FINAL PROJECT

SINGLE FAMILY HOUSE

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UNIVERSITAT POLITÉCNICA DE VALÈNCIA

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DESCRIPTIVE MEMORY

The point of this Project is the construction of a single family house.

CHARACTERISTIC’S PLOT

The edification will be constructed in a rectangular plot. The topography is practically plane, but it is 1.15 meters lower than the level street. The determination of characteristics of soil are specified in the relevant geotechnical study.

The building is situated in an urban zone in Vinarós, it has an area of 570 m², and this location and situation are considerate adequate in order to the use of the house, and compliance of the County Zoning Rules of the plot.

INFORMATION ABOUT THE LOCATION

The road into the building is planned from a public thoroughfare and it’s going to be totally surfaced.

The potable water comes from the mains municipal supply and it counts with canalization for the connection planned in front of the plot.

There is plumbing municipal supply in front of the plot, which is connected to the interior mains of the edification through its own connection.

The electricity supply it’s going to be made from the low voltage distribution running on public roads.

The plot is situated in urban ground non-consolidated and its use is residential for detached house. The corresponding plots, have square geometry. Its limits are: Front accesses directly with the main road and with north orientation, the rest sides are limited with others plot.

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<td>COUNTY ZONING RULES</td>
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<tr>
<td>EDIFICATION ZONE INSOLATE UNIFAMILAR PROJECT</td>
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<tr>
<td>Minimum plot area 400 m²</td>
</tr>
<tr>
<td>Minimum distance to one of principal edge 12 m.</td>
</tr>
<tr>
<td>Minimum distance to principal edge 4 m.</td>
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<tr>
<td>Edificability 0.50 m²/m²: 285 m²</td>
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<tr>
<td>Maximum occupation plot 50%</td>
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</tbody>
</table>

REQUIREMENT PROGRAM:

It is propose a program of needs based on the construction of a detached house on ground floor and first floor.

The facade composition should be attractive, but simple constructive characteristics, with conventional materials.

The housing should respond to a typology for residence and contain the following minimum elements:
- Kitchen, living-room, 4 bedrooms, 2 bathrooms, toilet, closet, pantry, reserve waste storage, terraces and garage.

ENVIRONMENT AND PROJECT DESCRIPTION:

The present project has been redacted in order to compliance the County Zoning Rules, and particularly the following regulations:
- Rules and orders of Generalitat Valenciana
- Basics rules and technical of buildings.
- General municipal management urban plan of Vinarós.
- Royal decree regulation of urban planning and land management (ROGTU)
- DC/09, Design conditions and quality, Decreet 151/2009 de 2 de October.
- Technology standards
ANOTHERS REGULATIONS:

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<td>RD 314/06</td>
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<td>NOISE</td>
<td></td>
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<tr>
<td>DB HR NOISE PROTECTION</td>
<td>RD 1371/07</td>
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<tr>
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<tr>
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<td>Law 22/94</td>
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<td>TECHNICAL BUILDING CODE (CTE)</td>
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</tr>
</tbody>
</table>
COMPLIANCE OF REGULATIONS

BASIC REQUIREMENTS RELATING TO THE FUNCTIONALITY (SU)

Use, so that the layout and dimensions of the spaces and the provision of facilities to facilitate the proper conduct of the functions provided in the building.

As for the dimensions of the units has followed the provisions of the Decree of habitability in force.

Minimum size of the enclosures (according to DC/09)

<table>
<thead>
<tr>
<th>TYPES</th>
<th>AREA (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple bedroom</td>
<td>6</td>
</tr>
<tr>
<td>Doble bedroom</td>
<td>8</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5</td>
</tr>
<tr>
<td>Living-room</td>
<td>16</td>
</tr>
<tr>
<td>Bathroom</td>
<td>3</td>
</tr>
<tr>
<td>Toilet</td>
<td>1.5</td>
</tr>
</tbody>
</table>

The areas provided in the house, object of the project.

<table>
<thead>
<tr>
<th>FLOOR</th>
<th>DENOMINATION</th>
<th>USEFUL</th>
<th>BUILT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground Floor</td>
<td>Kitchen</td>
<td>13.95</td>
<td>73.02</td>
</tr>
<tr>
<td></td>
<td>Living-room</td>
<td>27.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hall</td>
<td>14.82</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pantry</td>
<td>2.84</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bath</td>
<td>3.23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Storage room</td>
<td>3.70</td>
<td>38.23</td>
</tr>
<tr>
<td></td>
<td>Garage</td>
<td>29.17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Porch</td>
<td>2.20</td>
<td>18.53</td>
</tr>
<tr>
<td></td>
<td>Cover terrace (50%)</td>
<td>16.33</td>
<td></td>
</tr>
<tr>
<td>First</td>
<td>Room 1</td>
<td>14.07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Room 2</td>
<td>11.28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Room 3</td>
<td>13.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Room 4</td>
<td>13.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dressing Room</td>
<td>5.95</td>
<td>97.57</td>
</tr>
<tr>
<td></td>
<td>Bathroom 1</td>
<td>5.59</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bathroom 2</td>
<td>4.15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corridor 1</td>
<td>4.71</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corridor 2</td>
<td>5.67</td>
<td></td>
</tr>
<tr>
<td>Terrace</td>
<td>Corridor 3</td>
<td>2.16</td>
<td>13.02</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>194.02</td>
<td>240.37</td>
</tr>
</tbody>
</table>

The house is equipped with all basic services and the telecommunications.

Housing is planned in such a way as to ensure telecommunication services (under specific telecommunications project) and telephone and audiovisual.

BASIC REQUIREMENTS FOR STRUCTURE

The structure of the building is going to be resolved with reinforced concrete and can be decomposed, for purposes of calculation, in: Foundations, supports, floors and unique elements.

The geometric description of the structure which is included in the plans for Execution Project shall be constructed and controlled in accordance with what indicated in the Technical Building (CTE) and EHE. The interpretation of plans and implementation requirements of the structure are ultimately subject to the directives and orders during the Construction of it imparts the Architect of the work.

The frameworks are made with a total depth of 25 + 5 cm, interaxis concrete vault of 70 cm.

Joists and complementary distribution, filling of breasts and compression layer of 5 cm, thick, all executed as established under current legislation. The framework will be concrete vault.

Based in the geotechnical study, adopted the following principles of typology and calculation of foundation and construction features of the same:

A system using strip footings with walls of 0.20 m supported on them.

Concrete elements will be carried out in situ with reinforced concrete H-25 N/mm², maximum size 20 mm, placed on structure formed by walls, pillars, beams bands, wrought beams and slabs, pouring consistency and compacted with vibrating plastic, steel bars B-500-S.

Transverse joints will shrink every 25 m², with distances between them not exceeding 5.00 m, being the depth of not less than 1/3 the thickness and width of 3 mm. The sill will include its corresponding mesh and bituminous waterproofing.
**BASIC REQUIREMENTS FOR SAFETY:**

1. Structural safety ([CTE DB SE]), so that will not occur in the home, or parts thereof, which originate damage or affect the foundation, supports, beams, slabs, bearing walls or other structural elements, and directly compromise the mechanical strength and stability of the house.

2. Safety in case of fire ([CTE DB SI]), so that occupants can evacuate the house safely, it can limit the spread of fire within the home itself and the adjacent and to allow the performance of firefighting equipment and rescue.

   Urban conditions: housing is easily accessible to firefighters. Outer space immediately next to housing meets the sufficient conditions for the intervention of firefighting services. All structural elements are fire resistant for longer than the largest sector of fire resistance. Access is guaranteed because the holes comply the conditions of separation. There is no incompatibility of uses. There must not be type of material due to its low fire resistance, flammability or toxicity may adversely affect the safety of the building or its occupants.

3. Utilization safety ([CTE DB SUA]), so that normal use of the building is no risk of accidents to people. The configuration of spaces, fixed or movable elements that are installed in the home, are designed so that they can be used for its intended purpose within the limitations of use of the building described later without risk of accidents involving for users. The riser of stairs is 20 cm, at most, and the footprint of 22 cm, at least. The size of all signs shall be measured at each step, depending on the direction of travel. (Section 4.2)

**BASIC REQUIREMENTS FOR HABITABILITY:**

1. Hygiene, health and environmental protection ([CTE DB HS]), so as to achieve acceptable conditions of safety and sealing in the air inside the building and it does not deteriorate the environment in their immediate environment, ensuring proper management of all types of waste.

   The home meets the requirements of habitability, energy efficiency and functionality required for this use.

   The entire building is provided with means which prevent the presence of water or moisture from inadequate atmospheric precipitation, from the ground or fused, and has means to prevent penetration or, where appropriate, enable their evacuation without producing damage.

   The house has adequate means to provide the hygienic equipment provided safe water for consumption in a sustainable manner, providing sufficient operating flow without altering the properties suitability for consumption and preventing the potential returns that may contaminate the network, incorporating means for saving and control of water. All equipment will have their own individual siphon.

   The house has adequate means for removing the wastewater generated independently with atmospheric precipitation.

2. Protection against noise ([CTE DB HR]), so that the perceived noise does not endanger the health of people and enable them to successfully carry out their activities.

   All vertical structural elements (interior partitions, partition walls of properties or different users, partition walls of interior common areas, walls separating the engine rooms, facades) have sound insulation required for applications provided on the premises that they enclose.

   All horizontal construction elements (generally slabs separating each floor, walkable roofs and slabs separating engine room), have sound insulation required for the intended uses in dependencies that are limiting.

3. Energy saving and thermal insulation ([CTE DB HE]), so as to achieve a rational use of energy necessary for the proper use of the house.

   The house has a fitting enclosure to limit energy demand required to achieve thermal comfort depending on the climate of the city of Vinaròs, the intended use and the summer and winter.

   The insolation and inertia characteristics, air permeability and exposure to sunlight, allow reducing the risk of surface humidity and interstitial condensation that could damage the features of the envelope.
Taken into account especially the treatment of thermal bridges to limit heat gains or losses and avoid hygrothermal problems in them.

The house has adequate lighting facilities to the needs of their users while providing an energy efficient control system that allows to adjust the ignition to the actual occupation of the area as well as a regulatory system that optimizes the use of natural light in areas that meet certain conditions.

The hot water demand will be covered in part by incorporating a system of collection, storage and use of low-temperature solar energy appropriate to the global solar radiation from its location and the hot water demand of house.

**BASIC REQUIREMENTS FOR FIRE**

The aim of the basic requirement “Safety in case of fire” is to reduce to acceptable limits the risk that users of a building suffer damage caused by a fire of accidental origin, due to the characteristics of their design, construction, use and maintenance.

**CTE SI-1. Interior propagation:**

Fire resistance of walls, ceilings and doors that define sectors of fire EI60. In garage the fire resistance of elements that delimit the sector will be EI 120.
CONSTRUCTIVE MEMORY

JUSTIFICATION

SOIL

The geotechnical study has been done in accordance with the parameters set out in Article 3 of Basic Document SE-C del CTE.

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<tbody>
<tr>
<td>VEGETAL SOIL</td>
<td></td>
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<tr>
<td>STRATIFIED ROCKS</td>
<td></td>
</tr>
</tbody>
</table>

Description of layers:

1. Arable land: Work layer of soil loose, easy removal with means and/or demolition landfill areas, debris, etc.

2. Stratified rocks: This layer is composed of stratified rocks forming a layer of indefinite thickness.

In view of this, the foundation plan will be to the depth specified in it, considered as adequate quality and suitable land to build the planned construction.

Not found the water table at a depth of foundation provided.

Admissible tension of soil

According to the classification adopted and the depth of foundations outlined in the plans, could be adopted permissible tensile soil of 2.00 kg/cm². The experience in this type of land and application of the allowable pressure recorded, shows that this tension can be adopted work with confidence. Anyway, will build on the second layer, the foundation being designed for not exceed the 2.00 kp/cm² in any point.

FOUNDATIONS

Due to the type of work, terrain features and ease of construction, the foundation will be adopted based on surface type: STRIP FOOTING.

The method of calculation used for the design of footings and their reinforcement is reflected in the regulation EHE-08.

STRUCTURE

The resistant structure of the building is projected by: WALLS OF CHARGE done by concrete blocks, PERIMETER REINFORCEMENT BEAMS, COLUMNS AND BEAMS.

It will be of concrete HA-25/B/20/Ilb, and steel B500S, and cement CEM II/A-L 42.5 R.

SLAB

Slabs will be formed by semijoints of prestressed concrete, for the loads and bending moments calculate, ceramic blocks, filling of breasts and compression layer will be implemented with concrete f_{ck}: 250 kg/cm², and steel f_{yk}: 5000 kg/cm².

BUILDING ENVELOPE

There will be two kinds of envelopes:

1. The construction system consist on brick wall of 12 cm thickness cladding.
2. The construction system will consist in one leaf of white perforated facebrick.

All exterior brick walls have an air chamber (inside of its, is placed thermal insulation) and an interior partition of 7 cm, plus coatings.
SEWERAGE

Downspouts pipes and storm sewer shall be PVC diameters indicated on the plans, placing prefabricated valve boxes at the locations listed in the project. The horizontal sewerage system will be of PVC as well, and their travels and diameters listed in the corresponding plane. The minimum slope will be 2%. This network will connect to public sewer.

ROOF

Walkable and non-walkable terrace.

PARTITIONS

Clay brick walls of 7 cm placed on edge and united with gypsum rows, the last row, and with Portland cement mortar the rest.

CONTINUOUS COATING

A gypsum plaster base on vertical and horizontal walls of interior rooms.

In external walls, Portland cement mortar without screeded and floated or colored coating monolayer.

- Pieces of gres ceramic.
- Granite stone for steps.
- Concrete garage and storage room.
- Granite worktop of 2 cm thickness on kitchen furniture.
- Tiling in kitchen, toilet and bath with ceramic tile to delivery to the ceiling.
- On terraces and exterior spaces of ceramic slip.
- Rain guard on windows and doors, Ulldecona’s stone.
- Halls, stairs clad with granite stone.
- Placated smooth veneer plaster on ceilings in bathrooms and kitchen, and facilities walkways.

WALLS FINISHES

Wet areas: tiled with ceramic tiles premium rate. Rest of housing: Painting all the walls with high quality plastic paint. All the walls of the house will be treated with anti-mildew and antibacterial.

FLOORING

Floor tiles inside large ceramic Porcelanosa premium rate, with baseboard. Wet areas: tiled with ceramic tiles premium rate.

INTERIOR CARPENTRY

Preframes are made of pine wood. Plain internal passing doors are varnished heat-treated beech wood, with corresponding fittings, handles and knobs.

Kitchen wood furniture with varnished heat-treated beech, pull handles of stainless steel and wood doors. Base unit prepared to 45 cm dishwasher.

Stairs banister of lacquered aluminium, compliance regulations with the risk of falls specified in CTE-SU1, Section 3.

EXTERIOR CARPENTRY

Monoblock type P.V.C. in color and aluminium roller blinds.

Reinforced entrance door of PVC in color, with inspection window, handle and security lock. Preframe is made of aluminium.

External railings work with stainless steel handrails.

FALL SAFETY CONDITIONS [CTE DB SUA]

1. Height > 0.55 m. Handrail or protective element:

   DESIGN:
   - Not scalable (support points will not exist in the height between 200 mm and 700 mm above the ground level or above the line of inclination of a straight)
• Minimum height:
  - Interior building: 0,90 m
  - Exterior building: 0,90 m

• Bars separation < 0.10 m

**HORIZONTAL RESISTANCE TO PUSH ON TOP SURFACE**

(Apart. 3.2.1 from Basic Document SE-AE)

- 1,6 KN/m

2. Opening windows with height above floor < 0.90 m → Safety glass or wired glass, panels or handrails.

**HORIZONTAL RESISTANCE TO PUSH ON TOP SURFACE.**

- 1,6 KN/m

**Locksmith**

All elements will be of stainless steel conveniently painted and finishes.

**PUMBLING**

The plumbing will be made based on standard copper tubes, hanging from the ceiling and mounting into walls.

The domestic distribution network will be hot and cold water with their diameters, keys and accessories for its perfect working order. It placed taps in each local wet.

The sanitary ware will be white vitreous porcelain from Roca in bathrooms and toilets. All chromed single-lever taps.

The sink will be single and stainless steel.

**ELECTRICITY**

The electrical system will be implemented strictly following the ITC-BT 25 in force, and the project plans.

- Electrification level: 9200 W (Elevated Electrification) because the useful area is 194 m$^2$ > 160 m$^2$ and the provision of electrical conditioning. The electrical network will have six circuits, with protectional box IP55, magneto-thermal differential...

  - General switch: 40 A.
  - Power switch control
  - Differential switch

**CIRCUITS:**

- C6. Lighting
- C7. Outlets
- C8. Forecast of electric heating
- C9. Forecast of air conditioning
- C10. Separated dryer
- C12. Provision of additional circuits

The interior installation will be made based networks mounting in walls, with semi-rigid plastic pipes with the copper wiring sections concerned.

The mechanisms and fittings will be of the series Simon.

T.V. antenna installation and telephony equipment acquisition, amplification and distribution, including making connection to earth and pre-installation for digital platform

Will place the earthing buried to provide a contact tension of less than 24 V in any mass of the building and a lower resistance of 20 Ohms, from the furthest point of the installation.

**INSULATIONS**

Insulating walls with polyurethane foam of 4 cm. sprayed in the interior leaf of brick wall and 25 kg/m$^3$ density.
GLASSES
Glass chamber Climalit 4/8/4 in windows, and 4/6/4 in doors.

VARIOUS
- Fencing of plot consists of concrete block factory plastered with mortar colored monolayer.
- Mailbox, single-family housing, with front slot for card input, and door and metal body colored exterior finish ixox.
- Plate medium vitoceramica.
- Slimline hood, midrange
- Bar in the kitchen made of wood like kitchen cabinets.
- Versatile mid-range oven
- Wood kitchen cabinets finished in natural beech veneer, wooden doors, straight edges, straight lines matte stainless steel handles, wall units, worktop and fume extractor for housing, low furniture in preparation for 45cm dishwasher.

SUSTAINING BUILDING

Justification of soil characteristics and parameters to be considered for the calculation of the structural system for the foundation.

According to the CTE-DB-SB-AE Shares and the NCSR Earthquake Resistant Construction Standard-02, the city is a basic acceleration zone less than 0.04 g where g is the acceleration of gravity. The seismic acceleration is less than 0.06 g so therefore no need for special measures for seismic reasons.

Basis of calculation
- Methods of calculation

The sizing of sections is done by the Theory of Boundary Limits States (DB-SE Section 3.2.1) and Service Limit States (DB-SE Section 3.2.2). The behavior of the foundation should be checked against the bearing capacity (strength and stability) and the ability to service.

- Checks

The checks of limit states are based on the use of a suitable model for the foundation system chosen and the soil in support of it.

- Loads:

Wind actions (CTE DB SE-AE)
In general, ordinary buildings are not sensitive to the dynamic effects of wind. This document does not cover Basic slenderness constructs above 6, which itself must be considered such effects.

The building is situated in zone A:
Velocity of air = 26 m/s
Wind dynamic pressure = 0.42 kN/m²

It has been considered the loads in building according DB-SE-AE, and geotechnic loads which are transmitted through the soil, according the document DB-SE [4.2 – 4.2 – 4.4].

As provided in the DB-SE-AE in Table 3.1 and Annex C, and EHE-08 the gravitational action and the live load, partition and snow that have been considered for calculation the structure of the building are specified:

<table>
<thead>
<tr>
<th>Levels</th>
<th>Overload</th>
<th>Partition overload</th>
<th>Slab self-weight</th>
<th>Floor and coating overload</th>
<th>Total load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level1 Sanitary slab 1</td>
<td>2.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>4.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>8.00 KN/m²</td>
</tr>
<tr>
<td>Level2 Sanitary slab 2</td>
<td>4.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>4.00 KN/m²</td>
<td>-</td>
<td>9.00 KN/m²</td>
</tr>
<tr>
<td>Level 3 Fist floor 1</td>
<td>2.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>4.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>8.00 KN/m²</td>
</tr>
<tr>
<td>Level 4 Fist floor 2</td>
<td>2.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>4.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>8.00 KN/m²</td>
</tr>
<tr>
<td>Level 5 Terrace floor 1</td>
<td>1.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>4.00 KN/m²</td>
<td>1.00 KN/m²</td>
<td>7.00 KN/m²</td>
</tr>
</tbody>
</table>
• Generalities:
  Analysis and design of the foundation require prior knowledge of the soil support characteristics, the type of building planned and the environment where the building is located.

• Admissible tension considered:
  2.0 kp/cm²

GEOTECHNICAL STUDY:

• Characteristic of materials:
  It will be all in HA-25 reinforced concrete strip footings on a clean concrete layer of HM20, 850 S steel and 850 T for electrowelded mesh. There is a perimeter reinforced concrete beams, and a wall of concrete block. It is placed a polyethylene sheet above wall of concrete blocks to avoid moisture by capillarity.

• Regulations considered in the materials used
  - Concrete: EHE- CTE
  - Steel: CTE-DB-SE
  - Concrete blocks: RB-90, UNE-ENV 1996-1-1.

STRUCTURAL SYSTEM

Data and the started hypothesis will be determined, the requirements program, the bases of calculation and procedures or methods used for the entire structural system as well as the characteristics of the materials.

This house is projected to meet the essential requirements of mechanical strength and stability, fire safety, hygiene, health, environment and safety in use. Compliance with these requirements is expected to meet during the life of 50 years.

It is no considered seismic action because the location of the building is not very exposed to earthquakes, according to NCSE-02.

FOUNDATION:

• Requirement program:
  Isolated house with ground and first floors divided into four levels. The ground floor will be in sanitary slab on two levels and the first floor will be on one-way slabs, divided into two levels.

• Characteristic values for loads:
  The values loads are collected above in compliance of DB-SE-AE.

BEARING STRUCTURE:

• Requirements program:
  Isolated house with ground floor on two levels in one of which is the garage and one storage and the other social area level. The second floor contains the rooms on two floors and the staircase that leads to a walkable terrace.

• Structural analysis model:
  It is performed a three-dimensional structural analysis by matrix methods of stiffness forming bar elements that define the structure: columns, beams, joists and cross beams.
• **Characteristics of materials:**

  It will be all in HA-25 reinforced concrete slab, beams and columns, with B500 S steel and B500T for electrowelded mesh.

  The HA-25 concrete shall conform in size aggregates and dosage to the provisions of EHE, requiring a minimum compressive strength of 25 N/mm² at 28 days with normal control.

• **Regulations considered in the materials used**

- Concrete: EHE-CTE
- Steel: CTE-DB-SE

**HORIZONTAL STRUCTURE:**

• **Requirements program:**

  Isolated house with ground floor on two levels in one of which is the garage and one storage and the other social area level. The second floor contains the rooms on two floors and the staircase that leads to a walkable terrace.

• **Structural analysis model:**

  Use of one-way slab with light elements of ceramic block, with an interaxis of 70 cm.

  The sizing of sections is performed according to the theory of limit states EHE Instruction. The calculation method of the floors is via a calculation on the assumption of plane continuous beam using the matrix method of stiffness or displacement, with an elastic analysis as EHE hypothesis.

  The depth of the one-way slabs of concrete with prestressed joists will exceed the minimum established in the EHE (Art. 50) for the design conditions, materials and anticipated loads, so it does not need to check arrow.

\[
H_{\text{min}} = \delta_1 \cdot \delta_2 \cdot L = 1.13 \cdot 0.974 \cdot 5.40 = 0.289 \text{ m} \quad \Rightarrow \quad H = 30 \text{ cm.}
\]

- \( \delta_1 = \left( \frac{q}{7} \right)^{0.5} \)
- \( \delta_1 = \left( \frac{9.00}{7} \right)^{0.5} = 1.13 \)
- \( \delta_2 = \left( \frac{L}{6} \right)^{0.25} \)
- \( \delta_2 = \left( \frac{5.4}{6} \right)^{0.25} = 0.974 \)
- \( L \) (maximum span of slab) = 5.4 m (slab 2)
- \( C \) (coefficient table 50.2.2.1.b) = 20

• **Characteristic of materials involved:**

  The data sections of columns and beams, and the reinforcement of the slab, beams and slabs negative, and other structural elements will be defined in the relevant structure plans. The HA-25 concrete shall conform in size aggregates and dosage to the provisions of EHE, requiring a minimum compressive strength of 25 N/mm² at 28 days. Normal control. The steel used shall be corrugated B500S and steel for welded mesh B500T.

• **Regulations considered in the materials used**

- Concrete: EHE-CTE
- Steel: CTE-DB-SE
- Slab and joists: EHE

**ENVELOPE SYSTEM:**

Constructive definition of the various subsystems of the building envelope, with description of their behavior regarding loads to which it is subject [self-weight, wind, earthquake, etc.] against the fire, safety use, removal sewage and behavior against moisture, noise and thermal insulation, and their basis of calculation.
The thermal insulation of these subsystems, the maximum expected energy demand of the building for summer and winter conditions and energy efficiency based on performance of proposed facilities in accordance with CTE DB-HE2.

CONSTRUCTIVE DEFINITION OF SUBSYSTEMS:

1. **ENVELOPES:**
The following types of enclosures:

**EXTERIOR SHEET:**
Enclosure consisting of an exterior sheet of perforated brick 25x12x10, injected polyurethane foam of 4 cm inside the air chamber of 6 cm.

Envelope of a sheet of white perforated facebrick of 24x12x5 cm, without vertical joint placement, anchored in slab by steel corrugated rods 10 mm diameter and angle made with the same type of rod.

**INTERIOR SHEET:**
Interior sheet will be made by hollow brick 24x12x7 cm, received with cement CEM IIA-P 32, SR, to coated, level and plumb, and grouting.

2. **EXTERIOR CARPENTRY:**
The exterior carpentry will be of P.V.C. medium series with thermal break, monoblock system with glass glazing with chamber Climalit type 4/8/4, and blind aluminum color. Its leaves can be sliding, swing and tilt swing (see plan of carpentry).

3. **OUTDOOR TERRACE:**
The project has two kinds of terrace.

1. **Walkable terrace:**
Consisting of: Layer of concrete cell with slope formation minimum height of 10 cm, and slope to 2%, 2 cm mortar layer thickness, asphalt waterproofing 4kg/m², placed with torch-extruded polystyrene thermal insulation with 4 cm thick, 3cm thick mortar layer-pavement terraces made with mortar mixed of 2 cm thick.

   Expansion joints

2. **Non walkable terrace:**
Consisting of:
Layer of concrete cell with slope formation minimum height of 10 cm, and slope of 2%, asphalt waterproofing 4kg/m², mortar layer of 3 cm thick, and rasilla flooring with dripcap.

   Even expansion joints.

4. **OUTSIDE FLOOR:**
One-way sanitary slab with pretensed self-resistance joist of HA, ceramic block and compression layer 5 cm, 70 cm between axis, 25 +5 edge, negative reinforcement and electrowelded mesh 150x300 cm and diameter 5 mm, with concrete HA/25 and steel 8500S, perimeter beams and lintels. Stair slab with a thickness of 20 cm, dimensions and reinforcement according to plan.

5. **WALLS IN CONTACT WITH NO HABITABLE SPACE AND A DEPTH GREATER THAN 0.50 m.**

   Wall made of concrete block of 20x20x40 cm, with breast filled with concrete with two grates round of 10 mm diameter., provided each 20 cm, cutting capillarity with waterproof sheet, received with cement mortar M-40a (1:6).

   Leaving interior holes of 40x20 cm in the lining of the sanitary slab for air circulation, and holes in enclosure walls to put louvers on all facades.
BEHAVIOUR OF SUBSYSTEMS.

Each of the building elements listed above have a behavior and a basis of calculation with respect to the dead load, wind, earthquake, fire, safety of use, water evacuation, response to moisture, thermal and acoustic insulation provided in the Enforcement Regulations of the CTE.

FINISHING SYSTEMS

It is shown the characteristics and requirements of the finishes and the parameters to complain the requirements of functionality, safety and livability (detailed finishes here are those that have proceeded to describe in the specification).

EXTERIOR FINISHES:

Monolayer mortar scraping color finish, waterproofing thickness of 2 cm. Compound of cement I/45-B, sand and water repellent. Complying with the rules of lighting in the section of the CTE-DB-HE facades and conditions of section 2.3 of the CTE-DB-HS.

Continuous coating of white cement.

Sandstone cladding for facade, on screeded walls and taken with gripping material or similar.

Metal cladding for chimney barbecue on screeded walls and taken with adhesive material or similar.

INTERIOR COATING

Garnished gypsum plaster finish. Complaining the conditions of reaction to fire in the chapter on Reaction to fire of building materials, coatings of the CTE-DB-SI. There will be a double layer of plastic paint on walls and ceilings.

ROOFS:

WALKABLE TERRACE-

Layer of cell concrete with slope formation minimum height of 10 cm, and slope to 2%, average thickness of 15 cm, 2 cm mortar thick layer, asphalt waterproofing 4kg/m², placed with torch, thermal insulation of extruded polystyrene with 4 cm, type roof-mate, layer of mortar of 3 cm, pavement on terraces made with rustic stoneware made with mixed mortar 2 cm thick.

TERRACE NO WALKABLE-

Aerated concrete layer with slope formation minimum height of 10 cm, and slope to 2%, average thickness of 15 cm, mortar layer 3 cm thick concrete layer cell of 2 cm, thick, even in auctions, forming expansion joints, completely finished.

In compliance with the enforcement in the roof section in the CTE-DB-HE and Section 2.4 covers the CTE-DB-HS.
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TRANSVERSAL SECTION

LONGITUDINAL SECTION
**D1**

Electrowelded + Negative Reinforcement

1.5V > V > 1m

Concrete ≤ 10 cm

Negative reinforcement

**D2**

Mesh + Negative Reinforcement

Block

Joist

Place joint, in case concrete > 10 cm

**D3**

Mesh + Negative Reinforcement

Concrete ≤ 10 cm

Joist

Block

**FINAL PROJECT**

**SINGLE FAMILY HOUSE**

**SLAB DETAILS**

JUNE 2012
DETAILS OF ANCHORAGE BARS IN COLUMNS

Details:
- Concrete:
  - Reinforcement
  - Horizontal anchorage
  - Concreting joints: rough, clean and wet before concreting

Nominal covers:
- Circular column
- Option A
- Option B

FINAL PROJECT
SINGLE FAMILY HOUSE
JUNE 2012

DETAILS COLUMNS

STUDENT:
MERCEDES ESTEVE MONTESÍNOS

HOMES
FRANTITÈK KULHANÈK / MILAGRO BORRA

SCALE:
PLAN NO.

36
Drainage bathrooms

<table>
<thead>
<tr>
<th>Feature</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sink</td>
<td>32 mm</td>
</tr>
<tr>
<td>Shower</td>
<td>40 mm</td>
</tr>
<tr>
<td>Tub</td>
<td>40 mm</td>
</tr>
<tr>
<td>Riser</td>
<td>56 mm</td>
</tr>
<tr>
<td>Toilet</td>
<td>110 mm</td>
</tr>
<tr>
<td>Dishwasher</td>
<td>40 mm</td>
</tr>
<tr>
<td>Washer</td>
<td>40 mm</td>
</tr>
</tbody>
</table>

FINAL PROJECT
SINGLE FAMILY HOUSE

JUNE 2012

SEWERAGE SYSTEM

SCALE: 1/100

STUDENT: MERCEDES ESTEVÉ MONTESINOS

TEACHER: FRAN TEBEK KULHANEK / MILAGRO BORRA