

## WP6. ENERGY REFURBISHMENT BUILDINGS

### D.6.1.- EXTRACT FROM THE MAIN TECHNICAL CHARACTERISTICS OF THE PRELIMINARY PROJECTS. ENERGY CONSIDERATIONS.

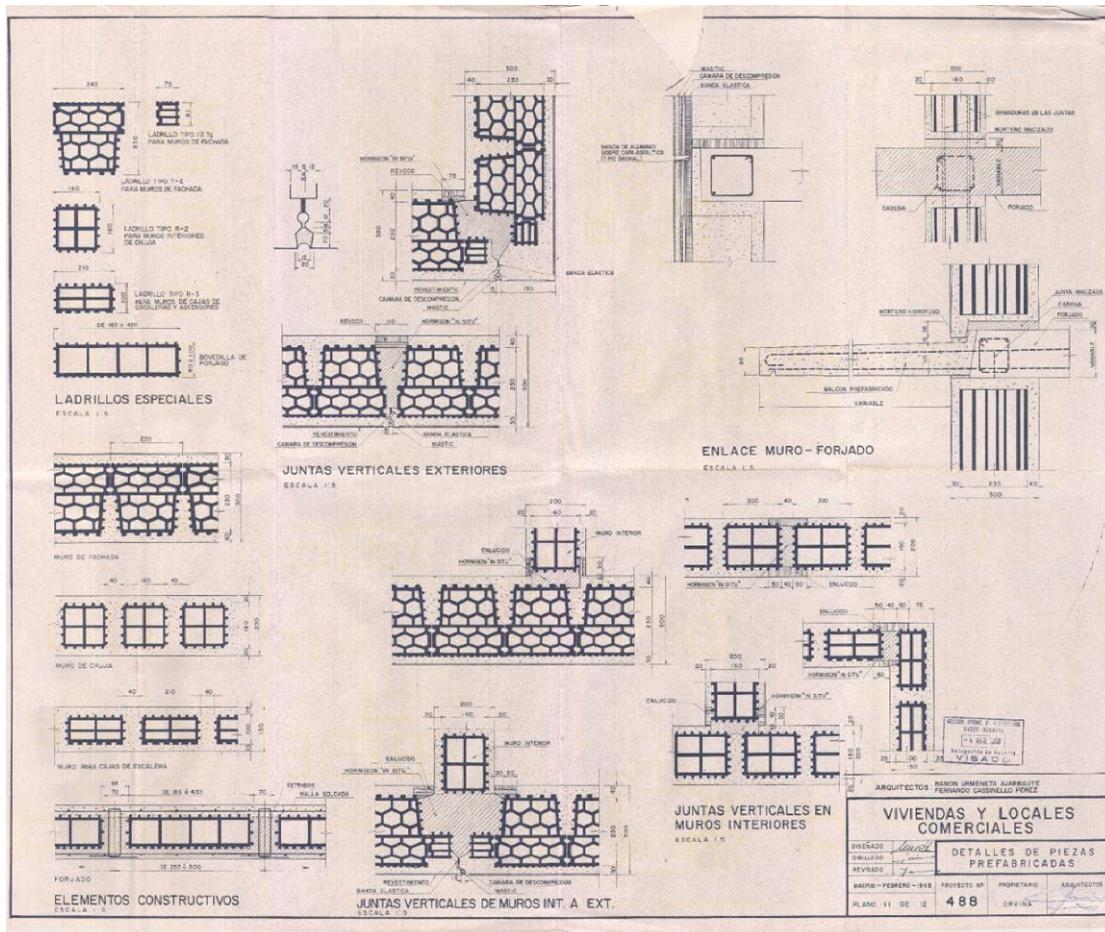
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## 1. Tender scope

The tender scope which was promoted by Nasuvinsa is in two areas called Group Orvina II and Group Orvina III in Chantrea District, Pamplona.

Both Groups fall into the same building typology; specifically a typology of towers implemented most of them, with prefabricated panels even if the earliest ones were built in brick.



Original plan – detail of the prefabricated panels

These towers, characterized by an H-shaped plant, with 4 properties per each floor and a central communication core, are arranged in groups, connected in plant by a lateral half-façade.



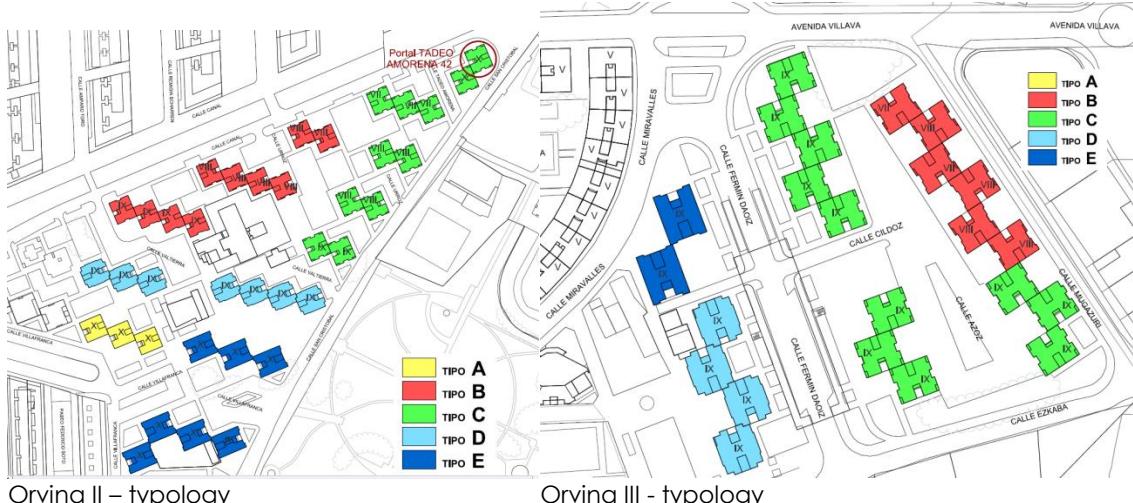
Orvina II - tender scope



Orvina III – tender scope

They are 61 towers in all: 38 in Orvina II area and 23 in Orvina III area, which is a total of 1,904 dwellings.

Between these towers we can differentiate mainly 5 types of buildings (type A, B, C, D and E). Most of the towers are typology C.



## 2. Technical conditions to take into account for the execution of the thermal envelope

The solution proposed for the intervention of the Thermal Enclosure of the buildings (façades, roof, enclosure of the non-heated spaces...) has to respond to the thermal needs reunited in the following clause and has to contribute with an aesthetic

composition which is consistent with the environment. It has to ensure both the technical and financial viability of the action.

Following items were considered:

- **Sustainability approach.** Sustainability studied in all the phases of the Project:
  - Design phase. Environment conditions (orientation, sunlight, prevailing winds...), hygiene and ventilation, insulation, energy efficiency, water, choice of materials...
  - Construction phase. Waste management, environment protection and energy efficiency.
  - Maintenance phase. It establishes the convenience of the monitoring and maintenance of the buildings during its useful life.
- **Financial viability.** One of the fundamental aspects to assign the tender was the financial viability of the actuation; they were chosen those proposals that achieving the requirements, technical and compositional quality, had the minimum costs.
- **Architectural quality.** The proposal had to assure an adequate architectural composition, guaranteeing an optimal result, both in a dwelling level and block or group level. This is to say, the architectural proposal had to take into account a double scale: dwelling-scale (more architectural) and block-scale (more urban).
- **Technical requirements.** The solution proposed had to guarantee an adequate conservation of the overall solution, greatly minimizing maintenance actions to be taken by the users of the facilities.

The action on the Thermal Enclosure would have to respond to the insulation requirements contained in the 2.3 table of the current CTE-DB-HE1 ("D" climate zone for Pamplona), according to Technical Code Building. It indicates a thermal transmittance of 0.60W/m<sup>2</sup>·K for the walls and elements in contact with the ground, 0.40W/m<sup>2</sup>·K for roofs and floors in contact with air and 2.70W/m<sup>2</sup>·K for the openings.

**Tabla 2.3 Transmitancia térmica máxima y permeabilidad al aire de los elementos de la envolvente térmica**

Parámetro	Zona climática de invierno					
	<b>α</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
Transmitancia térmica de muros y elementos en contacto con el terreno <sup>(1)</sup> [W/m <sup>2</sup> ·K]	1,35	1,25	1,00	0,75	0,60	0,55
Transmitancia térmica de cubiertas y suelos en contacto con el aire [W/m <sup>2</sup> ·K]	1,20	0,80	0,65	0,50	0,40	0,35
Transmitancia térmica de huecos <sup>(2)</sup> [W/m <sup>2</sup> ·K]	5,70	5,70	4,20	3,10	2,70	2,50
Permeabilidad al aire de huecos <sup>(3)</sup> [m <sup>3</sup> /h·m <sup>2</sup> ]	≤ 50	≤ 50	≤ 50	≤ 27	≤ 27	≤ 27

<sup>(1)</sup> Para elementos en contacto con el terreno, el valor indicado se exige únicamente al primer metro de muro enterrado, o el primer metro del perímetro de suelo apoyado sobre el terreno hasta una profundidad de 0,50m.

<sup>(2)</sup> Se considera el comportamiento conjunto de vidrio y marco. Incluye lucernarios y claraboyas.

<sup>(3)</sup> La permeabilidad de las carpinterías indicada es la medida con una sobrepresión de 100Pa.

The solution of the Thermal Enclosure would have to respond to the following points too:

- Inclusion of the existing installations on the façade, detecting and deleting those which nowadays are out of order, including the diversion of gas terraced to the façades.
- Relocation of the TV and telephone antennas located on the façades to reduce the visual impact.
- Each Group has a shared heat-system. The general heat-distribution runs along the buried part of the public area and along the roof of the ground floor of the buildings. One of the purposes of the EFIDISTRICT FWD Project is to achieve, at least, the regulation and monitoring at the portal level. This is why it will be valued the possibility of placing these general pipelines on façade.

At first, the tender was proposed to towers in "C" typology because it was the typology with the most number of buildings in the area. But then it was requested to technical teams proposals for each project adapted to all different typologies both for Orvina II and Orvina III. This way, different projects were selected taking into account the better solution for each building typology because it was seen that a unique project would not provide a solution for every different typologies.

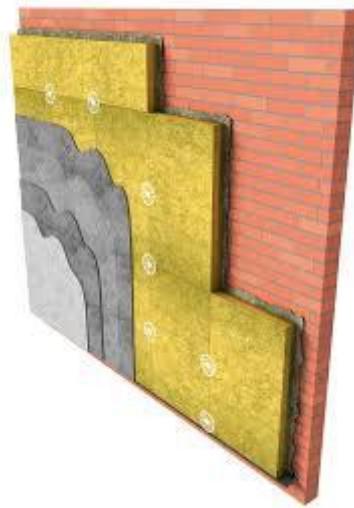
### **3. Materials**

All the materials proposed by the technical teams on the tender comply with the current regulation (CTE-DB-HE1). However, despite different options were proposed, the residents' associations will be the ones who will take the last decision about the selection, taking into account different elements such as the quality, price, aesthetic considerations...

Two technical solutions are the most common to insulation the existing façades. On the one hand, the ventilated facade system; an outside enclosure system made up of an inner sheet, the insulation (different materials available) and an outer non-airtight sheet, with a ventilated chamber between them. On the other hand, ETICS system (External Thermal Insulation Composite System), is an insulation system without chamber inside its interior. Every two systems have the option of the election of the different materials which would be the finishing layer.



Ventilated façade System



ETICS System

In both systems it is possible to choose the type of the insulation material. Most typical, and the two ones chosen by the neighbours, are the EPS (expanded polystyrene) and the rock wool, even there is an exception that uses natural cork on its project. The factor which indicates the isolation level, the thermal conductivity ( $\lambda$ ), is between  $0.034\text{W}/(\text{mK})$  and  $0.036\text{W}/(\text{mK})$  in all the projects contemplated in EFIDISTRICT FWD, guaranteeing the law enforcement and the correct working of the new façade systems.

According to the requirements of the Navarra Government, every window that does not meet the technical requirements will be changed. Two options were proposed to the house owners because a lot of them have already closed the balconies with carpentries that in most of the cases do not comply with current requirements. This is why two options are contemplated in the projects: balconies closed or not, but taking into account that both of them will have to comply with isolation requirements.

The most complicated problem to be solved concerning the insulation of the buildings was to eliminate the existing thermal bridges achieving a continue envelope on the buildings, specifically complicated was to solve the insulation in the areas around the holes in the façade, such as balconies that most of the residents had closed with enclosures that do not meet the thermal insulation requirements. This is why in the projects two option were contemplated on purpose of that: the first one was to close the balconies (most of the residents will opt for this approach) with a new enclosure according to the requested thermal enclosure conditions, and the second one was, when the balcony is not closed, to insulate inside of the balcony (floor and ceiling) and to change the windows in there, if necessary.

## 4. Energy saving targets

In addition to comfort and aesthetics benefits, the energy savings of the refurbishment are very significant. These benefits were explained to the residents in the different meetings that happened at the beginning of the project where they were explained

main problems of the area. Most of the neighbours didn't realize that those problems exist, this is why these meetings were important, it was explained the diagnoses done before and the potential solutions.

The explanation of the importance of the building insulation, and the energy saving obtained with that, was one of the main objectives of the communication campaign and the meetings with the residents. To explain it clearly, the idea of an "overcoat for the building" was used, together with the thermographies where the different temperatures on the buildings are clearly observed.



In addition, some general estimates about consumption and savings were explained in those meetings:

**efidistrict** ORVINA II. Calle Tadeo Amorena 41. 24 viviendas Nasuvinsa Navarra de Suelo y Vivienda, S.A.

**El consumo de energía medio anual de la Agrupación ORVINA II.**

**Sólo energía: 532.000 euros/año**  
**1.200 viviendas**

- Consumo de energía medio **433 euros/vivienda.**  
**REGULACIÓN Y CONTROL**
- Teniendo en cuenta sólo la Envolvente se puede estimar un **ahorro razonable del 50%** de la energía.

**Estimated saving**

- Lo que supone un ahorro prudente de **221 €/año/vivienda.**
- Lo que supone un ahorro medio de **18,50 euros/mes vivienda.**  
**SIN TENER EN CUENTA LA SUBIDA DE LA ENERGÍA.**

On funded by the Intelligent Energy Europe Program of the European Union  
Gobierno de Navarra Nasuvinsa Navarra de Suelo y Vivienda, S.A.  
Fecha: 15 de septiembre de 2015

In the case of the group Orvina II, it was stipulated an average energy consumption of 532,000 €/year (1200 dwellings), which suppose 433€ year/dwelling. Taking into account that with just the envelope insulation savings of energy will be around 50% , it is estimated that a dwelling could save 221€/year, 18.50€/month dwelling.



**efidistrict** ORVINA III. Calle Azoz 7. 32 viviendas. Nasuvinsa Navarra de Suelo y Vivienda, S.A.

### Capacidad de ahorro con la Envoltura Térmica

**El consumo de energía medio anual de la Agrupación ORVINA III.**

**Sólo energía: 536.000 euros/año**  
**704 viviendas**

- Consumo de energía medio **760 euros año/vivienda.**

**REGULACIÓN Y CONTROL**

- Teniendo en cuenta sólo la Envoltura se puede estimar un **ahorro razonable del 50%** de la energía.

**Estimated saving**

Lo que supone un ahorro prudente de **380 €/año/vivienda.**  
 Lo que supone un ahorro medio de **31,70 euros/mes vivienda.**

Logo: European Union, Gobierno de Navarra, Nasuvinsa

Fecha: 11 de marzo de 2015

In the case of the group Orvina III, it was stipulated an average energy consumption of 536,000 €/year (704 dwellings), which suppose 760€ year/dwelling. Taking into account that with just the envelope insulation savings of energy will be around 50% , it is estimated that a dwelling could save 380€/year, 31.70€/month dwelling.

These are the estimates just with the insulation, but if it is taking into account the control consumption that it is expected to be compulsory by January 2017, and the renovation of the existing District Heating, expected savings will be around of the 70% of the energy.

This was clearly explained in one of the proposal selected, "kuTXa TXuria", by VArquitectos.

Existing thermal bridges values and Project thermal bridge values:

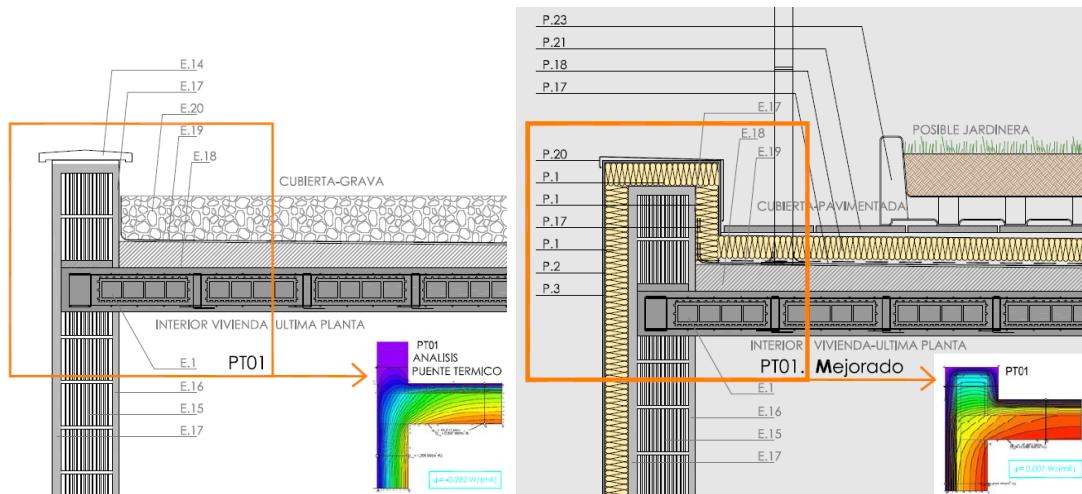
**Existing thermal bridges**

ANALISIS PUENTES TERMICOS EN ESTADO ACTUAL			
SITUACIÓN-ENCUENTROS	VALOR $\psi$ (W/mK) PUENTE TERMICO	T°, ESQUINA/ CONDENSACION	
PT 01 Cubierta-Fachada-Forjado	$\psi = -0.282$ W/mK	11°C SI	
PT 06 Balcón-Fachada	$\psi = 0.534$ W/mK	13°C SI	
PT 02 Fachada-Forjado	$\psi = 0.504$ W/mK	14°C SI	
PT 03 Fachada-Persiana-Carpintería	$\psi = 0.791$ W/mK	5°C SI	
PT 04 Fachada-Carpintería	$\psi = 1.92$ W/mK	9-10°C SI	
PT 05 Forjado-Fachada P Baja	$\psi = -0.397$ W/mK	13°C SI	

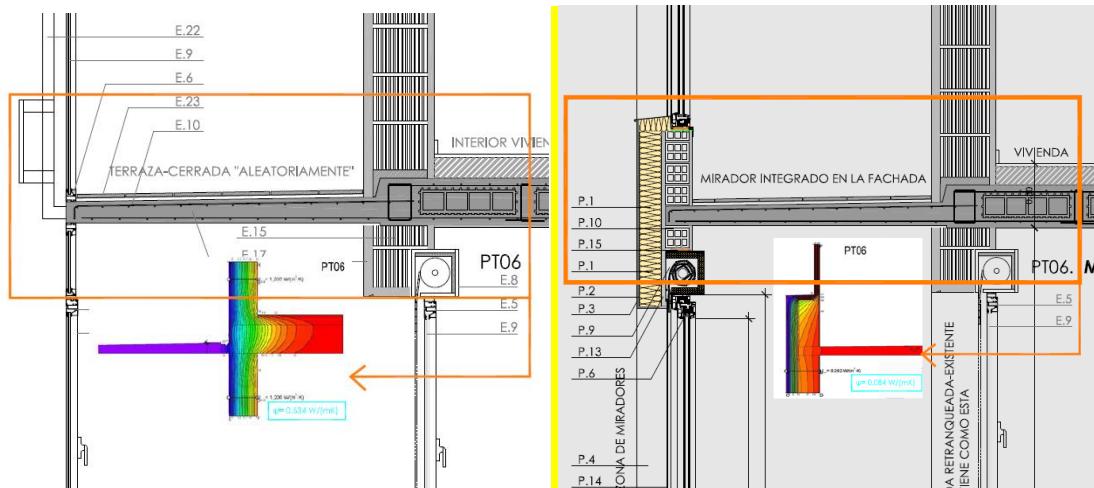
**Project thermal bridges**

ANALISIS PUENTES TERMICOS EN PROPUESTA			
SITUACIÓN-ENCUENTROS	VALOR $\psi$ (W/mK) PUENTE TERMICO	T°, ESQUINA/ CONDENSACION	
PT01. M Cubierta-Fachada-Forjado	$\psi = 0.007$ W/mK	17-18°C NO	
PT06. M Balcón-Fachada	$\psi = 0.084$ W/mK	>18°C NO	
PT02. M Fachada-Forjado	$\psi = 0.025$ W/mK	>18°C NO	
PT03. M Fachada-Persiana-Carpintería	$\psi = 0.4131$ W/mK	15°C NO	
PT04. M Fachada-Carpintería	$\psi = 0.068$ W/mK	16°C NO	
PT05. M Forjado-Fachada P Baja	$\psi = -0.035$ W/mK	18°C NO	

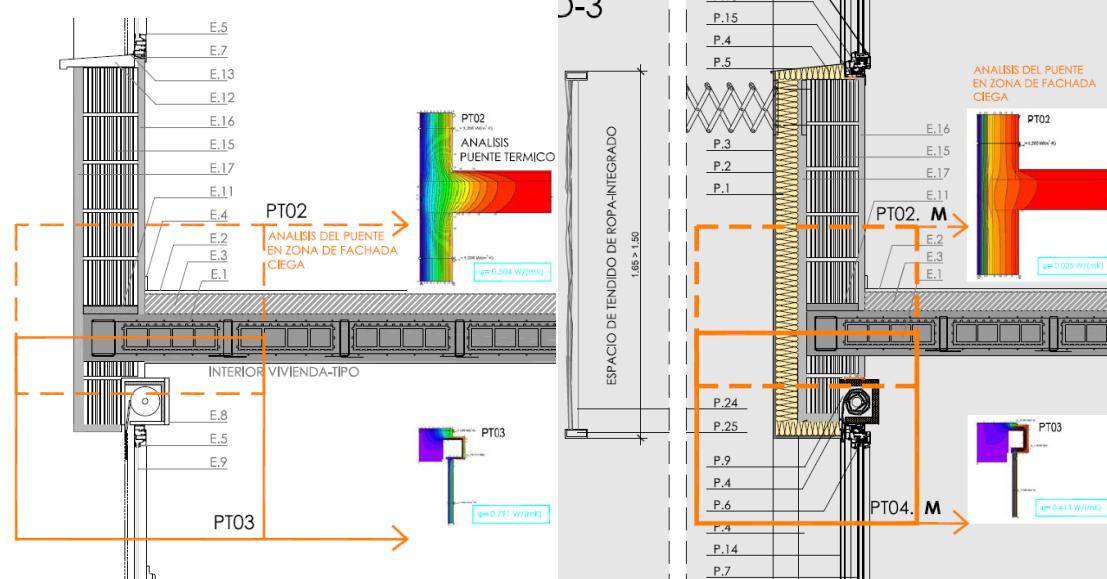
Elimination of thermal bridges in the encounter roof-forged and its thermographies:



Elimination of thermal bridges in the closed balcony and its thermographies:



Elimination of thermal bridges in the encounter of forged- blind façade and its thermographies:



## 5. Energy impacts

We hereby the energy impacts of the WP6 Energy refurbishment buildings (ERB).

### 5.1 Grant Agreement signed (dated on 1<sup>st</sup> March 2014)

Category of investments	Amount already signed	Initial amount in €	Avoided GHG emissions (tCO <sub>2</sub> e/year)	Primary energy savings		Renewable energy produced	
				(toe/year)	(MWh/year)	(toe/year)	(MWh/year)
Building Renovation (ERB)	-	4.747.750 €	272	124	1.446	0	0

### 5.2 Indicators of the IR (dated on 1<sup>st</sup> September 2015)

Category of investments	Amount already signed	Amount still expected to be signed	Avoided GHG emissions (tCO <sub>2</sub> e/year)	Primary energy savings		Renewable energy produced	
				(toe/year)	(MWh/year)	(toe/year)	(MWh/year)
Building Renovation (ERB)	3.965.000 €	5.000.000 €	240	82	952	0	0