



## Passive House Retrofit Best practice example No 1 from Spain



## SABADELL (Spain)

**Improvement of all building facilities (electrical, plumbing, elevators)**

**Improvement of winter and summer comfort**

**Attractive new look of the buildings**

### Project data

Location, address:	Arraona-Sabadell (Barcelona)
Region:	Cataluña
Surroundings:	Northeast of Spain
Climate:	Mediterranean climate
Heating degree days:	1200
Year of construction and renovation:	1960-61 (constructed); 2001 (renovated)
Typology:	Big multifamily house
No. of dwellings:	61 dwellings
Treated floor area:	3,366 m <sup>2</sup> (average of 60m <sup>2</sup> each dwelling)
Owner:	Shared property (housing association and tenant)
Architect and Builder:	Julio Chinchilla Ballesta, Damián Solares Nebot & Obra Sindical del Hogar y Arquitectura.
Costs of (energy) saving measures:	€ 1.800.000
Renovation financed by:	ADIGSA



Figure: Big multifamily house, before and after renovation (courtesy of ADIGSA housing association)

### Objectives and Results

Within this renovation project, the intention of ADIGSA social housing association has been, on one hand, the improvement of the structural and constructional quality and the quality of living of the tenants. On the other hand, the intention has been to save energy, using materials with low environmental impact, obtaining a much more sustainable building.

The renovation is financed by ADIGSA, without any cost for the tenants.

The energy saving in energy need per dwelling estimated is: 1.992 Kwh/year<sup>1</sup> (east orientation) and 2.082 Kwh/year<sup>1</sup> (west orientation). (Assuming 19 °C indoor temperature, using the tool: "Programa de cálculo de consumos energéticos, ICAEN", 1999)".

In the renovation, apart from the measures to minimize transmission and ventilation losses in winter, many overheating protection measures for summer have been carried out: like awnings, light colours in façades, deciduous trees, insulation of roofs and improvement of the glazing and frames.

### Renovation concept

#### Key renovation features

- Structural rehabilitation
- Renovation of electrical and plumbing installations
- Elevators
- Static-mechanical ventilation system
- External insulation of façades
- Insulation of roofs
- New glazing and frames reducing thermal bridges
- Improved efficiency boiler for heating and DHW
- Awnings
- Use of light colours in façades
- Vegetation (deciduous trees)

## Technical details

### Before renovation

#### Constructions

- Non-insulated roof (most of dwellings)
- Non-insulated façades
- Steel window frames
- Single glazing
- Wall U -value<sup>1</sup>: 1.23 W/m<sup>2</sup>K
- Roof U -value<sup>1</sup>: 1.25 W/m<sup>2</sup>K

### After renovation

#### Constructions

- External insulation of roof
- External insulation of façades
- New or adjusted insulation window frames
- Single or double glazing
- Wall U -value<sup>1</sup>: 0.52 W/m<sup>2</sup>K
- Roof U -value<sup>1</sup>: 0.44 W/m<sup>2</sup>K

## Energy saving

The energy saving in energy need for heating and cooling per dwelling estimated is around: 1.992 Kwh/year (east orientation) and 2.082 Kwh/year (west orientation). (Assuming 19 °C indoor temperature, using the tool: "Programa de cálculo de consumos energéticos, ICAEN", 1999).

Treated floor area: (average of 60m<sup>2</sup> each dwelling).



Figure: Overheating protection: awnings  
(courtesy of ADIGSA housing association)

## Additional information

- Complete restoration and improvement of the building installations: improvement of the electrical installation, improvement of the plumbing installation, installation of a new anti-fire system installation, installation of a new ventilation system, installation of new elevators.
- Improvements of the quality of live of the tenants.
- Improvement of the thermal comfort: external insulation on façades and roof, new glazing and frames reducing thermal bridges, overheating protection in summer.
- Lower energy costs for the tenants.
- Improvement of the acoustic comfort, air quality and health of the tenants.
- Urbanistic revaluation.
- Because of, among others, the light coloured paints, the houses have got a fresh new upgraded look.

## Lessons learned and conclusions

- To make the renovation of the building efficient and economically feasible, it is very important not to displace the tenants during the civil works, if it is possible. For instance: external insulation instead of internal insulation.
- The inclusion of an active solar installation for domestic hot water is very difficult due to the diversity of energetic sources used in each dwelling (electricity, gas, wood) and the decentralization of the community facilities. The civil works would be very complicated and expensive.

## References

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- [3] Barata, C. Els barris d'Adigsa- Arraona- Els Merinals. Departament de Benestar Social-Generalitat de Catalunya, Barcelona, 1993