



PROBIS

**SUPPORTING PUBLIC PROCUREMENT OF BUILDING INNOVATIVE
SOLUTIONS**

**Regione Lombardia – ALER Bergamo Lecco Sondrio
Treviglio
via Dei Mulini n. 10/20
via Filzi n. 11/13**

Prospectus

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PROBLEM STATEMENT

In Lombardy, the majority of the public social houses dates back to 1970 and requires today a significant energy refurbishment, especially in the perspective of reducing the economic costs put on the tenants (fuel poverty).

Since 2007, the Regional Administration focused on the certification of the energy performance and the reduction of energy consumption of the buildings, in application of the European Directive 2002/91/EC.

Furthermore, the DG for Social housing developed some regional programmes for the energy efficiency of public houses but the refurbishment of the existing public housing stock, which is essential in achieving the EU targets, is very hard, due to financial and technical reasons.

PROBIS project and the pilot in Treviglio is an occasion to identify solutions:

- able to guarantee same benefits with lower cost, or more benefits and results with the same average cost
- which are technically standardized, replicable almost anywhere, reducing design time and fees;
- focusing on the entire product lifecycle, promoting re-use of old removed materials or their efficient recycling.

The two buildings in Treviglio (BG), the first of 54 dwellings located in Via Dei Mulini n. 10/20 (buildings with four floors) and the second of 54 dwellings in via Filzi n. 11/13 (buildings with six floors), dates back to the early '80s, are poorly insulated and they have very obsolete plants.

In both cases the heating system is centralized and fuelled by natural gas. In the case of via Filzi n. 11/13 the existing heat generator was recently replaced with a new one with high-performance and two-stage modulating burner.

In both cases, the production of hot water is autonomous with a boiler methane located in the kitchen.

The construction systems of the two complexes in Treviglio (Bergamo - I) are the typical ones of the period of construction and, for this reason, they have many problems related to thermal bridges in the nodes and façades because the insulation is not continuous and is located only in the cavities of the external walls.

Moreover, the iron windows don't guarantee anymore the air and water tightness and they have a high thermal dispersion. It's impossible to fix them.

Finally, in Via Dei Mulini, the actual heating system must be replaced because is very obsolete.

The two complexes are fully owned by ALER and are rented with very low prices to people who cannot access the ordinary rent market for economic reasons and are characterized by social fragility.

PILOT DESCRIPTION

Basic Facts of the Pilot Building (actual situation before the renovation)

Table 1: Basic information

Location	Treviglio (Bergamo-I) via dei Mulini 10-20, via Filzi 11-13-15
Type of building	1) Articulated linear 2) tower
Built (year)	1971 - 1980
Building Purpose and Users	Social housing
Number of dwelling or units	54, 18+18+18
Number of floors	4, 6
Total heated volume and floor surface	15.000 +12.700 m ³ ; 4000 + 3600 m ²
Building envelope technology	Both buildings have: <ul style="list-style-type: none">• Brick masonry with concrete cavity and walls and AC + bricks, insulation glass wool 4 cm.• Iron windows with old type double glazing: vacuum only, no lower thermal conductivity gas filling, no low emissivity coatings.
Space heating technology (generation, distribution...)	In both cases the heating system is centralized and fuelled by natural gas and the distribution is by iron pipes with poor insulation. <ul style="list-style-type: none">• Via Filzi: the existing heat generator was recently replaced with a central condensing boiler with two-stage modulating burner;• Via dei Mulini: old central heating system.
Space cooling technology	None
Ventilation technology	none
Lighting technology	Traditional lighting system with energy saving lamps
Others relevant features	Heating distribution system (manifold) located at every floor. In both cases, the production of hot water is autonomous with a boiler methane located in the kitchen.

Via dei Mulini



Via Filzi



Energy consumption:

Table 2: Energy consumption before renovation

	Before the renovation	
	kWh/y	kWh / m ² or m ³ / y
Space heating and ventilation via dei Mulini	399.392 produced	99,85/sq.m.
	676.422 primary	168,10/sq.m.
Space heating and ventilation via Filzi	404.778 produced	112,44/sq.m.
	428.797 primary	119,11/sq.m.
Space cooling		
Sanitary Hot water	n.d. autonomous gas boiler	
Electricity (building electricity excluding household)		
<ul style="list-style-type: none">• lighting• other uses	n.d.	

Other		
Total		

Actual costs

Table 4: Costs before renovation

	Before the renovation
	€ / year (average)
Space heating and ventilation	
Space cooling	Via dei Mulini 65.700 €/y
Sanitary Hot water	Via Filzi 40.410 €/y
Others	
Maintenance costs	
<ul style="list-style-type: none"> • Space heating, cooling and hot water systems • Envelope • Indoor Lighting System • Others 	Via dei Mulini 940 €/y via Filzi n.d.
Total	107.050 €/y

DESIRED SOLUTION DESCRIPTION

Owner requirements	Functional Requirements	Performance Requirements
Phases:		
Refurbishment	Windows installation with minimal disturbance for the users	Every window must be replaced in maximum 2 hours, excluding finishes.
	New condensing boilers installation (via dei Mulini) on existing central heating system with minimal interventions and without service interruption.	Installation during no heating activity or temporary external system to ensure the temperatures in the heated spaces.
Management	Reduction of the thermal heat loss on the blind façades of the buildings.	Transmittance of the isolated component: $\leq 0,29$ W/sq.m. °K
	Reduction of the thermal heat loss on the attic of the buildings.	Transmittance of the isolated component: $\leq 0,29$ W/sq.m. °K
	Windows: reduction of temperature decline in heated spaces during the period of inactivity or attenuation of the heating	Windows with $U_w \leq 1,3$ W/sq.m. °K

	system.	
	Easy access to information for the analysis of energy consumption and its split among the tenants.	Consumption check by Wi-Fi systems
Maintenance	Windows: durability and minimal maintenance.	Warranty: glazing's gasket sealing for ≥ 10 years, frames for 20 years, hardware for 15 years
	Heating central system: reduction of replacement of wearable parts.	Warranty of wearable components: ≥ 3 years
	External insulating system: no maintenance and high durability.	Warranty on the general functionality of the system and the characteristics of the finishes: ≥ 10 years
	No internal condensation due to thermal bridges.	Use of air ventilation devices
Disposal	Minimal environmental impact of components and products.	Specific warranties and certifications for every single product.

User requirements	Functional Requirements	Performance Requirements
Phases:		
Refurbishment	Refurbishment with minimal disturbance for the users because tenants will continue to live in their dwellings during the works.	Mainly outside interventions with use of dry systems and reduction of noise and dust.
	New condensing boilers installation (via dei Mulini) on existing central heating system with minimal interventions and without service interruption.	Installation during no heating activity or temporary external system to ensure the temperatures in the heated spaces.
Use	Thermostatic valves easy to use.	Use of user-friendly devices suitable for the social housing tenants.
	In each apartment, it has to be possible the management of the room temperature and radiators on/off.	Individual control of the room temperature and radiators on/off. Direct reading of the thermal energy consumption by each tenant.
	Indoor air quality and no condensation on thermal bridges	Use of air ventilation devices with heat recovery systems

KPI and CONSTRAINTS DESCRIPTION

KPI related to the solution performances	Description (and measure unit)
KPI S.1	Via dei Mulini saving of 265.000 kWh/a compared to current consumption. Via Filzi saving of 102.000 kWh/a compared to current consumption.
KPI S.2	Quantity and cost of maintenance on heating system and windows below the historical one on similar buildings.
KPI related to the refurbishment process	

KPI P.1	Time control of execution.
KPI P.2	Minimization of inconvenience for tenants with interviews post intervention.

Constraints related to the solution performances:

The refurbishment investments are carried on by ALER, but the benefits from the energy saving goes to the tenants. For this reason, is difficult for ALER to do high investments, even if there will substantial future economies.

In particular, the total investment for the redevelopment project is up to € 1.1 million.

Impossibility to transfer the tenants during the work.

Constraints related to the refurbishment process:

The realization of the exterior insulating system has been limited to the blind façades of the buildings to reduce costs.

Moreover, both for limited economic resources and for lack of space, there were excluded interventions of insulation of the ceiling of the garages on the ground floor.