

# Energy Efficiency in Portuguese Social Housing

## TWO BUILDINGS, TWO REASONS FOR SUCCESS

THE  PROJECT

## IN PORTUGAL

*José Coimbra*

## Brief Presentation of FENACHE

- The only organization that officially represents Housing Cooperatives in Portugal
- FENACHE has been developing all the efforts to improve quality in social housing
- FENACHE has adopted the Declaration for the Quality in the Cooperative Housing
- FENACHE has formed an External Technical Commission to implement this document

# Bouça's Ensemble

## Retrofitting An Existing Construction

### Brief Historical Report

- Bouça's Ensemble was designed by **Siza Vieira** in 1975
- Bouça's construction started in 1977 and was concluded in 1979
- Building had very low habitable conditions, with several problems due to non-existent external insulation



Thermal insulation was inexistent



# Bouça's Ensemble

## Retrofitting An Existing Construction

### Work to be done

- Retrofitting of the 56 dwellings, consisting on:
  - Replacement of old and damaged doors and windows by new wooden ones;
  - Applying thermal insulation on roofs and façades to increase inner comfort e diminish energy consumption both in winter for heating and in summer for cooling;
  - Waterproofing of roof-coverings and façades to prevent water infiltration inside the dwellings.



# Bouça's Ensemble

## Retrofitting An Existing Construction

### Improvement on Thermal Insulation

Cement asbestos sheets removal



Thermal insulation with waterproofing sheets covered with fine gravel



# Bouça's Ensemble

## Retrofitting An Existing Construction

Improvement on Thermal Insulation

Façades coating and wall thermal insulation



# Bouça's Ensemble

## Retrofitting An Existing Construction

Improvement on Thermal Insulation  
and renewing windows

Façades  
coating and  
wall thermal  
insulation





# Bouça's Ensemble

## Retrofitting An Existing Construction

### Building's Final Images

**A success of retrofitting  
original author's architecture**



# Positive outputs of such an Experience

We have taken the example of Bouça's Retrofitting as an important activity that will be “reproduced” in future Buildings



**Images of  
Vila Nova de Gaia**

# New Standards for Housing Construction

## European Legislation

### **Directive 2002/91/EC:**

**Improvement of the Buildings' Energy Performance  
considering outdoor climate and local conditions  
considering indoor climate and financial profitability**

## Portuguese Legislation

*Published on the 4<sup>th</sup> of April 2006*

<b>Law nr. 78/2006</b>	<b>Energy Certification</b>
<b>Law nr. 79/2006</b>	<b>Air conditioning energy Systems in Buildings</b>
<b>Law nr. 80/2006</b>	<b>Building Thermal Characteristics</b>

# The Importance of Demonstration Projects

- Considering that recent legislation is extremely demanding if we consider the traditional practices of the building sector, and that
- There is a wide distance between what is normally done and what the new rules demand
- FENACHE advanced the fulfilment of new legislation in Portugal joining a pilot project named:
- SHE – SUSTAINABLE HOUSING IN EUROPE
- This Demonstration Project was very important to convince our society that Energy Efficiency is possible to achieve just with a small increase on costs and to show the benefits of Energy Efficiency.

# The Example of the SHE Project

## Description



## *Moving from the Extraordinary to the Ordinary*

- A European Demonstration Project with Social Housing Organisations
- Funded by the European Commission under the 5<sup>th</sup> Framework Programme on “*Energy, Environment and Sustainable Development*” and supervised by:
  - Prof. Eduardo Maldonado of the University of Oporto
  - Prof. Matheos Santamouris of the University of Athens

## Main Purposes

- ✓ To assess and demonstrate the real feasibility of Sustainable Housing using pilot projects (714 dwellings from Denmark, France, Italy and Portugal);
- ✓ To involve and convince the stakeholders of the construction process about sustainable housing

# The Portuguese SHE Partner



A Cooperative Union formed in 1998 aiming to promote:

1. Ponte da Pedra 1<sup>st</sup> Phase (150 non-sustainable dwellings) 1999 – 2003
- 2. Ponte da Pedra 2<sup>nd</sup> Phase (101 sustainable dwellings) 2005 – 2006**



# Ponte da Pedra 2<sup>nd</sup> Phase

## A New Construction

### Description

- Cooperative construction under controlled costs approved and financed by the Portuguese Institute Housing of 101 dwellings
- Building's management according to the Norm NP EN ISO 9001:2000
- Technical Control with a ten year insurance policy
- Sustainable construction rules in respect of the SHE Project
- First construction in Portugal designed to obtain a Certificate of Energy Efficiency Grade "A"

# Energy Management

***We have adopted several measures to reach a  
HIGH ENERGY SUSTAINABLE PERFORMANCE:***

Adoption of superior quality in **THERMAL INSULATION** (respecting the very recently approved Regulation on Energy Efficiency).

Introduction of **RENEWABLE ENERGIES**

**ENERGY SAVING** on artificial lighting and water heating

## Goal

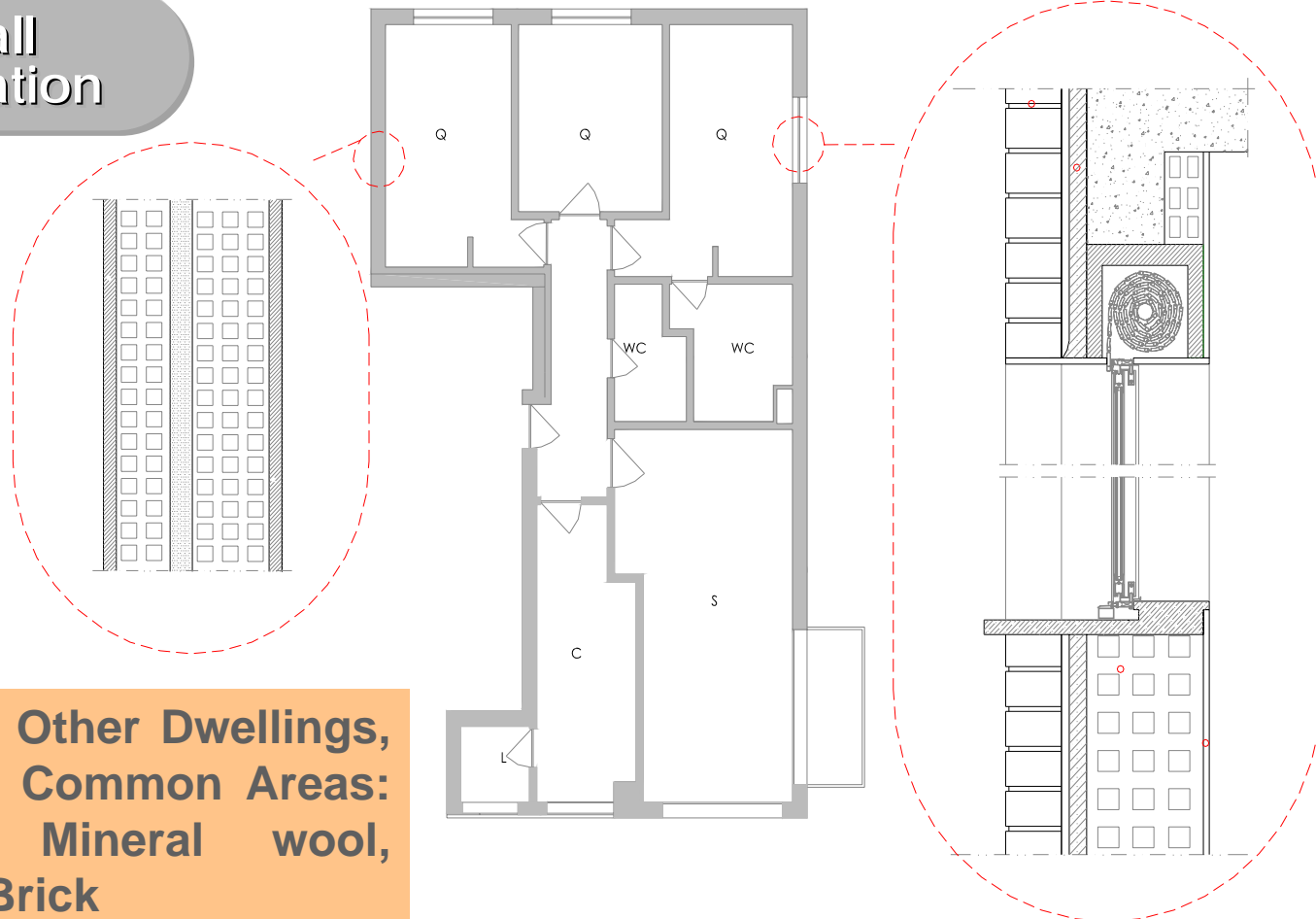
Improvement of **20%**, considering the old Portuguese regulations

- to improve comfort
- to avoid air-conditioning
- to reduce total energy consumption



# Energy Management

## Wall Insulation



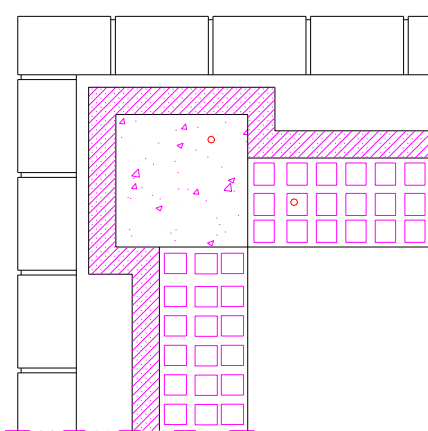
**Walls to Other Dwellings,  
lifts and Common Areas:  
4 cm Mineral wool,  
Double Brick**

**Insulated Façades, Boxes for Roller  
Blinds & Double Glazing**

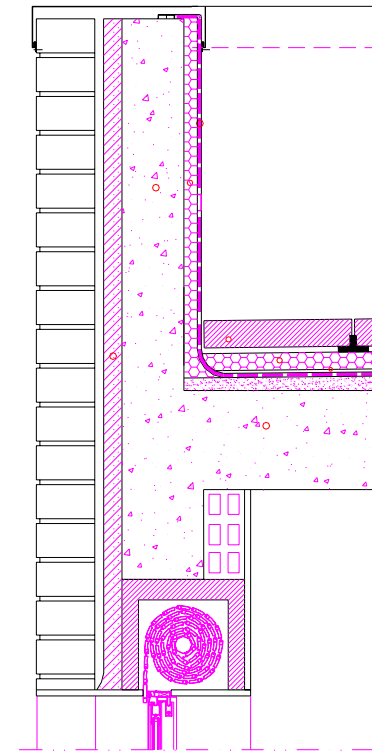
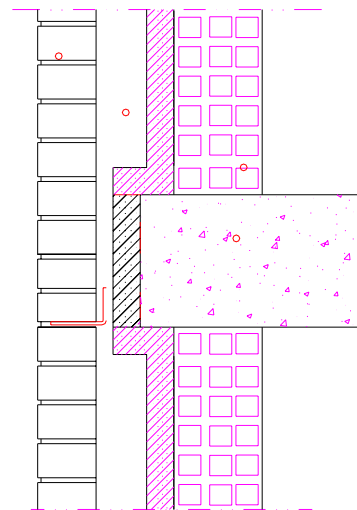
# Energy Management

## Thermal bridges carefully treated

**Aerial view**



**Frontal view**



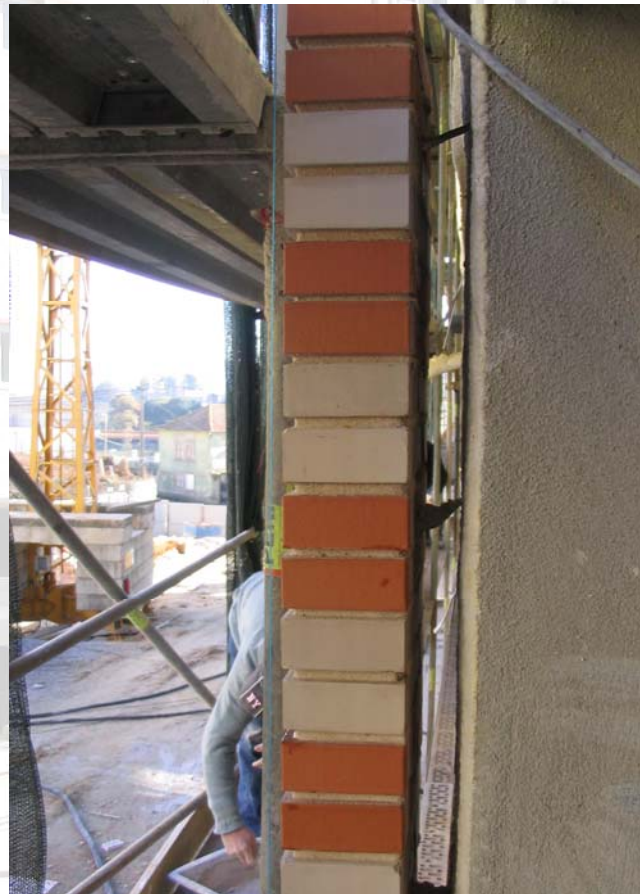
# Energy Management

Projected  
Polyurethane



# Energy Management

Double Wall angle supported  
with air gap of 4 cm



# Energy Management

## Roof Insulation

6 cm insulated roofs



# Energy Management

## Thermal and acoustic blind box



# Energy Management

## Renewable Energies



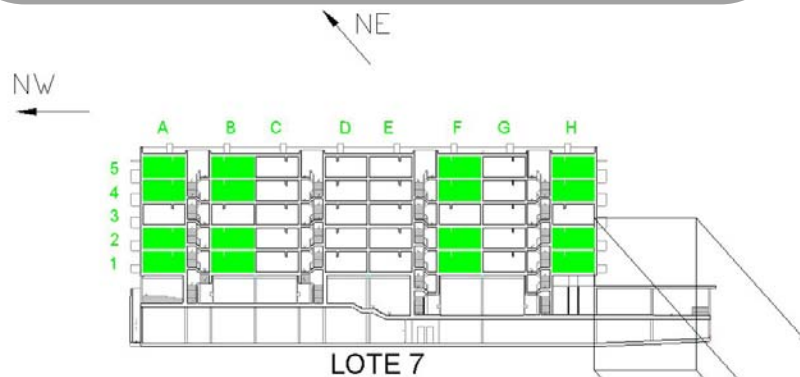
**Solar Collectors**



**Gas hot water heaters for  
apartment top-up**

# Energy Management

## Energy Performance



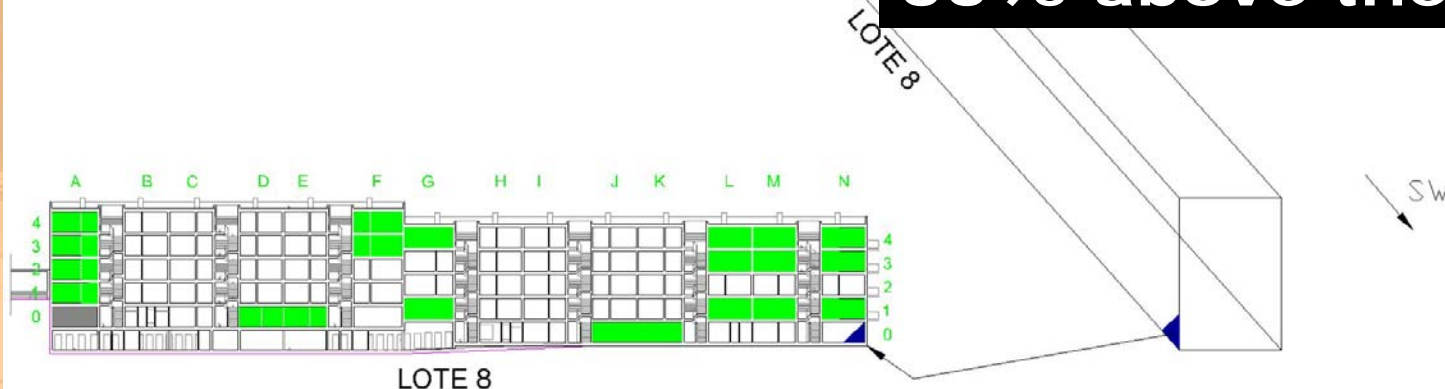
According to the new 2006 rules, the improvements in each dwelling are:

**Without solar collectors:**

9% above the minimum

**With solar collectors:**

55% above the minimum





## Solutions of Low Energy Lighting

**The model dwelling suggested efficient solutions for lighting:**

- Neon bulbs



- T5 bulbs

- Electronic ballasts



## Lighting in Common Areas

- **Low Energy electronic bulbs turned on through solar cells from the outside**
- **Movement detectors in staircases and corridors**



# Energy Management

## Energy Certification

**According to the new regulation on Energy Certification, Ponte da Pedra – 2<sup>nd</sup> Phase will reach level “A”**

NOME/LOGO DA ENTIDADE ACREDITADA

SÍMBOLO DO SPQ

Edifício/Fracção:

Morada:

Área Útil de Pavimento:

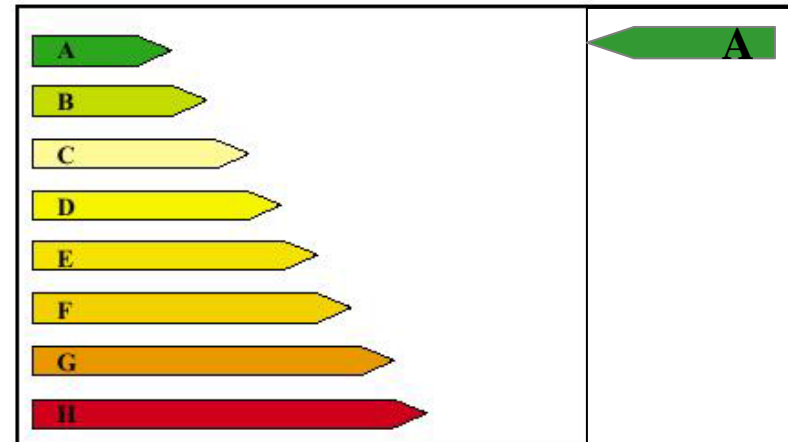
Data de Emissão do Certificado:

Aquecimento   
Tipo: \_\_\_\_\_

Arrefecimento   
Tipo: \_\_\_\_\_

AQS   
Tipo: \_\_\_\_\_

Iluminação   
Tipo: \_\_\_\_\_



Consumo Energético: \_\_\_\_\_ kWh/m<sup>2</sup>.ano

Emissões de CO<sub>2</sub>: \_\_\_\_\_ ton/ano

Válido até: \_\_\_\_\_

Assinatura do Director Técnico  
(Selo Branco)

# Energy Monitoring

## Monitoring Plan

January 2007 – December 2007

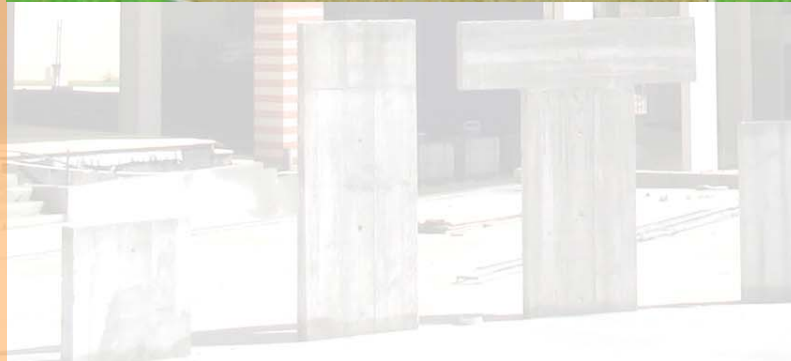
In order to define more accurately the efficiency of the sustainable characteristics of the construction, monitoring will be made on:

- Building Envelope (Surface temperature, Heat flow)
- Energy consumption for sanitary hot water
- Electricity (Consumption for ventilation and lighting)
- Comfort (Indoor temperature, Indoor humidity, Mean radiant temperature)

# Images of the Sustainable Building – Project / Construction



# Images of the Sustainable Building – Project / Construction



# Images of the Sustainable Building – Project / Construction



# Positive outputs of such an Experience

We have adopted the rules of energy efficiency and sustainable construction in the future Cooperative Buildings



**Leça Palmeira – 29 dwellings**



**Starting Date – 25/02/2006**



**Guifões – 40 dwellings / Elderly Building**



**Starting Date – 25/02/2006**



## **The Conception of Energy Efficient Buildings was possible:**

- Respecting the under controlled costs of Social Housing;
- Gaining the financial and technical support of the Portuguese Housing Institute;
- Improving the Life Quality Level of Inhabitants and Future Owners.

# TWO BUILDINGS, TWO REASONS FOR SUCCESS

Retrofitting of  
Social Housing

An Energy  
Efficient New  
Construction

