
c) check the time it takes the water to go out at operating temperature once the hydraulic balance of the various derivations of the return network and open the tap one to one of the farthest from each of the derivations, without open any tap in the last 24 hours;
d) measuring temperatures of the network;
e) with the accumulator at full activity, check with contact thermometer the temperatures at its output and taps. The return temperature must not be lower than 3 ° C at the output of the accumulator.
3.2. SANITATION SERVICE

The collectors of the building must drain, preferably by gravity into the well or pit which is usually the point of connection between the drainage installation and the public sewer network, through the corresponding connection. Water hydraulic closures should be available in the installation to prevent the transmission of air in the rooms occupied not affecting the waste stream. The pipe drainage network must have the simplest route possible, distances and slopes to facilitate the evacuation of waste and be self-cleaning. Should be avoided water retention inside. Will be provided adequate ventilation systems that allow the functioning of the hydraulic closure and evacuation of sewer gas. The installation should not be used for the evacuation of residues other than wastewater or rainwater.

Pipes; the diameter must not decrease in the direction of flow. It may be provided an increase in diameter when connecting to the downpipe flow rates much larger than those of the situated upstream section.

Suspended collectors; the downpipes should be connected by special pieces. They should have a slope of 1% or more. Must not connect at the same point more than two collectors. Registers points in horizontal routes every 15 meters long.

Buried collectors; pipes should be placed in ditches located below the distribution of drinking water. They should have a slope of 2% or more. The connection of downpipes will be done with interposition of a pit at the end of the downpipes, which must not be siphonic.

Connecting elements; in buried networks the joint between the vertical and horizontal networks, between their encounters and derivations, must be arranged with pits on concrete foundation with accessible cover. Can connect only one collector for each side of the pit, such a way that the angle formed by the collector and the output is greater than 90 °.

Primary ventilation subsystem; considered sufficient as the only ventilation system in buildings with less than 7 levels and drain derivations are less than 5 m.

Wastewater downpipes should extend at least 1.30 m over the roof of the building if it is not passable and 2.00 m it is. The primary ventilation outlet must not be located closer than 6 m from any outside air intake for air conditioning or ventilation and should surpass it in height. The output of the ventilation should be adequately protected from strange things and the design should be such that the wind action favors the expulsion of gases.
Single derivations (DB HS5; Water Evacuation) Table 4.1

<table>
<thead>
<tr>
<th>Tipo de aparato sanitario</th>
<th>Unidades de desagüe UD</th>
<th>Diámetro mínimo sifón y derivación individual (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Uso privado</td>
<td>Uso público</td>
</tr>
<tr>
<td>Lavabo</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Bidé</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Ducha</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Bañera (con o sin ducha)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Inodoro</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Con cisterna</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Con fluxómetro</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Urinario</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Pedestal</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Suspensido</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>En batería</td>
<td>-</td>
<td>35</td>
</tr>
<tr>
<td>Fregadero</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>De cocina</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>De laboratorio, restaurante, etc.</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Lavadero</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Vertedor</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>Sumidero sifónico</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Lavavajillas</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Lavadora</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Cuarto de baño (lavabo, inodoro, bañera y bidé)</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Inodoro con cisterna</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Inodoro con fluxómetro</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Cuarto de aseo (lavabo, inodoro y ducha)</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Inodoro con cisterna</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>Inodoro con fluxómetro</td>
<td>8</td>
<td>-</td>
</tr>
</tbody>
</table>

Commercial diameters

<table>
<thead>
<tr>
<th>Diámetro (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>63</td>
</tr>
<tr>
<td>75</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>110</td>
</tr>
<tr>
<td>125</td>
</tr>
<tr>
<td>160</td>
</tr>
<tr>
<td>200</td>
</tr>
</tbody>
</table>
Wastewater downpipes (DB HS5; Water Evacuation) Table 4.4

<table>
<thead>
<tr>
<th>Máximo número de UD, para una altura de bajante de:</th>
<th>Hasta 3 plantas</th>
<th>Más de 3 plantas</th>
<th>Máximo número de UD, en cada ramal para una altura de bajante de:</th>
<th>Hasta 3 plantas</th>
<th>Más de 3 plantas</th>
<th>Diámetro (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>25</td>
<td>25</td>
<td>6</td>
<td>6</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>38</td>
<td>38</td>
<td>11</td>
<td>9</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>53</td>
<td>53</td>
<td>21</td>
<td>13</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>280</td>
<td>280</td>
<td>70</td>
<td>53</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>360</td>
<td>740</td>
<td>740</td>
<td>181</td>
<td>134</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>540</td>
<td>1100</td>
<td>1100</td>
<td>280</td>
<td>200</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>1200</td>
<td>2240</td>
<td>2240</td>
<td>1120</td>
<td>400</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>2200</td>
<td>3600</td>
<td>3600</td>
<td>1680</td>
<td>600</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>3800</td>
<td>5600</td>
<td>5600</td>
<td>2500</td>
<td>1000</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>6000</td>
<td>9240</td>
<td>9240</td>
<td>4320</td>
<td>1650</td>
<td>315</td>
<td></td>
</tr>
</tbody>
</table>

Horizontal wastewater collectors (DB HS5; Water Evacuation) Table 4.5

<table>
<thead>
<tr>
<th>Máximo número de UD y la pendiente adoptada</th>
<th>1%</th>
<th>2%</th>
<th>4%</th>
<th>Diámetro (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>20</td>
<td>25</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>-</td>
<td>24</td>
<td>29</td>
<td>29</td>
<td>63</td>
</tr>
<tr>
<td>-</td>
<td>38</td>
<td>57</td>
<td>57</td>
<td>75</td>
</tr>
<tr>
<td>96</td>
<td>100</td>
<td>160</td>
<td>160</td>
<td>75</td>
</tr>
<tr>
<td>264</td>
<td>321</td>
<td>382</td>
<td>382</td>
<td>110</td>
</tr>
<tr>
<td>390</td>
<td>480</td>
<td>580</td>
<td>580</td>
<td>125</td>
</tr>
<tr>
<td>880</td>
<td>1056</td>
<td>1300</td>
<td>1300</td>
<td>160</td>
</tr>
<tr>
<td>1600</td>
<td>1920</td>
<td>2300</td>
<td>2300</td>
<td>200</td>
</tr>
<tr>
<td>2900</td>
<td>3500</td>
<td>4200</td>
<td>4200</td>
<td>250</td>
</tr>
<tr>
<td>5710</td>
<td>6920</td>
<td>8290</td>
<td>8290</td>
<td>315</td>
</tr>
<tr>
<td>8300</td>
<td>10000</td>
<td>12000</td>
<td>12000</td>
<td>350</td>
</tr>
</tbody>
</table>
3.3. ELECTRICAL INSTALLATION (ITC-BT)

**Description and calculation**
Selection of the degree of electrification; we are in a house that exceeds 160 m², and therefore requires a high degree of electrification. Being a high power electrification not be less than 9200 W at 230 V.

**Municipal connection;** we call this the installation between the distribution network of hydroelectric and general protection box. This network is made by the developer, so it is not our concern.

**Electric meter;** the meter shall be centralized in prefabricated modules, taking care that the derivations in these modules are distributed independently within their respective protective tube. The situation of the module has not to be wet, will be sufficiently ventilated and illuminated, and if the level of the soil is less than or equal to the corridors and surrounding locals, shall be provided for drainage sinks, in case of failure, neglect or rupture of water pipe.

**Line deliverer to housing;** the section was calculated by the formula:

\[ S = \frac{L \cdot W}{C \cdot v \cdot V \cdot \cos f} \]

Being:
- \( S \) = Section of the line in mm²
- \( L \) = Length of the line in meters
- \( W \) = Power in watts
- \( C \) = Conductivity coefficient
- \( v \) = Rated voltage
- \( \cos f \) = Power factor

Will be made of Copper conductor with special isolation.

**Interior installation;** Will be as follows:

Circuits; will be installed at least four independent circuits are:

- Circuit for lighting and lighting power outlets.
- Circuit for the washing machine and water heater.
- Circuit for the kitchen.
- Circuit for other applications.
General box of distribution; automatic differential switch of 25 A. capacity, single-phase 230 V and 30 mA sensitivity. All this embedded in a box, plasticized elements will be in fixing guides. The general protection box will be placed in the main entry or on the facade of the building. Shall keep a terminal for the ground connection of the box, if it is metallic.

Bathrooms installations; due that we are installing outside the volume of protection, it is not necessary to use safety outlets. The only outlet will be placed next to switch, outside the volume of protection and at height of 1.20 meters from the ground.

THE MATERIALS USED

Electric cable; for indoor installation has been used copper double insulated and different colors.

Protective conductors; of copper and will present the same insulation conductors. Will be installed by the same pipeline than these.

Identification of the cables; installation cables are identified by the colors of their isolation;

- Clear blue for neutral conductor.
- Yellow green to the ground conductor and shield.
- Brown, black and gray, for conductors or phases.

Protection tubes; will be used to embedding corrugated plastic, immune to attack by building materials. It must be protected at intersections with hot water pipes. In the changes of direction registers will be used.

Connection boxes; these will be plasticised with white cover and sized according to the drivers who derived in there.

Control and operation devices; commutator and switches, which cut the maximum current of the circuit in which they are placed, without causing permanent arcing, opening and closing circuits, and no possibility of taking an intermediate position, shall be of closed type and insulated material.

TV Antenna - FM; will be installed completely independent of the electrical system of the house. Will have two internal connections in the home.

Ground connection; all the light points and outlets of the house are connected to the ground as well as TV antenna. This will be a bare conductor of Cu.

Protection devices; are the electrical circuit breakers, fuses and circuit breakers. Its ability to cut to short circuit protection, will agree with the short circuit current that may arise at a point of installation. Will be marked with the nominal current operation.
voltage as well as the indication sign of disconnection. Fuses used to protect the secondary circuits shall be calibrated to the intensity of the circuit they protect. Shall be provided with non-combustible insulation. They could be replaced safely and be marked with the nominal current work voltage.

4. REGULATIONS

- NCSE-02; Earthquake Resistant Construction Standard
- EHE 08; Structural Concrete Instruction
- REBT; Low Voltage Electrotechnical Regulation
- RITE 2007; Regulation of Thermal Installations in Buildings Valencian Community
Urbanistic Planning Order 193/1988 of 12 December, of the MINISTRY of PUBLIC WORKS, PLANNING AND TRANSPORT. Standards for accessibility and removal of architectural barriers
- Technical building code (CTE)

- DB SE; Structural safety
  DB SE1; Stability and resistance
  DB SE2; Edification actions
  DB SE3; Foundations
  DB SE4; Steel
  DB SE5; Walls
  DB SE6; Wood

- DB SI; Safety in case of fire
  DB SI1; Interior propagation
  DB SI2; Exterior propagation
  DB SI3; Evacuation of occupants
  DB SI4; Fire protection installations
  DB SI5; Intervention of firefighters
  DB SI6; Structural fire resistance

- DB SUA; Utilization Security and Accessibility
  DB SUA1; Security against the risk of falls
  DB SUA2; Security against the risk of impact or entrapment
  DB SUA3; Security against the risk of imprisonment
  DB SUA4; Security against risks caused by inadequate lighting
  DB SUA5; Security against the risk caused by high occupancy situations
  DB SUA6; Security against the risk of drowning
  DB SUA7; Security against risks caused by moving vehicles
  DB SUA8; Security against risks associated with the action of thunderbolt
  DB SUA9; Accessibility
- HS DB: Public Health
  HS DB1; Protection against humidity
  HS DB2; Waste collection and removal
  HS DB3; Indoor Air Quality
  HS DB4; Water supply
  HS DB5; Drainage

- DB HR; Noise protection

- DB HE: Save Energy
  DB HE1; Limiting energy demand
  DB HE2; Efficiency of thermal installations
  DB HE3; Energy efficiency of lighting installations
  DB HE4; Minimum solar contribution to hot water
  DB HE5; Minimum photovoltaic contribution electricity
5. PLANS
1 Filler block
2 Auto-resistant small beam
3 Compression layer
4 Anti-fissure reinforcement
5 Concrete
6 Tension reinforcement

CHANGE IN SLAB DIRECTION WITH PILLAR JOINT
LANDSCAPED FLAT ROOFTOP LAYERS:

1. Plants chosen depending on the zone
2. Special formation underlayer (5cm)
3. Against-fall protection Fallnet®
4. Polypropylene filter sheet SF
5. Drainage system Froradrain® FD 25-E
6. Protection mat SSM 45
7. Intermediate layer: Synthetic geotextil felt 100g/m2
8. Anti-root waterproofing
9. Intermediate layer: Fibreglass felt 100g/m2
10. Thermic insulation
11. Regularization layer: Cement mortar M40-a (1:6)
12. Cellular concrete for thermic insulation and slope formation (3%)
13. Vapour barrier adhered with blowlamp
14. Primer layer
15. Slab
1. Plants chosen depending on the zone
2. Special formation underlayer (5cm)
3. Protección anticaida Falinet *
4. Polypropylene filter sheet SF
5. Drainage system Froradrain ® FD 25-E
6. Protection mat SSM 45
7. Intermediate layer: Synthetic geotextil felt 100g/m²
8. Anti-root waterproofing
9. Intermediate layer: Fibreglass felt 100g/m²
10. Thermic/ acoustic insulation
11. Regularization layer: Cement mortar M40-a (1:6)
12. Cellular concrete for termic insulation and slope formation (3%)
13. Vapour barrier adhered with blowlamp
14. Primer layer
15. Slab
16. Gravel
17. Double waterproofing (10cm minimum overlap)
18. Siphonic drain
19. Drilled brick 24x11.5x9cm
① Permanent concrete shuttering
② Stone slabs pavement
③ Gravel bed (3-5cm thick)
④ Polystyrene (expansion absorption)
⑤ Ceramic hollow brick 24x11.5x7
⑥ Perimetral gutter
⑦ Water-repellent pointing
⑧ Anticorrosive metallic railing
⑨ ... 
⑩ Anticorrosive reinforcement
⑪ Elastic mortar
⑫ Plaster smooth continuous false ceiling
① Galvanized electro-soldered wire, PVC laminated
② Moss vegetable fibers substrate
③ Geotextile felt
④ Polytene panel
⑤ Fastening corbel
⑥ Sill
⑦ Grippers
⑧ Reinforced drilled face brick (24x11.5x5cm) wall
⑨ Collection of water excess
1. Gravel (2.4cm)
2. Intermediate layer: Synthetic geotextil felt 100g/m2
3. Thermic insulation
4. Intermediate layer: Synthetic geotextil felt 100g/m2
5. Waterproofing layer
6. Primer layer
7. Regularization layer: Cement mortar M40-a (1:6)
8. Cellular concrete for thermic insulation and slope formation (3%)
9. Vapour barrier adhered with blowlamp
10. Primer layer
11. Slab
12. Siphonic drain
1. Gravel (2-4cm)
2. Intermediate layer: Synthetic geotextil felt 100g/m2
3. Miscinic insulation
4. Intermediate layer: Synthetic geotextil felt 100g/m2
5. Waterproofing layer
6. Primer layer
7. Regularization layer: Cement mortar M40-a (1:6)
8. Cellular concrete for thermic insulation and slope formation (3%)
9. Vapour barrier adhered with blowlamp
10. Primer layer
11. Slab
12. Pointing
13. Sill
14. Ceramic hollow brick (25x18x12)
1. Gravel (2-4cm)
2. Intermediate layer: Synthetic geotextil felt 100g/m²
3. Thermic insulation
4. Intermediate layer: Synthetic geotextil felt 100g/m²
5. Waterproofing layer
6. Primer layer
7. Regularization layer: Cement mortar M40-a (1:6)
8. Cellular concrete for thermic insulation and slope formation (3%)
9. Vapour barrier adhered with blowlamp
10. Primer layer
11. Slab
12. Pointing
13. Sill
14. Ceramic hollow brick (25x18x12)
1. Gravel (2-4cm)
2. Intermediate layer: Synthetic geotextil felt 100g/m2
3. Thermic insulation
4. Intermediate layer: Synthetic geotextil felt 100g/m2
5. Waterproofing layer
6. Primer layer
7. Regularization layer: Cement mortar M40-a (1:6)
8. Cellular concrete for thermic insulation and slope formation (3%)
9. Vapour barrier adhered with blowlamp
10. Primer layer
11. Slab
12. Joint material: elastomer
CENTRAL PILLAR COATING

1. Socket
2. Paint finish
3. Gypsum plaster (1cm)
4. Ceramic hollow brick 24x11.5x7
5. Cement mortar
6. Pillar

HORIZONTAL SECTION (1:5)

EDGE PILLAR COATING

1. Socket
2. Paint finish
3. Gypsum plaster (1cm)
4. Ceramic hollow brick 24x11.5x7
5. Thermic-acoustic insulation of extruded polystyrene foam (25mm)
6. Interior cement mortar (1.5cm)
7. Drilled face brick 24x11.5x5cm

HORIZONTAL SECTION (1:5)
1. Acoustic insulating sheet
2. Mortar (1:6)
3. Terrazzo tile
4. Socket
5. Paint finish
6. Gypsum plaster (1cm)
7. Ceramic hollow brick 24x11.5x7
8. Thermic-acoustic insulation of extruded polystyrene foam (3cm)
9. Interior cement mortar (1.5cm)
10. Drilled face brick 24x11.5x5cm
11. Anticorrosive reinforcement
12. Elastic mortar
13. Plaster smooth continuous false ceiling
VERTICAL SECTION H-H'

- 1. Acoustic insulating sheet
- 2. Mortar (1:6)
- 3. Terrazzo tile
- 4. Socket
- 5. Paint finish
- 6. Gypsum plaster (1cm)
- 7. Ceramic hollow brick 24x11.5x7
- 8. Cement mortar
- 9. Pillar
- 10. Thermic-acoustic insulation of extruded polystyrene foam (3cm)
- 11. Interior cement mortar (1.5cm)
- 12. Drilled face brick 24x11.5x5cm
- 13. Anticorrosive reinforcement
- 14. Elastic mortar
- 15. Plaster smooth continuous false ceiling

HORIZONTAL SECTION

SINGLE FAMILY HOUSE
Author: CAROLINA CABALLERO ROIG

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

Scale: 1:10
WALL SECTION BY FLAT SLAB WITH PILLAR
Plan Nº: 50
1: Case study title:

2: Single family house

3: Author:

4: Carla Caballero Rodig

5: Scale:

6: 1:10

7: Case study title: Case and fixed window

8: University of Politecnica de Valencia

9: Single family house

10: Carolina Caballero Rodig

11: Scale: 1:10

12: Case and fixed window

13: University of Politecnica de Valencia