# Abdelmalek Sayad school complex in Nanterre

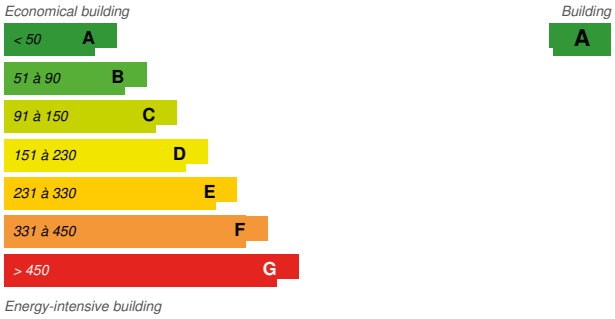
by Katleen Vercauteren / 2015-06-29 15:46:01 / France / 18275 / FR


**Primary energy need :**

**43.18** kWhep/m$^2$.an

**(Calculation method : )**

**ENERGY CONSUMPTION**




**Building Type** : School, college, university
**Construction Year** : 2013
**Delivery year** : 2013
**Address 1 - street** : rue Abdelmalek Sayad 92000 NANTERRE, France
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 5 063 m$^2$
**Construction/refurbishment cost** : 13 712 175 €
**Cost/m2** : 2708.31 €/m$^2$

**Proposed by :**

GAMBA

## General information

The school group Abdelmalek Sayad sheds develops an architecture that recalls the site's industrial past: the polluting battery plant in exemplary school environmental perspective, it is a symbol accentuated by the facades bearing the Republican motto in 40 languages.

Beyond the reduction of energy consumption and production of renewable energy, the project aims to reduce the carbon impact of the construction itself and the building throughout its cycle vie.C'est as such **manifest** as **a building of its life cycle, it also stores more carbon than it emits, including construction:**
- Energy consumption divided by 4 relative to the regulatory level (passive)
- Consumed mainly renewable energy (heat network with recovery of waste water and geothermal)
· - Central ensure a photovoltaic renewable energy production exceeded consumption (positive energy)
· - The use of renewable bio-based materials and to significantly reduce the embodied energy in particular (carbon storage)

The implementation of the school group promotes the quality of urban integration, quality andthe use bioclimatic design (passive heating of buildings, balance between compactness and performance envelope, daylighting strategy for all areas, the strategy hygrothermal comfort comfort for winter and summer comfort). Food safety has also been extreme care using only the saint materials (VOC or formaldehyde) and even air-purifying (photocatalytic). On the concrete floor of the car park, the building is completely made of wood: wood frame walls platform structure, Solid wood flooring without glue journaled (26 cm), wood frame walls and

wood fiber insulation, solid wood furniture.

The NFA Agency has developed environmental expertise and competence integrated wood, and was distinguished by its commitment for nearly 20 years in these fields.

## Sustainable development approach of the project owner

The project is part of a global environmental initiative supported by the City of Nanterre, one of the first in France to have with a territorial climate plan in 2007. The vote of this plan has boosted the energy service which enlisted new skills through the creation of two posts: a peeler stream and an energy engineer. The objective of the CFEP for the nine municipal buildings was to increase the thermal regulations and systematize the use of renewable energies. In 2011 the City of Nanterre realized his first BBC building with a wooden frame and insulation. In the school group Abdelmalek Sayad, she wished further enhance the ambition of overall environmental performance of the building. The idea was also to transform land polluted by Fulmen business in a place ecologically exemplary, through the strong desire to write a very ambitious environmental program for school groups: the goal of building an energy building positive is stopped, the timber construction method is recommended and an efficient overall environmental balance is requested. The program's goal was to set ambitious targets while remaining open enough on how to get there, as well as the appreciation of the level of the overall environmental performance of the building.

# Stakeholders

## Stakeholders

Function : Contractor

Ville de Nanterre

Mme Collignon - Tel: 0147295238

http://www.nanterre.fr/
Program / Project management / Operations Management

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Function : Designer

Nicolas Favet Architectes

Nicolas Favet - Tel: 01 41 58 15 26

http://www.nfa.fr/
Design / Works / Environmental Engineering

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Function : Thermal consultancy agency

Coretude

Alain Duval - Tel: 01 30 59 97 53

http://www.coretude.com/
Thermal Engineering / CVC / CFO CFA / GTC

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Function : Structures calculist

BIIC

Robert Pastor - Tel: 01 47 47 42 42

Engineering Concrete Structure

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Function : Structures calculist

Teckicea

Sylvain Rochet - Tel: 03 81 46 48 53

http://www.teckicea.fr/
Wood Structure Engineering

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Function : Other consultancy agency

Pascal Loison Economiste

Pascal Loison - Tel: 03 28 52 31 74

Economics of Construction

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Function : Structures calculist

Gamba Acoustique

Jean-Philippe Dejaifve - Tel: 01 39 93 21 71

http://www.gamba-acoustique.fr/
Acoustic Engineering

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Function : Other consultancy agency

Périchimie

Marc Vauthier - Tel: 01 30 99 02 98

http://www.perichimie.fr/
Remediation of Soil Engineering

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Function : Assistance to the Contracting Authority

Les ENR

M. Monaco - Tel: 01 57 19 50 06

www.lesenr.fr
AMO Phase Environmental Studies

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Function : Company

Vaninetti SAS

M. Burnouf - Tel: 01 30 94 58 08

Macro-Lot Clos covered extended (carpentry, roofing, waterproofing, photovoltaic, exterior joinery, cladding, partitions, linings, millwork)

## Contracting method

Macro packages

## Type of market

**Table 'c21_maroc.rex_market_type' doesn't exist**

# Energy

## Energy consumption

Primary energy need : 43,18 kWhep/$m^2$.an

Primary energy need for standard building : 100,89 kWhep/$m^2$.an

Calculation method :

Breakdown for energy consumption : according RT2005: - 13.25 Heating - ECS 4.43 - 15.48 Fans - Lighting 9 - Auxiliary 1.02 - Photovoltaic Production -48.92 according end of the project and taking account of renewable energy heating network, the measured air tightness : 5.3 Heating / ECS 2.66 / 15.48 Fan / Lights 4.5 / auxiliaries 1.02 / photovoltaic production -52.34

## Envelope performance

Envelope U-Value : 0,33 $W.m^{-2}.K^{-1}$

Building Compactness Coefficient : 0,43

Indicator :

Air Tightness Value : 0,39

## More information

Regulatory calculations were made without taking into account that the district heating system is 50% renewable, and with an airtightness of 1.2 in Q4. The calculations adjusted for these items provide a primary energy need of -23.39 ep kWh / m² / year

# Renewables & systems

## Systems

Heating system :

- Urban network
- Low temperature floor heating

Hot water system :

- Urban network

Cooling system :

- Urban network
- Floor cooling

Ventilation system :

- Natural ventilation
- Nocturnal Over ventilation
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Heat pump (geothermal)
- Energy recovery from waste

Renewable energy production : 185,00 %

Photovoltaic Electricity Production: - 312 solar panels providing a peak power of 99 840 Wp - The framework of fixing the roof on a surface of approximately 550m² - 6 DC side switching cabinets including disconnectors, surge arresters and RCD - Inverters for convert the direct current produced by the AC panels - 1 switching cabinet incorporating side AC disconnect switches, surge arresters and RCD - 1 type of emergency stop punch for emergencies - one monitor connected to the housing Internet for the postponement of production data - one display output at the reception to communicate the activity of the plant on the site At the heating network - more than 50% of the energy of heating network comes from the recovery of waste water and geothermal tablecloth.

## Smart Building

BMS :

GTC for: savings in energy consumption, ease of maintenance and monitoring, user comfort. Control of the envelope with hundreds of control and measurement points: outdoor temperature, indoor, heated floor in

Smartgrid :

No smart grid itself, but part of photovoltaic production is used locally to provide lighting (constant) of the public underground car park beneath the building.

Users' opinion on the Smart Building functions : A priori, no particular remark. Users are satisfied with the conditions of comfort which translates as the home automation system / BMS is not necessary negatively users. The expert system is he, who managed the company responsible for building operations management.

# Environment

## Urban environment

Land plot area : 4 967,00 $m^2$

Built-up area : 4 967,00 %

Developed on five hectares of reclaimed brownfield enterprise ECAC / Fulmen, the eco-neighborhood ZAC Sainte Geneviève Centre aims to become an exemplary operation for sustainable development. Thus, the housing (600), two residences (apprentices and young workers) offices and shops (1000m) and facilities (school complex / recreation center and public parking) are being implemented as part of a charter Environmental has two major development areas: an architecture that reconciles bioclimatic techniques and the reduction of consumption of fossil fuels, and promoting renewable energy (solar, heat networks). Three new streets (classified as Zone 30), a pedestrian will be created, and a small square in the heart area and kitchen gardens in the heart of islets. The first buildings under construction (A2 lots and B3) meet the certification THQE (Very High Environmental Performance) while the following lots (Lots B1-B2, C) will satisfy the minimum label BBC (Low Consumption Building). School group and recreation center (group A1), currently under construction, is itself a zero energy building wooden structure. The new school complex with its contemporary and expressive architecture allows to affirm the identity of the new ZAC Sainte Genevieve in Nanterre. The architectural approach integrates environmental quality as an integral part of the project design. Environmental aspects guiding the project upstream from the sketch phase in defining the guidelines of the architectural part of the building's morphology and its materiality, as well as in the definition of systems and control strategies sound and lighting moods.

# Products

## Product

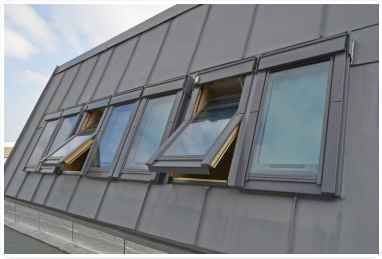
Velux Integra

VELUX

jean.marc.piuro@velux.com

http://www.velux.fr

Product category : Gros œuvre / Charpente, couverture, étanchéité



• Materials: wood, bio-based material used in the construction of VELUX windows INTEGRA® comes from forests managed in a rational and sustainable manner as demonstrated by the PEFC certification. • Manufacturing process: much falls wood needed for production of the window is recovered and valued in internal streams (fuel for heating plants) or external. • Logistics: The location on the French territory of window manufacturing plants, shutters and blinds can limit the impact of gas emissions of greenhouse gases associated with transport. • Air tightness: The level of tightness of windows allows air to limit the infiltration of cold air in winter. This feature reduces the building's heating needs. • Energy saving: The installed windows have a transmission coefficient of 1.1 W / (m².K), the highest market value for a double glazed roof window. These performances contribute to reducing heating needs. In summer, the automatic opening of motorized INTEGRA® windows at night can cool the building, avoiding the need for an energy-intensive air conditioning. • Life cycle: The wooden windows VELUX INTEGRA are the subject of a specific Environmental and Health Data Sheet, which can appreciate as accurately the environmental performance of the project.

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Solid Wood journaled

Sidler

info@sidlerholz.ch

http://www.sidlerbst.ch/

Product category : Gros œuvre / Structure, maçonnerie, façade

The assembly of wooden boards in packet journalling makes available the timber construction elements for configuring floors, walls and solid wooden roofs. In fact, it comes to form the structural portion of a floor joist that, a wall that amounts or a roof that rafters. The assembly is done by driving beech pins through holes of precise and regular interval in packets planks, wooden strips. The timber is dried at about 15%, beech journals are kept close to 7% - they then swell in contact with the timber to ensure sustainable assembly.

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Gypsum Fibre plate

Fermacell

gilles.delesvaux@xella.com

http://www.fermacell.fr

Product category : Second œuvre / Cloisons, isolation

The plates fermacell-gypsum fibers consist of 80% gypsum and 20% of paper fibers obtained by a recycling process. The homogeneous mixture of these two natural ingredients is mixed with water - no other binder. The whole is compressed to high pressure and dried to obtain a rigid plate and odorless, which, after impregnation of a water-repellent substance, is cut to the required sizes.

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## Costs

### Construction and exploitation costs

Total cost of the building : 13 712 294 €

## Health and comfort

### Indoor Air quality

Reducing chemical, physical and biological pollution inside the building has chaired the constructional and technical choices and building finishes. The implementation of effective ventilation double flow, allows both significant energy savings, but also allows for indoor air quality: -In filtering incoming air effectively with gravimetric filters and opacimetric (G4 and F7) usually used in hospital settings, filtering among other plant pollens, dust, germs, etc ... -In providing excellent airtightness of the building and ventilation networks (class B), in addition to energy savings, also prevents air infiltration pests and carriers of hazardous -A flow adjustment depending on the air quality and occupation by CO2 sensor 18-25 m3 / h or much more than the French standard (there is evidence that high CO2 levels resulting in reduced school performance) -The mouth insufflation and extraction are positioned to ensure optimal scanning Reducing indoor air sources indoor pollution has been the subject of great attention and special monitoring throughout the project: -A use of products with eco-labels certifying their very low emissions including their routine maintenance and Emission Display -The reduction of fibers and particles: Fermacell (cellulose gypsum board), wood wool encaissonnée instead of mineral wool, wooden false ceilings -The generalized reduction of VOC and formaldehyde: linoleum flooring with 100% natural treatment Surface glue factory with non-emissive, non-emitting paint in aqueous phase, using solid wood without glue, etc ... -Implementation of widespread sanitizing materials such as paint and hard floor coverings photocatalytic effect (apart VOCs, gases, odors, molds, fungi and even bacteria and viruses) The construction process consisting essentially of bio-based materials, it was brought particular care not to allow fungal or bacterial growth in the walls finely modeling the vapor migration in walls and ensuring their perspirance.

## Comfort

Health & comfort : Winter Comfort The building surisolation avoids the effects of cold wall ensuring homogeneity of their surface temperature, accompanied by a low-temperature floor heating can reproduce the best feeling of comfort. Heating is by primarily by solar gain, then underfloor heating provides an inertial base that complements the dual flow ventilation with hot water battery that provides dynamic air preheating, then relayed by contributions internal (heat from occupants, children and adults). Thus, while providing comfort to the children arrive in the morning, we avoid the discomfort that usually follows in the morning, when internal inputs in addition to the contribution of radiant heat. Each room is equipped with a temperature sensor and a CO2 sensor that can modulate the finest possible comfort conditions based activities (dormitories, motor skills room, classroom, health, etc ...) solar gain and needs. The airtightness of the building and the double flow ventilation can prevent the direct introduction of outside air and the air currents which children are very sensitive. Summer comfort The organization of the building on the plot, the constructive choice and design of the enclosure meet the needs of a real strategy in place to ensure summer comfort. Bioclimatic design limits the direct solar gain in the correct orientation and size of windows and types of glazing, with sun protection on the facades east, west and south by breezes suns with adjustable blades that can benefit from natural light without risk overheating. The interior street is located in a naturally shaded area of the building most of the day and is equipped with external sun protection textiles. Sunscreens are manually controllable by users, but are, in basic plan, automation to optimize energy inputs and comfort and in particular, to avoid any risk of overheating. The constructive solution timber is sometimes criticized for its low inertia, but the use of wood fiber with large thicknesses for insulation, the partition as well as the use of gypsum board Fermacell cellulose and the presence of yokes at each level can benefit from inertia providing comfort equivalent to a "hard" solution. The device is completed by a free cooling consisting enjoy the night freshness for over-ventilate the area for unloading and thus the refresh for the next day. Also, the building is designed to take advantage of good natural ventilation, the air speed being a notorious component of the feeling of freshness. Thus, the floors of classrooms, most sensitive to overheating benefit both of opening the roof and facade, on opposite directions, with significant natural draft. Ultimately, especially in local high density of occupation, a passive refresh was set up in relation to the district heating system in geothermal energy. The network to keep water circulation including summer, sending cool water (ground temperature in summer is about 12 ° C) does not consume any energy. Better, certainly at the margin, but the solution even recharges the soil and improve plant efficiency to the next heating season. Level studies, assumptions go beyond regulatory calculations are based on purely theoretical data and in any case mean that confront evil with the reality of summer conditions. Also, global warming seeming to be an acquired data, it seems logical to take this into account in the design of buildings to remain in office for decades. Thus, 2 is added to the conventional weather curved and the building is "tested" by modeling for a heat wave scenario (at 30 ° day and night). More than 120 simulations have been performed to find the right technical and constructive solution. The objective of comfort sought is less than 40 hours at + 27 ° on the annual occupancy time including in these extreme conditions.

Calculated thermal comfort : simulation thermique dynamique. Aucun local avec plus de 40 heures par an au dessus de 27°

Acoustic comfort : The first solution, architectural and functional is the local acoustic zoning by creating more dynamic areas (catering, function rooms, interior street) and other quieter (dormitories, classrooms) also as far away from outside noise of roads to allow to open windows in summer to naturally ventilate without being too embarrassed. The nursery and primary courses are also separated by the building to prevent discomfort related to possible synchronization recreations. Also, the technical equipment can emit noise (ventilation, heating) are isolated, all service rooms are located in the basement. The second solution is constructive and seeks to avoid disturbing noise by good performance of weakening external noise and noise transmission in the building. It ensures the isolation of the envelope to outside noise thanks to a composition combining mass walls (cellulose gypsum panels, solid wood) and spring (wood fiber) in a building system combining thermal and acoustic performance. It also provides isolation between local, either by walls or woodwork or high performance by reducing impact noise by combining a concrete screed with hardwood floors and the use of absorbent flooring . The third solution is to promote good speech intelligibility by good acoustics correction. It also reduces the source intensity and noise propagation. It consists essentially of absorbent surfaces to decline in all local: wood fiber concrete ceiling, in discontinuous and continuous activity rooms in restaurants, wall covering paneling pierced in circulation, internal street, the room Restore, perforated ceilings wooden strips in circulation, gypsum board ceilings cellulose punched into the classrooms and activity, etc ... Finally, the fourth solution is to reduce technical equipment noise. Essentially focused on ventilation, these measures consist largely dimensioned ducts to ensure a high flow rate, without whistling effect; device supplemented with sound traps disposed along the array.

# Carbon

## GHG emissions

Methodology used :
Tool Cocoon / Bilan Carbone ADEME

## Life Cycle Analysis

Eco-design material : Prefabricated timber frame wall Intermediate floor hardwood journaled (no glue) wooden glulam timbers and traditional carpentry wood fiber insulation panels Doublages gypsum cellulose linoleum floors and wooden exterior joinery roof windows

# Contest

## Building candidate in the category

Green Building Solutions Awards 2015
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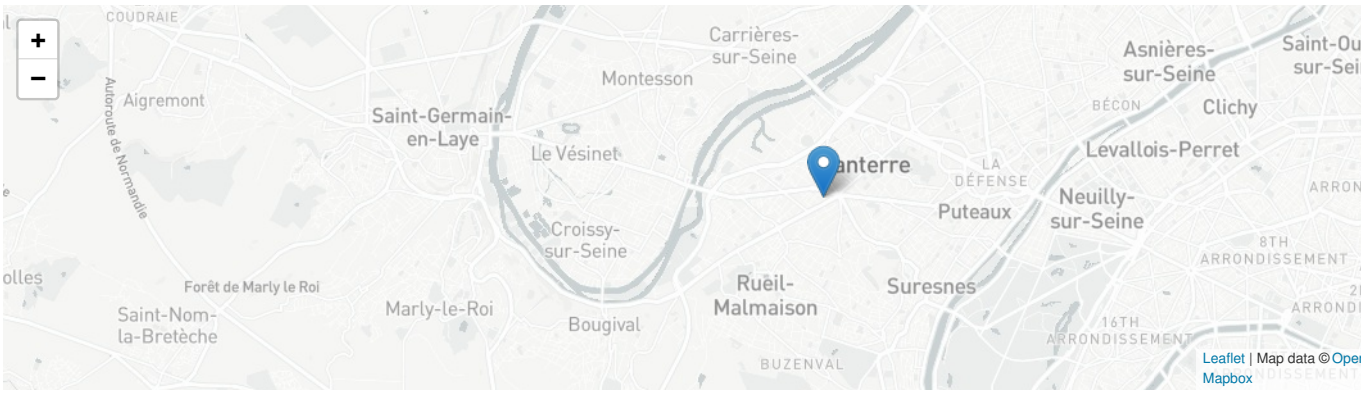
Santé et confort

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