Technical High School for Health Professionals in Ettelbruck

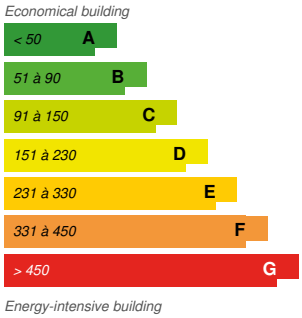
by Fabeck Tatiana / 2019-06-04 17:07:17 / Luxembourg / 9618 / FR

Primary energy need :

39.3 kWhep/m².an

(Calculation method : RGD du 31 août 2010 - bâtiment fonctionnel)

ENERGY CONSUMPTION



Building Type : School, college, university
Construction Year : 2016
Delivery year : 2019
Address 1 - street : Impasse Avenue Salentiny L-9080 ETTELBRUCK, Luxembourg
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 7 237 m² NGF
Construction/refurbishment cost : 10 €
Number of Pupil : 450 Pupil
Cost/m2 : 0 €/m²

Certifications :

MINERGIE-ECO® MINERGIE-P®

General information

Technical High School for Health Professionals in Ettelbruck won the Sustainable Construction Grand Prize of the 2019 Green Solutions Awards at the Luxembourg level + a mention for the international Sustainable Construction Grand Prize

The Lycée pour Professions de Santé in Ettelbruck, now the largest wooden building in the Grand Duchy, is a pilot project. It is indeed the first Luxembourg public building with positive energy, in other words it produces more energy than it consumes. It is also the first in Luxembourg to aim for a "Minergie-P- ECO" certification In addition to the comfort of the occupants, which reaches its highest level thanks to this certification, it is also the ecological footprint of the building that has been at the centre of attention since the design phase.

In this respect, the use of materials with a low environmental impact such as wood for the construction system, or clay panels for the interior walls, has been favoured. Also noteworthy is the use of an innovative hybrid ventilation system that combines natural and mechanical ventilation. In addition, the entire roof is covered with photovoltaic panels and combined with an inter-seasonal heat storage system, and flat solar collectors with a combined surface area of approximately 350 m2 are vertically integrated to heat the seasonal tank installed in the stairwell.

Many measures make it a sustainable building: Energy production:

- **thermal collectors on the facade with a seasonal reservoir;**
- **complete roof coverage with photovoltaic panels;**
- **optimization of solar gains in winter, while avoiding overheating problems in summer.**

Renewable energies :

- **• photovoltaic installation of 2,121 m²; 258,000 kWh/a;**
- **• 350 m² of thermal collectors on the facade;**
- **• energy storage tank (91,000 l of water, height 20m);**
- **• 24 kW heat pump;**
- **• hybrid, natural and fan coil ventilation.**

Reduction of energy consumption:

- **controlled ventilation based on CO2 measurement - efficient cooling of the P.V. wave rooms by external air supply;**
- **high-performance computer equipment and electrotechnical devices A++++;**
- **optimized lighting (LED);**
- **minimization of losses by efficient envelope (30 to 40 cm of thermal insulation).**

Data reliability

Assessor

Photo credit

Fabeck Architectes

Stakeholders

Contractor

Name : Administration des bâtiments publics
Contact : martine.schmitt@bp.etat.lu
https://travaux.public.lu/fr/projets/projets-batiments/2016/lse.html

Construction Manager

Name : /

Stakeholders

Function : Designer

Fabeck Architectes

mail@fabeckarchitectes.lu

https://www.fabeckarchitectes.lu/

Function : Other consultancy agency

Betic Ingénieurs-Conseils S.A

mail@betic.lu

www.betic.lu
Technical engineer

Function : Other consultancy agency

Daedalus Engineering S.à.r.l

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www.daedalus.lu
Static engineer

Function : Other consultancy agency

EBP Schweiz AG

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Function : Other consultancy agency

SECO Luxembourg

mail@secolux.lu

www.secolux.lu

Security

Function : Environmental consultancy

D3 Coordination

a.hardy@d3coordination.lu

www.d3coordination.lu

Health and safety coordination

Function : Environmental consultancy

Dehne, Kruse Brandschutzingenieure

info@kd-brandschutz.de

www.kd-brandschutz.de

Fire safety concept

Owner approach of sustainability

As a pilot project for public buildings, this building reflects the state's desire to become a pioneer in technological innovation in sustainable construction, including zero energy buildings, and to guide the private sector towards sustainability and the environmental and energy performance of buildings. This is the second such experience for the State since the Nature and Forestry Administration in Diekirch is also positive energy.

Architectural description

With a gross surface area of approximately 8,400 m², the school will accommodate some 430 students in 16 classrooms and 6 clinical teaching rooms. The programme also includes an administration wing and a 200 m² multi-purpose room.

When planning the 4-storey building, several factors were predominant, including grey energy, the program and the construction system.

The decision to build a wooden construction with a system particularly adapted to this project is based on the objective of reducing grey energy. In several parts of the project, synergies were found, such as the roof covering of the sloping roof with photovoltaic panels that provide both coverage and energy production.

In addition to the criteria of sustainability, ecology and energy, which represent the pillars of the concept, other importan t elements have not been neglected, such as optimised natural lighting, acoustics, indoor climate, ecological materials, etc. This is based on the standardised energy concept for high schools, but has been adapted to the particular needs of this project.

All these factors have had an impact on the volume and layout of the project and are reflected in the architectural expression. Already the facade, with its wooden cladding and integrated solar panels, expresses the ecological character of the project. Inside the building, the water tank for energy storage is the central element around which the stairwell develops.

Energy

Energy consumption

Primary energy need : 39,30 kWhep/m^2.an

Primary energy need for standard building : 89,80 kWhep/m^2.an

Calculation method : RGD du 31 août 2010 - bâtiment fonctionnel

CEEB : 5.05

Envelope performance

Envelope U-Value : 0,23 $W.m^{-2}.K^{-1}$

Building Compactness Coefficient : 0,21

Air Tightness Value : 0,90

Renewables & systems

Systems

Heating system :

- Heat pump
- Solar thermal

Hot water system :

- Heat pump
- Solar Thermal

Cooling system :

- Others

Ventilation system :

- Natural ventilation

Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Heat pump

Renewable energy production : 275,00 %

The entire roof is covered with photovoltaic panels, which represents an installation of 1,550 m² and a production of 258,000 kWh/year, against an estimated requirement of 92,650 kWh/a.

On the south-east and south-west façades, flat solar collectors with a combined surface area of approximately 350 m2 are vertically integrated.These collectors heat the seasonal tank that is installed in the stairwell. With its height of nearly 20 metres and diameter including 3.1 metres of insulation, this tank is the largest installed in Luxembourg in a functional building and offers a capacity of 91,000 litres. During the summer period, the tank is heated, the temperature can reach 95°C.

Finally, two heat pumps with a capacity of 12 kW each complete the seasonal storage tank supply. They are installed in the exhaust of the ventilation unit and draw energy from the ventilation unit. The water injected into the heating network, with a temperature of approximately 28°C, is distributed by a floor system for the multi-purpose room, the fireplace and the cafeteria.

Smart Building

BMS :

This building has been designed to take advantage of all available resources. In addition to the renewable energy devices mentioned above, it is particularly efficient in terms of ventilation with the use of an innovative hybrid system that combines natural and mechanical ventilation. Fan coil units, with very low power consumption, allow the fresh air from the corridors to be drawn and pulsed into the other rooms. The corridor thus acts as a ventilation duct, which avoids a conventional metal cladding system.

The building is also equipped with high-performance computer equipment and A++++ electronic devices, as well as optimized LED lighting.

Environment

GHG emissions

GHG in use : 9,60 $KgCO_2/m^2/an$

Methodology used :

According to post-ADB CPE

GHG before use : 25,40 $KgCO_2 /m^2$

Building lifetime : 50,00 an(s)

, ie xx in use years : 2.65

Life Cycle Analysis

Eco-design material :

All the materials needed to build the school have been carefully selected to minimize their environmental impact :for example, ballasted columns instead of concrete piles, a wooden construction or clay panels for the interior walls.

In addition to the targeted Minergie-P-Eco certification, which requires that the grey energy used to build the building be limited as much as possible, theproject also aimedto achieve a Minergie-P-Eco+ level. With this in mind, the building was designed to have a positive energy balancethat would also take intoaccount grey energy expenses.

Water management

Consumption from water network : 504,00 m^3

Consumption of harvested rainwater : 192,00 m^3

Water Self Sufficiency Index : 0.28
Water Consumption/m2 : 0.07
Water Consumption/Pupil : 1.12

Comfort

Health & comfort :

In addition to the criteria of sustainability, ecology and energy, which are the pillars of the concept, other important elements have been taken into account to ensure a high level of comfort for occupants, such as optimized natural lighting, acoustic performance and a temperate indoor climate.

To contribute to this pleasant working environment in the most energy-efficient way possible, automatic and micro- perforated blinds have been installed. In summer, they allow just enough natural light to pass through to illuminate the room while rejecting most ofthe sun's rays during the day, and automatically open at nightto let the heatescape. In winter, the blinds close completely at night to keep the day's warmth. Theuse of solar energy is thus maximized, both to light the rooms and to heat them.

Finally, it should be noted that the MINERGIE-P-ECO certification rewards the most efficient buildings in terms of home and work comfort for occupants, and guarantees above-average comfort while presenting very low energy consumption.

Calculated indoor CO2 concentration :
De 800 à 1200 ppm

Measured indoor CO2 concentration :
Sans élèves < 450 ppm

Calculated thermal comfort : Entre 20 et 26°C

Products

Product

Fan coil - ductless ventilation system

Betic Ingénieurs-Conseils

www.betic.lu

Product category : Table 'c21_germany.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 = '19'

Betic Consulting Engineers has designed a sheathless ventilation system to minimize the use of high energy grey materials. These minimalist fan coil systems, manufactured by Climalux, were installed in the building at a rate of 2 per classroom.

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Energy storage tank 91,000L

BTD

https://www.btd-gmbh.de/

Product category : Table 'c21_germany.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 = '18'

On the south-east and south-west façades, flat solar collectors with a combined surface area of approximately 350 m2 are vertically integrated and are used to heat a 91,000L seasonal tank. With a height of 19.89 metres and a diameter of 3.1 metres, this tank is the largest installed in Luxembourg in a functional building. It has 300mm thick glass wool insulation (0.040W/m.K) and complies with the Minergie-ECO standard.

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Costs

Urban environment

The future site of the Technical High School for Health Professions is located in Ettelbruck, towards Warken, in the immediate vicinity of the other 2 high schools in the city and between the current Agricultural High School and the North Hospital.

This location on the edge of the "school campus" opens onto the main facade and its playground towards the Agricultural High School. The entrance is located on the courtyard side and access for students is from the impasse Avenue Salentiny. On the rear facade is the delivery access as well as 25 external spaces, common access with the hospital car park.

Building Environnemental Quality

Building Environmental Quality

- indoor air quality and health
- comfort (visual, olfactive, thermal)
- water management
- energy efficiency
- renewable energies
- building end of life management
- products and materials

Contest

Reasons for participating in the competition(s)

The Technical High School for Health Professions, located in Ettelbrück, will soon welcome nearly 430 students in 16 classrooms and 6 clinical teaching rooms. The programme includes an administration wing and a 200 m² multi-purpose room.

Initiated by the public buildings administration, the school was designed according to the principles defined for buildings in The term "positive energy" means that it produces more energy than it consumes, but also attaches great importance in

its design to grey energy, i.e. the non-renewable primary energy required for its construction and demolition.

Some particularities mark this project such as the use of wood for the construction system or clay panels for the interior partitions. In order to reduce grey energy as much as possible, the choice of materials was made, for example, for ballasted columns to reinforce the ground instead of concrete piles. In addition to its purely technical interest, this method makes it possible to reduce the environmental impact of the project, compared to other processes.

Also noteworthy is the use of an innovative hybrid ventilation system that combines natural and mechanical ventilation. In addition, the entire roof is covered with photovoltaic panels. 2,121 m² of this 2,121 m² installation represents a production of 258,00 0 kWh/year.

Thermal collectors linked to a seasonal reservoir have been installed on the facade. This building is als o equipped with high-performance computer equipment and A++++ electronic devices, as well as optimized LED lighting. The building envelope has been particularly well cared for with a thermal insulation of up to 40 cm.

On the south-east and south-west façades, flat solar collectors with a combined surface area of approximately 350 m2 are vertically integrated. These collectors heat the seasonal tank, which is installed in the stairwell, with a height of nearly 20 metres and a diameter including 3.1 metres of insulation, providing a capacity of 91,000 litres. During the summer period, the tank is heated, the temperature can reach 95°C.

This heating system, the largest of its kind installed in a functional building in Luxembourg, was designed specifically for the project and is fully in line with the overall concept of the very rigorous "Minergie- P-ECO" certification. This label, which goes beyond taking into account energy and comfort criteria, includes the use of ecological materials and the prohibition of products harmful to health.

The Lycée Technique pour Professions de Santé is the largest wooden building in the Grand Duchy, both in terms of its built surface and its height.

To come back in more detail to the heating system, two heat pumps with a capacity of 12 kW each complete the seasonal storage tank supply. They are installed in the exhaust of the ventilation unit and draw energy from the ventilation unit. The water injected into the heating network,withatemperature of approximately 28°C, is distributed by a floor system for the multi-purpose room, the foyer and the cafeteria. Fan coil units, with very low power consumption, allow the fresh air from the corridors to be drawn and pulsed into the other rooms. The corridor thus acts as a ventilation duct, which avoids a conventional metal cladding system.

Building candidate in the category

Energie & Climats Tempérés

Bas Carbone

Santé & Confort

Prix du public

Prix des Etudiants

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