



ESCUELA TÉCNICA SUPERIOR
DE ARQUITECTURA DE SEVILLA
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PLEA '86
International Conference on
PASSIVE AND LOW ENERGY
ARCHITECTURE
in Housing



Volume I.

Pécs, Hungary
September, 1st-5. 1986.

Literature

- Sabady P.R.: Solararchitektur-Praxis
(Praxis of the solar-architecture)
Helion-Verlag, 8004 Zurich
11. World-Editions
- Sabady P.R.: Wie kann ich mit Sonnenenergie heizen?
(How can I heat with the sun?)
Helion-Verlag, 8004 Zurich
8. World-Editions
- Sabady P.R.: Biologischer Sonnenhausbau
(Biological sunhouse construction)
Helion Verlag, 8004 Zurich
4. World-Editions

Some of the books are translated in English, Spanish,
Italian, Dutch, Portuguese, Russian, Hungarian, Bulgarian.



BIOCLIMATIC RESEARCH AND MEASUREMENT
PROTOTYPE HOUSE IN ANDALUCIA

Architect: Pilar Alberich Sotomayor
Authors : José M^o Cabeza Lainez
 José Pérez de Lama
Director : Jaime López de Asiain

SEMINARIO ARQUITECTURA BIOCLIMATICA. E.T.S.A.
Avda. Reina Mercedes s/n. 41012 Seville.Spain

Project. Program. Site. Solution. Construction. Measurements.

Project: Cuadrado House. Mairena del Aljarafe.Seville.Spain.

Program: A single-family house for winter and summer use with an integrated active and passive solar energy system designed to be responsive to climate and culture of continental-mediterranean location.

The dwelling is sponsored by Spanish Ministry through its official protection housing program which precises tight conditions on area (90 square metres),volume,quality,design and economy. It is also the prototype for a 124-unit complex in Osuna (Seville) now under construction.

Site: Area of gently rolling hills in continental-mediterranean climate with strong N.E. winds.

Solution: a two-story building with south-facing main façade which generates a sequence of functions displaying living-room and bedrooms to the front of the house (South) and staircase, kitchen, bathrooms to the rear (North).

The two-level organization produces also a diverse set of spaces accommodating the various program-calls,so living-room and kitchen are on the ground floor,bedrooms and bathrooms are on the second floor;these spaces are linked by the stair which proves to be a significant point in stratification and ventilation.

Economic heating and cooling system includes solar includes solar collectors,fireplace,ventilation,shading pergola and passi

ve solar applications. The system is expected to reduce energy use by a high percentage.

Construction: white wash façades, insulated brick-walls, concrete slabs and ceramic-tile roofing.

Measurements: meteorologic parameters (daylighting, temperature humidity, wind speed and direction) are being registered both inside and outside the house by a microprocessor unit. Thus the comparison between theoretical calculations and empirical data will be possible. Two months of measurements are available now.

ARCHITECTURAL DESIGN

Program

A house for an artist and his family to live in the whole year and situated five miles outside Seville. The intention was to build a house into the natural landscape of "el Aljarafe" and to give it a simple strong form so that it resembled traditional buildings of mediterranean-continental climate which biases the culture of this land.

At the same time an active and passive heating and cooling system would provide the required energy at low costs, taking into account that passive heating and cooling systems are closely related to this vernacular building tradition we had exposed before.

But, as the dwelling was sponsored by Spanish Ministry by means of an issue called "viviendas de protección oficial" (official protection housing) the program asked for tight conditions on area (90 square metres), volume quality, design and budget. Furthermore, this house was the prototype for a 124-unit complex to be released soon.

Site

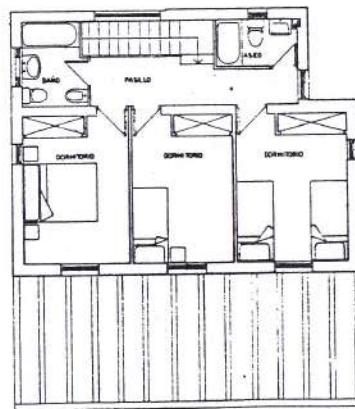
Area of gently rolling hills near the elevation known as "Cornisa del Aljarafe" in a mediterranean-continental climate with strong winds in winter and cool breezes in summer.

Prevailing vegetation is olive tree and pastures.

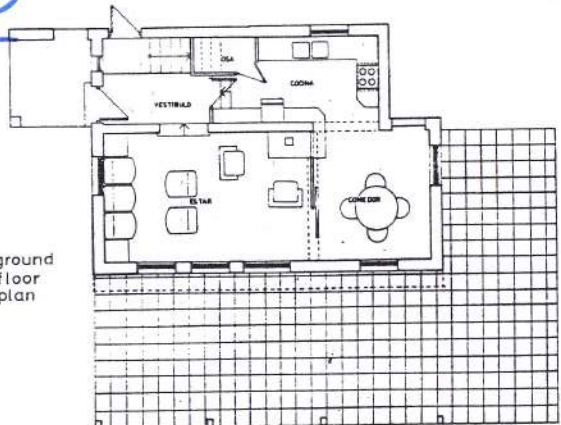
Solution

The living-room and kitchen are on the lower floor. Within a rectangular plan there is a sequence of functions from South to North where main rooms (living-rooms, bedrooms) face South and the rest (kitchen, bathrooms) face North. Walls have few and small windows except the one looking South. On the upper floor

second floor plan

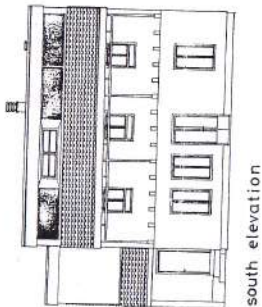


ground floor plan

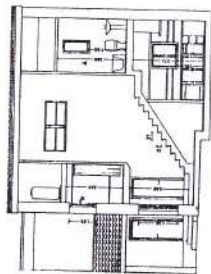


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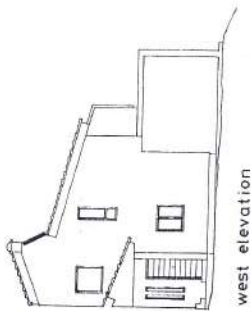


south elevation

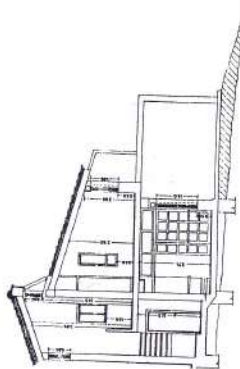


section

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west elevation



section

D-101

are three bedrooms and two bathrooms. A stair connects the two levels and also the spaces, allowing cross ventilation.

From the living-room french doors open onto the south-facing terrace, a pergola stands over this terrace. It is covered with deciduous leaf vegetation providing a spare volume double-height which soothes the inside-outside change of temperature while maintaining view out and daylighting.

On these conditions project will enhance on site.

Construction materials and methods

Stuccoed façades, insulated brick-walls (as they are described in the energetical design chapter), concrete slabs, ceramic floors and ceramic-tile roofing. These construction methods faithfully adjust with local building tradition.

The house was finished by October '85.

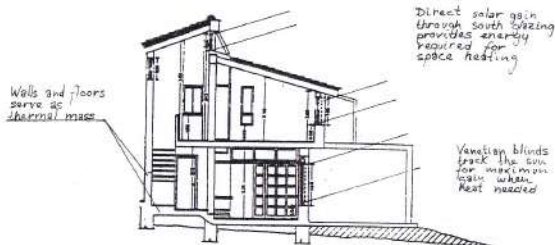
The family is living in it, and the two months of measurements have already been registered.

ENERGETICAL DESIGN

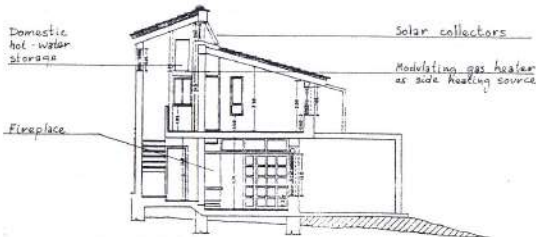
This chapter and the former undergo a continuous process of feedback from each other, for joining architectural and energetic concepts to design has been our attempt through-out this project. Thus a series of passive and active heating and cooling functions has been produced.

- Direct solar gain through South glazing. It provides the majority of energy required for space heating. Also in the rear of the house thanks to the saw-teeth form of the roof.
- Indirect gain on thermal masses of insulated brick walls and concrete floors, which, at the same time act as a storage for the heat or a handicap for its penetration as the case may be (winter or summer).
- Innovative insulation system includes external thin wall, insulation and internal thick wall, that provides a high thermal resistance.
- Fireplace as side-heating system, leading hot air to the room in the upper floor by a tube radiator.
- Cornice and moving shutters programmed to provide shading while maintaining maximum view out in warm periods.

D-102



PASSIVE HEATING SYSTEM



ACTIVE HEATING SYSTEM



PASSIVE COOLING SYSTEM

D-103

- Cross ventilation from north windows to roof top windows, through double-height space of the stair. Clerestory windows on roof-top to vent excess heat and controlled by user.
- Pergola covered with deciduous leaf vegetation. It creates a sequence of temperatures inside-outside and shades in warm periods.
- Windows of selected colours, textures and dimensions to optimize daylighting.
- Solar collectors for domestic hot water.

MEASUREMENTS

Main parameters to determine are:

- Daylighting level
- Inner and outer temperature
- Wall transmission
- Humidity level
- Wind speed and direction

- The system's device is an NSC 800 Microprocessor with built-in Key-board-display and recorder.
- From this unit, 17 plugged-in cells register the former parameters; including 5 cells for humid temperature, 9 for dry temperature and 3 for daylight. These cells are placed on significant points of the model, such as staircase, south-heated rooms or walls.
- All measurements will be taken hourly and according to our prospect for periods of one year at least.
- The program intends to compare theoretical results of bioclimatic calculation for design with an accurate series of data empirically obtained; moreover, to certify the validity of current energy-saving constructions in Andalucía, Spain.



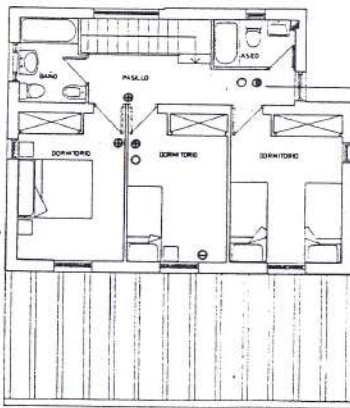
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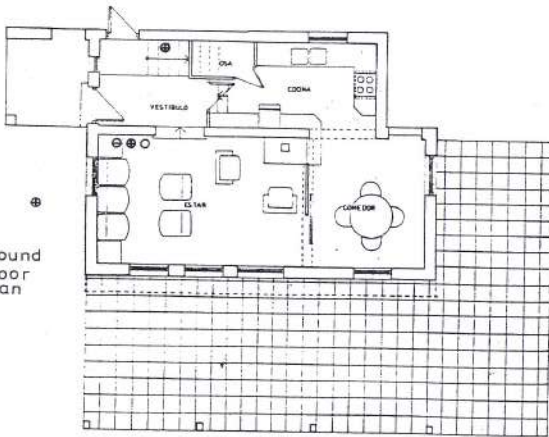
cell
situation
○ daylight
⊗ temper.
& humid.
⊙ temper.
in walls
⊙ wind



on the
roof top

second
floor
plan

ground
floor
plan



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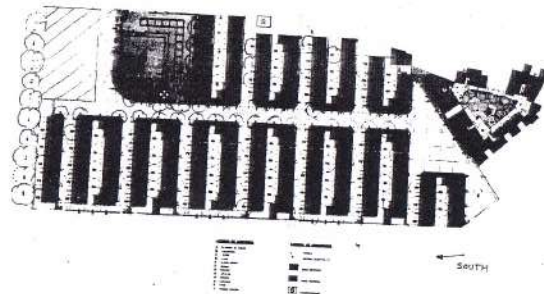
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E. T. S. DE ARQUITECTURA
UNIVERSIDAD DE SEVILLA
ESTACION BIOCLIMATICA ND-266

VELOC. M/S	TEMPERATURA GR. CENT.	ILUMIN. 1 Y 2 KLUXES	
DIREC. GRADOS	HUMEDAD. %	ILUMIN. 3 KLUXES	
IDENTIFICACION	EA	FECHA	26 02 13 11 49
VELOC. DESV.	DIREC. DESV.		
MEDIA VELOC.	MEDIA DIREC.		
1 9	2 207 3	5 9	
TEMP. 1	TEMP. 2	TEMP. 3	TEMP. 4
12 9	13 0	13 0	12 5
ILUM. 1	ILUM. 2	ILUM. 3	HUMD. 1
1 0	3 3	23 5	92 0
		92 2	70 7
		80 2	75 7
			99 3

MEASUREMENTS SCHEDULE



124-unit complex. Site plan

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