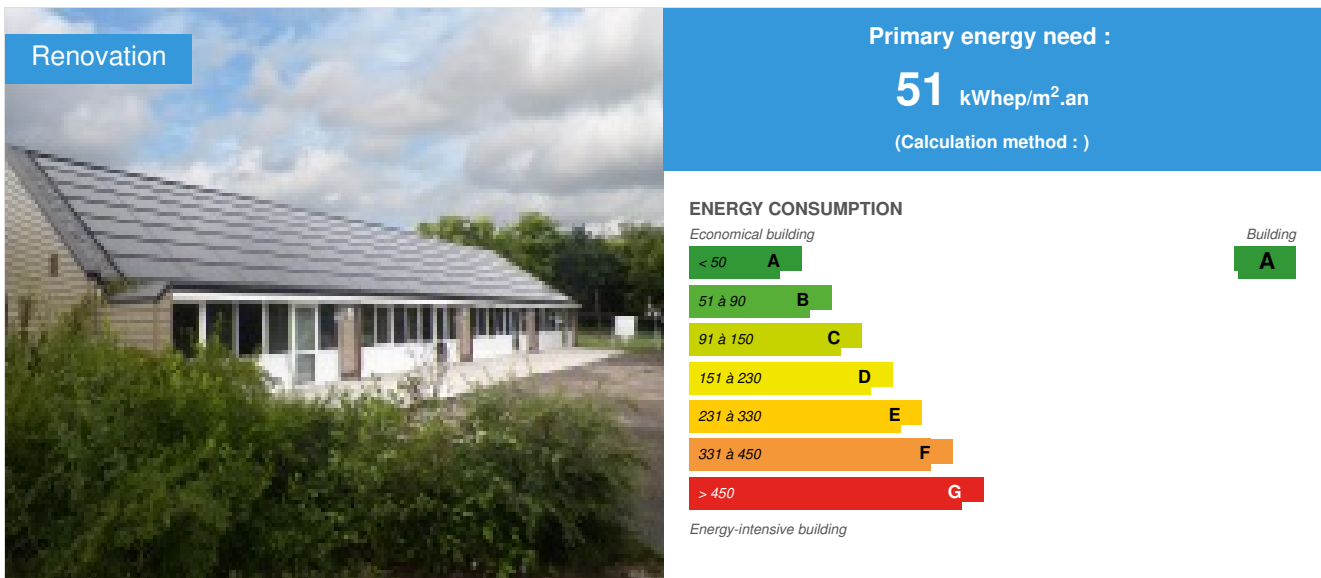


## Kindergarten Michel Ange in Amiens (BEPOS refurbishment)

by Rodolphe Deborre / 2015-05-26 09:14:50 / Francia / 13526 / FR



**Building Type** : Preschool, kindergarten, nursery  
**Construction Year** : 2012  
**Delivery year** : 2013  
**Address 1 - street** : 3, rue Michel Ange 80000 AMIENS, France  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 1 217 m<sup>2</sup>  
**Construction/refurbishment cost** : 1 404 000 €  
**Number of Children** : 200 Children  
**Cost/m<sup>2</sup>** : 1153.66 €/m<sup>2</sup>

Certifications :



### General information

Energy refurbishment of Michel Ange School built in the 70s in order to transform it into a positive energy building as requested by the building owner which is the city of Amiens.

Third Industrial Revolution:

- Energy Efficiency
- Energy Producer Building

Sustainable development approach of the project owner

The city of Amiens wanted to refurbish the kindergarden of Michel Ange, by making the first positive energy refurbishment on the French territory. The goal is even more ambitious than the occupants are young children, whose comfort can not be neglected.

Rabot Dutilleul Construction Company has joined forces with SECA ENVIRONNEMENT agency, so as to offer to the city of Amiens an overall technical solution, incorporating both technical and structural constraints of a refurbishment, but also ambitious energy objectives.

The result: energy efficiency and sustainability beyond the initial specifications, in accordance with the budget.

## Architectural description

Architect and general contractor- the city of Amiens.

The goal was to reach the BEPOS level for a very major refurbishment of the building, without much changes in the visual aspect of the building, excepting the roof.

## Building users opinion

For the city of Amiens, the refurbishment of the kindergarden Michel Ange represents different challenges. First, a social issue, because this project helps to make children but also their parents, and more generally the educational sector, more aware of the energy saving needs.

The economic aspect is also important with energy savings estimated at 17,000 € per year for the school. The last issue is of course environmental; this renovation project is a part of a sustainable development policy and of the objective of reducing greenhouse gas emissions initiated by Amiens Métropole, seen in particular in this school, through the production of electricity using photovoltaic panels on the roof.

In the construction phase, the use of a general contractor was appropriate to ensure the overall goal. By high energy performances, Rabot Dutilleul Construction has committed to ensure the respect of the air tightness of the building envelope. To preserve this air tightness during the future maintenance operations, data sheets have been developed to raise awareness of the procedures to avoid any deterioration of the concept.

After over a year of functioning, if the savings are real, the expected results are somewhat skewed because of the creation of a recreational centre inside the school which had not been included in the simulations before work.

The observations also show that further efforts are required in terms of awareness and user education which behavior can lead to overconsumption. In conclusion, the energy refurbishment of the kindergarden Michel Ange into a positive energy building - a first case in Picardy - is a most successful experiment of Amiens Métropole, whose profits may be valued on future construction or renovation projects .

Jean CHEDRU, Head of Real Estate Heritage Service, Amiens Métropole.

## If you had to do it again?

Rabot Dutilleul Construction wants to answer to new and ambitious consultations from an energy point of view, in line with the ambitions of North Pas de Calais about the Third Industrial Revolution.

## See more details about this project

<http://www.picardie.ademe.fr/sites/default/files/files/Mediatheque/Publications/coup-vent-16-juillet-2013.pdf>

## Stakeholders

### Stakeholders

Function :

Rabot Dutilleul Construction

Bruno Delbarre

<http://www.rabotdutilleulconstruction.com/>

Project director

Function : Contractor

Ville d'Amiens

<http://www.amiens.fr/>

Function : Thermal consultancy agency

SECA Environnement

Gabriel Parenty

[http://www.groupe-seca.com/index.php?option=com\\_content&view=article&id=160:ada-environnement&catid=93:agences&Itemid=625](http://www.groupe-seca.com/index.php?option=com_content&view=article&id=160:ada-environnement&catid=93:agences&Itemid=625)

Function : Others

ADEME

Florent DUPUIS

<http://www.picardie.ademe.fr/>

Monitoring the actual energy performance

## Contracting method

Macro packages

## Type of market

Table 'c21\_spain.rex\_market\_type' doesn't exist

## Energy

### Energy consumption

Primary energy need : 51,00 kWhep/m<sup>2</sup>.an

Primary energy need for standard building : 106,00 kWhep/m<sup>2</sup>.an

Calculation method :

Breakdown for energy consumption : Heating: 28 Cooling and Hot Water: 0 Ventilation: 13 Auxiliary and lighting: 11 PV: 61

Initial consumption : 160,00 kWhep/m<sup>2</sup>.an

### Real final energy consumption

Final Energy : -8,00 kWhef/m<sup>2</sup>.an

Real final energy consumption/m<sup>2</sup> : 16,00 kWhef/m<sup>2</sup>.an

Year of the real energy consumption : 2 014

### Envelope performance

Envelope U-Value : 0,38 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

Thermal performance of joinery sets improvement:  $U_w = 1.3 \text{ W} / \text{m}^2 \cdot \text{K}$  Insulation: Façades: pregroche 50 + 10 + mineral wool ( $\lambda = 0.040$ ) thick 150 mm /  $R = 5.59 \text{ m}^2 \cdot \text{K} / \text{W}$  Roof: mineral wool ( $\lambda = 0.041$ ) thick 220 mm /  $R = 5.5 \text{ m}^2 \cdot \text{K} / \text{W}$

Indicator : I4

Air Tightness Value : 0,73

### More information

Within the context of PREBAT (Research and Experimentation Programme on Energy in the Building), aimed at experimenting with techniques and materials that will make the future reference and to anticipate future thermal legislation, ADEME launched calls for projects at the regional level for new constructions and for renovations.

As the first refurbished school at BEOPS level in Picardy, the Michel Ange school naturally had a particular interest for the Picardie Regional Directorate of ADEME.

With an ambitious technical specifications, beyond the eligibility criteria imposed by ADEME, this project was the subject of a monitoring consumption over the first year after the works, a procedure which at the time was not mandatory. After one year of use, analysis of ADEME shows that the school does not reach the level BEPOS according to a building producing more energy than it consumes. It is overconsumption 15 kWhEp / m<sup>2</sup>.year beside the production. Several reasons explain this deviation from the forecast: First, the calculation toolkit is based on assumptions sometimes detached from the reality reality. The hot water consumption is a good example: While it is considered to be zero, the hot water actually represents 19% of building energy consumption. Furthermore, computer equipment or electrical appliances do not enter to the initial calculation. We must also take into account the behavior of users who are not necessarily aware of the energy savings which bad practices can lead to overconsumption (like poorly closed taps or lights that remain on). Despite this established discrepancy, the goal is not far and should be attainable after some adjustments and awareness. The results of the work on the Michel Ange school is very positive. The Michel Ange school is for ADEME an iconic operation, subject of numerous articles in internal publications and in the local press. The very positive feedback from users confirm the quality of the comfort of the building. Florent DUPUIS Engineer Building and Renewable Energy ADEME - Direction Régionale de Picardie

## Renewables & systems

### Systems

Heating system :

- Condensing gas boiler
- Water radiator

Hot water system :

- Other hot water system

#### Cooling system :

- No cooling system

#### Ventilation system :

- Double flow heat exchanger

#### Renewable systems :

- Solar photovoltaic

Renewable energy production : 107,00 %

## Environment

### Urban environment

Classic urban environment of Amiens. Project of refurbishment without changing this environment

## Products

### Product

Membrane Vario Duplex

ISOVER

Resp Commercial

<http://www.isover.fr/Offre-produits/Catalogues-produits-ISOVER/Membrane-Vario-Duplex>

Product category : Table 'c21\_spain.innov\_category' doesn't exist SELECT one.innov\_category AS current,two.innov\_category AS parentFROM innov\_category AS oneINNER JOIN innov\_category AS two ON one.parent\_id = two.idWHERE one.state=1AND one.id = '7'

Membrane composed of a film based on polyamide grid laminated to a nonwoven web - Achieves excellent air tightness performance - Removes the risk of condensation in the lumber and promotes their drying - Compatible with bare and coated kraft wool

Easy installation



## Costs

### Construction and exploitation costs

Renewable energy systems cost : 123 000,00 €

Cost of studies : 19 000 €

Total cost of the building : 1 440 000 €

Subsidies : 216 000 €

### Energy bill

Forecasted energy bill/year : -1 500,00 €

Real energy cost/m<sup>2</sup> : -1.23

Real energy cost/Children : -7.5

## Carbon

### GHG emissions

GHG in use : 7,00 KgCO<sub>2</sub>/m<sup>2</sup>/an

Methodology used :

BET calculation

## Reasons for participating in the competition(s)

ENR: 200 m<sup>2</sup> of photovoltaic panels on the roof

Energy refurbishment : exterior increased insulation

Net-Zero energy Building : replacement of the original CMV (controlled mechanical ventilation) by a dual flow ventilation.

Third Industrial Revolution:

- Energy Efficiency
- Energy Producer Building

## Building candidate in the category



Energies renouvelables



Rénovation énergétique



Bâtiment zéro énergie

