

ELEMENTARY SCHOOL « VICTOR HUGO » (Clapiers, FRANCE) – Renovation Project performance - 26 kWh/m²/y PE

GENERAL INFORMATION

Primary energy: In France, the conversion of primary energy into final energy is fixed (1 kWh of electricity = 2.58 kWh of primary energy, hydrocarbon 1 kWh = 1 kWh of primary energy, wood 1 kWh = 1 kWh of primary energy (0.6 kWh of primary energy in the BBC label EFFINERGIE).

Ubat: Heat loss of a building by transmission through the walls (including thermal bridges) and windows expressed in W/m²/K. The lower Ubat is, the better the building envelope is performing.

Cep: Conventional energy consumption of a building for heating, cooling, domestic hot water, electricity for pumps and fans, and lighting facilities are expressed in kWh/m²/year in primary energy.

BBC Label EFFINERGIE

The energy target is not given in absolute value. This label requires designing buildings twice as efficient as conventional buildings.

New buildings: The target for maximum primary energy consumption is 50% of the baseline fixed by the thermal regulation. It is mandatory to design airtight buildings to minimize air infiltrations and therefore the needs for heating (Cep ref of the thermal regulation 2005).

Retrofitting buildings: The target for maximum primary energy consumption is 60% of the baseline fixed (Cep ref of the thermal regulation for existing buildings).

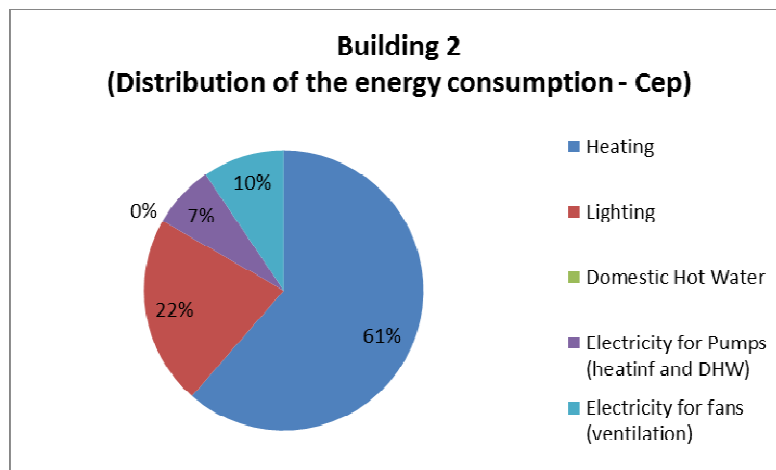
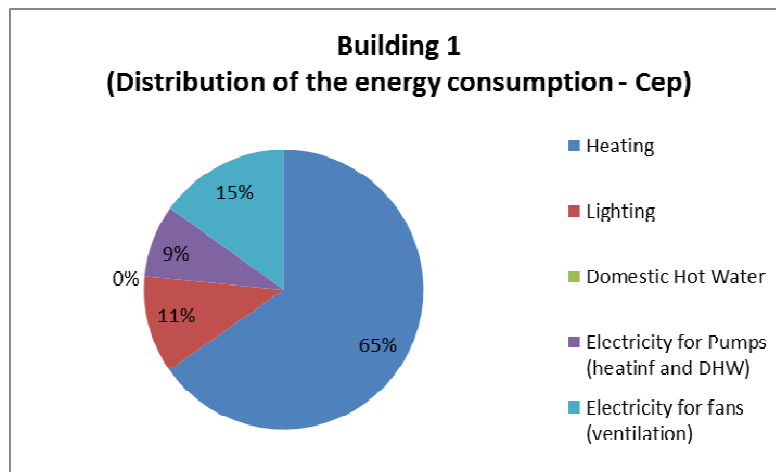
GENERAL INFORMATION	
Name of the public building renovation	Elementary school Victor Hugo
Location	Clapiers (Hérault – France)
Altitude	80 m
Area	1206 m ²
Date of construction	1986
Date of renovation	2012
Short description	<p>School Victor Hugo renovation project was the winner of a call for proposals launched by ADEME and the Languedoc-Roussillon region. The school consists of four buildings (1,206 sq.m.).</p> <p>Building 1: 168 m² consisting of two classrooms and a library.</p> <p>Building 2: 512 m² consisting of two classrooms on the ground floor.</p> <p>Building 3 is identical to building 2.</p> <p>Building 4, in R+1, is designed on the same architectural principles and the same facilities.</p> <p>The renovation is to improve the insulation of the walls both inwards with 10 cm of glass wool and the outside with 4 or 5 cm of expanded polystyrene.</p> <p>For equipment, a central heating network was created because the building was heated electrically. The new system consists of two wood pellet boilers, each one with a nominal capacity of 48 kW.</p> <p>Single-flow mechanical ventilation ensures the quality and renewal of the indoor air.</p>



	And finally, a local production of electricity was installed on the roof with 24.95 m ² (3.5 kWp) of photovoltaic solar modules (not included in the thermal calculation).
Key actors	
building owner	Mairie de Clapiers
Thermal studies engineers	ENR Concept

Thermal calculation results

	Performance Level	BEFORE	Regulation objective	AFTER (Project)
Building 1	Cep [kWep/m ² /year]		78.68	45,01
	Ubat [W/m ² /K]		1.004	0.661
Building 2	Cep [kWep/m ² /year]		61.85	25.96
	Ubat [W/m ² /K]		1.056	0.565



ENERGY EFFICIENCY MEASURES			
Building envelope	Walls	Exterior block walls 20 cm, insulated from the outside with 4 cm of polystyrene and inside with 10 cm of glass wool	$U_p = 0.210 \text{ W}/(\text{m}^2 \cdot \text{K})$
	Low-floor insulation	Low floor open ground, consisting of a 20 cm concrete slab with an edge insulation	$U_p = 0.500 \text{ W}/(\text{m}^2 \cdot \text{K})$
	Flat floor	Attic roof, insulated with 28 cm of glass wool	$U_p = 0.139 \text{ W}/(\text{m}^2 \cdot \text{K})$
	Windows	Double glazing aluminum windows out of thermal bridges	$U_w = 1.77 \text{ W}/(\text{m}^2 \cdot \text{K})$
	Thermal bridges	No information	
	Air tightness	1.70 m ³ / (h·m ²) at 4 Pa - Value confirmed by measuring	
Building techniques	Heating	New central heating network with radiators powered by two wood pellet boilers, each one with a nominal capacity of 48 kW.	
	DHW	No DHW for the thermal regulation calculation	
	Ventilation	Single-flow ventilation	
	Local electricity production	24.95 m ² (3.5 kWp) of photovoltaic solar modules	

BUDGET and SOURCE of FINANCING	
Global budget	€ 625,973 without VAT € 519 without VAT/ m ² of floor area for all four buildings (1,206 sq.m.)
Source of financing	€40 without VAT/m² of floor area Region Languedoc Roussillon = € 66,060 without VAT ADEME = € 48,120 without VAT

