THE CURRENT STATUS REPORT
1. INTRODUCTION

2.4. OBJECT

Describe how is the current state of the building which will give us an idea for further actions.
The building is located in the historical centre of Valencia, specifically “El barrio Del Pillar”.

The overall objective is recognition to the property; the features are described too, as well as structural, the current construction system, condition of facilities, etc.

The mean reason why this building has been chosen for this project, is because is a project with a real execution, which will empower a historic building by means of the necessary allocations to be inhabited with right conditions of comfort and stability.

2.5. PROJECT DETAILS

PROMOTER: Responsible owner.
PLANNER: Technical competent.
LOCATION: Street, number and city where is located the building.

1.1.1. THE SITE.
The building occupies one plot. The plot has a square shape located in the corner which is consisted by two streets (Illustration 1.2 Graphic Information from the Virtual Land Registry Office), has an area of 123.00 m² and has the following municipal services:

Water supply: municipal network of clean water, the manhole is located on the sidewalk.

Electricity: It has low voltage connection.

Telecommunications: It has connection to the telephone network; the manhole is located on the sidewalk.

Sanitation: There is a municipal sewer manhole on the sidewalk of the street.


2. BRIEF HISTORICAL OVERVIEW.
The building is located in the historical centre of Valencia, specifically in “El Barrio del Pilar” Originally it was known as “Velluters” and it was a neighbourhood out from the walls of Valencia, was a working class neighbourhood which was dedicated to the industry of silk and velvet.
On 1865 the walls were tumbled down and the neighbourhood became part of the municipality.
The property had a simple air; the buildings weren’t ostentatious, as we can appreciate in the picture 1.
3. THE CHARACTERISTICS OF THE BUILDING

The building object of this project is located in the historic centre of Valencia (Spain), is a residential building and commercial premises on the ground floor, occupying a plot of 127,00 m².

It is located in "El Barrio del Pilar" on the corner where make an intersection “Recadero” and “Maldonado” streets.

Access to the property is down the Recaredo Street 24, and down the Maldonado Street there is an exclusively access to a local.

Furthermore, there is an easement for ventilation and lighting above the adjacent building on Maldonado Street.

2.6. DESCRIPTIVE REPORTAGE BUILDING.

3.1.1. Functional diagram of the current status

Ground floor: On the ground floor there are two commercial premises; one of them has an access through Recaredo Street. (Local I. see plan 0.3) and the other one has the access trough Recadero and Maldonado streets. (Local D1. See plan 0.3) and occupies both; the ground floor and the first floor which is accessed by a unique ladder.

Furthermore, there is an access door to the building [Photo 3.1], a small lobby and a ladder which connects all the rooms to the outside, and the rooftop.

First floor: The access to this floor is by the stairs of the building. This floor has a three bedroom dwelling (House 0.1. See plan 0.4) : a kitchen, a bathroom, a living room and corridors. One bedroom and the living room have ventilation and lighting through the windows from Recaredo and Maldonado streets by means of the facade. The kitchen and bathroom made it through the central yard of the building; the last room has ventilation and lighting through an easement to adjacent yard to the adjacent building on Maldonado Street.
Second floor: The access to the floor is through the stairs of the building. There are two dwellings (Housing 2 and Housing 3. See plan 0.5), there is also an independent access from the staircase landing.

The second housing has three rooms, a kitchen, living room, a terrace, a bathroom, corridors and a small balcony overlooking the street Recaredo.

The ventilation and lighting of the living room is through the facade of Recaredo Street, kitchen and bathroom by the central courtyard of the building and the other room is by easement of the adjacent building.

The third housing has three rooms, a storeroom, kitchen and bathroom. Ventilation and lighting is through the exterior facades and the kitchen and bathroom, through the courtyard of the building.

Third floor: This floor also has two housing (Housing 4 and 5. See plan 0.6). The access to this floor is by stairs and the individual access to housing is on the landing of the staircase.

The fourth housing has three rooms: Kitchen, bathroom and three small balconies. Ventilation and lighting are by the exterior facade and through the yard lights of the building.

Finally, the last housing has three rooms: A dealer, kitchen, bathroom and a terrace. Ventilation is by the exterior, the yard lights and easement on the adjacent building.

Floor under the roof: In this floor there are rooms that are considered to be used to store objects from the people who are residing in the property.

Roof: This building has a flat roof with a slightly slope, but it is passable and an inclined cover of three waters; Furthermore, has a cover for the stairs. The flat roof consists of 50x40 cm ceramic tiles handmade. The sloping roof is also of handmade ceramic tile.

Both decks have damages that have been caused by the age of the building or even the lack of maintenance.
And below is presented a table of usable and constructed surface areas of the building.

<table>
<thead>
<tr>
<th>STAY</th>
<th>FLOOR SPACE (m²)</th>
<th>BUILT AREA (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GROUND FLOOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business premises I1</td>
<td>53.15</td>
<td>62.00</td>
</tr>
<tr>
<td>Business premises D1</td>
<td>42.38</td>
<td>50.88</td>
</tr>
<tr>
<td>Courtyard</td>
<td>4.45</td>
<td></td>
</tr>
<tr>
<td>Stairs</td>
<td>7.25</td>
<td>9.90</td>
</tr>
<tr>
<td>TOTAL GROUND FLOOR</td>
<td>107.23</td>
<td>122.78</td>
</tr>
<tr>
<td><strong>FIRST FLOOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing 1</td>
<td>70.74</td>
<td>84.31</td>
</tr>
<tr>
<td>Business premises D1</td>
<td>25.73</td>
<td>31.81</td>
</tr>
<tr>
<td>Common elements</td>
<td>7.05</td>
<td>8.86</td>
</tr>
<tr>
<td>TOTAL FIRST FLOOR</td>
<td>103.52</td>
<td>124.98</td>
</tr>
<tr>
<td><strong>SECOND FLOOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing 2</td>
<td>53.4</td>
<td>64.94</td>
</tr>
<tr>
<td>Housing 3</td>
<td>42.17</td>
<td>55.96</td>
</tr>
<tr>
<td>Common elements</td>
<td>7.18</td>
<td>8.97</td>
</tr>
<tr>
<td>TOTAL SECOND FLOOR</td>
<td>102.75</td>
<td>129.87</td>
</tr>
<tr>
<td><strong>THIRD FLOOR</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housing 4</td>
<td>42.41</td>
<td>56.29</td>
</tr>
<tr>
<td>Housing 5</td>
<td>51.48</td>
<td>63.12</td>
</tr>
<tr>
<td>Common elements</td>
<td>8.57</td>
<td>10.45</td>
</tr>
<tr>
<td>TOTAL THIRD FLOOR</td>
<td>102.46</td>
<td>129.86</td>
</tr>
<tr>
<td><strong>UNDER ROOF</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Box room 1</td>
<td>9.56</td>
<td>13.01</td>
</tr>
<tr>
<td>Box room 2</td>
<td>14.00</td>
<td>16.20</td>
</tr>
<tr>
<td>Box room 3</td>
<td>14.13</td>
<td>18.84</td>
</tr>
<tr>
<td>Common elements</td>
<td>9.94</td>
<td>12.59</td>
</tr>
<tr>
<td>TOTAL UNDER ROOF</td>
<td>47.63</td>
<td>60.64</td>
</tr>
<tr>
<td><strong>TOTAL BUILDING</strong></td>
<td>463.59</td>
<td>568.13</td>
</tr>
</tbody>
</table>
2.7. Structural elements description.

Foundation:
This section can’t say clearly the type of building foundation, the study of the current state of the foundation will be made by a competent professional. On the other hand, we can assume that it is continuous footings under the walls.

Vertical elements:
The vertical structure is formed by manufactured walls, made of handmade baked bricks, and lime cement.

Horizontal elements:
The horizontal elements of this building are pine wood, which in some cases is painted white and another unpainted, so is wood natural color.

Inclined structures:

Roof:
The building has an incline roof, and a flat passable roof.

The inclined roof is formed by pieces handmade of Moorish tiles cooked ceramic, endured by a lime mortar and supported by a network of wooden slats, which in turn are supported by some battens and these to the building structure.

The flat and passable roof is formed by pieces of 50x40 cm made with artisan cooked clay, the shingles are joined together by means of a lime mortar, with this the pieces were joining and at the same time is useful to prevent penetration of water inside. The support system is the same as shown in the picture above.

Stairs:
The Stair of the building was carried out with the Catalan vault system (See plan 0.9), made of bricks, lime mortar (Picture 3) and a formation of steps with ceramic and wooden slats. As shown in Picture 7.
2.8. THE COATINGS AND FINISHING

Exterior:
The facades have a plaster mortar, having generally good condition, although there are spots for pollution that has accumulated over time.

On the other hand, there were some detachments of the facade, that is why in the building has been installed a tarp to prevent damage from occurring to others.

The yard lights also have a lime mortar plaster, which are painted white, as is shown in the picture.

Inside:
The inner part of the property the most of the vertical walls that make up the divisions are coated with a plaster of lime mortar [on brick] and then has been applied a base of white paint and finally has been placed wallpaper in some cases.

In other cases the parameters are painted light blue.

According to the visual analysis are considered plastic paints. (See Picture 09)
Throughout the building there is a common pavement, which is a piece of 30x30 cm that fully covers the housing. These pieces are positioned in a way that has prevented joints between them, and there’s no kind of “vorada” among them that can be seen.

### 3.1.2. Joinery

#### Exterior Joinery

The carpentries which are on the ground floor directly overlooking to the street, are metal. On the upper floors the joinery in contact with the exterior is wood, which is in very poor condition.

#### Inside Joinery

On the ground floor are wooden and they are in very poor condition.

There are wooden floors, which are in very poor condition.

### 2.9. Pathologies

The following study of the pathologies of the building was made from the visual inspection of the property, which has been shown the following:

#### The Chipped

Detachment of the lining of the brick maybe is for lack of maintenance and environmental circumstances.

#### Brick wear.

Some brick parts are wearing caused by moisture, frost and sea breezes.

#### Rot.

Produced by moisture and lack of maintenance that affects mainly the wood elements.

#### Corrosion.

Motivated by the lack of maintenance, moisture and salinity of the environment are affecting mainly the metallic elements.

#### Efflorescence.

White spots covering the walls, in this case produced by contact with products that contain chlorine. It can also be produced by the salt content of the water used in the building or its materials.

#### Detachment.

Pieces of brick are separating, this can be caused by lack of maintenance, this can be caused by lack of maintenance.

#### Cracks.

They may be vertical horizontal or inclined, produced for many reasons, one of them may be the movement of the building.
**Surface deposits.**

Accumulation of particles on the surfaces of the elements, which over time can affect the element that contains them.
## Listing for Pathological Analysis

<table>
<thead>
<tr>
<th>File Nº:</th>
<th>1.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building:</strong></td>
<td>Recaredo 24</td>
</tr>
<tr>
<td><strong>Damage:</strong></td>
<td>Detachment of the outer coating</td>
</tr>
<tr>
<td><strong>Type:</strong></td>
<td>Physical</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Roof</td>
</tr>
</tbody>
</table>

### Description:
- Partial detachment of the plaster layer on the outside wall, which is on the north side of the stairs roof on the roof floor.
- Occasional detachments of the plaster coat on the outside walls of the south and west facades of the stairs roof on the roof floor.
- Specific detachments on the inner face of the wall of the protecting roof.

### Photos:
- A
- B
- C

### Possible Causes:

**Direct:**
- As there are facade walls, one of the direct causes is moisture. Soluble salts in rainwater installed between the factory and the plaster are the responsible that, with the passage of time, the latter is detached.

**Indirect:**
- Defect in the installation of building materials, lack of adhesion, high salt content in the pieces of brick.
- Lack of maintenance and upkeep of the building.

### Evolution:
It should act immediately, because of the absence of the facade cladding, contributes to the penetration of moisture in the pieces of brick and therefore to rapid deterioration of these.

### Previous Diagnosis:
Although currently it is a pathology that affects to the esthetic of the building, with the passage of time can affect the structural capacity of the affected walls, because of moisture penetrates the wall and causes erosion of the piece of brick.

### Proposed Intervention:
Repair the affected facades by removing traces of plaster that are about to come off, as well as the dirt that has been deposited and subsequent application of plaster mortar monolayer similar to the facade color.

To carry out the cleaning of the facade, the application of pressurized water is recommended to not let dust or loose items.

It is recommended apply a mortar layer no more than two cm.

“ibersec monocapa type OC-CSIV-W2 according to UNE-EN 998-1” brand CEMEX or similar.

### Maintenance:
Annual review of the facade conservation status to check the absence of spalling, bulging, cracking, cracks or peels, and should be made a checking for these, requesting the assistance of a qualified technician.
# Listing for Pathological Analysis

<table>
<thead>
<tr>
<th><strong>File Nº:</strong></th>
<th>2.1</th>
</tr>
</thead>
</table>

**Building:** Recaredo 24  
**Damage:** Dirt on the outer face of the facade.  
**Type:** Physical  
**Location:** North facade

### Description:
Pathological process is there in form of dark spots which is visible in most of the north facade of the building (Maldonado street) on the plaster layer.

### Possible causes:

**Direct:**
- Deposit of dirt caused by external agents such as the contamination in the environment, which is deposited on the facade by the rainwater, and over the years is accumulated and produces these dark spots.

**Indirect:**
- Lack of the building maintenance.

### Evolution:
The evolution of this pathology is slowly but over time, it can affect the coating layer of the facade.

### Previous diagnosis:
Although currently it is a pathology that affects the esthetic of the building, with the passage of time can affect the coating layer and the consequently penetration of moisture into the building.

### Proposed intervention:

Cleaning.  
It is recommended to clean by water pressure instead of chemicals or abrasives, and clean the blemishes that exist already.

### Maintenance:

Periodic review of the visual aesthetics of the facade to detect spots in it.  
If there is a reappearance of these same dark spots, they should be treated by a qualified technician.
# Listing for Pathological Analysis

<table>
<thead>
<tr>
<th>File No.</th>
<th>2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>Recaredo 24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Damage</th>
<th>Dirt on the outer face of the facade.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Physical</td>
</tr>
<tr>
<td>Location</td>
<td>East facade (main facade)</td>
</tr>
</tbody>
</table>

**Description:**
Pathological process is there in form of dark spots which is visible in most of the west facade of the building (main facade) on the plaster layer.

**Possible causes:**

**Direct:**
- Deposit of dirt caused by external agents such as the contamination in the environment, which is deposited on the facade by the rainwater, and over the years is accumulated and produces these dark spots.

**Indirect:**
- Lack of the building maintenance.

**Evolution:**
The evolution of this pathology is slowly but over time, it can affect the coating layer of the facade.

**Previous diagnosis:**
Although currently it is a pathology that affects the esthetic of the building, with the passage of time can affect the coating layer and the consequently penetration of moisture into the building.

**Proposed intervention:**
Cleaning.
It is recommended to clean by water pressure instead of chemicals or abrasives, and clean the blemishes that exist already.

**Maintenance:**
Periodic review of the visual aesthetics of the facade to detect spots in it.
If there is a reappearance of these same dark spots, they should be treated by a qualified technician.
### Listing for Pathological Analysis

<table>
<thead>
<tr>
<th><strong>File No:</strong></th>
<th>2.3</th>
</tr>
</thead>
</table>

**Building:** Recaredo 24  
**Damage:** Dirt  
**Type:** Chemical  
**Location:** Inside of the building

### Description
Deposits of bird droppings inside of all building floors, in both planes; horizontal and vertical

### Possible causes:
- Direct:
  - Droppings deposited by birds (pigeons) that nest in the building.
- Indirect:
  - Abandonment of the property for many years without care to place mats or board up the openings thereof.

### Evolution
The droppings contain acids that destroy rapidly the walls where they are deposited, so is required an immediate intervention.

### Previous diagnosis:
When the droppings are mixed with moisture and pollutants in the atmosphere, causes the deterioration of building materials which encourage the appearance of flora inside the building.

### Proposed Intervention:
When the droppings are mixed with moisture and pollutants in the atmosphere, causes the deterioration of building materials which encourage the appearance of flora inside the building.

### Maintenance:
Inspection of the correct state of the meshes and prevent access of the birds inside.
**LISTING FOR PATHOLOGICAL ANALYSIS**

<table>
<thead>
<tr>
<th>File Nº: 2.4</th>
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<tbody>
<tr>
<td><strong>Building:</strong> Recaredo 24</td>
</tr>
<tr>
<td><strong>Damage:</strong> Dirt</td>
</tr>
<tr>
<td><strong>Type:</strong> Physical</td>
</tr>
<tr>
<td><strong>Location:</strong> Yard lights</td>
</tr>
</tbody>
</table>

**Description:**
Accumulation of waste, such as wood, pieces of brick, animal droppings, plastic and dirt.

**Fotografía/s:**

**Causas probables:**

**Direct:**
- Waste deposit.

**Indirect:**
- Abandonment of property for many years

**Evolution:**
The continuous accumulation of trash and other debris is clogging the drain of the lights yard and a faster appearance of moisture.

**Previous diagnosis:**
The accumulated debris inhibit the correct draining of the yard lights, this leads to the appearance of dampness and the growth of vegetation and, as a consequent the property deterioration.

In addition is favored the appearance of damp, that destroy the vertical surfaces.

**Proposed intervention:**
Immediate removal of the remains of accumulated rubbish, and checking the proper drainage state.

Proceed to the replacement of the affected pavement pieces to repair the vertical surfaces by applying paint anti moisture.

**Maintenance:**
Constant cleaning of light yard to prevent accumulates debris and waste deposited naturally or directly.
<table>
<thead>
<tr>
<th><strong>LISTING FOR PATHOLOGICAL ANALYSIS</strong></th>
<th><strong>File Nº: 3.1</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building:</strong> Recaredo 24</td>
<td></td>
</tr>
<tr>
<td><strong>Damage:</strong> Oxidation and corrosion</td>
<td><strong>Type:</strong> Chemical</td>
</tr>
<tr>
<td><strong>Location:</strong> Balcony railings on the north facade</td>
<td></td>
</tr>
</tbody>
</table>

**Description:**

**Oxidation:** Is the contact reaction of the air and water on the surface of a metal, which produces a metal oxide surface layer.

**Possible causes:**

**Direct:**

- Contact with moisture from rainwater and air.

**Indirect:**

- Abandonment of property for many years.

**Evolution**

Although there is currently only a little bit of rust, over time there can take place the corrosion process thus destroying the metal.

**Previous diagnosis:**

The constant exposure outdoors of the iron railings leads to the appearance of rust. It is recommended the application of the protection to the entire balcony railings surface.

**Proposed Intervention:**

Sanding the entire surface to remove the oxide layer to the metal and in good condition, remove dust and degrease with a degreasing agent, it is important not clean the metal with water and soap, apply a primer for iron and take special care in the corners, angles and junctions.

Subsequently intends to apply two layers of anti-rust paint.

**Maintenance:**

Is necessary performing regular visual inspections to detect possible occurrences of rust and corrosion and having a regular maintenance of the building.
### Listing for Pathological Analysis

<table>
<thead>
<tr>
<th>File number: 3.2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building:</strong></td>
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<tr>
<td><strong>Damage:</strong></td>
</tr>
<tr>
<td><strong>Type:</strong></td>
</tr>
<tr>
<td><strong>Location:</strong></td>
</tr>
</tbody>
</table>

#### Description:

- **Oxidation:** Is the contact reaction of the air and water on the surface of a metal, which produces a metal oxide surface layer.

#### Possible causes:

- **Direct:**
  - Contact with moisture from rainwater and air.

#### Direct:
- Abandonment of property for many years

#### Evolution:

Although there is currently only a little bit of rust, over time, corrosion process can take place, thus destroying the metal.

#### Previous diagnosis:

The constant exposure outdoors of the iron railings leads to the appearance of rust. It is recommended the application of protection to the entire balcony railings surface.

#### Proposed intervention:

- Sanding the entire surface to remove the oxide layer to the metal and in good condition, remove dust and degrease with a degreasing agent. It is important not clean the metal with water and soap, apply a primer for iron and take special care in the corners, angles, and junctions.
- Subsequently intends to apply two layers of anti-rust paint.

#### Maintenance:

- It is necessary performing regular visual inspections to detect possible occurrences of rust and corrosion and having a regular maintenance of the building.
**LISTING FOR PATHOLOGICAL ANALYSIS**

<table>
<thead>
<tr>
<th>Archivo Nº</th>
<th>3.3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building:</strong></td>
<td>Recaredo 24</td>
</tr>
<tr>
<td><strong>Damage:</strong></td>
<td>Oxidation and corrosion</td>
</tr>
<tr>
<td><strong>Location:</strong></td>
<td>Inner stair railings</td>
</tr>
<tr>
<td><strong>Type:</strong></td>
<td>Chemical</td>
</tr>
</tbody>
</table>

**Description:**

**Oxidation:** Is the contact reaction of the air and water on the surface of a metal, which produces a metal oxide surface layer.

**Corrosion:** Loss of a metal from an electrolytic cell that is formed between said metal and other element close to it. Usually occurs as a result of oxidation - reduction.

**Possible causes:**

**Direct:**
- Contact with moisture from rainwater and air.

**Indirect:**
- Abandonment of property for many years

**Evolution:**

The corrosion process is quite fast so it is necessary to act like one.

**Previous diagnosis:**

The constant exposure outdoors of the iron railings leads to the appearance of rust. It is recommended the application of the protection to the entire balcony railings surface.

**Proposed intervention:**

Sanding the entire surface to remove the oxide layer to the metal and in good condition, remove dust and degrease with a degreasing agent, it is important not clean the metal with water and soap, apply a primer for iron and take special care in the corners, angles and junctions.

Subsequently intends to apply two layers of anti-rust paint.

**Maintenance:**

It is necessary performing regular visual inspections to detect possible occurrences of rust and corrosion and having a regular maintenance of the building.
### Listing for Pathological Analysis

<table>
<thead>
<tr>
<th>File number: 4.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building:</strong> Recaredo 24</td>
</tr>
<tr>
<td><strong>Damage:</strong> Section Loss</td>
</tr>
<tr>
<td><strong>Location:</strong> Under roof – box room</td>
</tr>
</tbody>
</table>

#### Description:
Loss section beams and straps that make up the structure that holds the ceramic pieces of the decks sloping.

#### Possible causes:

**Direct:**
- Fire on the ground floor deck

**Indirect:**
- Abandonment of property for many years

#### Evolution:
Section loss due to fire, occurs very quickly and is stopped at the time of termination of this.

#### Previous diagnosis:
The Loss of the section produces a decreasing the bearing capacity of the timber and therefore can result in collapse of the roof. So, the replacement of the bearing structure of the pitched roof storage area is recommended.

### Proposed Intervention:
Complete replacement of the wood from the affected area.

### Maintenance:
Is necessary performing regular visual inspections to detect possible injuries caused by biotic and abiotic attacks in the wood. In addition, the products stored in the storage shouldn't be able to cause chemical reactions that may cause damages to worst.
<table>
<thead>
<tr>
<th>LISTING FOR PATHOLOGICAL ANALYSIS</th>
<th><strong>File number:</strong> 5.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building:</strong> Recaredo 24</td>
<td></td>
</tr>
<tr>
<td><strong>Damage:</strong> Capillarity humidity</td>
<td><strong>Type:</strong> Chemical</td>
</tr>
<tr>
<td><strong>Location:</strong> Ground floor in contact with the ground.</td>
<td></td>
</tr>
</tbody>
</table>

**Description:**
The rising moisture occurs in the bases of the walls in the form of spots or unsightly coloration due to salts transported by moisture, as a result, it causes to bulge of the paint layer, in some cases it generate the coating detachment of the wall.

**Possible causes:**

Direct:
- There is an excess of water in the land, which climbs the walls that are in contact.

Indirect:
- - Lack of insulation between the building and the land.

**Evolution:**
If nothing was done, the deteriorating wall may affect the carrying capacity of it.

**Previous diagnosis:**
The main problem is an aesthetic level, but if nothing is done could have structural consequences.

**Proposed Intervention:**
As the presence of these moisture is in determinate areas, is recommended the passive electro phoresis which changes the direction of the electric field of the wall, and consequently it causes the moisture down to the land.

Grounding through a line of electrodes acting as anodes incorporated into the wall.

**Maintenance:**
Performing regular visual inspections to detect possible instances of efflorescence.
REFORMED STATE REPORT
1. REGULATION TO USE

To carry out this rehabilitation must be presented the national, regional and local regulations, as is detailed below:

Technical Building Code:
- DB-HE Save Energy.
- DB-HS Healthiness.
- DB-SI Safety in case of fire.
- DB-SUA Security of Using and Accessibility

Low voltage electrotechnical regulations (REBT)

The Regulations for thermal installations in buildings

The Valencia General Urban Development Plan (PGOU) (BOE 14/01/1989)

Special Plan for Internal Protection and Reform (PEPRI) of “Velluters” neighborhood (UE1AR-18R) (BOP 5/8/1999)

Rules to design and Quality in the Valencian community.

DC/09 Chapter IV. Rehabilitation.

2. DESCRIPTION

Is projected the building rehabilitation whose main objectives are:

- Returning the building to his current use in good condition with the corresponding functional adaptation. This design does not affect the structural design of the building, only describes the present structure which is considered to exist.
- Considering the most of the essence of the building, with the greatest possible use of the components, minimizing the demolitions. Although the building is not listed, the project acts in some cases as if it was.
- Provision and renovation of facilities, such as water, electricity and domestic hot water with solar energy.

2.18. COMPLIANCE WITH DESIGN STANDARDS AND DESIGN QUALITY, AND DWELLINGS QUALITY OF VALENCIAN COMMUNITY.

Detailed below sizing and compliance with paragraph Rehabilitation IV of this standard:

THE BUILDING:

The project meets the specified things in Article 25:
- Access door to the building with a free space of 0.92 m wide and 2.05 m high.
- Current common staircase with minimum step width of 0.80.

Considerations on the scope of the project:

The vertical, horizontal and the stair structure will be reviewed and checking by a qualified technician to determine their status and interventions if it was necessary.

The project does not change the characteristics of the common staircase of the building, maintaining the same width step, steps, plateaus, clearances, external openings, etc... from the current state. The only action is to renew the rough pavement and railings in disrepair.

The project does not modify the distribution of the courtyard of the building, which used to serve only for bathrooms and laundry rooms the dwellings, as well as an ironing room.

The project does not modify the storage building, located on the deck ground floor.

DWELLINGS.

Regarding the rehabilitation of private elements of the dwellings meets the specifications for dwellings from the Chapter I of the design standards and quality of housing in the area of Valencian community. DC/09

Funtcionality Conditions.

Article 1. Useful minimum surfaces
### Table 2.1 Useful surfaces of the dwellings (Own Source)

<table>
<thead>
<tr>
<th>Housing</th>
<th>Interior project area (m²)</th>
<th>Minimum area (m²) DC/09</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing 1</td>
<td>63.02</td>
<td>30.00</td>
</tr>
<tr>
<td>Housing 2</td>
<td>48.05</td>
<td>30.00</td>
</tr>
<tr>
<td>Housing 3</td>
<td>42.78</td>
<td>30.00</td>
</tr>
<tr>
<td>Housing 4</td>
<td>84.93</td>
<td>30.00</td>
</tr>
<tr>
<td><strong>Housing 1 / Area</strong></td>
<td><strong>Interior project area (m²)</strong></td>
<td><strong>Minimum area (m²) según DC/09</strong></td>
</tr>
<tr>
<td>Double bedroom</td>
<td>13.16</td>
<td>8.00</td>
</tr>
<tr>
<td>Living room - dining room - kitchen</td>
<td>27.59</td>
<td>18.00</td>
</tr>
<tr>
<td>Bathroom</td>
<td>4.04</td>
<td>3.00</td>
</tr>
<tr>
<td><strong>Housing 2 / Area</strong></td>
<td><strong>Interior project area (m²)</strong></td>
<td><strong>Minimum area (m²) según DC/09</strong></td>
</tr>
<tr>
<td>Double bedroom - living room - dining room - kitchen</td>
<td>41.55</td>
<td>21.00</td>
</tr>
<tr>
<td>Bathroom</td>
<td>3.66</td>
<td>3.00</td>
</tr>
<tr>
<td><strong>Vivienda 3 / Area</strong></td>
<td><strong>Interior project area (m²)</strong></td>
<td><strong>Minimum area (m²) según DC/09</strong></td>
</tr>
<tr>
<td>Double bedroom</td>
<td>8.48</td>
<td>8.00</td>
</tr>
<tr>
<td>Living room - dining room - kitchen</td>
<td>29.07</td>
<td>18.00</td>
</tr>
<tr>
<td>Bathroom</td>
<td>4.64</td>
<td>3.00</td>
</tr>
<tr>
<td><strong>Housing 4 / Area</strong></td>
<td><strong>Interior project area (m²)</strong></td>
<td><strong>Minimum area (m²) DC/09</strong></td>
</tr>
<tr>
<td>Double bedroom</td>
<td>16.85</td>
<td>8.00</td>
</tr>
<tr>
<td>Kitchen</td>
<td>9.88</td>
<td>5.00</td>
</tr>
<tr>
<td>Living room - dining room</td>
<td>27.08</td>
<td>16.00</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>4.15</td>
<td>3.00</td>
</tr>
<tr>
<td>Bathroom 2</td>
<td>3.52</td>
<td>3.00</td>
</tr>
</tbody>
</table>

### Article 2. Relation between different spaces or enclosures.

Access to personal care spaces is from the circulation spaces of the house. The bathrooms are not the only step to access another room or enclosure.

### Article 3. Linear dimensions.

- Circulation spaces, of bathrooms and kitchens dwellings: compliance with the minimum height of 2.20 m.
- Circulation spaces, of bathrooms and kitchens dwellings: compliance with the minimum height of 2.20 m.
- Met in enclosures can register free of obstacles figures. The minimum recordable figures are:
  - Access to dwelling: Ø 1.20 m.
  - Dining room: Ø 1.20 m.
  - Kitchen: Ø 1.20 m.
  - Bathroom: 1.20 m.
- Met in enclosures can register figures for furniture. The minimum recordable figures are:
  - Living room: 3.00 x 2.50 m.
  - Dining room: Ø 2.50 m.
  - Kitchen: 1.60 m. Between parameters.
  - Bathroom: 1.10 x 1.20 m.
  - Bedroom: 2.60 x 2.60 m.
- The minimum dimensions are met in assigned areas to sanitary appliances and the corresponding use area. The laundry room (in dwelling 4) is sized according to the devices in, considering the area assigned to each device for washing and the use of this area, are dimensioned in the reformed plane state. Ground floors to third are the worst-dimensions to verify compliance.

### Article 4. Horizontal and Vertical Circulations.

- Gateway to dwellings with free space of 0.82 m wide and 2.03 m high.
- Is observable that dwellings have a hole in the outer with a greatest width of 0.90 m and 1.50 m2 surface increased to allow the furniture transporting.
- Free space on interior passing doors is 0.72 m wide and 2.03 m high.
- The minimum width of aisles is 0.90 m, allowing bottlenecks to a width of 0.80 m with a maximum length of 0.60 m by the presence of structural elements or passage facilities, but not exceeding 25% of the total length of the enclosure, measured along the axis of the passageway.

### Article 5. Equipment.

The storage is fulfilled:
It meets the minimum equipment in kitchens:
- A sink with hot and cold water supply and evacuation with hydraulic closure.
- Space for dishwasher, hot and cold water intake, drain and electrical connection.
- Space for kitchen, oven and electric connection.
- Minimum space of 2.50 m bench development, including the sink and cooking area, measured at the edge bordering the area of the user.

- It meets the minimum equipment in the laundry room:
  - Space for washing machine, hot and cold intake water, drain and electrical connection.

- It meets the minimum equipment in bathrooms:
  - A sink and a shower with hot and cold supply water, all with hydraulic closure.
  - A supply of toilet with hot and cold water with hydraulic closure.

The wet rooms (kitchen, bathroom and toilet) are coated with washable and waterproof material to a height of 2.00 m. In addition the coating on the cooking area will also be fireproof.

Habitability conditions.

Article 12. Natural lighting.

Article 5.82 of the General Plan Planning regulations Valencia is more demanding than the DC-09 standard in this paragraph; minimum illumination required is 1/7 of the surface of each living room area.

Not met at all areas of the dwellings to be prioritized conservation of existing facades and hollow (with a criterion of heritage conservation, whether or not building listed) on compliance with minimum surface lighting.

### Table 2.1 Volume of storage (Own Source)

<table>
<thead>
<tr>
<th>Housing</th>
<th>Storage project (m³)</th>
<th>Minimum storage (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HOUSING 1</td>
<td>6.80</td>
<td>0.80/user</td>
</tr>
<tr>
<td>HOUSING 2</td>
<td>3.40</td>
<td>0.80/user</td>
</tr>
<tr>
<td>HOUSING 3</td>
<td>3.40</td>
<td>0.80/user</td>
</tr>
<tr>
<td>HOUSING 4</td>
<td>11.50</td>
<td>0.80/user</td>
</tr>
</tbody>
</table>

3. **SPECIFICATION.**

Below is proceed to detail the demolition and construction of the new elements are mentioned in the previous section.

#### 3.1. PRIOR ACTIONS.

Before undertaking any action, it is necessary to provide protection to the building against occupational risks that could affect personnel (see Health and Safety Study). The next thing to do is the clean of debris and remains of furniture and woodworking existing, bird droppings etc.

#### 3.2. DEMOLITIONS.

**Ground floor.**

On the ground floor will be held the demolition of the auxiliary construction where are supported chlorine and water drums from venue "I1".

On the venue "D1" no item will break down, except for doors and windows that are bricked up because the venue is completely diaphanous.

**First to Third Floor.**

In this plant all partitions of 6.00 cm in width will be demolished, which are ceramic block with a plaster layer on each side.

The existing woodwork of doors and windows will be demolished and the false ceiling hurdle.

Existing facilities (water, electricity, etc.) will be dismantled.

Finally, the existing pavement is lifted.

**Floor under the roof.**

On this floor the woodwork of the access doors to each storages are demolished as well as the windows.
3. Rooftop and Tiled roof.

Complete demolition of the roof and the Arabic tile roof because these that already exist are very worn, and are believed to repair is not feasible because of the moisture seepage has caused the deterioration of the wooden structure.

The roofs with a 32% minimum slopes, will lack waterproofing, as illustrated 3.1 “Minimum slopes for not having waterproofing”

Will be composed of wooden structure, thermal insulation, waterproofing, and received tiles with mortar.

In the case of passable roof will consist of wooden structure, thermal insulation, waterproofing and tiling ceramic plates, and as the current, with the same geometric features.

3.3. Structure.

3.3.1. Horizontal Structure.

In the area of building structure is carried out a visual test to detect damages. In the case of major injuries of the structure, these will be treated by competent technicians in the field. See section study of injuries.

3.3.2. Vertical structure.

Like the previous section, we proceed to perform a visual inspection in order to check the possible existence of injuries and pathologies.

3.3.3. Decks

The deck will be the same characteristics of the one existing, but with thermal insulation and waterproofing.

3.4. Division of Enclosures Interior.

The partitions will be plasterboard, metal core and screwed own of the system.

3.5. Finishes and Carpentry.

3.5.1. Paintings.

White acrylic paint will be applied inside the walls of plasterboard.

3.5.2. Pavements

Having lifted the layer of the existing pavement, a new ceramic floor, formed by layer self-leveling mortar, thermal insulation mortar layer and layer of pavement is constructed.

The penthouse floor, where there are damaged wood boards are replaced.

The ladder shall change the pavement, raise the existing pavement and will be installed ceramic parts in accordance with existing.

On the Ground floor, after completing repairs pathologies, it is come to you place a layer of self-leveling mortar 2 cm on the thermal insulation of expanded polyethylene 4 cm thick will be installed on this a layer of cement mortar and ceramic pavement.

3.5.3. Carpentry

Exterior Carpentry.

External joinery will be made of wood and glass, and similar to the existing design. The external joinery will have acoustic and thermal properties, which have to comply with current building regulations and also for comfort inside the building.

Interior Joinery

The doors to each of the dwellings will be of varnished and armored wooden. Inside the dwellings, the joinery will be of varnished wood, which will anchored to plasterboard system of the partition walls.
### 3.6. INSTALLATIONS.

#### 3.6.1. Low voltage.

The building will have three-phase supply of 400 V. The facility is underground to the General Fund Protection (CGP) located on the facade, from there passes to the meter cabinet located at the access to the building on the ground floor.

Since the counters up individual leads, until each floor, through a canal, by the stairwell.

Supply to the dwellings will be single phase power and 9200 W at 230 V.

The cables used are fire retardant are kind a hose

The internal circuits are as follows:

- **C1**: Circuit internal distribution intended to feed the lighting points.
- **C2**: Circuit internal distribution outlets intended for general use and refrigerators.
- **C3**: Internal distribution circuit intended to feed the kitchen and the oven.
- **C4**: Internal distribution circuit, designed to power the washing machine, dishwasher and electric boiler.
- **C5**: Internal distribution circuit intended to power outlets bathrooms, as well as auxiliary bases Bathroom kitchen.
- **C9**: Circuit internal distribution, for the installation of air conditioning.

Protection and the circuits wire shall be as follows:

- **10 A.** For lighting circuits, cable of 1.50 mm².
- **16 A.** For general power circuits, cable of 2.50 mm².
- **20 A.** For the circuits of oven, washing machine and dishwasher, cable is 4.00 mm².
- **25 A.** For the air conditioning circuit, the cable used will be 6.00 mm².

These elements are protected by a differential, an automatic switch (IGA).

All these elements will be housed in an overview of control and protection (CGMP) that will be inside each home.

All installation, both housing and communal services, will have a parallel circuit ground, which will be connected to the earth electrode building.

In humid areas such as toilet rooms, the installation shall comply with the teachings of the ITC-BT 27 Electrical low voltage regulations in force.

The installation inside dwellings shall be recessed or in battered walls and by false ceiling.

#### 3.6.2. Telecommunications.

The telecommunications facility shall have the following functions:

- **d)** The acquisition and adaptation of sound diffusion radio signals and terrestrial television and distribution to the connection points located in different homes or premises and the distribution of signals for radio and television satellite to said connection points.

- **e)** Provide access to telephone service available to the public and services that can be provided over such access through the necessary infrastructure to enable the connection of different houses or local to the network operators authorized.

- **f)** Providing access to telecommunications services provided by operators of cable telecommunications networks, operators fixed access wireless service (SAFI) and other holders of individual licenses that enable for the establishment and operation of public telecommunications networks.

The telecommunications facility shall be kept to as set out in Royal Decree 346/2011.

It will be composed of the following elements:

1. - Manhole entrance, located on the outside of the building and shall be 0, 40 x0, 40x0, 60 m.
2. - RITU, located on the covert, and will be 2, 00 x1, 00x0, 50 m.
3. - Secondary records, one for each floor (common area), 0, 45 x0, 450x0, 45 m.
4. - Checking network termination located inside of dwellings, 0,50 x0, 60x0, 08 m.

Will be provided power supply from the building.
3.6.3. Sanitation and ventilation.
Disposal of contaminated gases.

The evacuation of gases from both the kitchen and the toilets toward the deck through brick-built chimneys.

Sanitation facility.

The sewage network will connect all drains devices to take them to the manhole, which are located downstairs and these to the public sewer system.

The rainwater drain will be independent and will join the two facilities on the downstairs manhole.

The dimensions of the installation can be seen in the sanitation map, which is attached.

3.6.4. The heating.

The home heating will be individualized, and will be composed of boiler, pipe work and radiators, as shown in the maps of the heating.

3.6.5. Hot water (ACS).

The homes will have hot water by solar energy; the facility will consist of solar panels located on the roof, solar heat exchanger, boiler downpipes network and individual boiler support for each dwelling.

The facility has energy meters to account for the energy consumption of each dwelling.

3.7. Environment considerations.

Over the years the construction sector has been one of the main responsible for the production of large amounts of CO₂ and consumption of large amounts of energy in the development of new materials.

In the execution phase is consumed large amounts of natural resources, such as water.

For the rehabilitation of this property will be considered the current environmental situation, both at law and the choice of materials and systems for sustainable facilities.

3.7.1. Installation of hot water production.

To comply with current legislation, will be provided the building a solar collection system for the production of hot water for use in homes. The objective of this system is the contribution of 60% of the hot water used in the building and thus complies with the above in the CTE DB-HE1.

With this reduced consumption of fossil fuels derived from oil or electricity will be achieved.

3.7.2. Dry construction.

It has decided to make the interior divisions of plasterboard, because it avoids overloading the structure of the reinforced, so got better thermal and acoustic conditions, faster execution of the work is accomplished, besides the water consumption is avoided in the process construction.

3.7.3. Facilities.

The correct sizing of the facilities involves significant energy savings in the building.

Materials that do not emit contaminants that can be mixed on the environment will be used.

One of the main environmental concerns is the proper rehabilitation of this building instead of demolishing and building a new one.
TECHNICAL CODE FOR BUILDING JUSTIFICATION
Rehabilitation Project of a Residential Building in Valencia.

CTE-HE

"The objective of this Basic Document (DB) is to establish rules and procedures for fulfilling the basic requirement of energy saving. The sections of this DB correspond to the basic requirements to HE 1 HE 5. Proper application of each section shall include compliance with the relevant basic requirement. The correct application of all the DB assumes that the basic requirement Power Save is satisfied."


The following basic requirements will be developed:

HE 1: Limitation of energy demand.
HE 2: Performance thermal installations.
HE 3: Energy efficiency of lighting installations.

SECTION HE-1 LIMITATION OF ENERGY DEMAND.

1. CHARACTERISATION AND QUANTIFICATIONS OF THE DEMANDS.

3.25. ENERGY DEMAND.

The energy demand of buildings is limited depending on the climate of the locality where the property is located, by climatic zoning and the internal loading of the spaces.

This demand will be lower than in a building model, in which the characteristics of the internal envelopes and partitions of the enveloping thermal will have a transmittance, no more than indicated, on the illustration 9. Table 2.1 from the CTE-DB HE1.

To avoid decompensation between the thermal qualities of different spaces, each of the internal envelopes and partitions of the thermal envelope will have a transmittance not exceeding that shown in Figure 9 Table 2.1 CTE-DB HE1.

Moreover, buildings, interior partitions that limit use units with heating provided in the project areas of the building that do not have heating, will have a transmittance not exceeding 1.2 W/m2.K.

3.26. CONDENSATIONS.

Will be limited the inner superficial condensations, so that avoid the formation of moulds on the internal envelopes that make up the thermal envelope of the building.

For them, those inner surfaces of the envelopes able to absorb water or particularly susceptible to degradation in the thermal bridges of the same, the monthly average relative humidity at the surface is less than 80%.

The interstitial condensations occurring on envelopes and interior partitions that make up the thermal envelope of the building shall be such as not to produce a significant reduction in thermal performance or risk of degradation or loss of utility. Furthermore, the maximum...
accumulated condensate in each annual period shall not exceed the amount of evaporation possible in the same period.

### 3.27. AIR PERMEABILITY A LA AIRE.

The carpentry of the voids (windows and doors) and envelopes skylights are characterized by air permeability.

The permeability of these elements that limit the living spaces of the buildings with the external environment, is limited depending on the location it is located, according to climate zone, air permeability of the joinery and wire clasps, measured with an overpressure of 100 Pa, have lower values at 50 m²/h.m² climate zone B.

### 2. PRE-ANNOUNCEMENT DATA.

The parameters and data needed to start the verification of compliance with the limitation of the energy demand mentioned (CTE-DB HE1).

### 3.28. CLIMATE ZONING.

There are 12 climate zones identified by a letter corresponding to the division of winter and a number corresponding to the division of summer.

Our building corresponds to a climatic zone B3 (Valencia capital), according to ilustration 1.1.

### 3.29. CLASSIFICATION OF THE SPACES.

The interior spaces are classified as habitable and uninhabitable. Those habitable spaces are classified based on the amount of heat dissipated inside, in spaces with low internal and high internal load space.

In our case, the storage area is not considered habitable and the rest of the building is considered to be living with a load and a low internal humidity class 3 (spaces where high moisture production is not foreseen).

Illustration 2.2. Thermal envelope. North - South section
### 3.30. THERMAL ENVELOPE

The thermal envelope is composed of all enclosures that limit living spaces with the outside environment (air or land or other building) and for all interior partitions, which limited living spaces with uninhabitable buildings, which in turn are in contact with the outside environment.

In the case of our building, the spaces are classified according to Table 2.1:

**Table 2.1 Classification of spaces according to the CTE-DB HE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Orientation</th>
<th>Components</th>
<th>Contact</th>
<th>Characteristic parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof</td>
<td>Tiled roof</td>
<td>C1 Tiled roof</td>
<td>Outside air</td>
<td>U_C1</td>
</tr>
<tr>
<td>Walls</td>
<td>North</td>
<td>M1 Facade walls</td>
<td>Outside air</td>
<td>U_M1</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>Inside</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>Inside</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inside</td>
<td>Inside</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floors and slabs</td>
<td>Inside</td>
<td>Division areas</td>
<td>Unused</td>
<td>U_M2</td>
</tr>
<tr>
<td></td>
<td>Inside</td>
<td>Under cover slabs</td>
<td>Unused</td>
<td>US2</td>
</tr>
<tr>
<td>Shaft</td>
<td>North</td>
<td>F_2 Wood with glass</td>
<td>Outside air</td>
<td>F_R2</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>F_2 Wood frame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skylight</td>
<td>North</td>
<td>F_2 Wood frame</td>
<td>Outside air</td>
<td>F_S2</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>F_2 Metal frame</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Illustration 2.3 Caption thermal envelope of the building

Illustration 2.4 Thermal envelope. East-West section
Here is presented the percentage of voids in the walls of our building, and the percentage of skylights on the deck (See Table 2.2 Percentage of voids in our building facades and skylights)

Table 2.1 Percentage of voids in our building facade

<table>
<thead>
<tr>
<th>ORIENTATION</th>
<th>TOTAL AREA (m²)</th>
<th>EMPTY AREA (m²)</th>
<th>% EMPTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>142.48</td>
<td>39.61</td>
<td>27.80</td>
</tr>
<tr>
<td>East</td>
<td>159.27</td>
<td>41.13</td>
<td>25.82</td>
</tr>
</tbody>
</table>

As seen, the surfaces of voids in the facades are below 60% and the surface of skylights on the roof is more than 5% so we can apply the simplified option.

3. CALCULATION AND SIZING WITH THE APPLICATION OF SIMPLE CHOICE.

3.3. CALCULATING THE CHARACTERISTIC PARAMETERS AND THE THERMAL ENVELOPE COMPONENTS.

3.1. Facade walls.

The walls are formed by a wall of brick 42 cm thick plaster layer on the outside of 1.5 cm and 1.5 cm inside (on average).

In the walls in contact with the exterior, the calculation of the thermal transmittance \( U \) applies the following formula:

\[
U = \frac{1}{\left( R_{si} + \sum R_i + R_{se} \right)}
\]

\( U \): thermal transmittance

\( R_{si} \): Thermal resistance of each type of closure (m² K / W)

\( R_{se} \): surface thermal resistance of indoor air (m² K / W). See Illustration 3.1

\( R_{se} \): surface thermal resistance of outside air (m² K / W). See Illustration 3.1.

\( R_i \) is obtained of each material, according to the following formula:

\[
R_i = \frac{e}{\lambda}
\]

\( e \): The average thickness of the layer (m)

\( \lambda \): Thermal conductivity of the material, taken from documents recognized (W/mk).

Table 2.2 Percentage of skylights on the deck

<table>
<thead>
<tr>
<th>ORIENTATION</th>
<th>TOTAL AREA (m²)</th>
<th>EMPTY AREA (m²)</th>
<th>% EMPTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covert</td>
<td>60.66</td>
<td>1.47</td>
<td>2.42</td>
</tr>
</tbody>
</table>
We make the comparison between the thermal transmittance of our building (See "Table 3.1 Thermal transmittance of the current facade") and the highest of walls and partitions of the thermal envelope (see "Figure 3.2 Table 2.1 Maximum thermal transmittance of envelopes and partitions inside of the thermal envelope U in W/m²K. HE1 CTE-D8").

As can be seen, the thermal transmittance of the existing facade exceeds permitted by the CTE-D8 HE1 in climate zone B therefore is necessary to look for a new solution.

To solve this, as a proposition, could be installing plasterboard composited of the polystyrene panel of 4 cm thick and plasterboard thickness is of 0.95 cm and get the following thermal transmittance (See "Table 3.2 thermal transmittance of the proposed system")

Therefore, the proposed system meets the parameters established for the thermal transmittance is less than 1.07 W/m²K.

3.1.2. Walls.

3.1.3. The maximum transmittance for walls is 1.07 W/m²K, which is the same requirement on the facades; the calculation for the current state is this (See "Table 3.3 Current thermal transmittance of walls").

The joint ownership of the current state does not meet the parameters set by the CTE, so is proposed the same solution applied to the facades (See "Table 3.4 Thermal transmittance of the proposed system for walls"): 

---

**Table 3.1 Thermal transmittance of the current facade**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mK)</th>
<th>e (m)</th>
<th>R (m²K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td>..</td>
<td>..</td>
<td>0.04</td>
</tr>
<tr>
<td>Exterior siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Brick wall</td>
<td>0.85</td>
<td>0.42</td>
<td>0.49</td>
</tr>
<tr>
<td>Inside siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Inside air layer</td>
<td>..</td>
<td>..</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Total thermal transmittance = 1.32 W/m²K

**Table 3.2 Thermal transmittance of the proposed system**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mK)</th>
<th>e (m)</th>
<th>R (m²K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td>..</td>
<td>..</td>
<td>0.04</td>
</tr>
<tr>
<td>Exterior siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Brick wall</td>
<td>0.85</td>
<td>0.42</td>
<td>0.49</td>
</tr>
<tr>
<td>Inside siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Polystyrene panel</td>
<td>0.037</td>
<td>0.04</td>
<td>1.08</td>
</tr>
<tr>
<td>Plasterboard</td>
<td>0.25</td>
<td>0.0095</td>
<td>0.04</td>
</tr>
<tr>
<td>Inside air layer</td>
<td>..</td>
<td>..</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Total thermal transmittance = 0.53 W/m²K

**Table 3.3 Current thermal transmittance of walls**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mK)</th>
<th>e (m)</th>
<th>R (m²K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td>..</td>
<td>..</td>
<td>0.04</td>
</tr>
<tr>
<td>Exterior siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Brick wall</td>
<td>0.85</td>
<td>0.42</td>
<td>0.49</td>
</tr>
<tr>
<td>Inside sidewall</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Inside air layer</td>
<td>..</td>
<td>..</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Total thermal transmittance = 1.49 W/m²K

**Table 3.4 Thermal transmittance of the proposed system for walls**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mK)</th>
<th>e (m)</th>
<th>R (m²K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick wall</td>
<td>0.85</td>
<td>0.42</td>
<td>0.49</td>
</tr>
<tr>
<td>Inside siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Inside air layer</td>
<td>..</td>
<td>..</td>
<td>0.13</td>
</tr>
</tbody>
</table>

Total thermal transmittance = 0.67 W/m²K
With this proposed solution, it meets the parameters of the CTE-D8 HE1

### 3.1.4. Interior Partitions.

Interior partitions have the same transmittance required for the facades (U = 1.07 W/m²K) according to Figure 3.3 Table 2.1 Maximum thermal transmittance of envelopes and interior partitions from the thermal envelope U on W/m²K. CTE-D8 HE1).

The thermal transmittance of the current state is reflected on the “Table 3.5 Thermal transmittance of the internal partitions from the current state”

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mk)</th>
<th>e (m)</th>
<th>R (m²k/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td>...</td>
<td>...</td>
<td>0.13</td>
</tr>
<tr>
<td>Outside siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Brick wall</td>
<td>0.85</td>
<td>0.14</td>
<td>0.16</td>
</tr>
<tr>
<td>Inside siding (lime mortar)</td>
<td>0.3</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Inside air layer</td>
<td>...</td>
<td>...</td>
<td>0.13</td>
</tr>
<tr>
<td>Total resistance</td>
<td></td>
<td></td>
<td>0.51</td>
</tr>
<tr>
<td>Total thermal transmittance</td>
<td>=0.56 W/m²K</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The solution of the current state from the interior partitions doesn’t meet the parameters required by the CTE-D8 HE1, so the solution proposed is reflected on the “Table 3.6 Thermal transmittance of the proposed interior partitions system”

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mk)</th>
<th>e (m)</th>
<th>R (m²k/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td>...</td>
<td>...</td>
<td>0.13</td>
</tr>
<tr>
<td>Outside siding (lime mortar)</td>
<td>0.3</td>
<td>0.015</td>
<td>0.05</td>
</tr>
<tr>
<td>Brick wall</td>
<td>0.85</td>
<td>0.14</td>
<td>0.16</td>
</tr>
<tr>
<td>Inside siding (lime mortar)</td>
<td>0.3</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Polystyrene panel</td>
<td>0.037</td>
<td>0.03</td>
<td>0.81</td>
</tr>
<tr>
<td>Plasterboard</td>
<td>0.25</td>
<td>0.095</td>
<td>0.38</td>
</tr>
<tr>
<td>Inside air layer</td>
<td>...</td>
<td>...</td>
<td>0.13</td>
</tr>
<tr>
<td>Total resistance</td>
<td></td>
<td></td>
<td>1.97</td>
</tr>
<tr>
<td>Total thermal transmittance</td>
<td>=0.56 W/m²K</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This solution meets the requirements of the Figure 3.3 Table 2.1 Maximum thermal transmittance of envelopes and interior partitions from the thermal envelope U on W/m²K. CTE-D8 HE1).

### 3.1.5. Windows.

The characteristic parameters of a hollow on the facades are thermal transmittance and the solar factor modified according to the CTE D8 HE-1.

In our case it is wooden windows with single glass, in our building there are two types of windows, which differ in size, percentage of frame and glass surface. To perform the thermal transmittance test, use the following formula:

\[ U_h = (1 - FM)U_{hv} + FM. U_{hm} \]

Where:

- \( U_{hv} \): Thermal transmittance from the transparent part (glass) (W/m²K)
- \( U_{hm} \): Thermal transmittance of the window frame (W/m²K)
- \( FM \): Fraction of the gap occupied by the framework.

\( U_{hm} \) and \( U_{hv} \) are obtained from the tables of hydrothermal properties.
Windows type 1:

\[ \text{FM}_{\text{tipo1}} = \frac{A_{\text{marco}}}{A_{\text{hueco}}} = \frac{1.82}{3.94} = 0.46 \]

\[ \text{U}_{\text{tipo1}} = (1-0.46) \times 5.7 + 0.46 \times 2 = 3.998 \text{ W/m}^2\text{K} \]

Windows type 2:

\[ \text{FM}_{\text{tipo2}} = \frac{A_{\text{marco}}}{A_{\text{hueco}}} = \frac{0.86}{2.26} = 0.38 \]

\[ \text{U}_{\text{tipo2}} = (1-0.38) \times 5.7 + 0.38 \times 2 = 4.294 \text{ W/m}^2\text{K} \]

The results obtained are compared with those transmittance limits values on the gap (See "Illustration 3.9 Table 2.2 Limit values of the characteristic parameters means CTE DB HE1")

The windows of type 1 don’t meet the requirements of the Figure 15 and the windows of type 2 are on the limit to meet the limits on the east facade and don’t meet on the north side.

The following solution is proposed to meet values the limits of the transmittance on the gap:

Are chosen windows with insulated glass, (4-6-4) and wooden frame medium density low.

Windows type 1:

\[ \text{FM}_{\text{tipo1}} = \frac{A_{\text{marco}}}{A_{\text{hueco}}} = \frac{1.82}{3.94} = 0.46 \]

\[ \text{U}_{\text{tipo1}} = (1-0.46) \times 3.3 + 0.46 \times 2 = 2.702 \text{ W/m}^2\text{K } \text{it meets} \]

Windows type 2:

\[ \text{FM}_{\text{tipo2}} = \frac{A_{\text{marco}}}{A_{\text{hueco}}} = \frac{0.86}{2.26} = 0.38 \]

\[ \text{U}_{\text{tipo2}} = (1-0.38) \times 3.3 + 0.38 \times 2 = 2.806 \text{ W/m}^2\text{K it meets} \]

3.1.6. Factor solar modificado.

Se cumple porque no hay \( F_{\text{Hlim}} \) para porcentajes de hueco entre 21 y 30% en espacios de carga interna baja.

3.1.7. Sill

Our sill is encompassed in the definition of case 1 “hearth or slabs supported on land level or a maximum of 0.50 m below this” according to the paragraph “E.1.2.1 Grounds in contact with the Land” from the “Appendix E Calculation of the characteristic parameters of the demand” of the CTE-DB HE 1

Proceed as follows:

The thermal transmittance U.S. (W/m2.K) shall be obtained from Table E.3 (See “Table E.3 Illustration 3.10 U.S. in W/m2K Thermal transmittance”), depending on the width D of the band insulation perimeter, insulation, thermal resistance of the insulation \( R_a \) calculated by the equation \( R = c / \lambda \) and the length, feature B.

Length Characteristic B ‘= is the ratio between the soil surface and the length of his semi perimeter, according to the expression:

\[ B’ = A / (1/2.P) \]

Where:
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Student: Rodrigo Xavier Moreira Aguilar. Director: Dr. José Manuel Gómez Soberón. Dra. Consuelo Gómez

P Sill perimeter length (m) = 58.86 m

A Sill area (m²) = 98.94 m²

Calculation:

\[ B' = \frac{98.94}{0.5 \times 58.86} = 3.36 \text{ m}. \]

Illustration 3.4 Table E.3 Thermal transmittance \( U_s \) in W/m²K

<table>
<thead>
<tr>
<th>( B' )</th>
<th>0.5 m</th>
<th>0.6 m</th>
<th>0.8 m</th>
<th>1.0 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_s )</td>
<td>1.59</td>
<td>1.78</td>
<td>2.08</td>
<td>2.58</td>
</tr>
<tr>
<td>( R_s )</td>
<td>0.40</td>
<td>0.45</td>
<td>0.56</td>
<td>0.68</td>
</tr>
</tbody>
</table>

The thermal transmittance according to the value of \( B' \) is 1.46 W/m²K.

Not met, since the maximum thermal transmittance for the zone B3 is 0.68 W/m²K, so it is proposed installing a band of 1 m wide and 6 cm thick polyurethane \( (\lambda = 0.025 \text{ W} / \text{mK}) \)

The following value is obtained:

\[ R_{\text{total}} = \frac{0.06}{0.025} = 2.4 \text{ m²K/W} \]

Table 3.7 Thermal transmittance of the current deck made of Arabic tiles.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>( \lambda ) (W/m.K)</th>
<th>( e ) (m)</th>
<th>( R ) (m².K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td></td>
<td></td>
<td>0.04</td>
</tr>
<tr>
<td>Tiled roof</td>
<td>1</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Ceramic brick</td>
<td>1</td>
<td>0.015</td>
<td>0.015</td>
</tr>
<tr>
<td>Inside air</td>
<td></td>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Total resistance</td>
<td></td>
<td></td>
<td>0.165</td>
</tr>
</tbody>
</table>

Total thermal resistance = 6.06 W/m²K

3.1.8. Covert.

The deck is an enclosure in contact with the outside air, and is consisted by Arabic tiles, caught by a mortar on the basis of hydraulic hollow.

Is calculated the thermal transmittance \( U \) of the current solution with the following formula:

\[ U = \frac{1}{R_{\text{total}}} \]

Where:

- \( R_{\text{total}} \) Total thermal resistance of a component formed of several layers (m²K/W).
- \( R_{\text{total}} = R_s + R_i + R_{\text{air}} \)
- \( R_i \) Thermal resistance of each layer (W/m²K).
- \( R_{\text{air}} \) Thermal resistance of air on the inside surface (W/m²K).
- \( R_{\text{air}} \) Thermal resistance of the air on the outer face (W/m²K).

From the "Figure 3.1 E.1 thermal resistors superficial of the enclosure in contact with the outside in m²K / W. CTE-D8 HE" is obtained \( R_s \) and \( R_{\text{air}} = 0.10 \text{ W/m²K} = 0.04 \text{ W/m²K} \).

With these data the following is obtained:

With this data we entered the "Enlightenment 3.10 Table E.3 U.S. in W/m²K Thermal transmittance" and consider that the condition is satisfied since the value for 2 m² K / W is already less than the maximum allowed.
The results obtained are compared with the maximum thermal transmittance required by the CTE D8 HE for this climate zone (see illustration 3.3 Thermal transmittance maximum of the envelopes and interior partitions of the thermal envelope U in W/m2K), we see that the current solution doesn't meet because the maximum allowed is 0.59 W/m2K for the deck.

The following solution for the tile roof is proposed (See "Table 3.9 Thermal transmittance of the system for the tile deck"):

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>λ (W/mK)</th>
<th>e (m)</th>
<th>R (m².K/W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside air</td>
<td>0.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic ceramic tile</td>
<td>0.7</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Lime mortar</td>
<td>0.3</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>Ceramic brick</td>
<td>1</td>
<td>0.015</td>
<td>0.02</td>
</tr>
<tr>
<td>Inside air</td>
<td></td>
<td></td>
<td>0.10</td>
</tr>
<tr>
<td><strong>Total resistance</strong></td>
<td></td>
<td></td>
<td><strong>0.23</strong></td>
</tr>
</tbody>
</table>

**Total thermal transmittance = 0.52 W/m²K**

As we can see, the transmittance values obtained in the proposed solutions are less than the maximum allowed, so this solution meets the requirements of the CTE-D8 HE.

### 3.1.9. Access Door.

Currently there is no access door on conditions, so that a solid wooden door with a thickness of 5 cm is proposed.

Is used the following formula:

\[ U_h = (1 - F_M)U_{thv} + F_M U_{thm} \]

\( U_{thv} \) Thermal transmittance of the transparent part (glass) (W/m²K)

\( U_{thm} \) Thermal transmittance of the window frame (W/m²K)

\( F_M \): Fraction of the gap occupied by the framework.

\( U_{thm} \) and \( U_{thv} \) are obtained from the tables of hydrothermal properties.

As the access door chosen hasn't transparent part, the formula is as follows:

\[ U_h = F_M U_{thm} \]

\( F_M = 1 \)

\( U_{thm} = 2 \)

\( U_h = 2 \text{ W/m}^2\text{K} \)
This solution meets because $U_h$ is lower than the $U_h$ in Figure 15. “Table 2.2 limits values of the characteristic parameters means. CTE D8 HE”

### 3.1.10. Solar factor amended of the shaft of the skylight of the ladder.

Se determina utilizando la siguiente expresión:

$$ F = F_s \left[ (1 - FM) \cdot g_{\perp} + FM \cdot 0.04 \cdot U_m \cdot a \right] $$

Where:

- $F_s$ is the factor of the skylight shadow obtained of the illustration 3.15. = 0,72
- $FM$ is the fraction of gap occupied by the frame = 0.55
- $g_{\perp}$ is the solar factor of the semitransparent part of the skylight = 0.
- $U_m$ is the thermal transmittance of the skylight frame = 2 W/°C
- $a$ is the frame absorptivity = 0,50

With the expression of Figure 21 we get:

$$ F = 0.72(1-.55)x0.90+0.55x0.04x2x0.50 = 0.30 \text{ it meets.} $$

### 3.32. LIMITATION OF THE ENERGY DEMAND.

To verify this claim, it is necessary to perform a check of each of the areas of internal load. In our case we have only one area of low internal load.


### 3.1.11. Checking characteristic parameters means.

#### Table 3.11 Checking characteristic parameters means of the thermal envelope.

<table>
<thead>
<tr>
<th>CLOSURES AND PARTITIONS</th>
<th>Characteristic parameters means (W/m²k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>Project</td>
</tr>
<tr>
<td>Cover</td>
<td>Cubierta Inclinada y azotea</td>
</tr>
<tr>
<td>Wall</td>
<td>Muros de fachada</td>
</tr>
<tr>
<td></td>
<td>Medianerías</td>
</tr>
<tr>
<td></td>
<td>División direciones recintos</td>
</tr>
<tr>
<td>Ground</td>
<td>Solera Pb</td>
</tr>
<tr>
<td>Gap</td>
<td>Wood frames with single glazing...</td>
</tr>
<tr>
<td></td>
<td>Wood carpentry</td>
</tr>
</tbody>
</table>

As we can see in the “Table 3.11 Checking characteristic parameters means of the thermal envelope.” it meets the requirements for the CTE DB-HE (See “Figure 3.2 Table 2.1 Thermal transmittance Maximum of the envelopes and interior partitions of the thermal envelope in W/m²K U”)

### 3.33. CONDENSATIONS.

Is necessary to verify compliance with the requirement of control both superficial and interstitial condensation.

#### 3.1.12. Superficial condensation.

Verifying the limitation of the superficial condensation is based on comparing the temperature factor on the inner surface \( F_{si} \) which must be greater than the temperature factor of the minimum inner surface \( F_{si, min} \) (See ‘Illustration 3.8 Table 3.2 Temperature Factor the minimum interior surface \( F_{si, min} \), CTE-DB HE ”) for interior and exterior condensation for the month of January and specified in Appendix G.1 of the CTE-DB HE1.

Illustration 3.7 Table 3.2 Temperature Factor the minimum interior surface \( F_{si, min} \), CTE-DB HE

<table>
<thead>
<tr>
<th>Zonas</th>
<th>Zonas</th>
<th>Zonas</th>
<th>Zonas</th>
<th>Zonas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clase de higrorretía 5</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>Clase de higrorretía 4</td>
<td>0.66</td>
<td>0.66</td>
<td>0.69</td>
<td>0.90</td>
</tr>
<tr>
<td>Clase de higrorretía 3 o inferior a 3</td>
<td>0.50</td>
<td>0.52</td>
<td>0.56</td>
<td>0.61</td>
</tr>
</tbody>
</table>

According to the appendix G, we apply this formula:

\[ f_{si} = 1 - U \times 0.25 \]

Where:

- \( U \): Thermal transmittance of the enclosure (W/m²K).
- \( F_{si} = 1 \times 0.49 \times 0.25 = 0.87 \) Meets because exceeds 0.52

Therefore there won’t be surface condensation inside of the facade walls.

#### 3.1.13. Interstitial Condensation.

The procedure for checking the formation of interstitial condensation is based on the comparison between the vapor pressure and the saturation vapor pressure that exists at each intermediate point of an enclosure formed by different layers, for the internal and external condensation on January and specified in Appendix G.1.

To check for any interstitial condensation, we have to check that the vapor pressure at the surface of each layer is less than the vapor pressure of saturated steam.

To perform this, we use the free program eCondensa 2

Facade:
3.34. CONSTRUCTION PRODUCTS.

3.35. FEATURES REQUIRED TO CONSTRUCTION PRODUCTS.

The buildings are basically characterized by the hygrothermal properties of building products that make up its thermal envelope. Products for the walls and blanking covert, products for holes and skylights are distinguished.

These properties will be obtained of declared values for each product, according to the CE, or recognized documents for each type of product.

These hygrothermal characteristics should be expressed in the technical specifications of the project.

3.36. FEATURES REQUIRED TO THE ENVELOPES AND INTERNAL PARTITIONS OF THE THERMAL ENVELOPE.

The characteristics required for these walls are set out in paragraph 2 of CTE-D8 HE. The calculation of these parameters must be recorded in the project report and also be included in the project specifications.

3.37. RECEIVE CONTROL IN WORK PRODUCTS.

The specific conditions for the receipt of the products will be indicated in the technical specifications of the project, including necessary tests to check that they have the characteristics required by the above paragraphs.

It should verify that the products received are those specified in the specifications of the project, have the required documentation, are characterized by the corresponding properties and have been tested, if required by the contract documents or the construction manager with the approval of the work, with the set frequency.
3.38. **CONSTRUCTION.**

3.39. **EXECUTION.**

Works will be carried subject to the draft, the law that is applicable to it, the rules of good building practice, and the instructions of the construction manager and the execution manager.

3.40. **CONTROL OF THE WORK EXECUTION.**

It was made according to the conditions of the project, its annexes and modifications, authorized by the construction manager and the execution manager.

It will be checking that the execution of the work is performed in accordance with the controls and the frequency set in the specifications of the project.

Any amendment which may be made will be well documented and don’t cease to fulfill the conditions required by the CTE-D8 HE.

The formation of condensation will be checked and if the filing of a vapor barrier is required, this will be placed on the warm side of the enclosure and will be controlled any breakage and damage occurring during installation.

And the air permeability, will be checked the fixing of fences of the carpentries which form voids and skylights, in any case the seal to the specified air permeability according to the climatic zoning B3.

3.41. **FINISHED WORK.**

In the finished work have been performing the service checks and tests provided for in the project or, in its case, ordered by the technical construction manager and required under applicable law.
SECCIÓN HE2 RENDIMIENTO DE LAS INSTALACIONES TÉRMICAS.

El edificio dispondrá de instalación térmica para mayor confort de las personas en temporada de frío, estas instalaciones se diseñarán acordes con el Reglamento de instalaciones térmicas de los edificios (R.I.T.E) vigente. Su aplicación a de quedar definida en el proyecto.

SECTION HE2 PERFORMANCE THERMAL INSTALLATIONS.

The building will have facility for thermal comfort of people in cold season; these facilities shall be designed in accordance with the Rules of heating systems in buildings (RITE) currently. Its application have to be defined in the Project.
CTE - DB HS

This basic document (DB) has as objective to establish rules and procedures for meeting basic health requirements. The sections of this DB correspond to the basic requirements HS1 to HS5. The correct application of this basic document assumes that the basic requirement “Hygiene, health and environmental protection” is satisfied, and at the same time is reduced to acceptable limits, the risk that users suffer discomfort and diseases, and prevent the building deteriorate and deteriorate the environment in their immediate environment.


SECTION HS 1 PROTECTION AGAINST THE MOISURE

This section applies to the walls and floors in contact with the ground and the walls that are in contact with the outside air, such as facades and decks (the ground of terraces and balconies are considered as covert).

1. DESIGN.

3.56. FLOORS.

1.1.1. Impermeability degree.

The minimum degree of impermeability required to the grounds in contact with the land against water penetration in this, is obtained from the following table:

<table>
<thead>
<tr>
<th>Presence of water</th>
<th>Coefficient of permeability of the ground</th>
<th>Coefficient of permeability of the soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alto</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Media</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Baja</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

From the "Figure 1.1 Table 2.3 Minimum degree of impermeability demanded to the grounds. CTE-DB HS1 "we consider for our building a low permeability.

1.1.2. Conditions of constructive solutions.

The terms of the constructive solution are obtained from figure 1.2, and it depends on the wall type, ground type, type of intervention in the land and the degree of impermeability.
From "Illustration 1.2 Table 2.4 Conditions of soil solutions. CTE-DB HS1" the following solutions are obtained:

C2: When the soil is constructed in situ, should be used a type of concrete with a moderate shrinkage.

C3: A complementary repellence of the soil should be performed by applying a liquid product pore “colmatador” over finished surface of itself.

D1: It must be arranged a drainage layer and a filter layer over the land beneath the soil. In the case of being used as a drainage layer being waterlogged must there be a polyethylene sheet above it.

1.1.3. Terms of singular points.

Will be respected the disposal conditions of reinforcement strips and termination, the continuity or discontinuity, as well as any other which alters the design, concerning the waterproofing system that will be used.

3.57. FACADES.

3.58. IMPERMEABILITY DEGREE.

The minimum degree of impermeability demanded depends on the area average rainfall and the degree of exposure to wind and location of the building and is obtained as follows:

1.1.3.1. Rainfall area.

The rainfall area is obtained from the following figure, in which the population of Valencia, belongs to IV area.

1.1.3.2. Degree of wind exposure.

The degree of wind exposure (See Figure 1.4 Table 2.6 Degree of exposure to wind HS1 CTE-DB) depends on the height of top of the building over the ground, of the wind zone location point.
Rehabilitation Project of a Residential Building in Valencia

(See Figure 1.5 Illustration 2.5 wind zones HS1 CTE-D8) and the kind of environment in which the building is located (type IV Plot: urban, industrial or rural zone According to paragraph 2.3.1b Illustration 1.3 Table 2.6 Degree of wind exposure. CTE-DB HS1)

From Figure 13 we find that the basic wind speed for Valencia’s zone A that corresponds to a speed of 26 m/s.

From the discussion in illustrations 12 and 13 is obtained that is a degree of exposure to wind V3 because the building has a height between 16 and 40 meters.

Illustration 1.5 Table 2.5 Impermeability degree required for the facades. CTE-DB HS1

It has been obtained by the illustration above that is a degree waterproofing 3.

1.1.3.3. Terms of constructive solutions.

Constructive conditions which are based on the existence (or not) of external cladding and the required degree of waterproofing has been obtained in paragraph 1.2.1.2.

Illustration 1.6 Table 2.7 Terms of the facades solutions. CTE-DB HS1

This combination gives us the following solution:

R1: The outer coating must have at least an average resistance to filtration, is considered to provide this resistance the following coating: Continuous coating with a thickness between 10 and 15 millimeters. The existing coating is at least 15 mm thick, so it is considered to meet this requirement.
C2: Should be used a main sheet of high thickness. Is considered such a factory mortar 1 foot solid brick ceramic. The wall of the facade has at least 42 cm thick and is of solid brick factory, so is deemed to fulfill this requirement.

1.1.3.4. Terms of singular points.

1.1.3.4.1. Start of the facade from the foundation.

There will be an impermeable barrier covering the entire thickness more than 15 cm above the ground level outer, to prevent the rise by layers water, or other solution that produces the same effect.

An outline of the condition described above is presented. See illustration 1.8

1.1.3.4.2. Meeting of the facade with the floor slabs.

The basic document envisages the possibility of reinforcement the outer coating with mesh cladding, and along with a separation seal between the main sheet and the floor slabs.

These solutions can’t be performed because the facade of the building is considered protected by the heritage of the city.

1.1.3.4.3. Parapets and roof finishing of the facades.

The parapet of the roof will be rebuilt, with the use of copings for the evacuation of rainwater to the guttering, preventing that this reaches the facade immediately below.

The coping will have a slope of 10° outwards and will have a "raindrop" waterproof, separated of the parameter at least two cm.

1.1.3.4.4. Eaves and comices.

We can’t act on these items except the reconstruction of the detached parts, because the facade is protected by the heritage of the city.

2. DECKS.

3.59. DEGREE IMPERMEABILITY.

The degree of impermeability required for the deck, unique and independent of climatic factors.

Constructive solution reaches the degree of impermeability to meet the following conditions.

3.60. CONDITIONS OF THE CONSTRUCTION SOLUTIONS

The covert feature:

- Slope proper, consisting of a sturdy wooden support.
- Thermal insulation according to the conditions of the CTE-D8 HE1.
- Waterproof sheet except in the height tail of the ladder because its slope is greater than the 32% minimum. The tail of storage area has a 32% slope, according to the 2.1 illustration is not necessary to grant waterproofing layer, but is installed because prevents the risk of moisture and acts on the safety.
- In the case of the flat roof, there will be an “antipunzonante” separating layer between the protective layer and thermal insulation.
There will be Arabic tile roof.

In addition to all this, the building has gutters that collect rainwater and a sump (Your sizing will be according to HS5 CTE-D8), which will be connected to the sewerage system of the building.

### 3.6.1. CONDITIONS OF THE COMPONENTS.

#### 2.1.1. The formation slopes system.
The formation slopes system must have an outstanding cohesion and stability enough against mechanical and thermal loads, and its constitution must be suitable for the fixing points of other components.

The slope of the flat roof (14%) will be towards the water drainage system.

The sloping decks must have at least the slope what is indicated on the illustration 1.9 Table 2.10 Slopes of sloping decks. CTE-D8 HS1, when they don’t have waterproofing layer. In our case, we have a waterproof layer, as indicated in section “2.2 Conditions of constructive solutions.”

#### 2.1.2. Thermal insulation.
The thermal insulation material must have a sufficient cohesion and stability to give the system the necessary robustness against mechanical loads. In our case is extruded polyethylene and meets this requirement, it is compatible with the waterproofing layer.

#### 2.1.3. Waterproofing layer.
The waterproofing layer is of bituminous material and shall be mechanically fixed because its slope is greater than 15%

#### 2.1.4. Protection layer.
The Arabic tiles meet this requirement. The overlap of the pieces will be in accordance with the slope of the element which serves as a support area, wind, storms and topographic elevation.

The support will be received by a mortar, an amount sufficient to ensure stability, depending on the roof slope, the maximum height of the tail, the overlap of the pieces and the topographic location of the building.
3.62. SINGULAR POINTS.

2.1.5. Meeting of the deck with a vertical parameter.
The waterproofing will last in the vertical wall to a height of at least 20 cm above the protective cover. The meeting with the facing will be rounded and is described with a radius of about 5 cm approximately.

2.1.6. Gutters.
Los canalones de las fachadas, serán restaurados in situ porque son de obra, tendrán una pendiente mínima de al menos de 1% hacia el desagüe.
Los canalones del patio interior serán metálicos prefabricados con una pendiente de al menos 1% hacia el desagüe.
Los desagües dispondrán de un elemento que evite el paso sólidos que puedan obturar los bajantes.

3. CONSTRUCTION PRODUCTS.

3.63. REQUIRED FEATURES FOR THE PRODUCTS.

3.1.1. Introduction.
The behavior of the buildings against water is characterized by hydric properties of construction products that make their envelopes.
The products for thermal insulation and those which are forming the main sheet forming the facade are defined by the following properties:
- The capillary water absorption.
- The sucking or initial rate of water absorption.
- The water absorption by long-term immersion.
Waterproofing products are defined by the following properties, depending on their use:
- Sealing.
- Resistance to root penetration.
- Artificial aging by long term exposure to the combination of ultraviolet radiation, high temperatures and water.
- Creep resistance.
- Sealing dimensional.
- Thermal aging.
- Flexibility at low temperatures.
- Resistance to static load.
- Resistance to dynamic loading.
- Elongation at break.
- Tensile strength.

3.1.2. Components of the main sheet facade.
When the main sheet is of brick, the bricks must be "caravista"

3.1.3. Thermal Insulation.
When the Thermal insulation is provided on the outside of the main blade must be non-hydrophilic.

3.64. CONTROL RECEPTION WORK PRODUCT.
The project specifications should indicate the control conditions for the receipt of the products, including the necessary tests to check that they have the characteristics required by the above paragraphs.
They verify that the products received:
- Correspond to those specified in the project specifications.
- Have the required documentation.

- They are characterized by the corresponding properties.

- They have been tested, when it is established in the specifications determined by the principal or the execution manager with the approval of the construction manager, with the set frequency.

3.65. CONSTRUCTION.

3.66. EXECUTION.

The work on this section will be run subject to the project, applicable law, standards of good building practice and the instructions of the construction manager and the execution manager.

3.1.4. Walls.

3.1.4.1. Conditions of the conduits.
Conduits should be watertight and sufficiently flexible to absorb the expected movements.

3.1.4.2. Conditions of the waterproofing sheets.
- Should be applied in environmental conditions that are within the prescribed limits in the specifications of application.
- It will apply when the wall is sufficiently dry according to the specifications of application.
- Be installed so that they do not come into contact with chemically incompatible materials.
- In the joints of the blades overlaps, will be respected the minimum prescribed in the specifications of application.
- The facing which to apply the waterproofing layer must not have burrs of mortar in brick factories, or any material that could pose a risk to puncture.

- When is used a waterproof sheet adhered previously should be applied previous primer and when is used not adhered waterproofing membrane, there should be sealed overlaps.
- When the sealing is done by the interior, must be placed reinforcement strips in the change of address.

3.1.5. Soils.

3.1.5.1. Conditions of the conduits.
The conditions for the conduits are the same as described in paragraph 4.1.1.1.

3.1.5.2. Conditions of the catchpits.
Must be sealed all the tables of the manholes to the own frame by the rubber bands or similar for the registration.

3.1.5.3. Cleaning concrete conditions.
The lower area of the sills should be compacted and have a minimum slope of 1%.
When you need to put a waterproof sheet on the concrete floor cleaning, the surface of the concrete must be leveled.

3.1.6. Facades.

It must be adhered to the item that is used as a support and be applied evenly over this.

3.1.6.2. Conditions of the thermal insulation.
It should be placed in a continuous and stable way.

3.1.7. Decks.

3.1.7.1. Thermal insulation.
It should be placed in a continuous and stable way.
3.1.7.2. Waterproofing conditions.

- The sheets should be applied in an ambient temperature conditions that are within the prescribed limits in the specifications of application.
- When work is interrupted, the materials must be adequately protected.
- The waterproofing should be placed perpendicular to the line of maximum slope direction.
- The different layers of waterproofing should be placed in the same direction and flashing.
- The overlaps should be in favor of the water current and should not be aligned with those of the continuous rows.

3.67. EXECUTION CONTROL

The controlling the execution of works according to the specifications of the project, its annexes and amendments approved by the project supervisor and the director’s instructions for the execution of the work.

Will be checked that the execution of the work is performed in accordance with the controls and the frequency thereof, established in the specifications of the project.

Any amendment which may be made during the execution of the work will be in the documentation of the work performed and in any case longer met the minimum conditions laid down in the CTE-D8 HS.

3.68. CONTROL OF THE FINISHED WORK

In the control will be follow the criteria indicated in Article 7.4 of Part I of the CTE.

This section of the core document not final tests is prescribed.

3.69. MAINTENANCE AND CONSERVATION

Keeping operations, which together with its periodicity, is included in Illustration 6.1 3.1 Table Maintenance operations should be performed CTE-D8 HS1. And relevant corrective actions if they are detected.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muros</td>
<td>1 año</td>
</tr>
<tr>
<td>Suelos</td>
<td>1 año</td>
</tr>
<tr>
<td>Fachadas</td>
<td>3 años</td>
</tr>
<tr>
<td>Cubiertas</td>
<td>1 año</td>
</tr>
</tbody>
</table>

Illustration 3.1 Table 6.1 Maintenance operations. CTE-D8 HS1