



Radomir 2 Bulgaria

47% energy saving
Improved building with longer life span
Better comfort, less energy consumption

Project data

Location, address:	Radomir
Region:	Western Bulgaria
Surroundings:	Municipality, part of the greater municipality of Pernik
Climate:	Mild continental
Heating degree days:	2900 in the heating season (mid of October - mid of April)
Year of construction and renovation:	1980 (constructed); 1997 (renovated)
Typology:	Panel multi – dwelling building of eight storeys
No of dwellings:	23
Total floor area:	4,991 m ²
Owner:	Owner occupied flats
Renovation design team:	Energoproekt
Realization team:	Exergia SA (Greece), Energoproekt (Bulgaria), ICEU (Germany)
Costs of energy saving measures:	Pay-back period for implemented energy saving measures: 10,8 years
Renovation financed by:	PHARE funded demonstration project



Refurbished building

Objectives and results

The objectives of this pilot project were to show the possibilities to save energy in dwelling buildings through the implementation of different energy saving measures and to assess the viability of different technologies used at building refurbishment. In three typical dwelling buildings, erected with prefabricated concrete panels, were implemented different energy saving measures. The implemented measures shown that with simple technologies can be reached significant energy savings – more than 46%. These measures are applicable for 30% of the dwellings in the country.

Renovation concept

Key renovation features

- Thermal insulation of exterior walls with extruded polystyrene;
- Water proofing and thermal insulation of roof with Keramsit;
- Change of wooden windows with PVC windows;
- Thermal insulation of basement ceiling;
- Installation of new boiler for space heating;
- Improvement of heating system;
- Installation of electrical heaters for hot water

State-of-the-art

Before renovation

Constructions [U-values: W/m^2K]

- Roof 0,9
- Non-insulated basement 2,9
- Non-insulated external concrete walls 2,95
- Double glazed wooden windows 2,9

Installations

- No boiler
- No control of the heating system
- No control of radiators

After renovation

Constructions [U-values: W/m^2K]

- Additional insulation of roof 0,5
- Insulation of basement ceiling 0,52
- Insulation of external concrete walls 0,52
- New PVC windows 1,8

Installations

- Installation of new efficient boiler for central heating
- Presetting heat radiation; optimum adjustment of the heating curve with weather-dependent flow temperature regulation
- Fixing of thermostatic valves on radiators;
- Fixing of timer-controls on radiators;
- Fixing of heat meters on radiators

Energy saving and monitoring

Energy consumption before renovation:

KWh/m²: 191,9

Energy consumption after renovation:

KWh/m²: 101,5

Percentage saving: 47%

The energy consumption before the refurbishment is calculated after an energy audit, as 55% of the rooms were not heated. After the renovation, the energy consumption has been monitored for 2 years.



Insulated pipes and control devices of the heating installation

Additional information

- The aim of the project was to show the possibilities for improvement of the energy characteristics of panel type dwelling buildings not connected to district heating.
- The implemented measures were chosen with regard to a possible wider implementation: availability of materials on the Bulgarian market, simple solutions, and replicable results.
- As the renovation did not affect the flats internally, the inhabitants did not have to move.
- The inhabitants were interviewed after the completion of the works. Most of them are satisfied by the results.
- The main result of the implemented energy saving measures is an increase of comfort of the dwellings: better temperature, less condensation, more aesthetical windows, etc.

Lessons learned and conclusions

- Simple measures as insulation of external walls and roof lead to high energy savings;
- The change of existing double glazed windows should be assessed for each building. If the windows are in good condition, it is better to repair and draught-proof them instead to change them. The pay-back period of new windows only from energy saving is too long.
- It is essential to involve all owners and inhabitants still in the beginning of the refurbishment process.