Passive Kindergarten Garnich

by Violaine Giaux / 2016-06-17 12:19:49 / Luxembourg / 11525 / FR

New Construction

Primary energy need :

49.5 kWhep/m^2.an

(Calculation method : Built before those regulations)

ENERGY CONSUMPTION

Economical building

- < 50 A
- 51 à 90 B
- 91 à 150 C
- 151 à 230 D
- 231 à 330 E
- 331 à 450 F
- > 450 G

Energy-intensive building

Building: **A**

Building Type : Preschool, kindergarten, nursery
Construction Year : 2010
Delivery year : 2012
Address 1 - street : 8353 GARNICH, Luxembourg
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 1 217 m^2 SHON
Construction/refurbishment cost : 3 650 000 €
Number of Children : 168 Children
Cost/m2 : 2999.18 €/m^2

General information

In 2008, a close cooperation between the Administration Communale de Garnich, architects of Architecture and Planning Workshop Ali Barthel and engineers from Betic SA was formalized to ensure the construction of a passive kindergarten in Garnich.

This construction with high energy efficiency, in operation since 2012, consists of two levels, a basement and a ground floor. To implement the basic principles of sustainable development, the majority of the windows are oriented south, blinds allow heat reduction during the summer, and the insulation thickness is optimized.

The building is composed as follows.

On the ground floor:

8 classrooms,

1 large central hall,

2 media room / library,

1 game zone,

2 toilets blocks F / H and toilets for disabled,

1 rest area,

1 baby room,

1 office,

2 cloakrooms.

In the basement :

1 studio / reserve,

1 teacher's office,

2 toilets blocks F / H

2 workers cloakrooms F / H

1 laundry,

1 storage room,

1 corridor,

1 technical area,

1 kitchen.

Geothermal features:

Built surface on the ground: 566 m2

Volume of the building: 5218 m3

Surface of the facade (with glass): 860 m2

Glazing facade surface: 299 m2

The Garnich kindergarten offers a daily supervision for children aged 4 to 12 years. The coaching staff works according to the pedagogy "Welt-Atelier", the idea of "competent child" is at the heart of the concept. The child, through his own experiences in different contexts, will develop reasoning and questioning.

More details on this project:

http://www.betic.lu/ under "our news"

Data reliability

Assessor

Stakeholders

Stakeholders

Function : Contractor

Administration Communale de Garnich

Laurent Gindt

http://www.garnich.lu/

Function : Assistance to the Contracting Authority

Schroeder & Associés s.a.

Olivier Zirhheld

http://schroeder.lu/
Management

Function : Designer

Atelier d'architecture et d'aménagement ALI BARTHEL

Ali Barthel

http://www.abarchi.com/index.html

Function : Other consultancy agency

Betic - Ingénieurs-Conseils

David Determe

http://www.betic.lu/
Thermical and technical Studies

Function : Environmental consultancy

Simon & Christiansen

Marc Waltener

http://www.simon-christiansen.lu/
civil engineering

Function : Environmental consultancy

SECOLUX s.a.

Pierre Favresse

http://www.groupseco.com/en
Approved firm

Function : Environmental consultancy

ARGEST s.a.

Cristian SLOJITORU

http://www.argest.eu/
Security and Safety

Function : Company

Bâti-Travaux

Rudolf Badura

http://www.bati-travaux.lu/
Flat Roofs

Function : Company

SCHREINEREI MESSERICH

Steve Messerich

http://www.messerich.com/franais/home
exterior woodwork

Function : Company

GABBANA

Dominique Miranda

http://www.gabbana.lu/fr/accueil.php
Sanitary - HVAC installations

Owner approach of sustainability

Launched in 2008, the construction project of the Garnich kindergarten took place in a period when the desire to improve the energy performance of buildings had grown considerably. The project is part of a strong sustainable development approach, which takes into account more than ever the energy consumption. Techniques have been designed to lower the energy consumption of the building, while adapting to the needs of space and comfort of the children and supervising staff. The ecological aspect has been integrated from the project design and the operating costs have been minimized. The choice of materials has also been included in the conception phase to meet a dual challenge: using environment friendly materials able to meet high requirements in terms of energy performance. At that time, the Office of Consulting Engineers Betic had already worked on the construction of two passive houses and was able to share its experience in the field. The previously used techniques have been fine tuned to further strengthen the "energy independence" of the kindergarten and the ambitious target was reached without any particular problems: an autonomous production of 85% of energy needs of the building.

Architectural description

The architectural principle is based on a timber frame insulated with wood fiber on the first floor and on the ground floor, with insulating blocks of rock wool covered with a dark gray brick siding. Flat roofs are isolated and vegetated to regulate the temperature in summer and help biodiversity existence. The rainwater are recovered in tanks to supply toilet flushing. The building's architecture incorporates the main features of a building to reduce energy losses, namely: - A compact design, - A thoughtful space organization and a separation of heated and unheated premises, - Large glass surfaces on the south facade and less on the north side, - An important amount of natural light, - Highly insulated walls ... Heated and unheated rooms are grouped into blocks to avoid heat transfers and excessive loss. Technical areas are located north and constitute a buffer zone with the outside. Important dimensions of windows facing south, east and west increase solar gain and daylighting contributions and thereby reduce the consumption of electrical energy for lighting. Awnings also guarantee the reduction of heat gain in summer and also provide thermal comfort during warm periods. Lighting is managed by skylights and dimmable lighting controlled by occupancy sensors and whose intensity varies according to the natural light. The implementation of a consistent insulating envelope reduces heat transfer from inside to the outside of the building and contributes to the set of techniques applied to the building for optimal efficiency.

If you had to do it again?

The first feedbacks have shown that the facilities were not fully exploited optimally. Furthermore, it appears that the occupants must integrate more useful information quickly. For instance, a user manual would have allowed a faster understanding of the building. From now on, Betic offers this type of service.

Building users opinion

The light provided by the skylight is really nice. It creates an intimate atmosphere but sufficient for daily activities. In terms of energy production, it's really fun and educational to be able to follow the production of photovoltaic panels in real time.

Energy

Energy consumption

Primary energy need : 49,50 kWhep/m^2.an

Primary energy need for standard building : 153,20 kWhep/m^2.an

Calculation method : Built before those regulations

Final Energy : 18,40 kWhef/m^2.an

Breakdown for energy consumption :
- Heating: 29%;
- ECS: 17.2%;
- Lighting: 22.7%;
- Ventilation: 30.4%;
- Power supply: 0.8%

Envelope performance

Envelope U-Value : 0,26 W.m^{-2}.K^{-1}

More information :
main opaque parts:
• Exterior walls - insulating facade on wood framing:
Double plating in plasterboard (2,5cnn - λ = 0.27 W / mK)
isolated technical installation area, on wooden substructure (6cm - λ = 0.035 W / mK)
Plate OSB (1.5cm - λ = 0.17 W / mK)
Frame wooden carrier (TJI beams) with insulating filling (24cm - λ = 0.035 W / mK)
Panel insulation in wood fiber (6cm - λ = 0.048 W / mK)
External rendering (1.5cm - λ = 0.87 W / mK)
• Exterior walls - brick veneer (Base):
plaster coating (1.5cm - λ = 0.53 W / mK)
insulation block (17.5 cm - λ = 0.15 W / mK)
Heat insulation (18cm - λ = 0.035 W / mK)
Blade ventilated air (4cm)
brick veneer anthracite (11.5cm - λ = 1.8 W / mK)
• Extensive green roof:
Plaster coating (1.5cm - λ = 0.53 W / mK)
Concrete slab army (25cm - λ = 2.1 W / mK)
Vapour barrier
Thermal insulation Rockwool (30cnn average - λ = 0.040 W / mK)
multilayer membrane Waterproofing (1cm - λ = 0.17 W / mK)
draining Mattresses (3cm)
Topsoil (7cm - λ = 2.1 W / mK)

Glazed part:
• Windows:
wood-aluminum profiles (U = 0.85 W / m2K)
Triple glazing (U = 0.60 W / m2K)
Total: U = 0.76 W / m2K

Building Compactness Coefficient : 0,53

Indicator : EN 13829 - n50 » (en 1/h-1)

Air Tightness Value : 0,59

Renewables & systems

Systems

Heating system :

- Geothermal heat pump
- Low temperature floor heating
- Others
- Solar thermal
- Canadian well

Hot water system :

- Condensing gas boiler
- Heat pump
- Solar Thermal

Cooling system :

- Canadian well

Ventilation system :

- Free-cooling
- Double flow heat exchanger
- Canadian well

Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Heat Pump on geothermal probes

Renewable energy production : 85,00 %

"Passive" does not mean "zero energy" but almost ... To replace the need for residual heat, several options were considered to achieve an optimal combination: heat recovery on the hood of the kitchen, a Canadian well, a geothermal heat pump, 10 solar panels and heat recovery on controlled mechanical ventilation. The heat created / recovered is distributed by the ventilation in classrooms and by underfloor heating in other rooms.
The domestic hot water is also covered by this combination of technology.
The use of the building being mainly in summer, solar panels were evidence. However, since these systems are working at low temperatures, a gas boiler that pushes hot water once a day to more than 60 ° C has been implemented to cancel the risk of legionella.
The building does not need air conditioning but the inside air blown by the fan has a temperature below the outside temperature because it is refreshed by the Canadian wells and boreholes.
Finally, to cover much of the electrical needs, 53 solar panels were set up on the green roof.

Environment

GHG emissions

GHG in use : 12,10 $KgCO_2/m^2$/an

Life Cycle Analysis

Eco-design material : Rain water is harvested from the 700 m2 of vegetal roof and provides the toilets network.

Products

Product

VELA ROUND CEILING

xalusa

ELECTRO-TECH

http://www.xalusa.com/en/Home

Product category : Génie climatique, électricité / Eclairage

coated aluminum lacquered white structured surface satin box with acrylic cover for uniform illumination. Allows distribution of direct / indirect light.

These luminaires are dimmable and energy efficient. They work very well with circular skylights and acoustic ceilings to delight the users.

Costs

Construction and exploitation costs

Renewable energy systems cost : 275 000,00 €

Total cost of the building : 3 650 000 €

Subsidies : 91 000 €

Urban environment

The localization of the kindergarten in its environment has been thought since the early days of the project. It was logically built near schools and playgrounds.

Land plot area

Land plot area : 3 346,00 m^2

Built-up area

Built-up area : 17,00 %

Green space

Green space : 680,00

Parking spaces

The kindergarten is by definition a crossing place where parents drop or pick up their children after activities, so significant areas of long-term parking were not necessary. Nevertheless, short-term car parks: "kiss and go", were installed to meet the needs of parents and parking lots have been provided for the operational and management staff.

Building Environnemental Quality

Building Environmental Quality

- Building flexibility
- indoor air quality and health
- biodiversity
- acoustics
- comfort (visual, olfactive, thermal)
- water management
- energy efficiency
- renewable energies
- maintenance
- integration in the land
- products and materials

Contest

Reasons for participating in the competition(s)

La maison relais de Garnich est réalisée selon le standard passif :

isolants de valeurs lambda performantes et d'épaisseurs conséquentes,
façade insufflée par de la laine de bois,
toiture végétalisée,
l'étanchéité à l'air du bâtiment est élevée, inférieure au seuil de 0.6 1/h fixé pour le passif.

Chauffage :

pulsion d'air chaud dans les salles,
plancher chauffant dans les halls et couloir.

Production de chaleur et d'eau chaude :

pompe à chaleur alimentée par des sondes géothermiques de 85m de profondeur,
complément assuré par 10 panneaux solaires thermiques.

Récupération de chaleur :

sur un groupe de ventilation par système à plaques à contre-courant sur la hotte de la cuisine,
sur un groupe de ventilation à roue pour les salles de classes,
par un échangeur terrestre (Puit Canadien) qui précède le groupe de ventilation des classes.

Récupération de fraîcheur :

par un échangeur terrestre (Puit Canadien) qui précède le groupe de ventilation des classes,
par les forages qui « by pass » la pompe à chaleur en été et rafraîchissent l'air de la ventilation des cuisines.

Production électrique :

56 panneaux solaires photovoltaïques produisent l'électricité nécessaire et réinjectent le surplus dans le réseau.

Récupération d'eau de pluie :

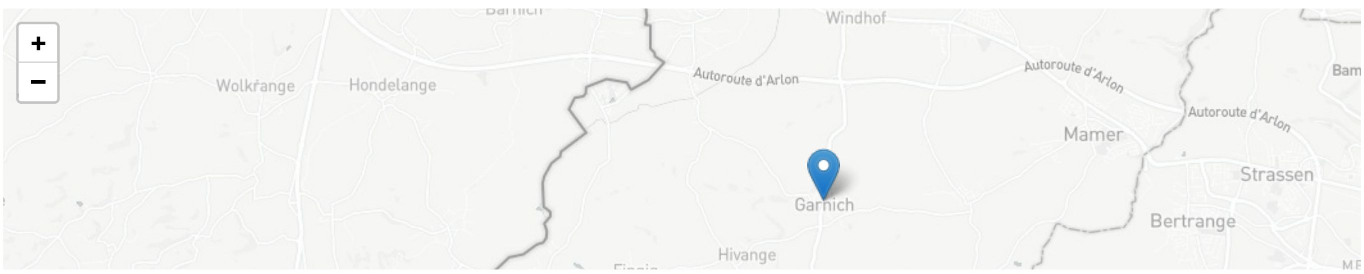
10.000 L de récupération d'eau de pluie sont installés dans le local technique,
alimentation des WC, urinoirs et robinets extérieurs.

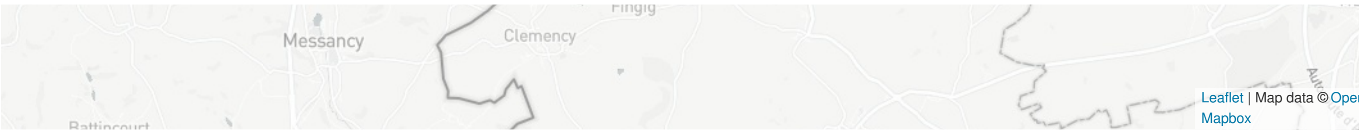
Grâce à tous ces équipements techniques combinés, la maison relais est quasiment autonome.

Building candidate in the category

Energie & Climats Tempérés

Coup de Coeur des Internautes





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