Retrofitting of Social Housing. Policy and Financing Options

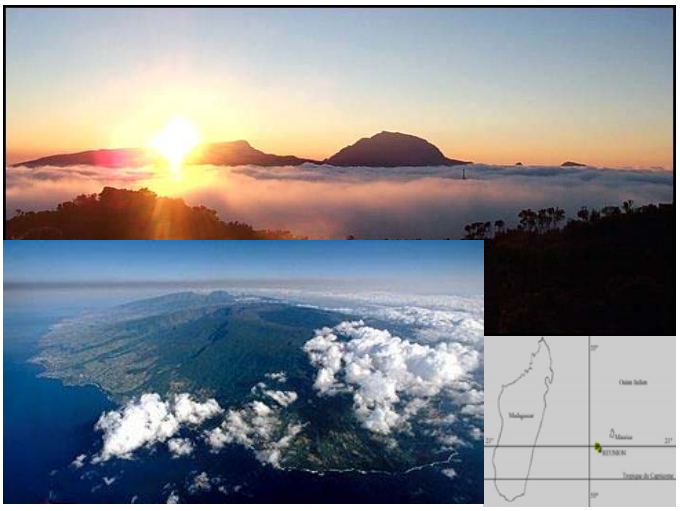
SESSION I: Case Studies

2nd Conference "HOUSING EUROPE"
"Retrofitting of Social Housing: Financing & Policy Options"
THESSALONIKI , Grece, 2006, November 07th & 08th

"Urban Renewal, Architectural Requalification, Social Supporting, and Sustainable Development" Related in a Social Housing Refurbishment Operation"

Presentation by Mr Herve P. GAERTNER

Summary

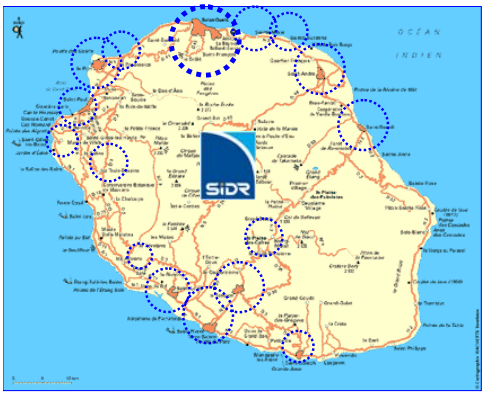


1.- THE GENERAL REUNION ISLAND CONTEXT:

Reunion is a tropical vocanic island located in the south of the Indian Ocean with a very mountainous relief. It has been inhabited since the middle of the 17th Century.

Its population, which comes from various ethnic and cultural backgrounds that have been mixing for 3 and a half centuries, grew from 670 000 inhabitants in 1999 to 760 000 in 2004 with more than 55% of them less than 25 years old, and will reach a million souls in 2020.

Its demographic development matches exactly the pace of its economic and social development, and this French Overseas Department is now a leading actor of the European Community in the Austral Africa and Indian Ocean zone.



Since 1949, the SIDR has been accompanying this development on the social and property holding levels.

By building over 28 000 accommodations in the main towns over the last 50 years, it has contributed to housing over 10% of the whole population, and for the most part it is essentially the most underprivileged one…

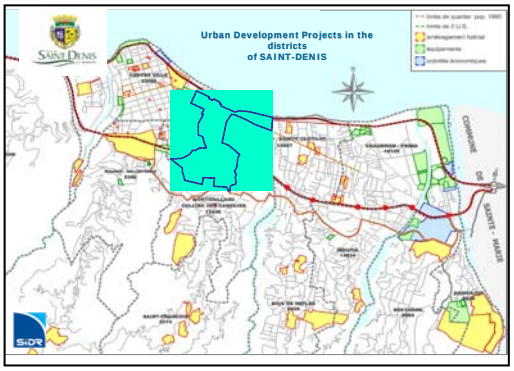
In some urban areas such as St-Denis, over 30% of the inhabitants are now housed by the SIDR.

Yet this healthy economic and social growth has some important drawbacks, not the least of which are:

- The increasing scantiness and expensiveness of building lands.
- An over-consumption dramatically and durably relying on raw material and energy source importations.

It has thus become imperative to rethink deeply the way the island develops.

2.- URBAN DEVELOPMENT & RENEWAL IN SAINT-DENIS

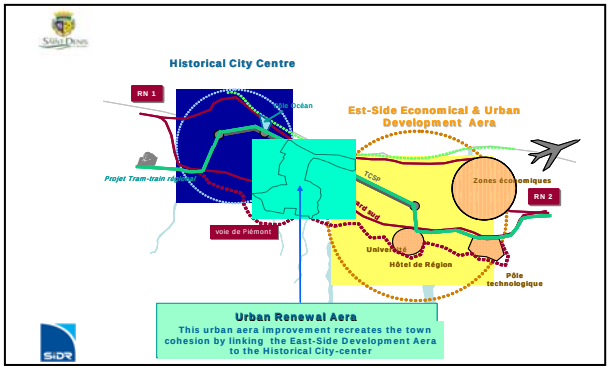


The city of St-Denis, located in the north of the island, is the administrative centre of the Department and counts 130 000 inhabitants, half of whom live in social or affordable housing.

The SIDR alone houses 35 000 people, dispatched up in districts of 3000 to over 10 000 inhabitants each.

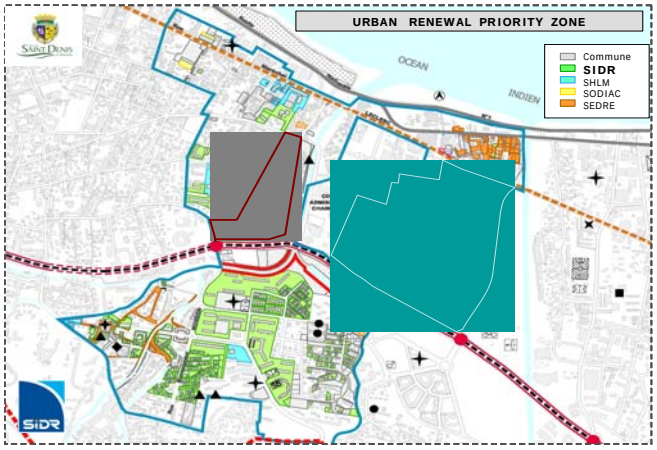
Over the last 30 years, strong economic and social development has lead the city to spread over the available easy building lands along the shore, between the sea and the mountains, while the mountainous slopes that surround the city remain the privileged environment for "wealthy" residential housing.

Over thirty development plans are currently under way or on the drawing board over the district.



This developed site counts about 3000 social housing units, built for the most part between 1965 and 1980 and owned by several Housing Companies.
(N.B : The areas in green are SIDR property).
In addition to urban transports enhancement and services grouping, one of the city's top priorities has been to build the boulevard linking the two sides of town and to enhance the side way linking sea shore and foothills districts.
The "VAUBAN" Renovation plan, which will be presented, is located on the side of these urban roads.
It is both part of the Urban Renewal Plan designed by city authorities, and of the SIDR's strategy to perpetuate its property by refurbishing it.

The main outcome of this strong development is that suburban social housing areas built over the 60's-80's period are now located right in the centre of town, close to the new business, administrative, cultural and judicial centres.
It has thus become imperative to renovate this area. This is one of the major focuses of the City's Urban Renewal Plan.
The territory covered by the plan spreads from the shore to the foothills of the mountains, and counts two distinct areas split by natural barriers – water courses flowing down from the mountains (gullies).



3.- THE SIDR SOCIAL HOUSING REFURBISHMENT PLAN

Since 1985, the SIDR has been investing in property refurbishment operations and it has renovated or rehabilitated about 4500 units from 1985 to 2005.

- 1985 to 1995: The first operations were focused on individual housing or on small clusters of single-story apartment buildings, with family transfer or temporary rehousing.
- 1996 to 2000: With the advent of the 1st Property Holding Plan the refurbishment also concerns collective housing buildings and the renovation program reach a 200 units/year rhythm. Rehousing constraints and difficulties to manage important family transfers lead the SIDR to realise alterations and improvements witho the tenants allowed to stay in their flats all throughout the process, and set up inhabitated collective apartment buildings rehabilitation.
- Since 2000: The 2nd Property Holding Plan pushed the rehabilitation rate to another level, and the improvement scheme took in sustainable development standards.
  - Progression to 400 renovated accommodations / year.
  - The Refurbishment Plan becomes a part of the Urban Renewal plan.
  - Creation and implementation of an accommodation upgrade plan with thermal improvement dispositions and solar-powered hot water production.

The Renovation of "VAUBAN" buildings group:

Although the buildings do not look derelict from the outside, a closer look reveals the need for alterations, improvements and comfort enhancement works in 35 years old buildings failing to match current standards:

- Run-down accomodations,
- Smallness of the rooms,
- Absence of doors inside the flats,
- No floor coverings,
- No hot water,
- Token equipement and facilities,
- Etc…

The VAUBAN's project specifical features

➢ **Fact sheet:**

- 400 social housing units (> 1 500 Inhabitants) dispached in 12 collective apartment buildings – 6 of which board the street, with 18 shops on the ground floor.
- A restrictive urban environment (road trafic, noise) requiring anti-noise devices.
- A strategic preference for renewable energy sources which implies specific technical and financial imperatives.
- A poverty-stricken population in a very « socially unstable » area:
  - 30% of family heads are employed, and the often have precarious jobs
  - Over 50% are unemployed and benefit from social welfare (ASSEDIC, RMI)
  - About 15% of the tenants are retired persons.
  - The average global income for each household is 20% below minimum wage.
  - Dramatic area fragility in terms of economy and security.

Because of the very "underprivileged social status" of this urban area, SIDR have to design a made-to-measure plan for this program so as to optimise its chances of success.

➢ **Necessity of preliminary dialogue with the tenants :**

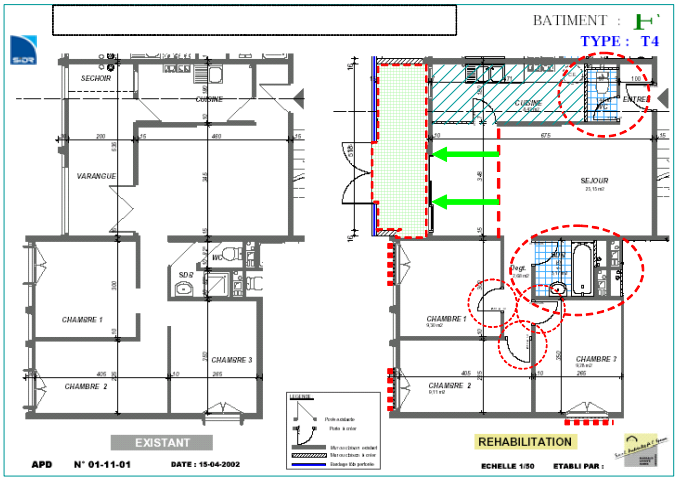
Once the technical and strategic options were determined, the project management team had to guarantee that it would suit both the inhabitants and the shop owners, and adapt the project according to their reactions while maintaining the initial objectives. Then, dialogue and individual social and economic support were vital to the achievement of goals :

- o Tenants and shop owners are invited to take part to the choices related to the improvements and alterations planned in the course of the rehabilitation process,
- o Design and signature of a convention between the landlord and the tenants, defining the collective agreement of all residents with the renovation plan.
- o Concerted redefinition of the accommodations' «occupancy balance» according to :
  - Accommodation sizes and family composition.
  - Family income and works-related costs.
  - Possibilities of / families' wish for a transfer to other apartment buildings in the same area (about 15% of housed families).

➢ **Social & Economic measures :**

- o Creation of a social support unit specificaly assigned to the operation to provide individual counselling and support to each family throughout the renovation works, which is composed of 5 trained professionals (1 « Social support » Project manager & 4 Social advisers)
- o Partnerships with institutional social and welfare administrations (CAF, ASSEDIC, PLIE,…)
- o Financial support tailored to individual needs :
  - To help tenants in trouble to pay rent and maintenance charges for the duration of the works.
  - Compensation contracts signed with shop owners to make up for important drops in sales.

➢ **Accomodation Upgrades :**



The same technical refurbishment implementation is applied to all the units :

- Living room enlargement and integration of the existing balcony.
- Kitchen enlargement and complete renovation.
- Creation of an independent toilet room.
- Complete renovation of the bathroom,
- Installation of doors inside the apartments,
- Building of a new front loggia equiped with a clothes horse,
- Replacement of old windows.

➢ **Constraints of renovation in inhabited environment :**

The execution conditions demanded a high degree of performance from the contractors as well as the consideration of the area's "social background" and of the inhabitants and shop-owners' living conditions. It is made specifically clear to all companies that a single team must be assigned to a given accommodation throughout the work process.

The standard durations for inside work in accommodations have been set to minimize nuisances related to "inhabited work sites".

VERY STRICT RULES ARE IMPOSED ON CONTRACTORS :

1.- Upon signing work contracts :

Commitment to a «social» clause (priority given to the young workers from the area during the recruitment process)

2.- While the work is in progress:

- o Outside and on building fronts :

  Specific day time schedules organised according to the type of work (security, noise, traffic jamming, obstruction and cluttering) so as to create a little nuisances as possible and to allow the shops to remain open.

- o Dans les parties communes:

  Contractors intervene only after the tenants were informed of the list and time of the operations to be conducted.

- o Inside the accommodations:
  - Throughout the work period, only one - and the same - team works in a given accommodation.
  - Work in an accommodation can only begin after an appointment was taken with the tenant and confirmed by the social workers' unit.
  - Intervention times and deadlines for the contractors are established on a daily basis, with high performance objectives: - *1 room = 2 days' work*

    Technical work (electricity,joinery,…)…….....1 Day

    Surface treatment (floor coverings, painting)…….1 Day
  - It is the tenant who is responsible for moving the furniture (most often with the help from the contractors).
  - The company is responsible for furniture protection and the daily cleaning of its work site.

➢ **Site's aspect while improvement work is in progress.**






➢ **Final architectural product……**

On the Urban Boulevard side…



On the side way and the shops' side….

In the inner court …



The shops and inside the accommodations …

…. And the constant presence of a social adviser….

➢ **The operation's social outcome :**

- o Prior to the operation (November 2001):
  - 463 families lived in the 400 accommodations.
- o Wile the operation was in progress (> 3 ans) :
  - 372 families have not moved from their accommodation,
  - 28 families were rehoused on the site, in accommodations left free by tenants who moved out.
  - 25 families were rehoused in new buildings completed in 2005 next to the operation site.
  - 20 families were rehoused in existing SIDR property accommodations located close to the site.
  - 14 families were rehoused in other operators' properties.
  - 4 families chose to leave the area.
- o Upon work completion (August 2004)
  - 399 renovated accommodations.
  - 1 tenant had refused that contractors come into his apartment:
    - The outside work and the improvements in collective areas were made according to plan.
    - The work inside the apartment was made in 2005, after the « rebellious » decided to leave.
- o No particular conflict or problem was to deplore between the tenants and the contractors wile work was in progress.
- o 11 shop-owners out of 18 received financial compensation for significant sales drop (15 to 25%) over 2 to 5 months.
- o Since the work was completed, no act of vandalism has been reported (apart from a few occasional « tags » at the foot of 2 buildings)
- o A satisfaction survey made in the end of 2005 - that is, 18 months after work completion - reported satisfaction rates of:
  - > 95% for accommodation and environment quality
  - > 78% for financial features related to rental & maintenance charges costs.
- o The statistics established by the Local Council for Security and Juvenile Crime Prevention (CLSPD) of the town of St-Denis show that crime and delinquency in the area dropped by 55% between 2003 and 2005…

4.- SEPECIFIC TECHNICAL FEATURES & SUSTAINABLE DEVELOPMENT

➢ **Thermal comfort features :**

The «ECODOM» label, designed for overseas territories by the French Eletricity Company (EDF) and the Agency for Energy Control and Savings (ADEME), sets standards:

- o Relying on the juxtaposition of simple technical solutions
- o Without thermal calculations
- o Mainly affecting housing disposition and accommodation organization:
  - "Crossing" flats with opposite openings
  - If possible : East-West oriented apartments (predominating wind)
  - Enhanced roof-coverings : 10 cm thick insulating coating
  - Wide openings
  - Doubling the front walls exposed to the sun by a 4 cm thick insulating coating lined on the inside surfaces
  - Solar protection given by the new loggias built from alveolar materials on building façades
  - Installation of « ECODOM - SIDR » doors made of a frame with enamelled steel shutters, guaranteeing a secure locked position, and an inside casement allowing air circulation through the flat even when the door is closed.

➢ **Anti-noise devices (on street fronts) :**

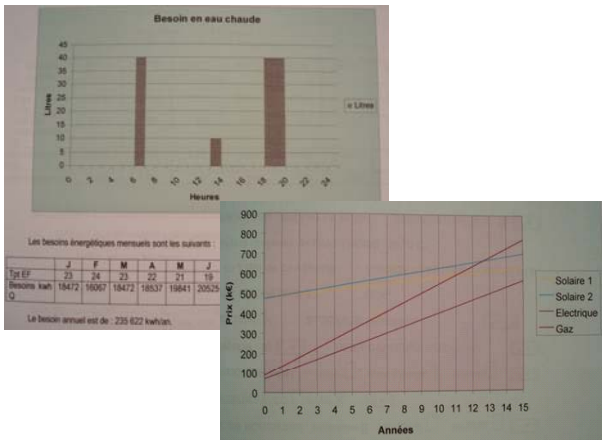
- o Creation of double-wall facades, with balconies set in front of living rooms as noise-traps.
- o New, reinforced 8mm thick windows.
- o Special acoustic absorbant wall-coverings applied to loggia and balcony walls when possible.

Anti-noise device assesment :

- o <u>Expected results</u> :
  - Noise level expected on the fronts : 65 dB(A)
  - Noise reduction wanted:
    - Windows opened: DnAT > **15 dB(A)**
    - Windows closed : DnAT > **32 dB(A)**
- o <u>Achieved results</u> :
  - Noise emission 2 meters away from the facade : 70 dB(A)

  Results (measures taken in the centre of the living room):
    - Window opened : 55db(A)
      - > ***Noise reduction:*** ***15 dB(A)***
    - Window closed 38 dB(A)
      - > ***Noise reduction:*** ***32 dB(A)***

➢ **Solar-powered hot water production:**



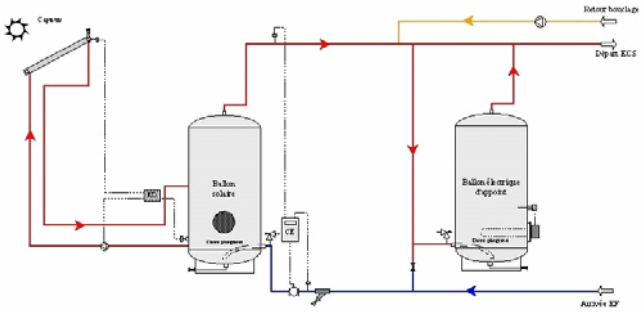
Hot water needs are assessed :
- For each building
- On a daily basis divided into hour time-slots

The necessary power is thus determined in function of:
- A given site (appartment building)
- A given time in the year (monthly basis)

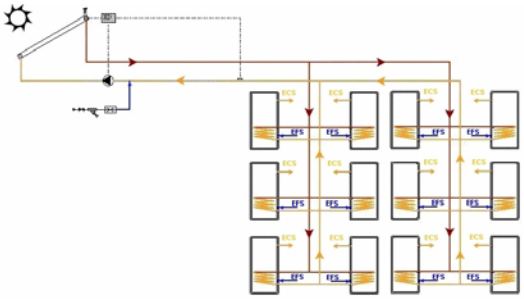
Comparing projected running costs for each energy solution allows for an assessment of return ratios and financial balance.

Technical solution adopted :
- The solar panels set on flat-roofs.
- 2 technical solutions were adopted according to equipement installation possibilities in the builldings :

SOLUTION 1:
Collective water stocking, and distribution to each accommodation with distinct water meters for hot and cold water.



SOLUTION 2:
Individual Stocking & Distribution.



IN BOTH CASES:
- Installation of a global tele-control system, and constant evaluation of individual water meters with tele-reported measures for water and electricity.
- Creation of a long-term maintenance contract (10 years).

Quality assesment of the Solar Plan :

☺ - Comfort
☺ - Energy Savings
☺ - Environment friendliness

In the VAUBAN project, 356 units are under solar-powered hot water production and.
The positive consequences of this equipment are :
►- Gas and Electricity savings for the tenants, and enhanced comfort.
(Ex. of gas saving : a individual 13kg gas cylinder used only for hot water production in a 4 persons family must be changed every 3 or 4 weeks. The cylinder refill cost 17,5 €…)
►- Electricity savings amounting to about **490 000 KW/h / year**
►- Avoid **380 t.of CO^2** rejections into the atmosphere (greenhouse effect gases)

7 000 units of the SIDR property stock are concerned by the SIDR solar equipment program :
- 2 800 already equiped or in process
- 2 300 in study (realisation : 2007-2013)
- 1 900 projected (> 2013)

☺ - Projected outcome in the middle term :
►- Eletricity savings: **9 8000 000 Kwh / year**
►- CO^2 emissions reduction: **7 500 t. / year**

4 .- FINANCIAL DATA

INVESTMENT BALANCE

OPERATION

	REFURBISHMENT	THERMAL IMPROVEMENT	NOISE PROTECTION	SOLAR HEATING (WATER)	TOTAL	
Nbr of UNITS :	400	290	187	356	400	
Nbr of SHOPS :	18				18	
UNITS PROGRAM AMOUNT (1+2) :	9 932 130 €	580 000 €	1 393 150 €	1 281 600 €	13 186 880 €	
TRADERS PROGRAM : & COMMERCIAL COMPENSATIONS	273 600 €				273 600 €	
					13 460 480 €	100%

(1) All the amounts are net of V.A.T.
(2) The UNITS PROGRAM amount includes cost of Engeenering team (625 K€) and Social Supporting team (183 K€)

FINANCING

			REFURBISHMENT	THERMAL IMPROVEMENT	NOISE PROTECTION	SOLAR HEATING (WATER)			
FINANCED AMOUNT :			9 932 130 €	90% 522 000 €	95% 1 323 493 €	95% 1 217 520 €	12 995 143 €	100%	96,5%
Amount / unit :			24 830 €	1 800 €	7 078 €	3 420 €	32 488 €		
-1-	Special Housing Main LOAN	< 2,5% 40 years	45% 4 469 459 €				7 856 373 €	60,46%	33,2% 58,3% 25,2%
-2-	Complementary LOANS	Market rates 20 years	30% 2 979 639 €	15% 87 000 €	15% 198 524 €	10% 121 752 €			
-3-	SUBSIDIES		25% 2 483 033 €	75% 435 000 €	80% 1 058 794 €	85% 1 034 892 €	5 011 719 €	38,57%	37,2%
	EDF			33,3%			145 000 €	1,1%	1,08%
	ADEME			33,3%			145 000 €	1,1%	1,08%
	REGION			33,3%	100%	40%	1 617 751 €	12,4%	12,0%
	ETAT		100%				2 483 033 €	19,1%	18,4%
	EUROPE (FEDER)					60%	620 935 €	4,8%	4,61%
-4-	SIDR self funding		273 600 €	10% 58 000 €	5% 69 658 €	5% 64 080 €	191 738 €	1,48%	
							273 600 €		
							465 338 €		3,5%

RENTAL MANAGEMENT BALANCE

	INITIAL OCTOBER 2001 Min.	INITIAL Max.	FINAL PROJECTION Min.	FINAL PROJECTION Max.	FINAL EFFECTIVE AUGUST 2005 Min.	FINAL EFFECTIVE Max.		
Unit Floor Space	17 m²	83 m²	21 m²	92 m²	21 m²	92 m²		
	57m²		64m²		64m²			
RESS. Tenant Income :	285 €	3 025 €	285 €	3 025 €	350 €	3 245 €		
	856 €		923 €		997 €		141 €	16,5%
RENTAL VALUE Net Rent Value :	65 €	216 €	77 €	290 €	79 €	297 €		
	168 €		221 €		226 €		58 €	34,5%
Ratio m²	2,95 €		3,45 €		3,53 €			19,8%
Maintenance Charges :	13,50 €	67 €	17 €	75 €	18 €	77 €		
	46 €		52 €		54 €		8 €	17,4%
Ratio m²	0,81 €		0,81 €		0,84 €			4,6%
Global Rent Value	79 €	283 €	94 €	365 €	97 €	374 €		
	214 €		273 €		280 €		66 €	30,8%
Ratio m²	3,75 €		4,27 €		4,38 €			16,5%
Housing Benefit :	0 €	170 €	0 €	170 €	0 €	195 €		
	77 €		86 €		89 €		12 €	15,6%
BALANCE Residual Rent Value :	55 €	258 €	55 €	258 €	61 €	325 €		
	137 €		187 €		191 €		54 €	39,4%
Income Prop. Contrib.:	11%	24%	11%	24%	13%	26%		
	16,0%		20,3%		19,2%		3,2%	19,7%
Must be < 25%								
FINANCIAL SAFETY Avail. money / month	719 €		736 €		806 €		87 €	12,1%
Family Typology Adultes	1,5		1,7		1,8			
Children	2,7		2,4		2,5			
Ratio /Person /Day	5,71 €		6 €		6,25 €		0,54 €	9,5%
Must be > 5 €								

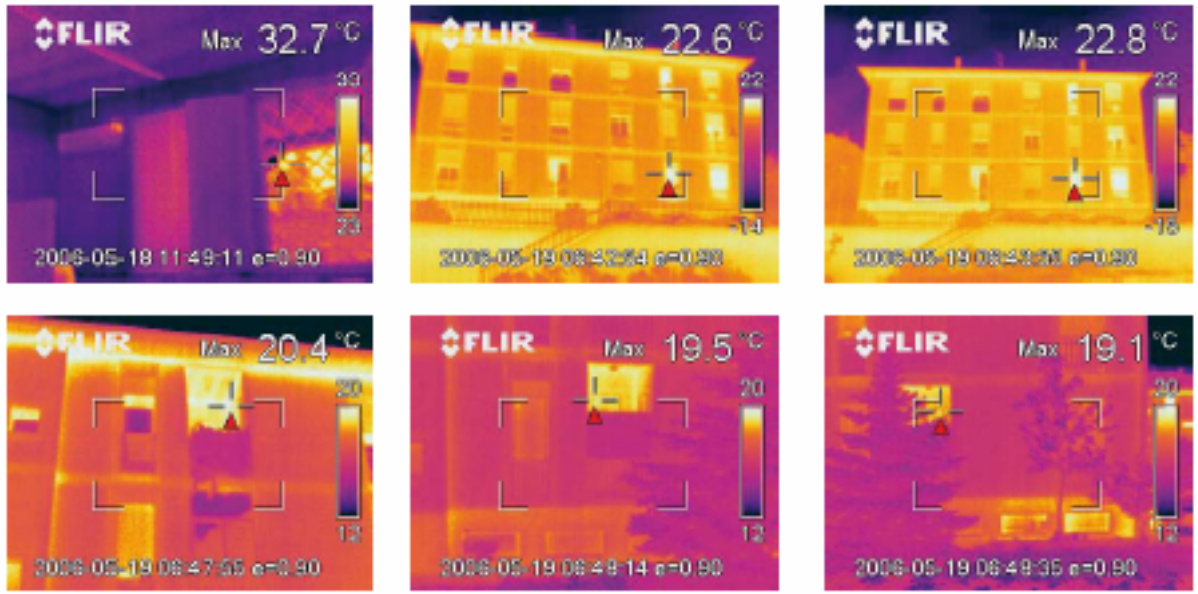
EVOLUTION

RETROFITTING OF SOCIAL HOUSE

BUILDINGS ERP
VIA MATTEOTTI 16,18,20,22
DI SANT'ILARIO D'ENZA (RE)

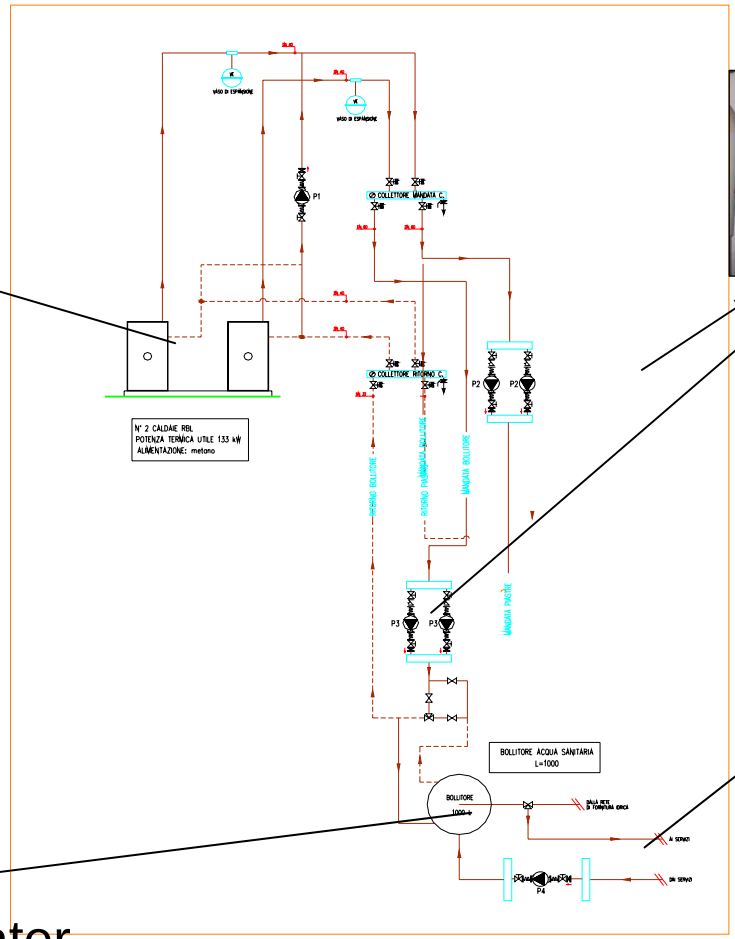
PHASES

1. Survey of the building and of the heating system
2. Analisys Natural gas consumption
3. Determination of current efficiency and E.D. (energy demand)
4. Simulation of works in order to save energy, determination of future efficiency and E.D.
5. Determination of payback of the investments



THERMOGRAFIC EXAM

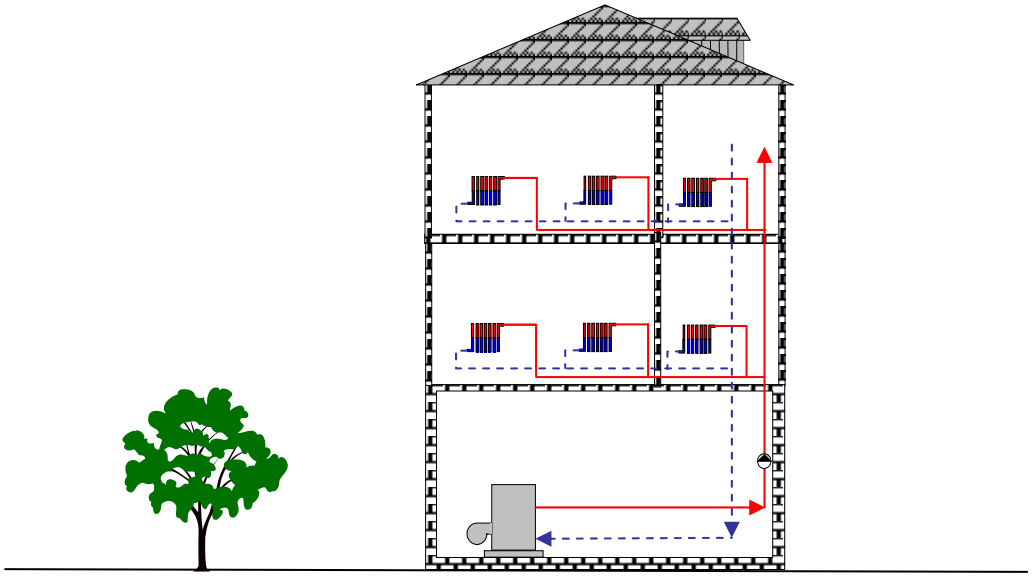
Boilers



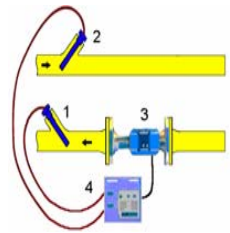
Pumps

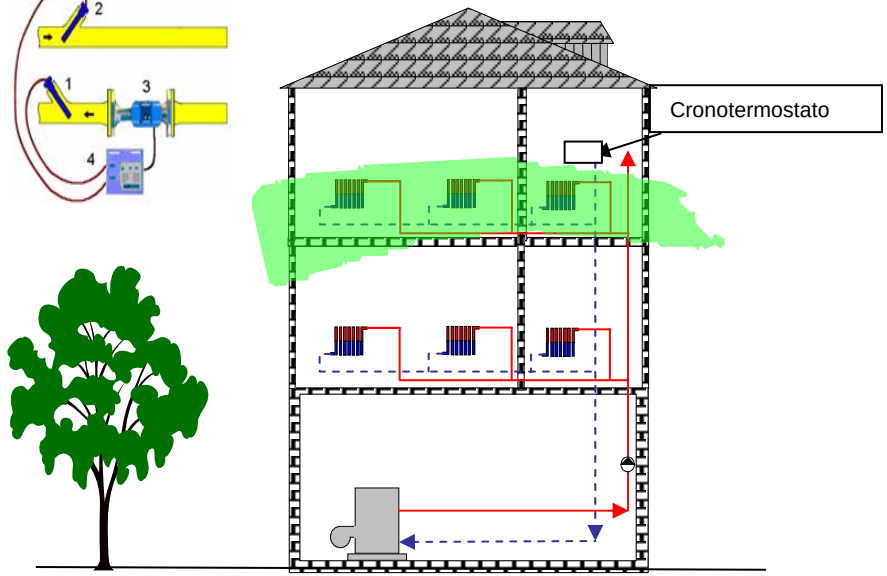
Tank san. Hot Water

- The material of existing radiator is Cast iron
- There is a manifold for each apartament



1) High efficiency Boilers (condensing)
2) Pumps with Frequency Converter
3) Individual record system of energy consumption





4. Comparison current and future efficiency

Current Efficiency (UNI 10348)

	Tipologia	Efficiency(%)
Production	2 Boilers 133 kW	η_p= 85.3
Distribution	Carbon steel piping with insulation	η_d= 95
Emission	Radiators	η_e= 90,7
Regulation	Thermostatic-Valves	η_r= 94
		η_{gs}= 67.6

Future Efficiency (UNI 10348)

	Tipologia	Efficiency(%)
Production	1 Boilers 100 kW	η_p= 97.3
Distribution	Carbon steel piping with insulation	η_d= 95
Emission	Radiators	η_e= 92,2
Regulation	Thermostatic-Valves- and two ways valves for each manifold and clim. Regu.	η_r= 96
		η_{gs}= 81.8

Comparison current and future

Current Energy and Consumption (UNI 832)

		Surface area	Vol
Heating (MJ/m³anno)	168.8	955m²	3540m³
Hot Water (MJ/m³anno)	33.1		
Tot. (MJ/m³anno)	201.9		
Gas Consum. (m³)	20.790		
D.E.	**173 kW/m² anno**		

Future Energy and Consumption (UNI 832)

		Surface area	Vol
Heating (MJ/m³anno)	125	955m²	3540m³
Hot Water (MJ/m³anno)	28,5		
Tot. (MJ/m³anno)	154		
Gas Consum. (m³)	15.437		
D.E.	**129 kW/m² anno**		

6. Determinatio of Payback period

Energy Cost +maintanance Before €	Energy Cost +maintanace after €	Savings €	Costs installation €	Payback (years)
19.500	11.500	8.000	70.000+tax	< 10

URBAN REQUALIFICATION PLAN

Compagnoni – Fenulli Area

THESSALONIKI

7/11/2006

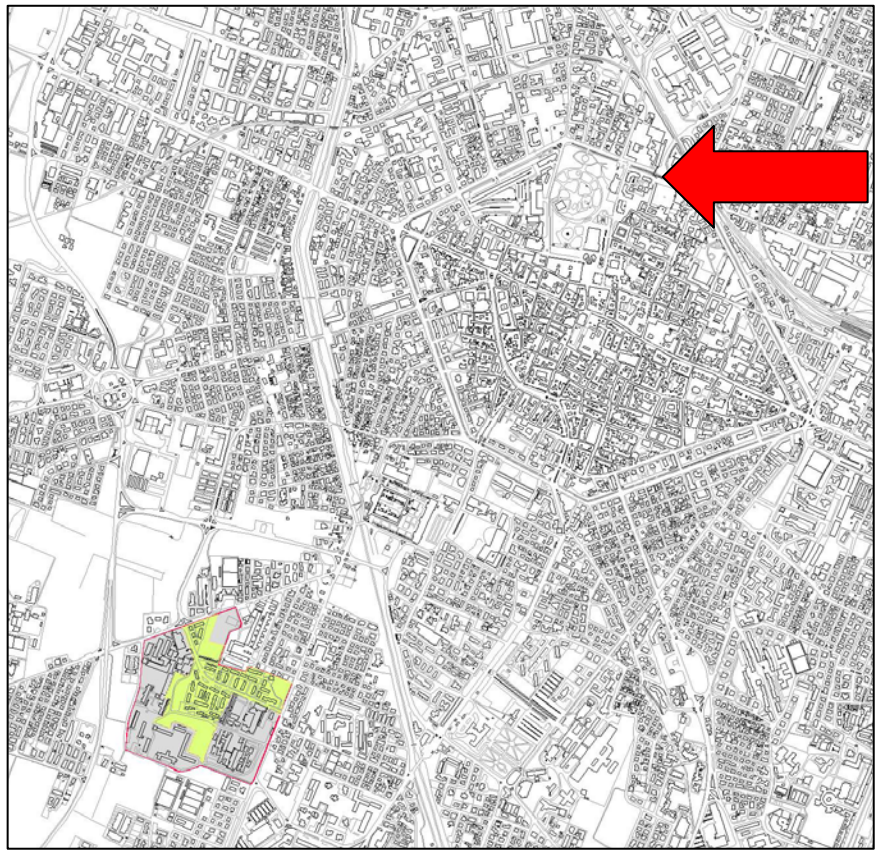
WHO WE ARE and WHAT WE DO

- 4156 dwellings (E.R.P.)
- 100 permanent tenancy
- 43 FINCASA's dwellings
- 42 dwellings for student

- 3883 Families
- 9060 tenants
- 1423 mononuclear families (36%)
- 618 extracomunitarian families (16%)

- ▶▶ buildings managements
- ▶▶ social mediation programs

ACER - WE ARE HERE



FROM 1955 TO 1965

538 DWELINGS

1500 RESIDENT

SOCIAL MEDIATION PROGRAM

- REGGIO EMILIA IS THE CITY WITH GREATER IMMIGRATION IN ITALY (13% OF TOTAL POPOLATION)

THE COMPAGNONI-FENULLI QUARTER IS A MEANINGFUL EXAMPLE OF URBAN AND SOCIAL REQUALIFICATION

- NO PARTECIPATION FROM THE STATE
- RIGID SYSTEM OF ALLOCATION
- OLD POPOLATION
- LACK OF SERVICES

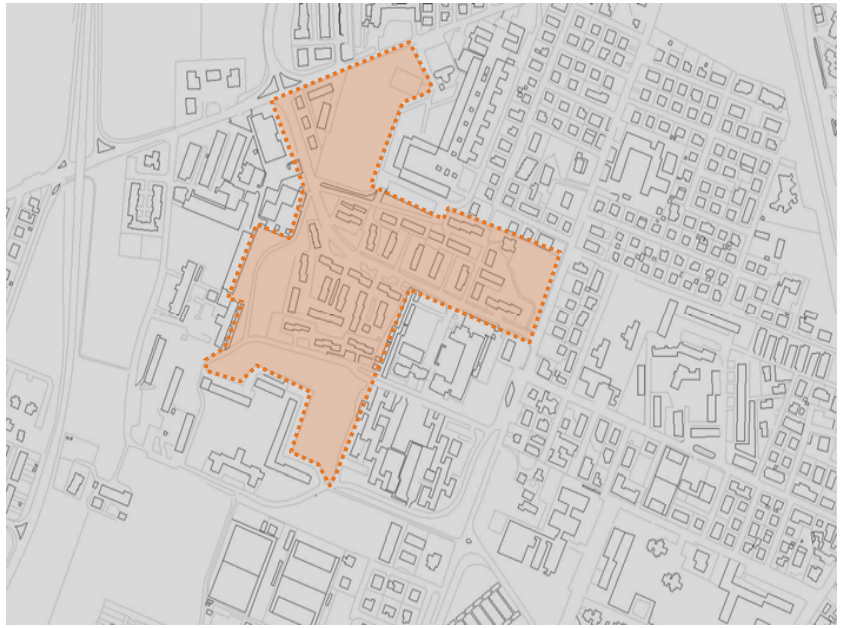
►► PROGRESSIVE DEGRADATION AND IDENTITY LACK OF THE QUARTER

ACER MAKES ACTIVE PROGRAMS OF SOCIAL MEDIATION

- OPEN QUARTER TO THE CITY
- AGGREGATION AREAS
- DIVERSIFIED ALLOCATION SYSTEM

FROM 1998 TO 2001

- REQUALIFY THE URBAN AREA
- SOCIAL REGENERATION
- IMPROVE HEALTH CONDITION AND SECURITY
- MORE SERVICES, MORE PUBLIC GREEN AREAS, MORE INFRASTRUCTURES



- REORGANIZATIONS OF THE PRATICTABILITY
- EVIRONMENTAL SOSTENIBILITY
- INFOPOINT IN THE DISTRICT

AGENDA 21

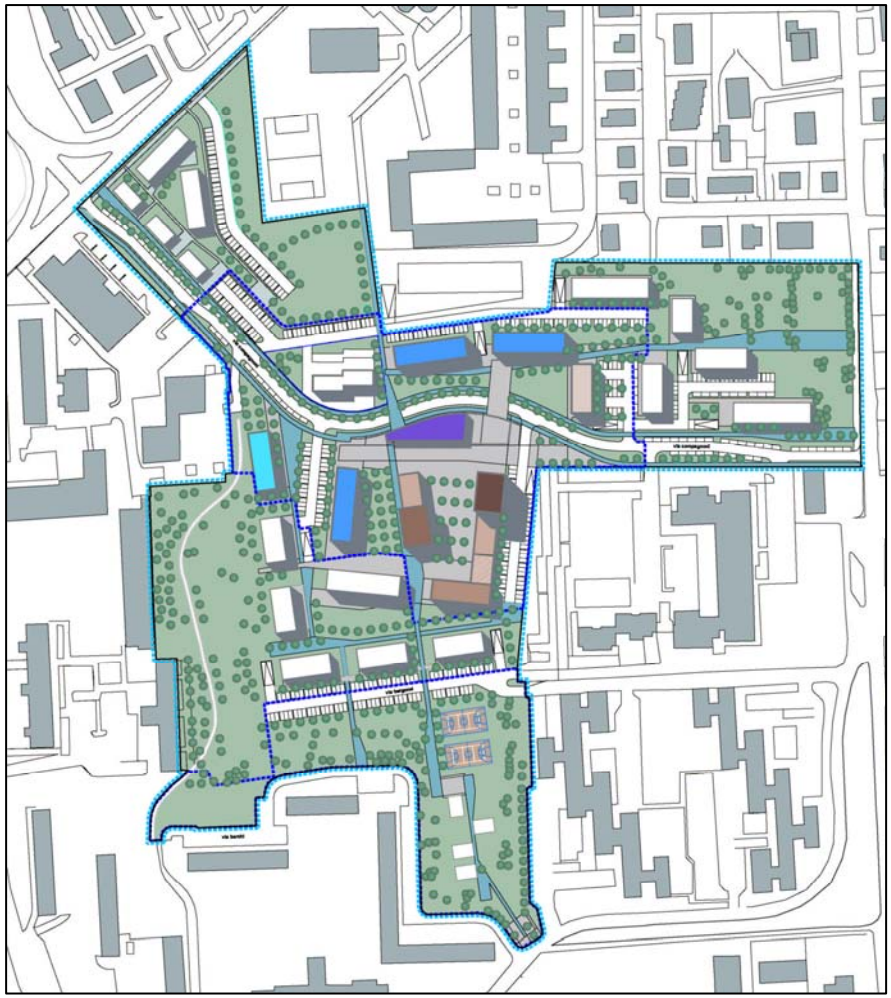
PUBLIC/PRIVATE PARTECIPATION

IN DECISION-MAKING

NEW WAY OF PARTECIPATION TO PLANNING

BETWEEN THE SUBJECTS THAT INHABITS AND LIVES THE QUARTER

FROM 1998 TO 2004



STATE OF ART

34 BUILDING

490 PUBLIC DWELLINGS

48 PRIVATE DWELLINGS

30 SOLD TO THE ASSIGNEES

385 FAMILIES

THE PLAN

28 BUILDINGS

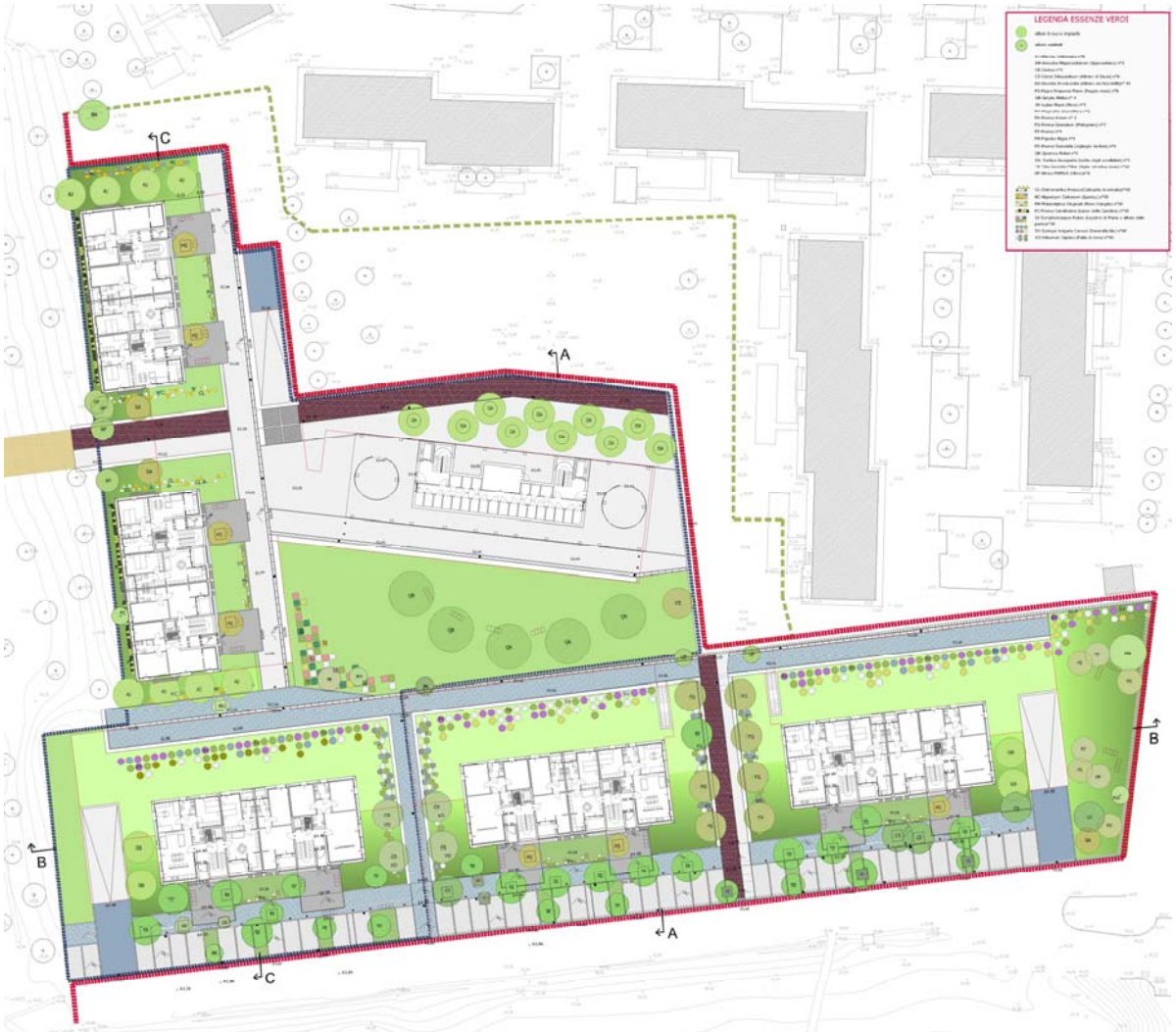
314 PUBLIC DWELLINGS

136 PIVATE DWELLINGS

TOTAL COST

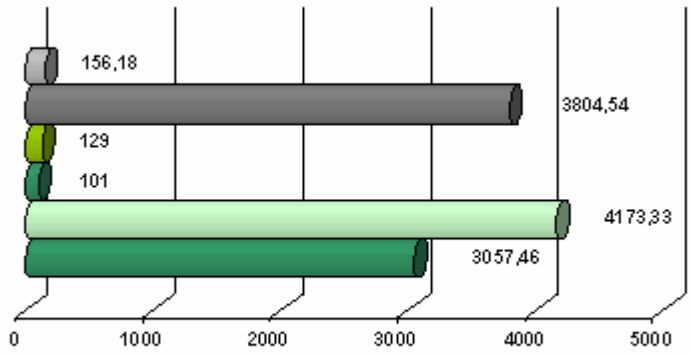
41.759.741,00 €

URBAN QUALITY

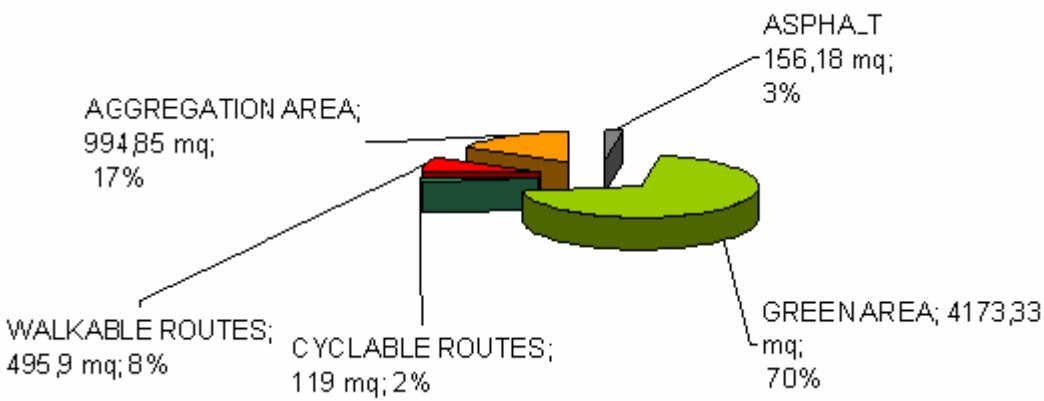


- **BUILT - NO BUILT INTEGRATION**
- **SUSTEINABLE MOBILITY**
- **MORE OPEN SPACES**
- **AGGREGATION AREAS**
- **GREEN AREAS**

ENVIRONMENTAL QUALITY

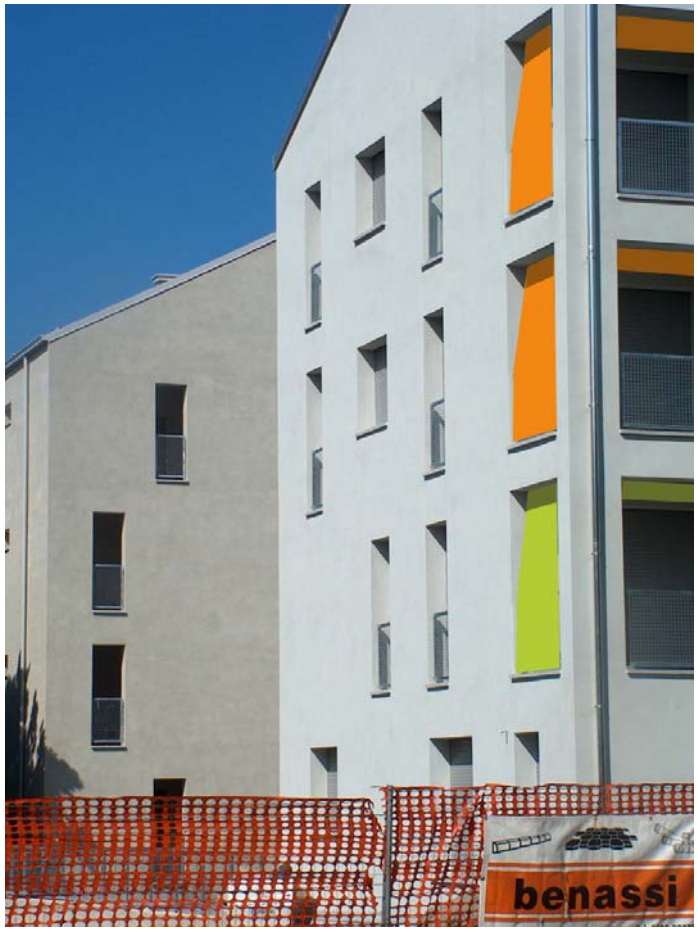


- % OF ASPHALTED AREAS AFTER REQUALIFICATION
- % OF ASPHALTED AREAS BEFORE REQUALIFICATION
- NO. OF TREES IN REQUALIFICATION PLAN
- NO. OF TREES BEFORE REQUALIFICATION
- SQUARE METERS OF GREEN AREA IN PLAN
- SQUARE METERS OF GREEN AREA BEFORE



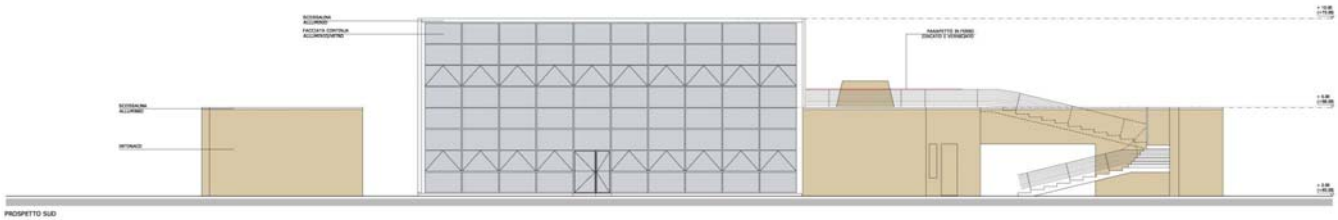
- ASPHALT
- GREEN AREA
- CYCLABLE ROUTES
- PEDESTRIAN ROUTES
- AGGREGATION AREA

BUILDINGS

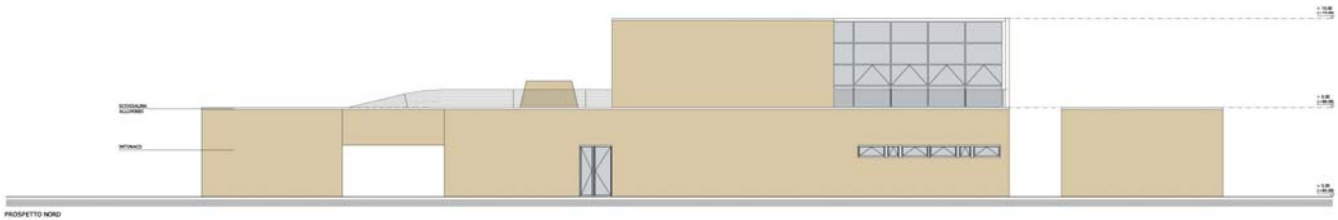


BUILDINGS

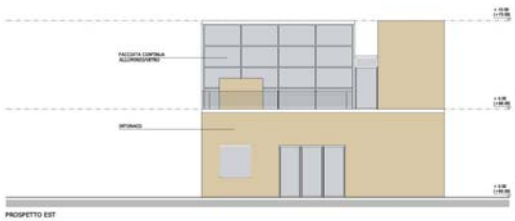
COLLECTIVE CENTER



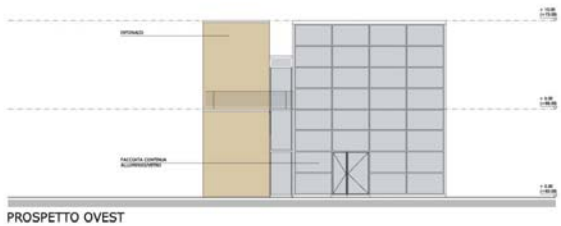
PROSPETTO SUD



PROSPETTO NORD



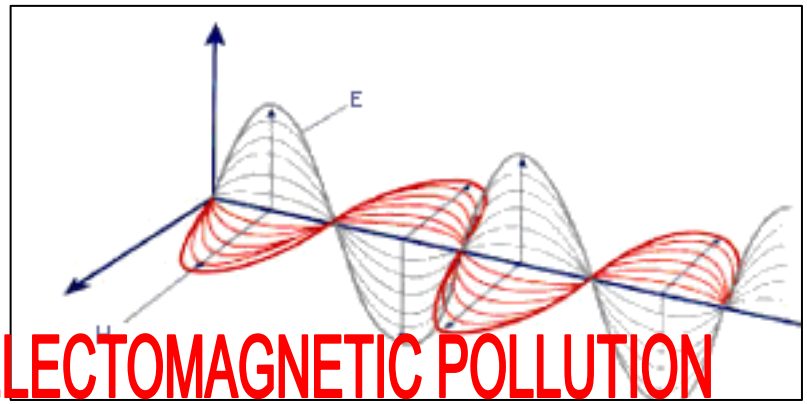
PROSPETTO EST



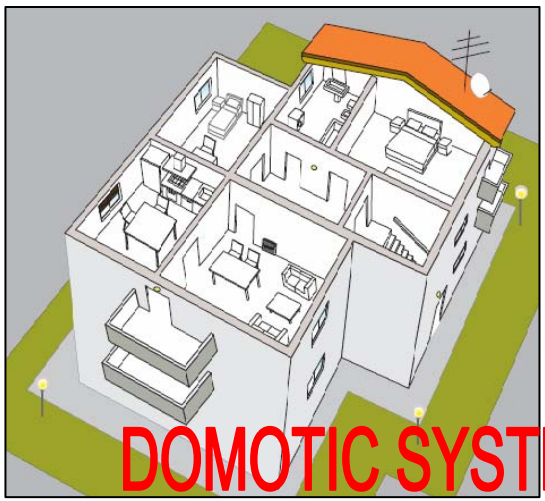
PROSPETTO OVEST

ENEVIRONMENTAL SOSTENIBILITY

WATER SAVING



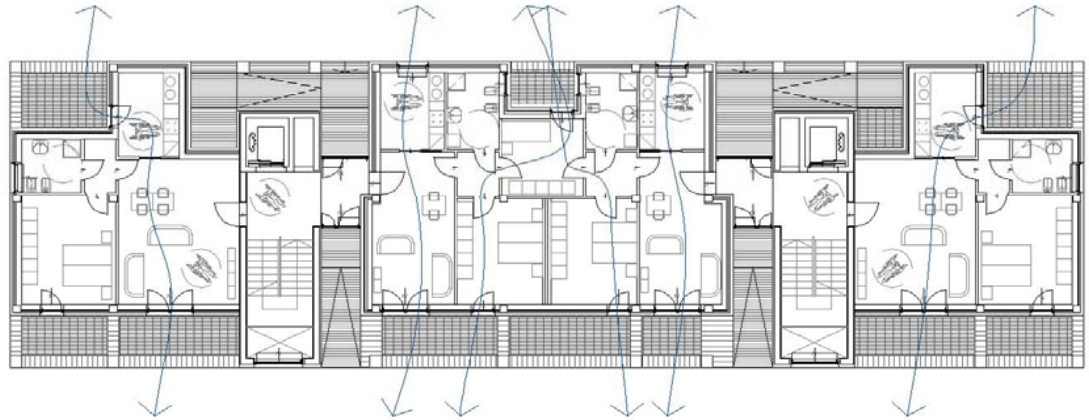
REDUCTION of ELECTOMAGNETIC POLLUTION

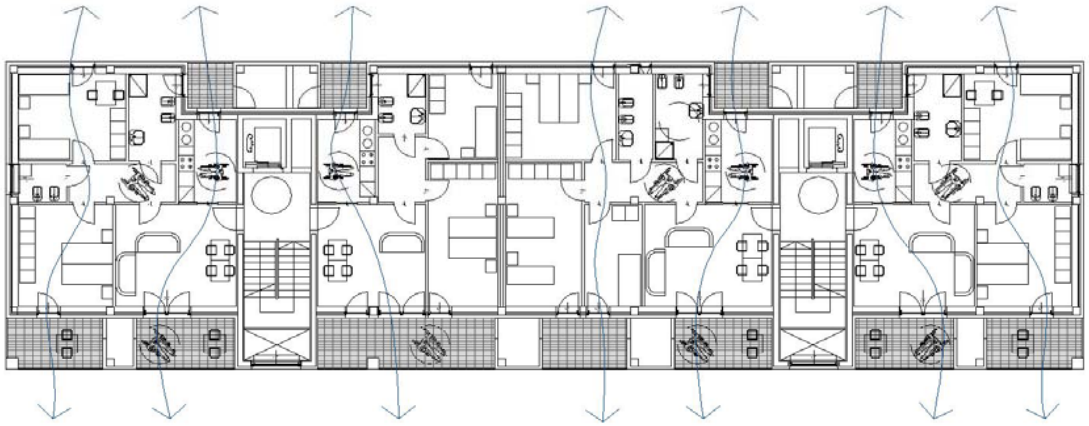


DOMOTIC SYSTEM

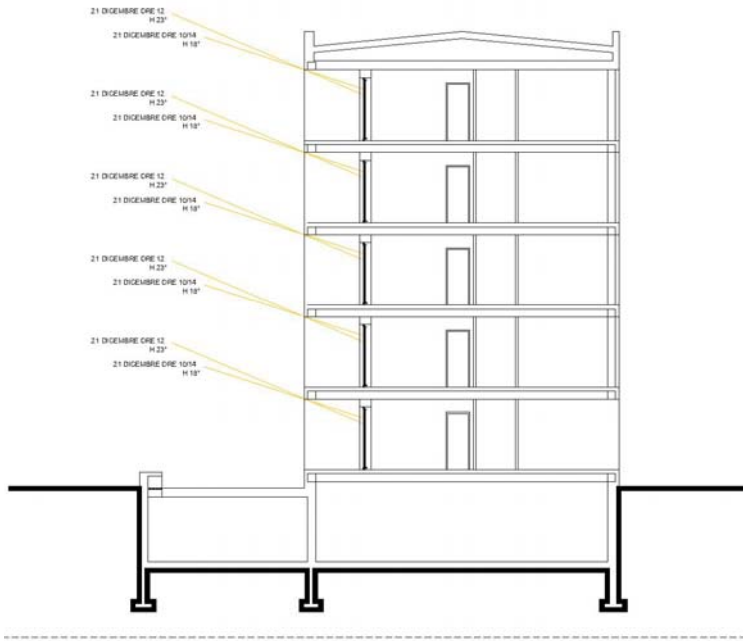
HEATING from PAVEMENT

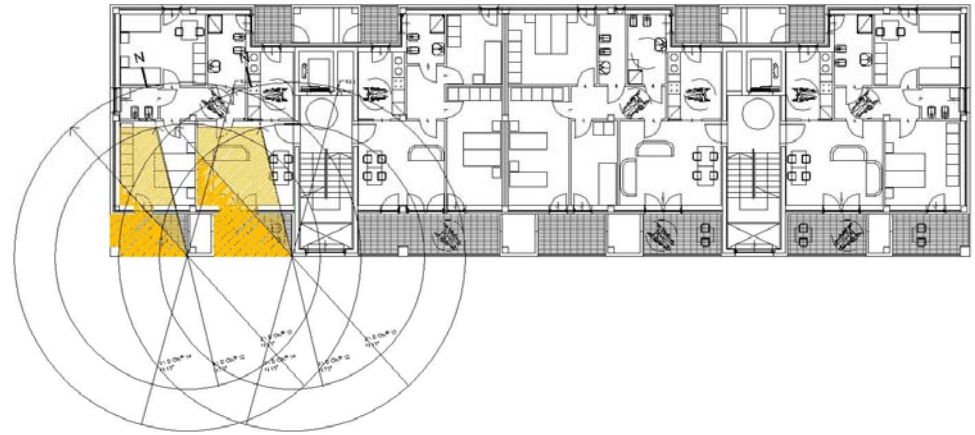
NATURAL SUMMER VENTILATION



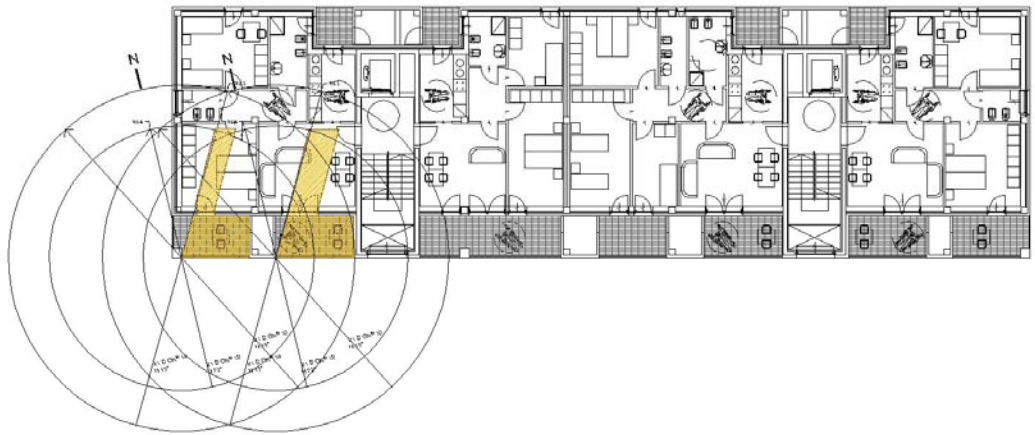


EXPOSURE TO THE SUN IN WINTER

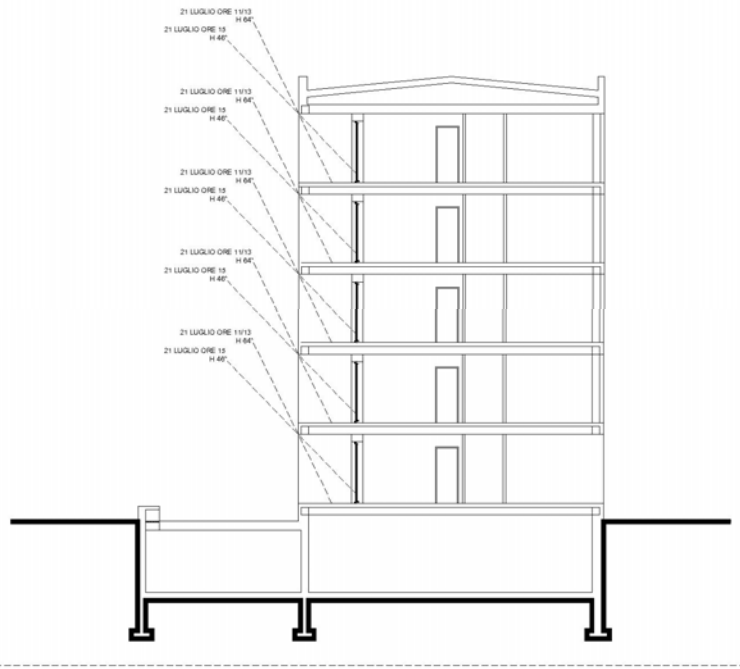


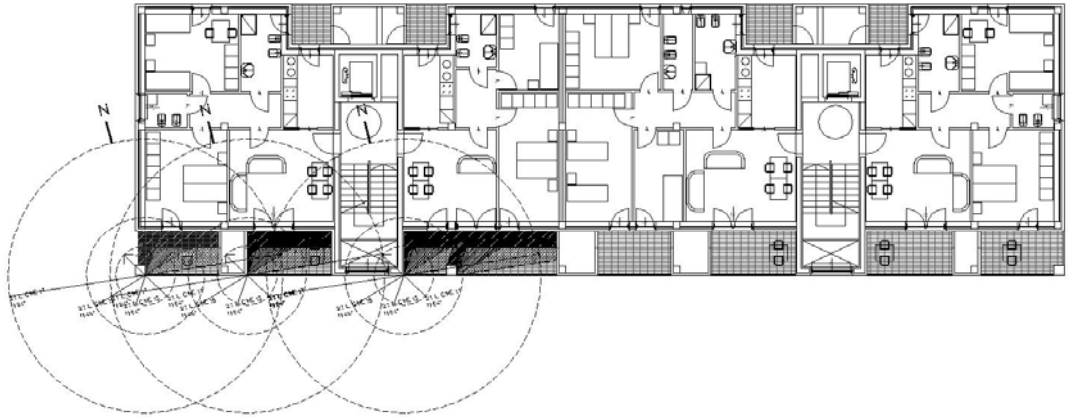


Piante tipo ERP 2b/2c

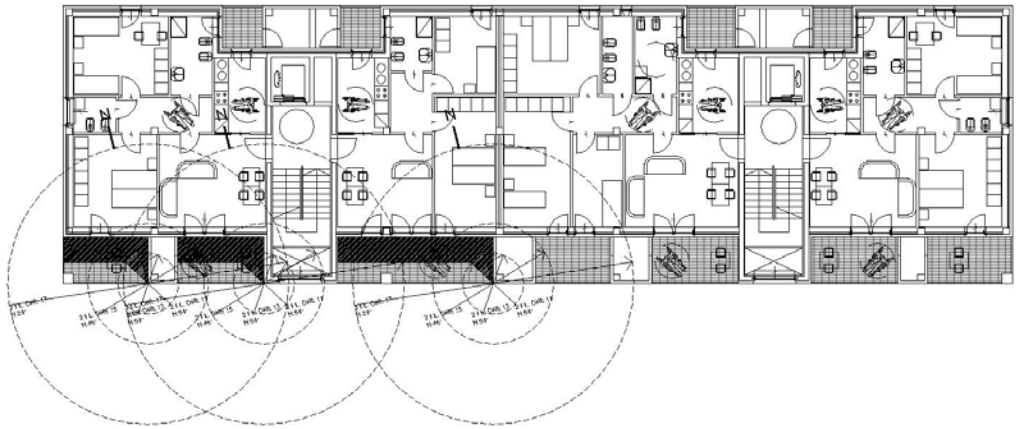


SHADING IN SUMMER

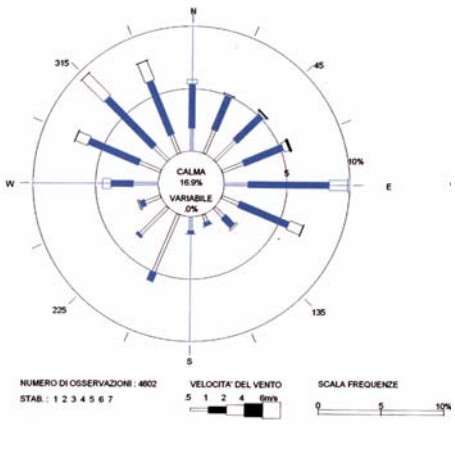


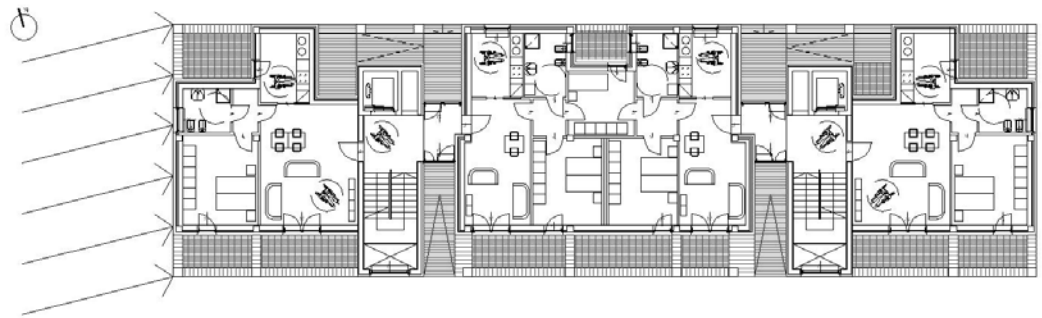


Piante tipo ERP 2b/2c

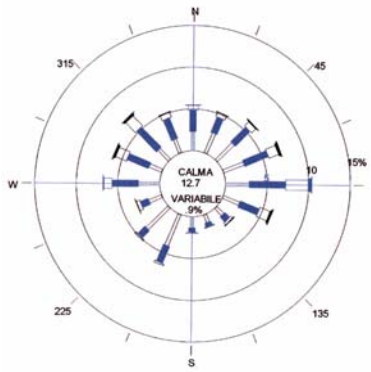


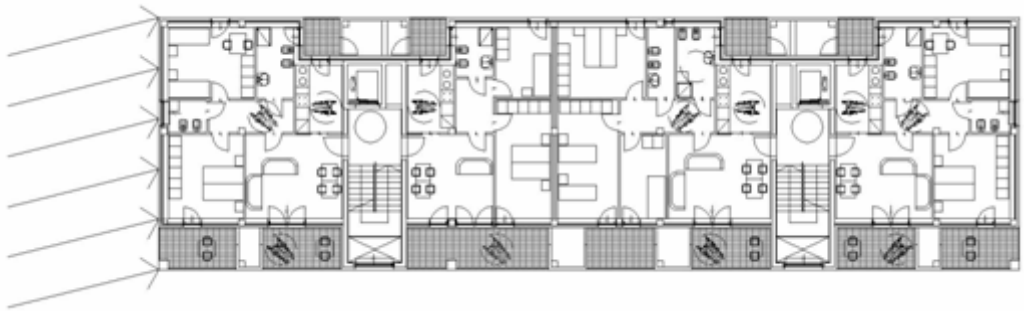
WINTER'S WIND



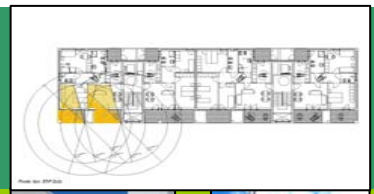
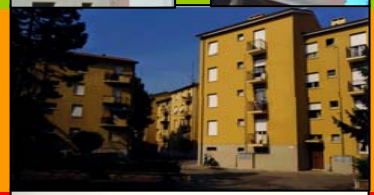


Piante tipo ERP2b/2c
indicazione della direzione prevalente dei venti invernali
(W, con velocità mai superiore ai 2.7 m/sec)





COMPARISON SYSTEM: ENVIRONMENTAL SOSTENIBILITY

BUILDING TECHNIQUES		CONSTRUCTION YEAR
EXPERIMENTAL		2005
CONVENTIONAL		2005
CONVENTIONAL		1985
CONVENTIONAL		1960

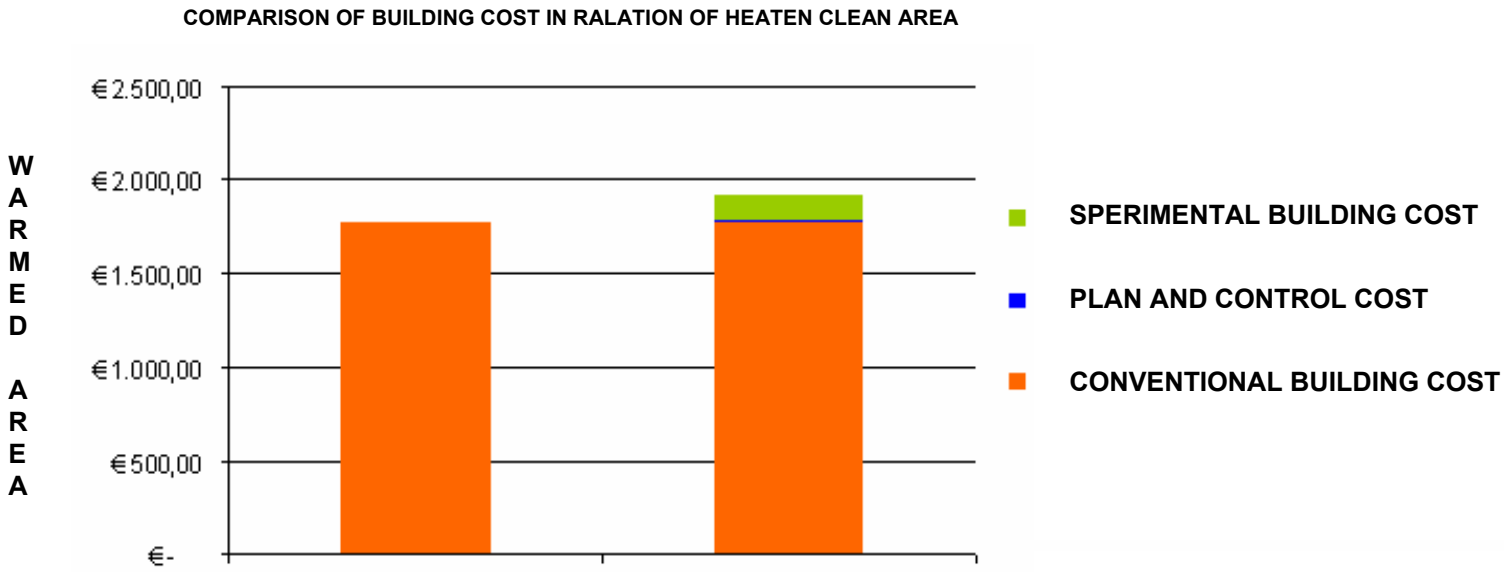
COMPARISON SYSTEM: ENVIRONMENTAL SOSTENIBILITY

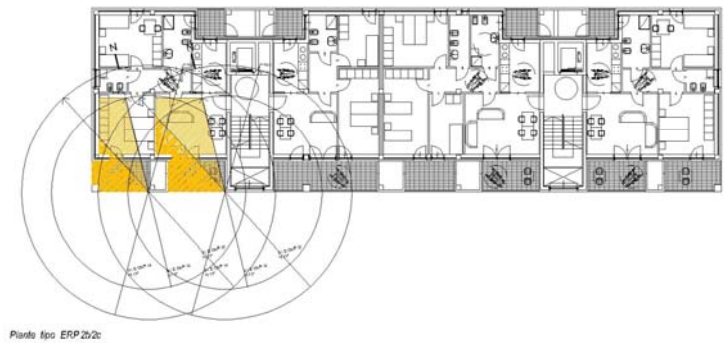
TELE-HEATING USE

BUILDING TYPE		kwh OF TELE-HEATING COST (YEAR 2003)	U.M.	NEED OF HEAT FOR SPECIFIC HEATING	U.M.	ENERGY CLASS	DWELLING	mq (MEDIUM VALUE)	LODGING ANNUAL COST 65 mq
EXPERIMENTAL (2005)		€ 0,0763	euro/kwh	29,73	kwh/mq a	A	20	70	€ 147,45
TRADITIONAL (2005)				70,33		C	16	57	€ 348,80
TRADITIONAL (1985)				124,81		F	24	39	€ 619,00
TRADITIONAL (1960)				153,34		G	24	39	€ 760,49

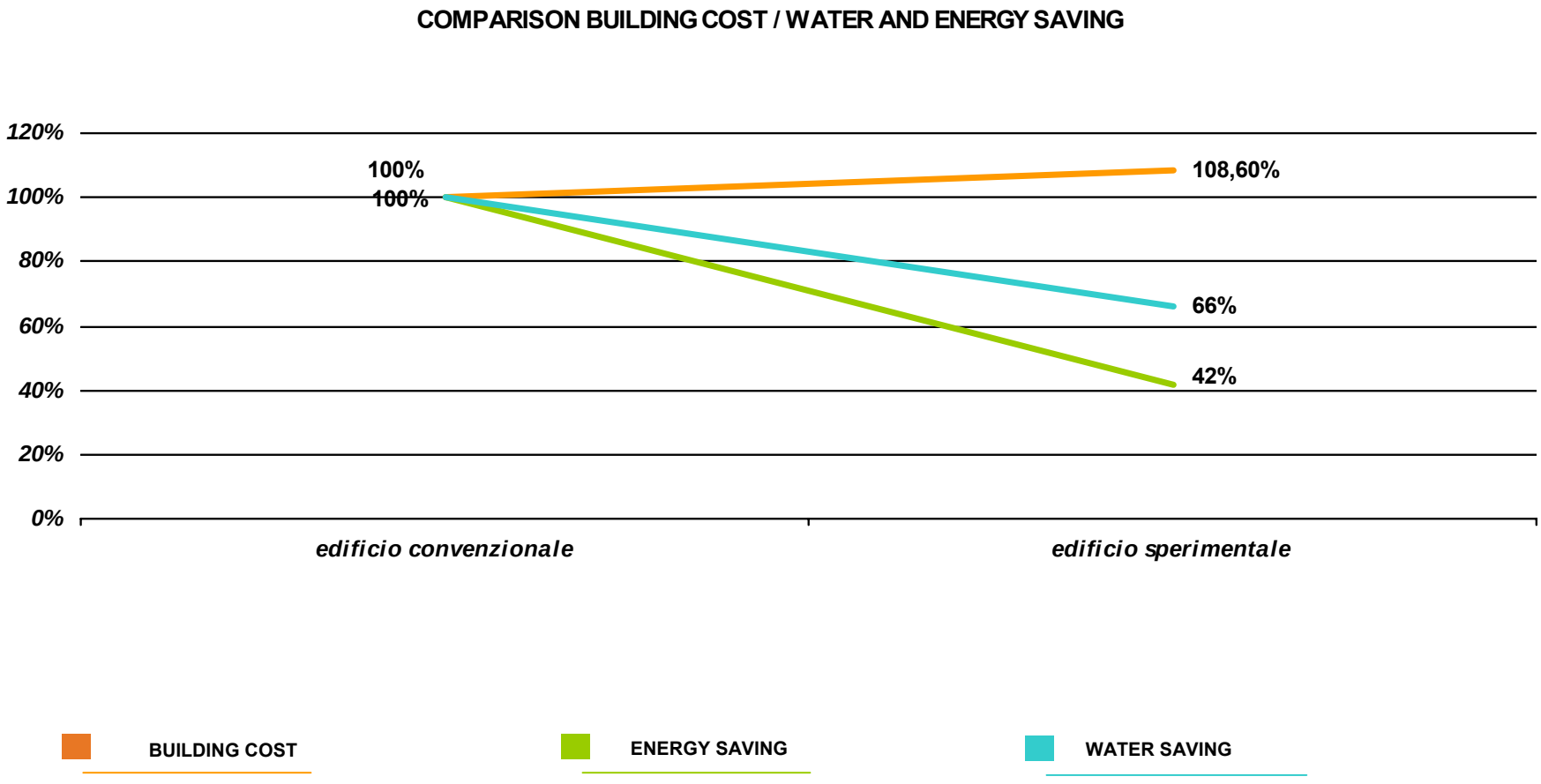
** rif. Casaclima localizzazione Reggio Emilia*

COMPARISON SYSTEM: ENVIRONMENTAL SOSTENIBILITY





COMPARISON SYSTEM: ENVIRONMENTAL SOSTENIBILITY



ENERGY CERTIFICATION

fep ≤ 15%

fep ≤ 30%

fep ≤ 50%

fep ≤ 70%

fep ≤ 100%

ECOABITA
LA CASA ECOLOGICA E CONVENIENTE

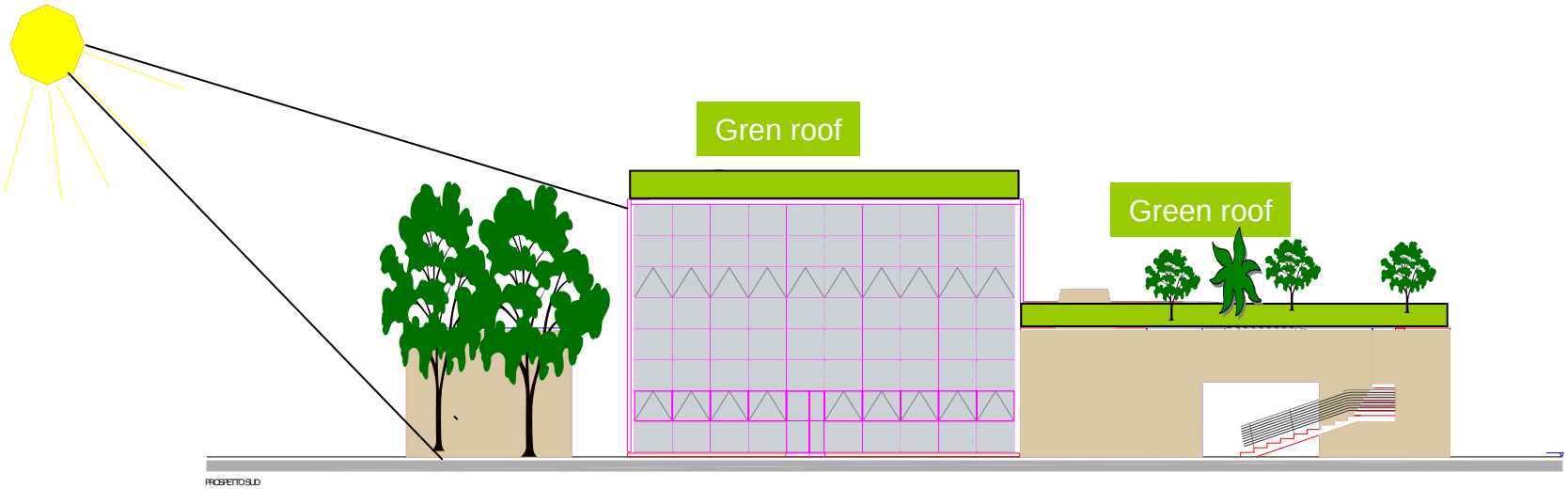
F.E.P.

ANNUAL ENERGY REQUIREMENT FOR WINTER HEATING FOR MQ OF SURFACE

COMPAGNONI – FENULLI DISTRICT

RETROFITTING OF COLLECTIVE CENTER

Building



Facade U_F = 1,4 W/mq°C
glass shading factor 0.25

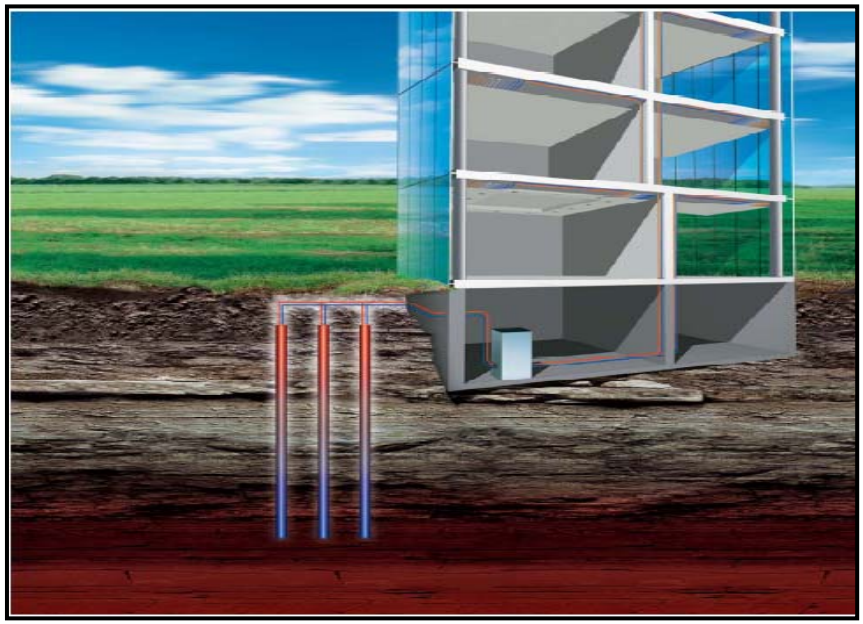
HVAC system

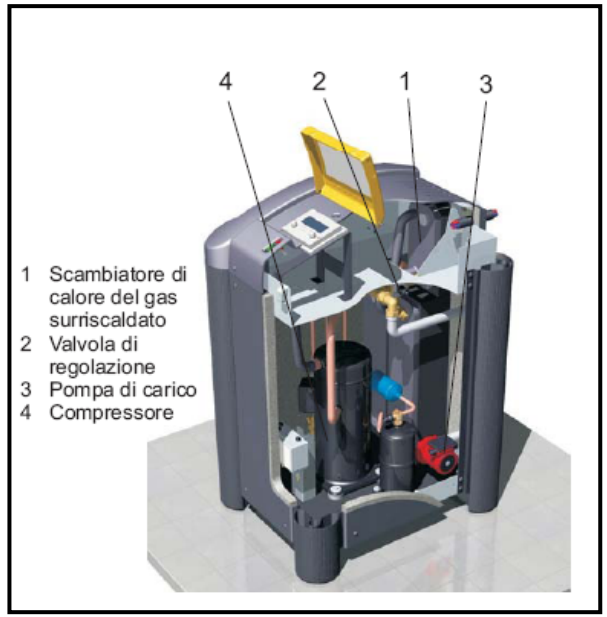
- Application of new technologies for Energy Saving (State of Art)
  - Geothermal Heat Pump (energy saving 50%)
  - Direct-cooling (deep probe) (energy saving 90%)
  - Soft cooling soft heating, (Ray conditioning) (energy saving 30%)
  - Heat recovery for ventilation air (energy saving: winter 78%, summer 30%)
  - Displacement ventilation (energy saving: 30%)

GHP

•**Geothermic Heat pump (GHP)** with deep probe

• COP (coefficient of perfomance) > 4,5





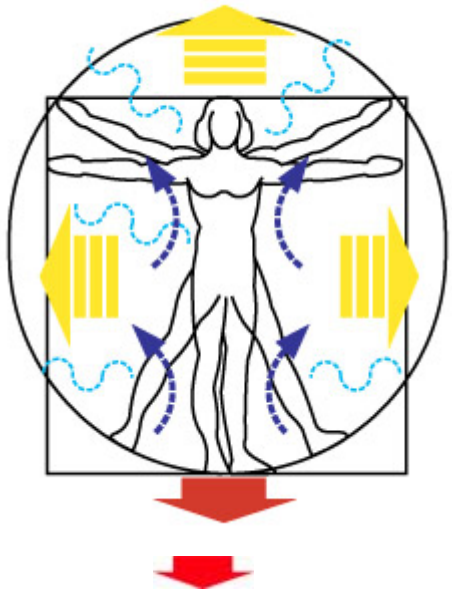
COMFORT

Comfort is the balance condition of the human body when it manages to give out its metabolic heat in the right proportions through the four ways of thermic exchange uniformly. These proportions depend, in importance order on:

- *Surfaces temperature*
- *Air temperature*
- *Relative humidity*

EVAPORATION

It depends on the pysical activity, the inner surfaces temperature and the air one.



RADIATION

It depends on the around surfaces temperatures.

CONVECTION

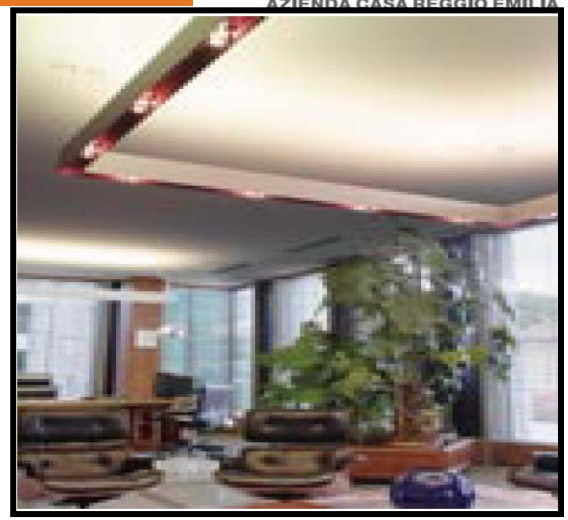
It depends on the temperature and the speed of the air.

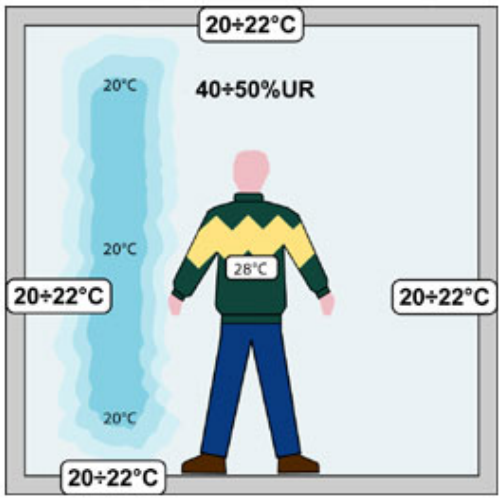
	Fan Coil	Ray conditioning
E	35%	30%
R	55%	30%
C	1%	1%
C	9%	39%

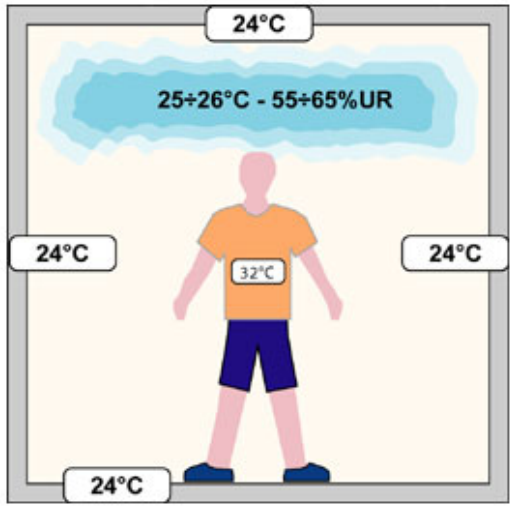
CONDUCTION

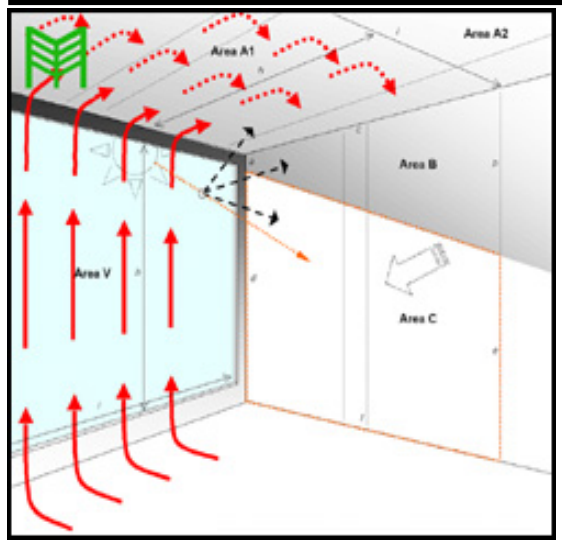
It depends on the surfaces temperature we feel

- Ray conditioning (soft cooling-heating)
- Comfort
- Efficiency
- Energy saving

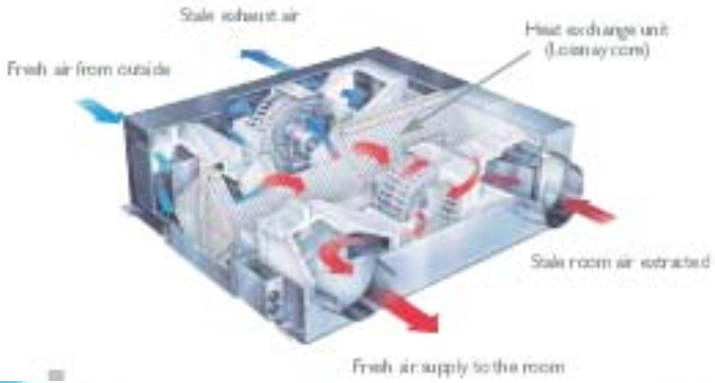






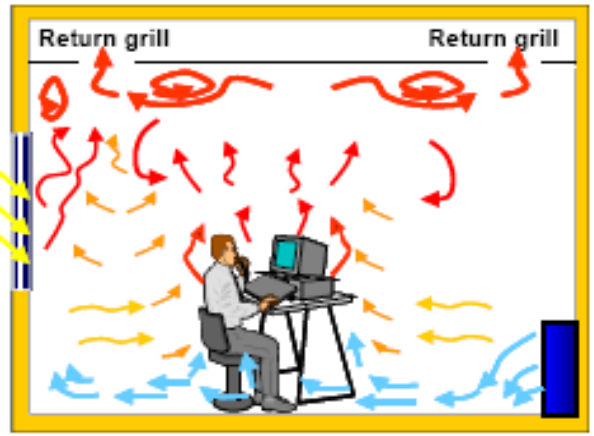


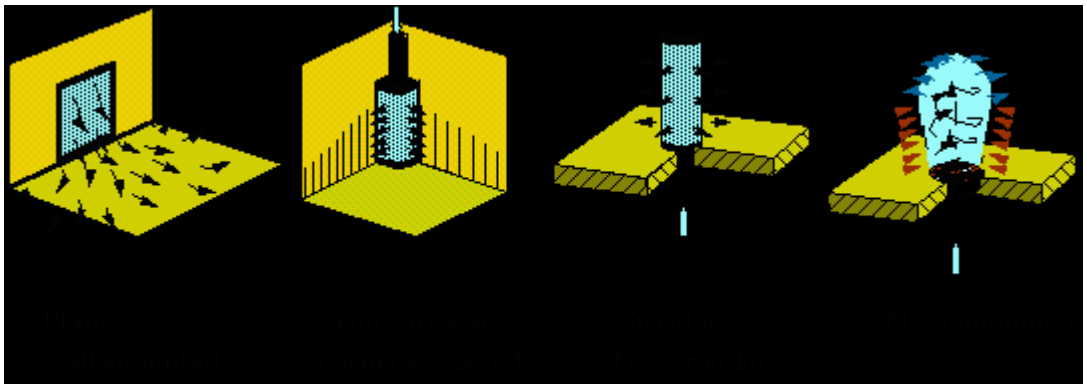
HEAT RECOVERY

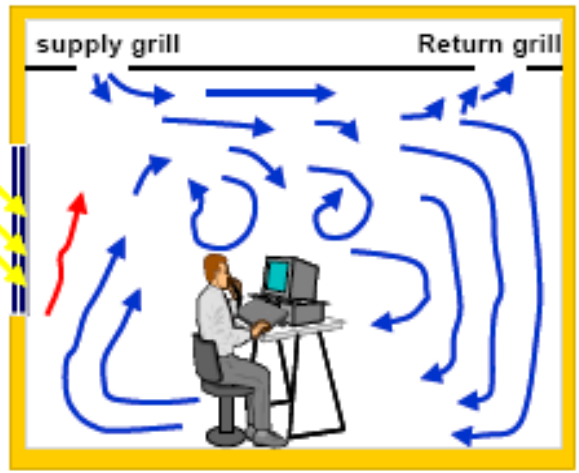


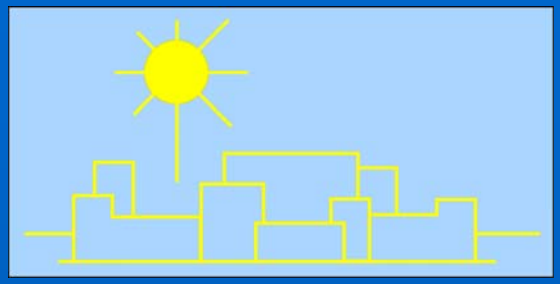
Displacement ventilation

Figure 9 Typical perforated plate wall diffuser









Worker's Housing Organization (OEK)
SOLAR VILLAGE

Retrofitting, Renovation and Optimization of the Solar Village Energy Systems Efficiency

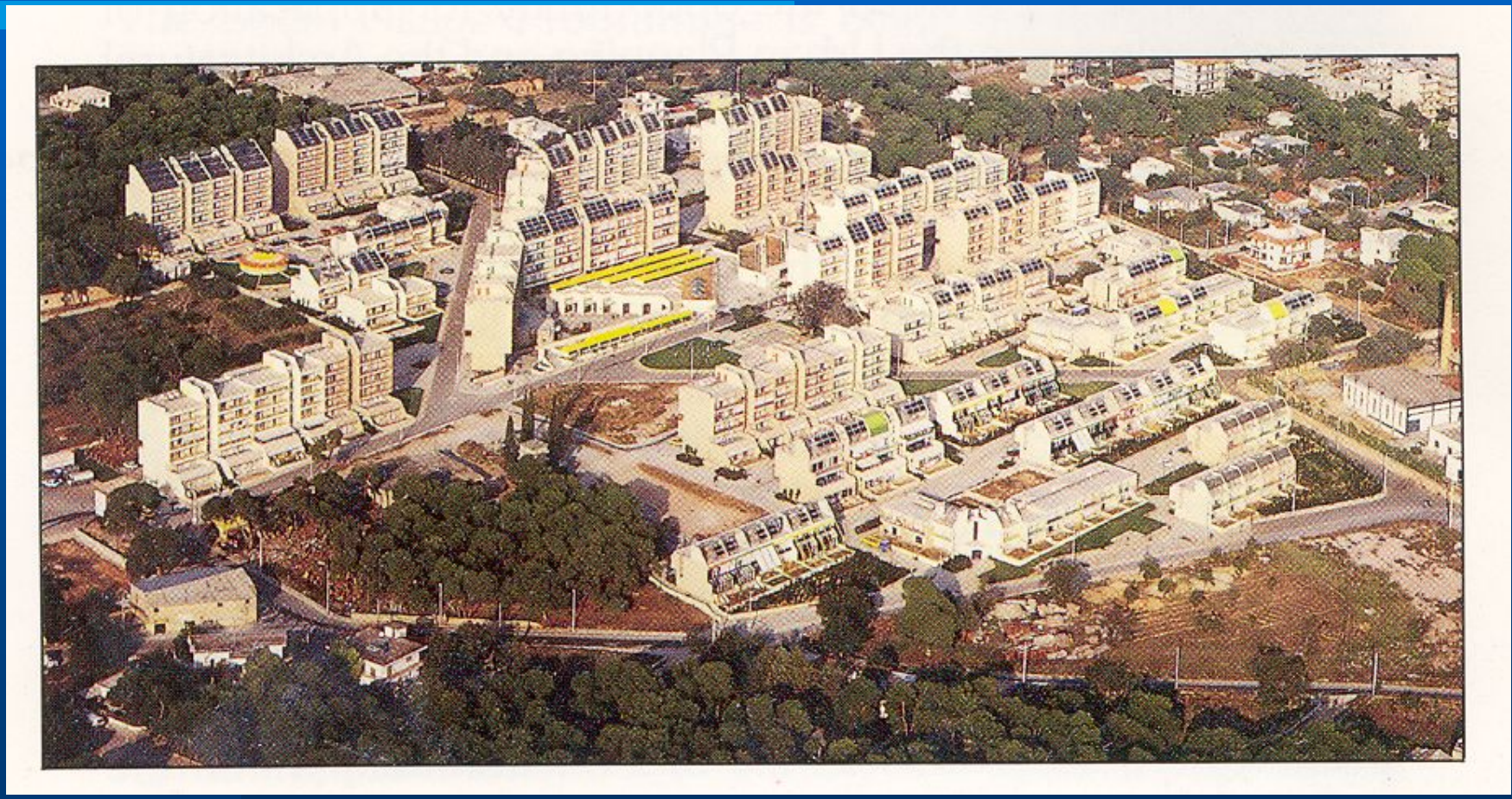
Nicholas Davliakos

Dipl. Mechanical & Electrical Eng.

Motivation

- Large use of RES in Greece.
- Why Renovation of Solar Village?
- Problems: Difficulties in giving property documents.

Solar Village (SV), Pefki Attica



Contents

1. Solar Village Project.
2. SV: A Sociological Approach.
3. Characteristics of SV.
4. Description of the SV Energy Regions.
5. SV Project Financing.
6. Property Documents.
7. Intended Renovation Works.
8. Conclusions.

Solar Village Project

- SV, an OEK settlement in Pefki, a suburb of Athens.
- Agreement on Scientific & Technical Cooperation: Greece - Germany.
- Program phases:

  (a) Design & Construction: August 1984 – June 1988.

  (b) Measuring & Evaluation: July 1988 – December 1991.
- Aiming: Rational use of Energy with increased application of Solar Thermal Technology.
- Experimental, Researchable & Demonstrative character of Project.

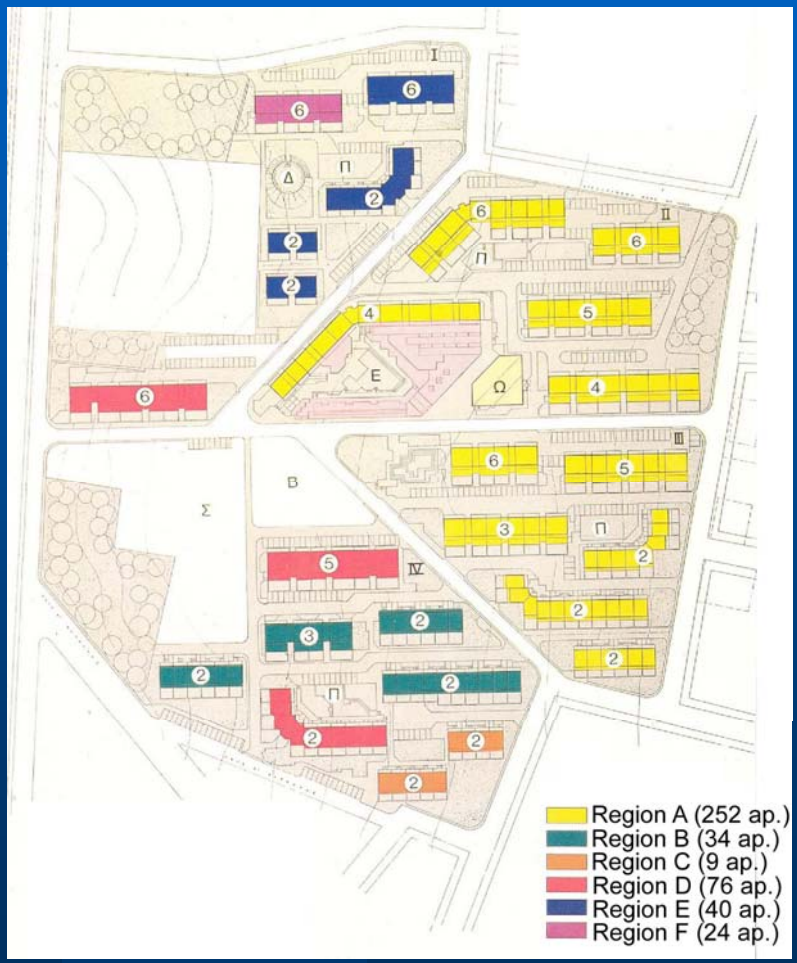
A Sociological Approach

- Assistance of the SV inhabitation.
- Degree of acceptance of the applied systems.
- Rational use of energy by the SV inhabitants.
- Quality of social life & environment in the community.

Characteristics of SV

- Site Total Area…….. 90,440 m^2.
- Building Area…….. 47,798 m^2.
- Utilities & Landscaping Area……... 35,740 m^2.
- Community Area…… 6,902 m^2.
- Number of Apartments (60-100 m^2)…… 435.
- Apartments Effective Area…… 33,130 m^2.
- Apartments Buildings (multi storied)……25.
- Energy Center……1 Building.
- Community Center…… 3 Buildings.
- Year of the inhabitation beginning……...1989.

Description of the SV Energy Regions



6 Energy Regions:

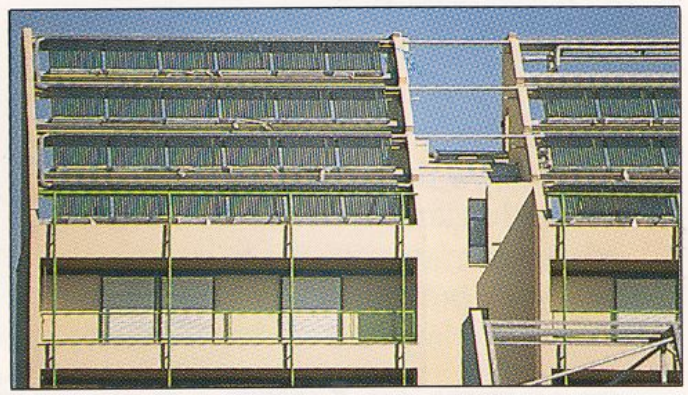
- **Region A** (11 b., 252 ap.): District-Heating Underground Network.
- **Region B** (4 b., 34 ap.): Passive Houses.
- **Region C** (2 b., 9 ap.): Autonomous Air Solar Collectors (SH & DHW).
- **Region D** (3 b., 76 ap.): Heat Pumps Air-to-Water (SH & DHW).
- **Region E** (4 b., 40 ap.)
- **Region F** (1 b., 24 ap.): Interseasonal Storage Tank (SH & DHW).

Description of the SV Energy Regions

Description of the SV Energy Regions

Glasshouse and Trombe Wall

Description of the SV Energy Regions



Heat Pipe Collectors

Interseasonal Storage of UFA

Description of the SV Energy Regions

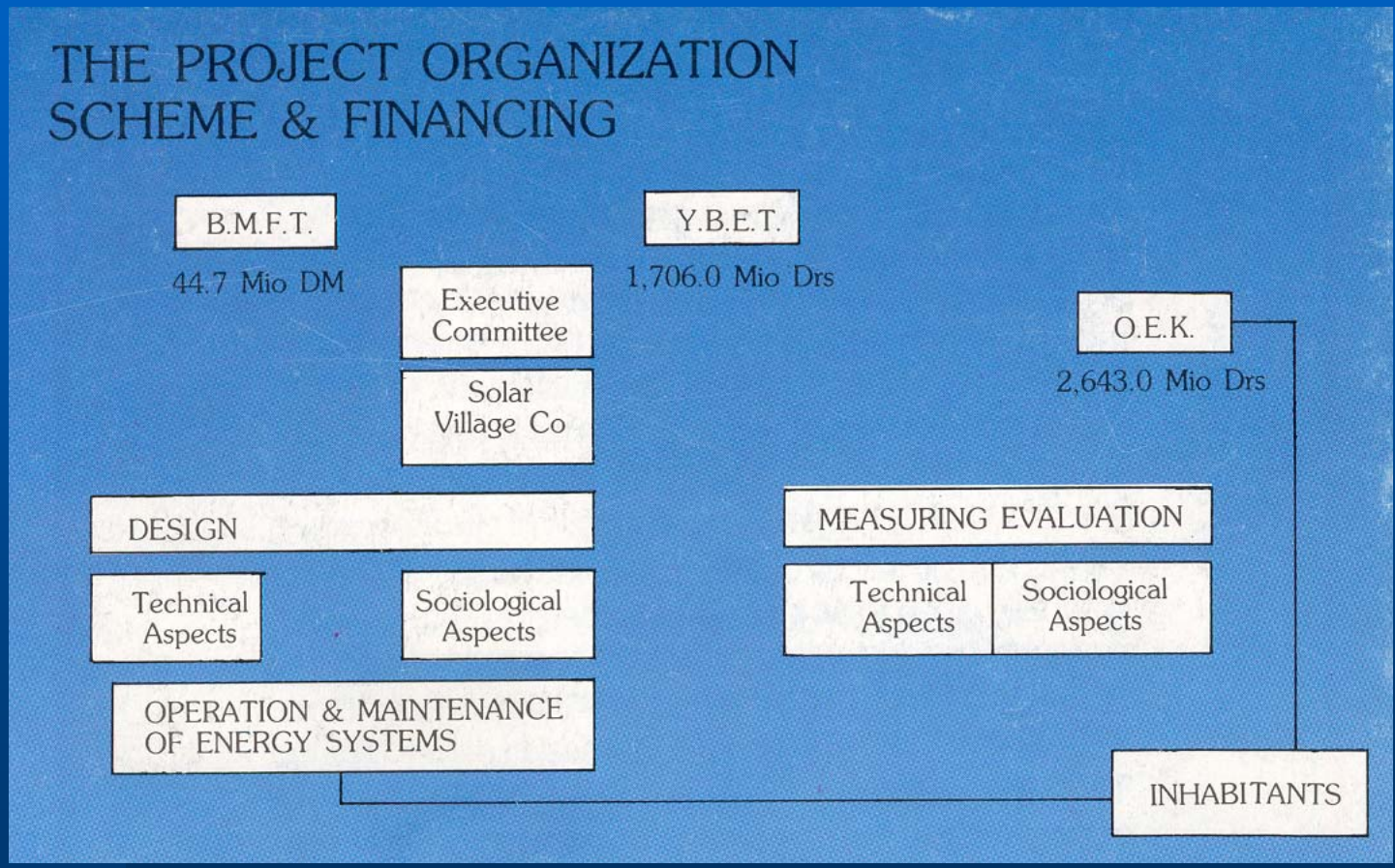
OEK
SOLAR VILLAGE/PEFKI, ATTICA

TECHNICAL DATA OF ENERGY SYSTEMS AND BUILDINGS

No	REGION	NAME OF BUILDING	NUMBER OF FLATS	FLAT EFF. AREA (m^2)	NUMBER OF INHABITANTS	SOLAR COLLECTORS (CENTRAL SYSTEMS) TYPE	INCLINATION (^{0})	AREA (m^2)	CONSTRUCTOR	USERS NEED	ENERGY TRANSFER FOR SH	WATER TEMPERATURE FEED/ RETURN (^{0}C)	HEAT DEMAND FOR SH (kW)	BOILER POWER (kW)	CONSUMPTION OF DHW PER DAY (Theor.) (m^3/day)	ENERGY DEMAND PER DAY (kWh/day)	REMARKS
1		UAA	41	2.750	152	VACUUM	50	98	CORNING	DHW	Radiators	67/47	113,50		7,60	266	District Heating
2		UAB	24	1.700	91	VACUUM	50	54	CORNING	DHW	Radiators	67/48	74,40		4,55	159	District Heating
3		UAC	40	2.960	154	FLAT PLATE	50	128	BP - CALPAK	DHW	Radiators	67/49	124,80		7,70	269	District Heating
4		UAD	26	1.770	97	VACUUM	50	63	CORNING	DHW	Radiators	67/50	79,00		4,85	170	District Heating
5		UAE	24	1.920	96	FLAT PLATE	50	72	CALPAK CICERO	DHW	Radiators	67/51	83,60		4,80	168	District Heating
6	A	UAF	24	1.700	91	FLAT PLATE	50	72	CALPAK CICERO	DHW	Radiators	67/52	74,40		4,55	159	District Heating
7		UAG	30	2.030	112	FLAT PLATE	50	81	CALPAK CICERO	DHW	Radiators	67/53	89,70		5,60	196	District Heating
8		UAH	18	1.230	68	FLAT PLATE	50	51	CALPAK CICERO	DHW	Radiators	67/54	56,90		3,40	119	District Heating
9		UAJ	8	800	40	FLAT PLATE	50	30	CALPAK CICERO	DHW	Fan Coil Un.	55	36,30		2,00	70	District Heating
10		UAK	11	1.100	55	FLAT PLATE	50	40	CALPAK CICERO	DHW	Fan Coil Un.	55	49,70		2,75	96	District Heating
11		UAL	6	600	30	FLAT PLATE	50	23	CALPAK CICERO	DHW	Fan Coil Un.	55	27,00		1,50	52	District Heating
12	G	Total:	252	18.560	986			712		SH			809,30	1.335,00			
13		UBA	6	600	30	FLAT PLATE	50	24	CALPAK CICERO	DHW	Passive						Autonomous thermosyphon
14	B	UBB	12	840	45	FLAT PLATE	50	33	CALPAK CICERO	DHW	Passive				2,25	79	Central System
15		UBC	6	600	30	FLAT PLATE	50	24	CALPAK CICERO	DHW	Passive						Auton. Thermosyphon, 4 m²
16		UBD	10	1.000	50	FLAT PLATE	50	40	CALPAK CICERO	DHW	Passive						Auton. Thermosyphon, 4 m²
17	C	UCA	4	400	20	AIR COLLECT	50	44		DHW+SH	Air ducts	35/26					Auton. air collector, 11 m²
18		UCB	5	500	25	AIR COLLECT	50	55		DHW+SH	Air ducts	35/26					Auton. air collector, 11 m²
19		UDA	36	2.660	139	HP				DHW+SH	Radiators	60/46	114,50	120,00	6,95	243	Heat Pumps electr. Driven (Out of order)
20	D	UDB	30	2.130	114	HP				DHW+SH	Radiators	60/46	93,50	120,00	5,70	199	
21		UDC	10	1.000	50	HP				DHW+SH	Fan Coil Un.	45/37	45,10	45,36	2,50	87	
22		UEA	24	1.700	91	FLAT PLATE	38	94	CORNING	DHW+SH	Floor Heating	32/28	74,30	85,00	4,55	159	Initialy vacuum collectors
23		UEB	8	800	40	FLAT PLATE	50	52	BP - CALPAK	DHW+SH	Fan Coil Un.	32/28	36,30	35,00	2,00	70	
24+25	E	UEC/D	8	640	32	FLAT PLATE	38	40	25% SIEMENS, 25% STIEBEL ELTRON, 50%SET	DHW+SH	Floor Heating	32/28	29,80	34,00	1,6	56	
26	F	UFA	24	1.700	91	VACUUM	50	168	PHILIPS	DHW+SH	Floor Heating	32/28	74,30	119,15	4,55	159	Interseasonal Storage Tank
TOTAL			435	33.130	1.743			1.286					1.277,10	1.893,51	79,40	2.776,00	

ABBREVIATIONS : **DHW:** Domestic Hot Water **SH:** Space Heating **IST:** Interseasonal Storage Tank **HP:** Heat Pump

SV Project Financing



Property Documents

- Difficulties in giving the final properties documents to the beneficiaries of OEK.
- Demand of the inhabitants: cheaper energy & more simplified energy systems.
- The Renovation works of the energy systems of the SV is unique solution.

Intended Renovation Works

- Replacement of solar collectors.
- Substitution of the heat pumps of Region D by central solar systems.
- Substitution of oil by natural gas.
- Installation of a new IST for Regions B & C.
- New global automation control system (BMS).
- Extended maintenance/ repair of all Energy systems.
- Improvement works of the buildings waterproof installation.

Conclusions

- **Simplification of all energy system installations.**
- **Improvement of energy system efficiency.**
- **Significant decrease of the conventional fuel consumption.**
- **Minimization of gas pollution.**
- **Minimization of operation & maintenance cost.**
- **OEK vests property documents to the SV inhabitants.**
- **Quality ameliorating of SV inhabitants life.**

ΜΕΛΕΤΗΤΙΚΗ ΟΜΑΔΑ

ΓΙΩΡΓΟΣ ΑΝΔΡΕΑΔΗΣ & Συνεργάτες Ο.Ε.: Ειδικές αρχιτεκτονικές μελέτες
Κυριάκος Γιαννόπουλος, Κυβέλη Μπότσογλου, Πολύνα Τορτοπίδη
ΠΑΥΛΟΣ ΚΡΕΜΕΖΗΣ : Στατικός
Κ.Α.Π.Ε. : Ειδικοί σε θέματα ενεργειακού σχεδιασμού
ΓΙΩΡΓΟΣ ΔΙΑΜΑΝΤΟΥΡΟΣ : Μηχανολόγος
ΑΝΝΑ ΜΠΑΧΑΡΟΠΟΥΛΟΥ :Κοινωνιολόγος
ΜΙΧΑΛΗΣ ΚΑΝΤΑΡΤΖΗΣ :Ειδικός σε θέματα Αστικού Σχεδιασμού

«ΣΧΗΜΑ Ε.Ε.» Κ.ΖΩΗΣ - Ι.ΔΗΜΗΤΡΑΚΟΠΟΥΛΟΣ: Πολεοδομικές μελέτες
ΚΩΝΣΤΑΝΤΙΝΟΣ ΠΑΤΙΛΟΚΩΣΤΟΠΟΥΛΟΣ: Τοπογραφικές μελέτες - Ειδικός σύμβουλος στη δημιουργία ψηφιακών υποβάθρων από Φωτογραμμετρικά υπόβαθρα και στη δημιουργία βάσης Γεωγραφικών Συστημάτων Πληροφοριών.
ΙΩΑΝΝΗΣ ΔΗΜΗΤΡΑΚΟΠΟΥΛΟΣ : Συγκοινωνιολόγος
ΧΡΗΣΤΟΣ ΠΕΤΡΟΠΟΥΛΟΣ : Περιβαλλοντολόγος

ΕΠΙΧΕΙΡΗΣΙΑΚΟ ΠΡΟΓΡΑΜΜΑ «ΠΕΡΙΒΑΛΛΟΝ» 2000-2006
στον άξονα προτεραιότητας 7 ΧΩΡΟΤΑΞΙΑ-ΠΟΛΕΟΔΟΜΙΑ-ΑΝΑΠΛΑΣΕΙΣ
μέτρο 7.1 ΧΩΡΟΤΑΞΙΑ-ΠΟΛΕΟΔΟΜΙΑ με κωδικό ΟΠΣ 84628
Το έργο συνχρηματοδοτείται σε ποσοστό 75% από το Ευρωπαικό Ταμείο Περιφερειακής Ανάπτυξης (ΕΤΠΑ).

Ανάπλαση του συγκροτήματος των εργατικών πολυκατοικιών -

μια νησίδα αμιγούς κατοικίας,

στο επίκεντρο μιας ζώνης

ευρύτερων ανακατατάξεων και μετασχηματισμών

“Αναπλάσεις με επίκεντρο το συγκρότημα των εργατικών πολυκατοικιών της Πολεοδομικής Ενότητας 7 του Δήμου Αμαρουσίου, για την λειτουργική, αισθητική και περιβαλλοντική αναβάθμιση του αστικού χώρου”

• Η **Ανάπλαση** ως στοχευμένη επέμβαση σε συγκεκριμένο τμήμα της πόλης (όχι ως γενική κανονιστική επέμβαση)

• Το **συγκρότημα των εργατικών πολυκατοικιών** δίνει την κοινωνική διάσταση του πληθυσμού που το κατοικεί.

• Ο **αστικός χώρος** των εργατικών πολυκατοικιών
- οργανωμένη δόμηση
- ιδιαίτερα χαρακτηριστικά στα κτίρια και στη μορφή των δημόσιων χώρων.

Ενεργειακή θεώρηση

Η **εξοικονόμηση των φυσικών πόρων**, είναι από τους πρωταρχικούς παραμέτρους του σχεδιασμού, κατεύθυνση που επιβάλλεται όχι μόνο από πολιτικές, αλλά είναι και επιλογή όλων μας.

• Επιλογές εξοικονόμησης ενέργειας στην χρήση των κτιρίων

• Βιοκλιματική διάσταση του σχεδιασμού των δημόσιων χώρων

• Διαχείριση κρίσιμων περιβαλλοντικών παραμέτρων όπως:
-κυκλοφορίας και της στάθμευσης,
-εξορθολογισμός των δικτύων υποδομών, διαχείριση των απορριμμάτων

Πρόγραμμα Αστικού Σχεδιασμού (Urban Design)

• Προσεγγίζει το θέμα του **από κοντά** καθώς θεωρεί την πόλη ως οργανισμό που απαιτεί σύνθετο σχεδιασμό σε πολλά επίπεδα.

• **Πολύ-παραμετρικός σχεδιασμός** που διαμορφώνει τις στρατηγικές και τα εργαλεία του με βάση το εκάστοτε συγκεκριμένο θέμα και χαρακτηρίζεται από την **ευελιξία** του.

Η **στρατηγική θεμελιώθηκε στη** **<u>συμμετοχή</u>** των κατοίκων στις διαδικασίες της μελέτης

Στρατηγική με άξονα την συμμετοχή

οργανώνεται γύρω από τα κύρια χαρακτηριστικά και προβλήματα:

Τη διττή ταυτότητα της ομάδας των κατοίκων
-ως δικαιούχων κοινωνικής πρόνοιας
-ως ιδιοκτητών των κατοικιών.

Τη διαφοροποιημένη ταυτότητα του ιδιωτικού αλλά και δημόσιου χώρου των εργατικών σε σχέση με το κυρίαρχο Ελληνικό αστικό μοντέλο που τις περιβάλλει άλλωστε.

Το έλλειμμα στην ποιότητα της κατασκευής του κτισμένου και του ελεύθερου χώρου

Εργαλεία της στρατηγικής με άξονα τη συμμετοχη:

1. Η δημιουργία και λειτουργία **γραφείου μελέτης**.

2. **Καταγραφή** σε επίπεδο διαμερίσματος με έμφαση στα ενεργειακά.

3. **Έρευνα πεδίου** για θέματα που αφορούν ευρύτερα στον αστικό και κοινωνικό χώρο.

4. **Ανοικτές συζητήσεις** και Ημερίδα πριν την ολοκλήρωση κάθε σταδίου της μελέτης

5. Σχεδιασμός στη κατεύθυνση της **ενεργειακής εξοικονόμησης** σε επίπεδο κελύφους .

6. **Σχεδιασμός από κοντά** (με διαδικασίες ανάδρασης) για τις επεμβάσεις στο δημόσιο χώρο.

7. **Ημερίδα παρουσίασης** τελικών προτάσεων και συζήτηση

8. Πρόταση μετεξέλιξης του γραφείου μελέτης σε **γραφείο της περιοχής.**

1. Δημιουργία και λειτουργία γραφείου μελέτης

Το γραφείο παραχωρήθηκε στην ομάδα μελέτης από τον Δήμο Αμαρουσίου

• Είναι ανοιχτό τρεις ημέρες την εβδομάδα

• Φιλοξενεί τις έκτακτες συναντήσεις που οργανώνουν οι μελετητές με τους κατοίκους

• Παρουσιάζονται οι προγραμματισμένες εκθέσεις και παρουσιάσεις της δουλειάς, που γίνονται μετά το πέρας κάθε φάσης του έργου.

Αποτελεί κύρια αρχή του «εκ του σύνεγγυς» σχεδιασμού ιδιαίτερα όταν αφορά σε μια αστική περιοχή **49,000** τ.μ. με **1500 κατοίκους** σε **380 διαμερίσματα**.

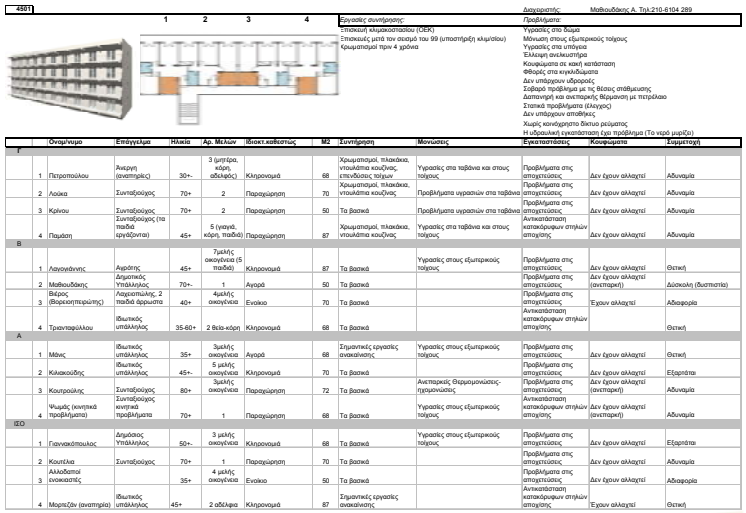
2. Καταγραφή σε επίπεδο διαμερίσματος

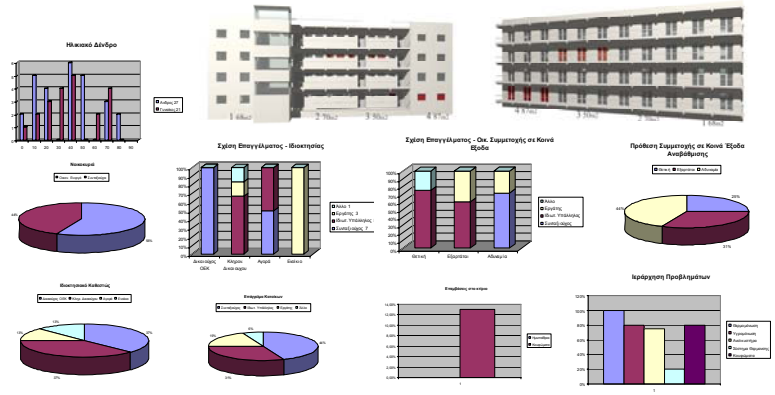
Καταγραφή, ενημέρωση και συζήτηση με όλους τους κατοίκους

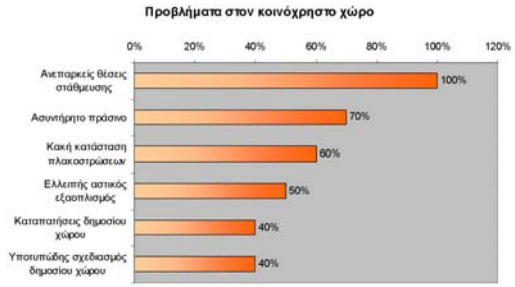
Η **επιτόπια καταγραφή** έγινε με συστηματικό τρόπο από το επιστημονικό δυναμικό της ομάδας μελέτης και περιλάμβανε:
- επισκέψεις σε όλες τις πολυκατοικίες και στα διαμερίσματα
- ατομικές συνεντεύξεις με σημαντικό αριθμό κατοίκων
-ουσιαστική συζήτηση πάνω στα ζητήματα που έθεσαν οι ίδιοι ή τα μέλη της ομάδας μελέτης.

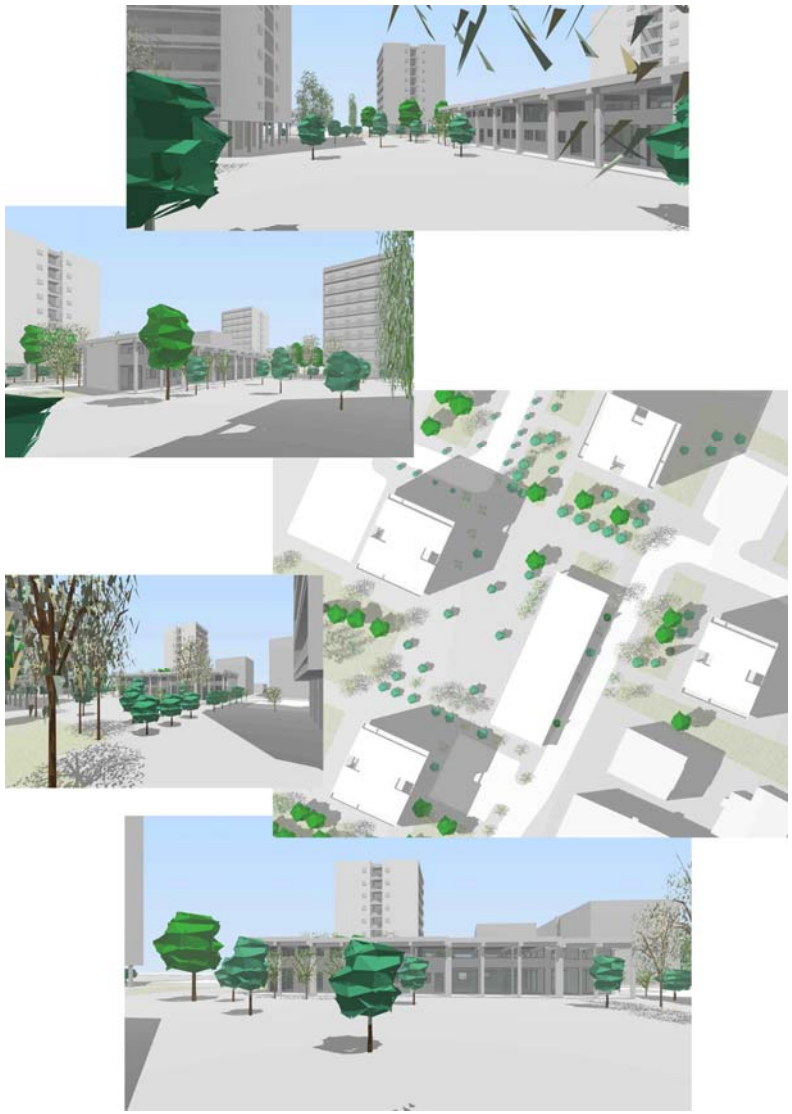
• **Αποδελτίωση** των στοιχείων που συγκεντρώθηκαν σε καρτέλες

• Εξαγωγή **διαγραμμάτων**, που **απεικονίζουν το προφίλ κάθε πολυκατοικίας** από δημογραφική, κοινωνική, οικονομική, ενεργειακή άποψη, καθώς και τα προβλήματα του κτιριακού κελύφους.









3 Έρευνα πεδίου για θέματα που αφορούν ευρύτερα στον αστικό και κοινωνικό χώρο

• Ανοιχτές ομαδικές συζητήσεις με κατοίκους των εργατικών πολυκατοικιών.

•Αναζητήθηκαν οι απόψεις των κατοίκων σχετικά με την διαφορετικότητα της συνοικίας τους, στον ιδιωτικό αλλά και το δημόσιο χώρο, την ταυτότητα της και το μέλλον της.

•Ερευνήθηκε και αξιολογήθηκε ο αστικός χώρος ως προς τα ενεργειακά του χαρακτηριστικά. (ηλιασμός, σκιασμός, άνεμοι, βλάστηση κ.λ.π.)

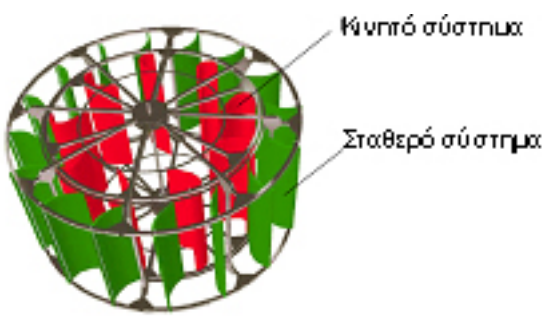
4. Ανοικτές συζητήσεις και Ημερίδα πριν την ολοκλήρωση κάθε σταδίου της μελέτης

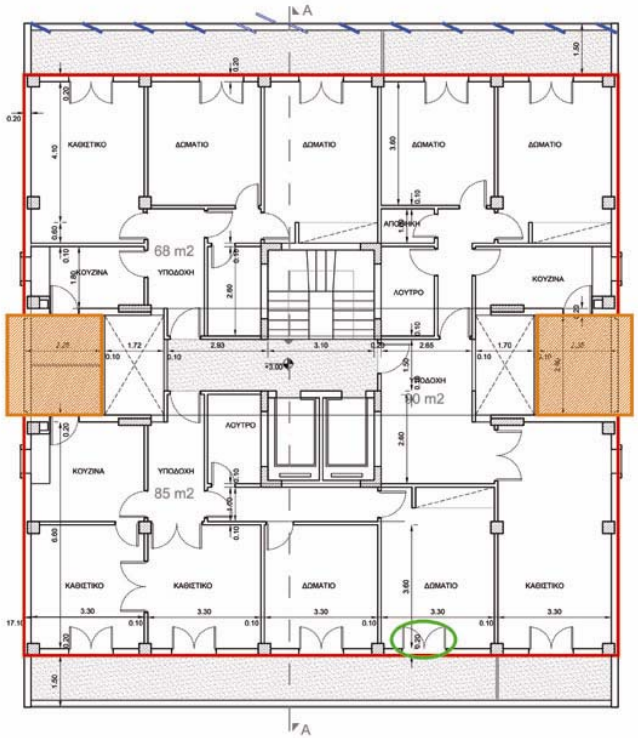
• **Παρουσίαση** του πρώτου σταδίου της πρώτης φάσης της μελέτης με την μορφή έκθεσης και ανοιχτή συζήτηση με συμμετοχή των κατοίκων και εκπροσώπων των Δημοτικών παρατάξεων και αφορούσε την καταγραφή των προβλημάτων και των πρώτων ποσοτικών και ποιοτικών συμπερασμάτων όσον αφορά τα προβλήματα κατοίκισης στη συνοικία.

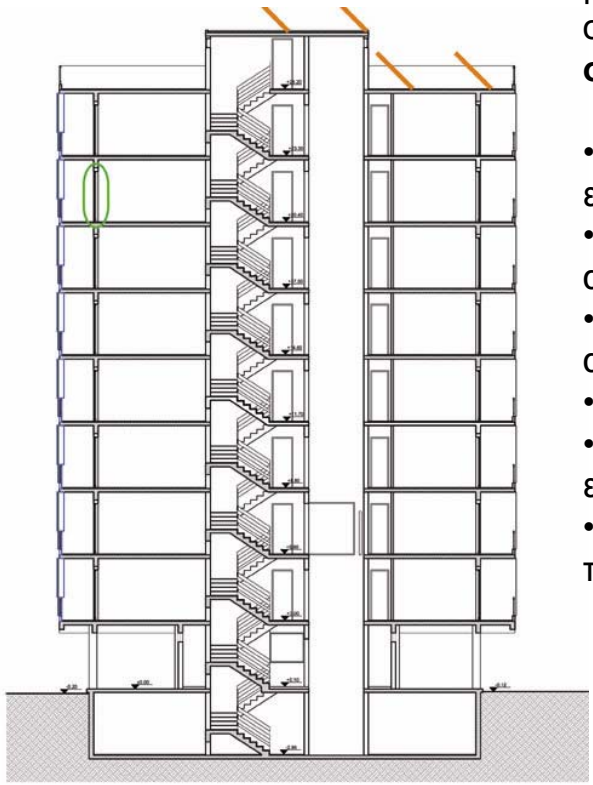
• Σύμφωνα και με τους κατοίκους τα κυριότερα **προβλήματα** ιεραρχημένα είναι:

Κτίρια:
1.Έλλειψη Θερμομόνωσης
2.Έλλειψη υγρομόνωσης
3.Έλλειψη ανελκυστήρων
4.Ανεπάρκεια συστήματος Θέρμανσης
5.Κακή ποιότητα των κουφωμάτων
6.Φθαρμένα δίκτυα ύδρευσης και αποχέτευσης

Αστικός χώρος:
1.Η στάθμευση
2.Συντήρηση του πράσινου και του δημόσιου χώρου
3.Η ιδιωποίηση τμημάτων του δημόσιου χώρου
4.Ο ελλιπής σχεδιασμός του δημόσιου χώρου (αστικός εξοπλισμός, προσανατολισμός, «ιδρυματική» σήμανση)







5. Σχεδιασμός στη κατεύθυνση της ενεργειακής εξοικονόμησης σε επίπεδο κελύφους .

• **Συναντήσεις** με τους κατοίκους των πολυκατοικιών **με σκοπό την παρουσίαση των προτάσεων** των μελετητών.

•**Αποδοχή των προτάσεων** των μελετητων από τους κατοίκους, οι οποίοι εκδήλωσαν **διάθεση συνεργασίας**.

•Θερμομόνωση και υγρομόνωση του εξωτερικού κελύφους των κτιρίων
•Εγκατάσταση συστημάτων ανανεώσιμων πηγών ενέργειας
•Δημιουργία ζωνών ανάσχεσης του αέρα
•Δημιουργία ηλιακών χώρων
•Εσυγχρονισμός των Η/Μ εγκαταστάσεων
•Αισθητική αναβάθμιση των όψεων των κτιρίων

6. Σχεδιασμός από κοντά (με διαδικασίες ανάδρασης) για τις επεμβάσεις στο δημόσιο χώρο.

Θα πραγματοποιηθούν **ανοιχτές συζητήσεις** με τους κατοίκους, για να καταγραφεί η άποψή τους για:

•**πλεονεκτήματα-μειονεκτήματα της συνοικίας, δημόσιες εξυπηρετήσεις, προσδοκίες**

•τη **σχέση τους με τους δημόσιους χώρους** της συνοικίας και πως αντιλαμβάνονται τον **ρόλο τους στην διαχείρισή τους**.

•Παρουσίαση των **προτάσεων των μελετητών:**

•Διαχείριση του προβλήματος των θέσεων στάθμευσης **υπόγεια γκαράζ, κάρτες κατοίκων**

•Λειτουργικός εμπλουτισμός του κέντρου της συνοικίας **Αίθουσα εκδηλώσεων, βρεφονηπιακός σταθμός, καφέ**

• Δημιουργία **χώρων άθλησης** στο νότιο τμήμα της συνοικίας

•Δημιουργία **μεταβατικών ζωνών** στους δημόσιους χώρους

•**Διαμόρφωση των υπαίθριων χώρων**

•**Σήμανση** των δημόσιων χώρων και **αλλαγή ονομασίας** των διευθύνσεων των κτιρίων

•**Ένταξη των δημόσιων χώρων** της συνοικίας στον ευρύτερο αστικό ιστό

7. Ημερίδα παρουσίασης τελικών προτάσεων και συζήτηση

Παρουσίαση των τελικών προτάσεων των μελετητών για τα κτίρια και τους δημόσιους χώρους

8. Πρόταση μετεξέλιξης του γραφείου μελέτης σε γραφείο της περιοχής

•Γραφείο διαχείρισης των προβλημάτων του οικισμού και της πολεοδομικής ενότητας ευρύτερα.
•Μετεξέλιξή του σε αποκεντρωμένη **υπηρεσία**, η οποία θα μεριμνά **για την υλοποίηση των μελετών** του προγράμματος.
•Συνεχής **ενημέρωση των κατοίκων** για την πορεία των προγραμμάτων.

- **Η ΑΜΕΣΟΤΗΤΑ ΣΤΗΝ ΥΛΟΠΟΙΗΣΗ ΤΩΝ ΕΡΓΩΝ- Ο ΧΡΟΝΟΣ ΩΣ ΠΑΡΑΜΕΤΡΟΣ ΤΟΥ ΣΧΕΔΙΑΣΜΟΥ**

- **Χαρακτηριστικό του Αστικού Σχεδιασμού: αν δεν υλοποιηθεί άμεσα τότε έχει αποτύχει.**

- **Ο Σχεδιασμός που επιχειρείται στο επίπεδο αυτό της συμμετοχής οικοδομεί σχέσεις και δημιουργεί ελπίδες και δεσμεύσεις μεταξύ των συμμετεχόντων**





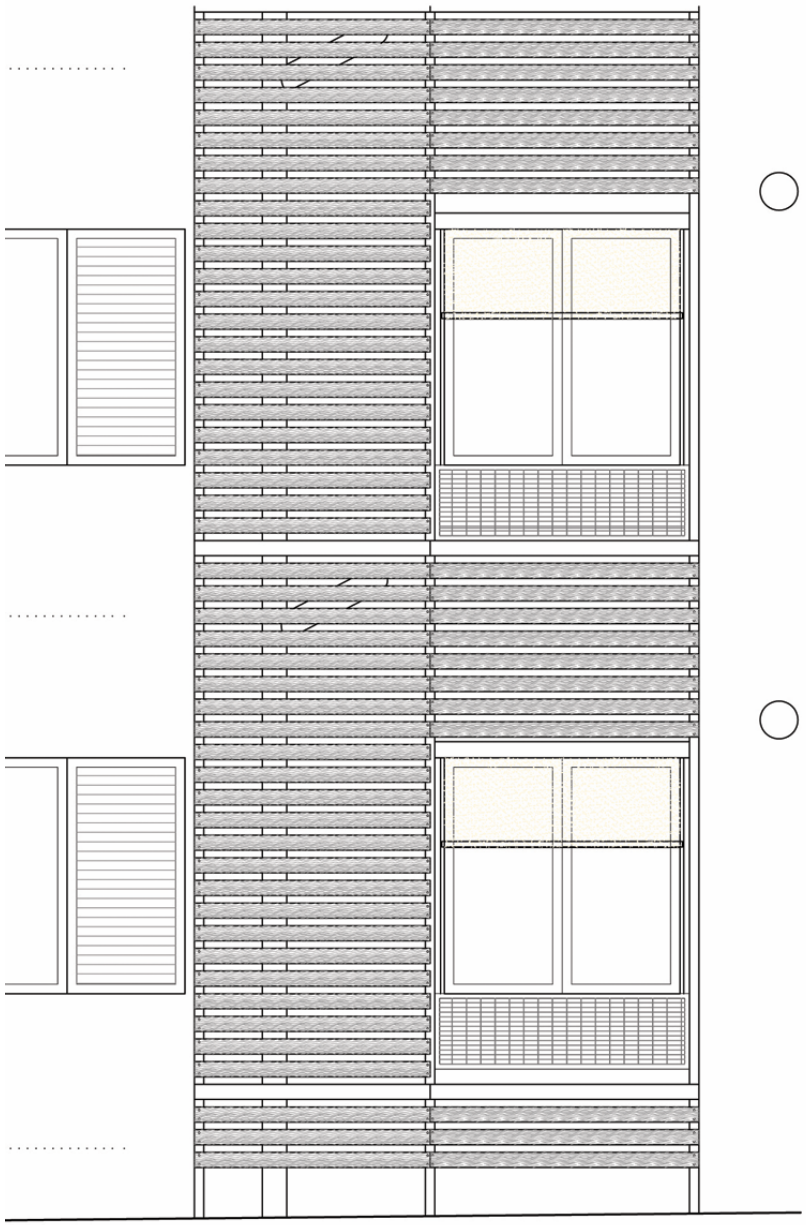


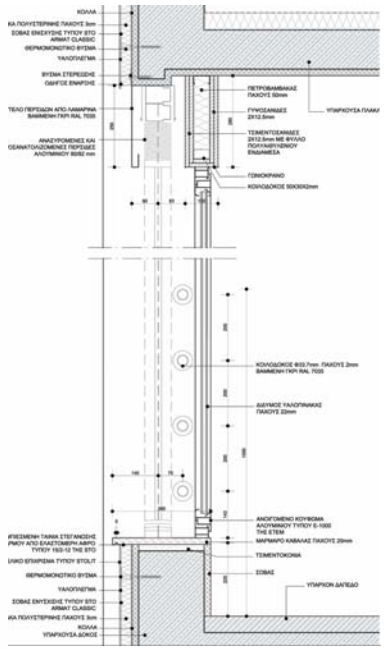


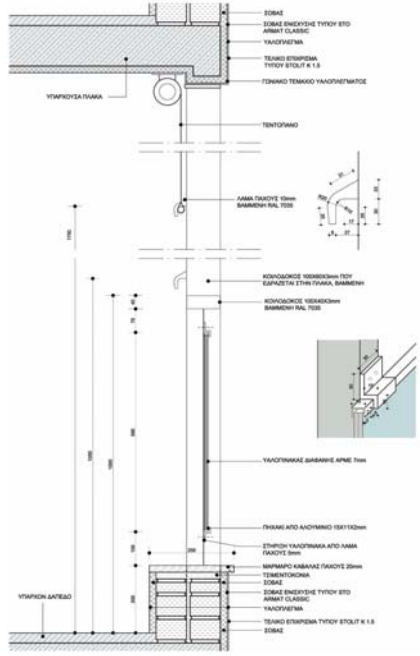


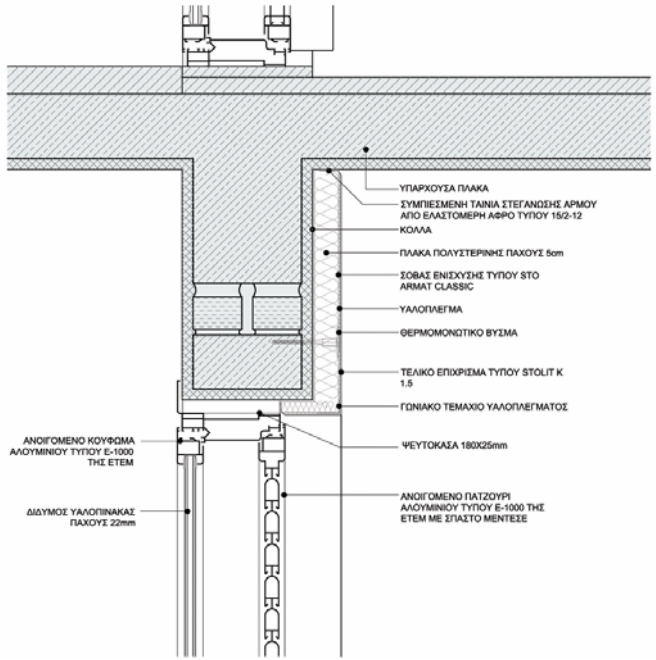







ΚΟΛΛΑ
ΚΑ ΠΟΛΥΣΤΕΡΙΝΗΣ ΠΑΧΟΥΣ 5cm
ΣΟΒΑΣ ΕΝΙΣΧΥΣΗΣ ΤΥΠΟΥ STO ARMAT CLASSIC
ΘΕΡΜΟΜΟΝΩΤΙΚΟ ΒΥΣΜΑ
ΥΑΛΟΠΛΕΓΜΑ
ΒΥΣΜΑ ΣΤΕΡΕΩΣΗΣ ΟΔΗΓΟΣ ΕΝΑΡΞΗΣ
ΤΕΛΟ ΠΕΡΣΙΔΩΝ ΑΠΟ ΛΑΜΑΡΙΝΑ ΒΑΦΜΕΝΗ ΠΚΡ RAL 7035
ΑΝΑΣΥΡΟΜΕΝΕΣ ΚΑΙ ΘΕΑΝΑΤΑΖΟΜΕΝΕΣ ΠΕΡΣΙΔΕΣ ΑΛΟΥΜΙΝΙΟΥ Φ082 mm
ΠΕΤΡΟΒΑΜΒΑΚΑΣ ΠΑΧΟΥΣ 50mm
ΥΠΑΡΧΟΥΣΑ ΠΛΑΚΑ
ΓΥΨΟΣΑΝΙΔΕΣ 2X12.5mm
ΤΣΙΜΕΝΤΟΣΑΝΙΔΕΣ 2X12.5mm ΜΕ ΒΥΛΟ ΠΟΛΥΑΦΡΙΣΤΗΡΙΟΥ ΕΝΔΙΑΜΕΣΑ
ΓΩΝΙΟΚΡΑΝΟ
ΚΟΛΟΔΟΚΟΣ 50X30X2mm
ΚΟΛΟΔΟΚΟΣ Φ33.7mm ΠΑΧΟΥΣ 2mm ΒΑΦΜΕΝΗ ΠΚΡ RAL 7035
ΔΙΔΥΜΟΣ ΥΑΛΟΠΙΝΑΚΑΣ ΠΑΧΟΥΣ 22mm
ΑΝΟΙΓΟΜΕΝΟ ΚΟΥΦΩΜΑ ΑΛΟΥΜΙΝΙΟΥ ΤΥΠΟΥ Ε-1000 ΤΗΣ ΕΤΕΜ
ΕΠΕΞΕΡΓΑΣΜΕΝΗ ΤΑΙΝΙΑ ΣΤΕΓΑΝΩΣΗΣ ΑΡΜΟΥ ΑΠΟ ΕΛΑΣΤΟΜΕΡΗ ΑΦΡΟ ΤΥΠΟΥ 15/2-12 ΤΗΣ STO
ΜΑΡΜΑΡΟ ΚΑΒΑΛΑΣ ΠΑΧΟΥΣ 20mm
ΤΣΙΜΕΝΤΟΚΟΝΙΑ
ΣΟΒΑΣ
ΥΛΙΚΟ ΕΠΙΧΡΙΣΜΑ ΤΥΠΟΥ STOLIT
ΘΕΡΜΟΜΟΝΩΤΙΚΟ ΒΥΣΜΑ
ΥΑΛΟΠΛΕΓΜΑ
ΣΟΒΑΣ ΕΝΙΣΧΥΣΗΣ ΤΥΠΟΥ STO ARMAT CLASSIC
ΚΑ ΠΟΛΥΣΤΕΡΙΝΗΣ ΠΑΧΟΥΣ 5cm
ΚΟΛΛΑ
ΥΠΑΡΧΟΥΣΑ ΔΟΚΟΣ
ΥΠΑΡΧΟΝ ΔΑΠΕΔΟ


ΣΟΒΑΣ
ΣΟΒΑΣ ΕΝΙΣΧΥΣΗΣ ΤΥΠΟΥ STO ARMAT CLASSIC
ΥΑΛΟΠΛΕΓΜΑ
ΤΕΛΙΚΟ ΕΠΙΧΡΙΣΜΑ ΤΥΠΟΥ STOLIT K 1.5
ΓΩΝΙΑΚΟ ΤΕΜΑΧΙΟ ΥΑΛΟΠΛΕΓΜΑΤΟΣ
ΥΠΑΡΧΟΥΣΑ ΠΛΑΚΑ
ΤΕΝΤΩΤΗΡΑΣ
ΛΑΜΑ ΠΑΧΟΥΣ 10mm ΒΑΦΜΕΝΗ RAL 7035
ΚΟΛΟΔΟΚΟΣ 100X60X3mm ΠΟΥ ΕΔΡΑΖΕΤΑΙ ΣΤΗΝ ΠΛΑΚΑ, ΒΑΦΜΕΝΗ
ΚΟΛΟΔΟΚΟΣ 100X40X3mm ΒΑΦΜΕΝΗ RAL 7035
ΥΑΛΟΠΙΝΑΚΑΣ ΔΙΑΦΑΝΗΣ ΑΡΜΕ 7mm
ΠΛΑΚΑΚΙ ΑΠΟ ΑΛΟΥΜΙΝΙΟ 15X11X2mm
ΣΤΗΡΙΞΗ ΥΑΛΟΠΙΝΑΚΑ ΑΠΟ ΛΑΜΑ ΠΑΧΟΥΣ 3mm
ΜΑΡΜΑΡΟ ΚΑΒΑΛΑΣ ΠΑΧΟΥΣ 20mm
ΤΣΙΜΕΝΤΟΚΟΝΙΑ
ΣΟΒΑΣ
ΣΟΒΑΣ ΕΝΙΣΧΥΣΗΣ ΤΥΠΟΥ STO ARMAT CLASSIC
ΥΑΛΟΠΛΕΓΜΑ
ΤΕΛΙΚΟ ΕΠΙΧΡΙΣΜΑ ΤΥΠΟΥ STOLIT K 1.5
ΣΟΒΑΣ
ΥΠΑΡΧΟΝ ΔΑΠΕΔΟ


ΥΠΑΡΧΟΥΣΑ ΠΛΑΚΑ
ΣΥΜΠΙΕΣΜΕΝΗ ΤΑΙΝΙΑ ΣΤΕΓΑΝΩΣΗΣ ΑΡΜΟΥ ΑΠΟ ΕΛΑΣΤΟΜΕΡΗ ΑΦΡΟ ΤΥΠΟΥ 15/2-12
ΚΟΛΛΑ
ΠΛΑΚΑ ΠΟΛΥΣΤΕΡΙΝΗΣ ΠΑΧΟΥΣ 5cm
ΣΟΒΑΣ ΕΝΙΣΧΥΣΗΣ ΤΥΠΟΥ STO ARMAT CLASSIC
ΥΑΛΟΠΛΕΓΜΑ
ΘΕΡΜΟΜΟΝΩΤΙΚΟ ΒΥΣΜΑ
ΤΕΛΙΚΟ ΕΠΙΧΡΙΣΜΑ ΤΥΠΟΥ STOLIT K 1.5
ΓΩΝΙΑΚΟ ΤΕΜΑΧΙΟ ΥΑΛΟΠΛΕΓΜΑΤΟΣ
ΑΝΟΙΓΟΜΕΝΟ ΚΟΥΦΩΜΑ ΑΛΟΥΜΙΝΙΟΥ ΤΥΠΟΥ Ε-1000 ΤΗΣ ΕΤΕΜ
ΨΕΥΤΟΚΑΣΑ 180X25mm
ΔΙΔΥΜΟΣ ΥΑΛΟΠΙΝΑΚΑΣ ΠΑΧΟΥΣ 22mm
ΑΝΟΙΓΟΜΕΝΟ ΠΑΤΖΟΥΡΙ ΑΛΟΥΜΙΝΙΟΥ ΤΥΠΟΥ Ε-1000 ΤΗΣ ΕΤΕΜ ΜΕ ΣΠΑΣΤΟ ΜΕΝΤΕΣΕ