BEI DE KUEBEN HOUSE

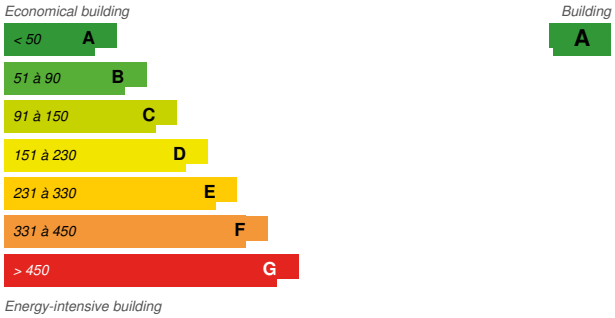
by Betic Ingénieurs-Conseils, part of Sweco / 2018-05-23 08:46:28 / Luxembourg / 11099 / FR

Primary energy need :

55.9 kWhep/m².an

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

ENERGY CONSUMPTION



Building Type : Preschool, kindergarten, nursery
Construction Year : 2016
Delivery year : 2017
Address 1 - street : 7410 ANGELSBERG, Luxembourg
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 2 300 m²
Construction/refurbishment cost : 5 500 000 €
Cost/m2 : 2391.3 €/m²

General information

In 2015, the municipality of Fischbach is launching the project for the construction of the new relay house and the extension of the basic school (Cycle 1), with the ambition of creating a space that is both welcoming and most respectful of the environment.To do this, two numerous technical devices have been proposed and selected: two large-scale photovoltaic installations, straw bale façade insulation, ventilation heated or cooled by geothermal energy, natural ventilation by motorized sashes...More details about this project :https://coeba.lu/projekt/kindertagesstaette-angelsberg (...)

See more details about this project

https://coeba.lu/projekt/kindertagesstaette-angelsberg/

Data reliability

Assessor

Stakeholders

Contractor

Name : Administration Communale de Fischbach
Contact : Romain Beckers
http://www.acfischbach.lu/fr/r%C3%A9sidents/historique-de-fischbach/maison-relais

Stakeholders

Function : Designer

coeba, dave lefèvre et associés

Marcel Emdé

https://coeba.lu/
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Function : Structures calculist

Schroeder & Associés Ingénieurs-Conseils

https://www.schroeder.lu/
-

Function : Other consultancy agency

Betic Ingénieurs-Conseils

Georges KIORPES

http://www.betic.lu/
-

Function : Environmental consultancy

Luxcontrol

https://www.luxcontrol.com/
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Owner approach of sustainability

In 2015, the municipality of Fischbach is launching the project to build the new relay house and the extension of the basic school (Cycle 1), with the aim of creating a welcoming and environmentally friendly space. Faced with the increase in the population and consequently the growing need for school infrastructures, this choice has made it possible to provide a complete response to needs by integrating urban planning, functional and technical considerations with the saving of resources, ecology and the biology of materials. The Fischbach municipal administration, which has been heavily involved in the Climate Pact since 2013, is demonstrating with the construction of this new building that a new type of construction is possible. Meeting the strictest standards, the building is part of a new direction in terms of economic and ecological prospects. The complex has been designed by all stakeholders to be CO2 neutral through reduced technologies and the highest level of use of renewable, environmentally friendly and recycled building materials. The pedagogical approach is not in rest, quite the contrary. The facilities selected enable children to be made aware of the use of natural resources. The building envelope has a wooden formwork and emphasizes the ecological aspect. The structure is composed of a concrete skeleton. The technical rooms and changing rooms, located at both ends, make it possible to reinforce the stability of the building. The mass of the concrete guarantees the storage of thermal energy and its subsequent release. Its inertia reduces the building's energy consumption, while improving its thermal comfort. The ceilings act as temperature regulators in summer and the floor heating, placed on the surface without additional screed, minimizes heat loss in winter. The façade treatment and insulation meet the criteria of a passive house. It is covered with larch panelling, one of the most resistant woods. The base of the building as well as the lower area of the north façade are covered with a clay plaster that children can play with. Flowers, handprints can indeed decorate a part of the building every new year.

The self-supporting structure of the outer walls consists of 10cm thick plywood panels. These, fixed to the ceiling or mounted from the floor, remain visible inside and reinforce the soothing climate of the building. The air in the rooms is improved by the absorption of moisture or the natural regulation provided by the wood. The insulation of the solid wood exterior wall was completed with straw thermal insulation.

VISION: development of a regional circular economy and creation of a new Luxembourg building tradition with bio-based regional building materials.

Architectural description

The relay house consists of two continuous levels, in which part of the second floor has been designed as a flat roof, opening onto nature and which can be transformed for an afternoon into an"extra classroom outside".
The building, 65m long and 17.5m wide, has a floor area of approximately 2,300m². The corbelled seat on the second level protects the entrance to the building and children from the elements.

Energy

Energy consumption

Primary energy need : 55,90 kWhep/m^2.an

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

Calculation method : RGD du 31 août 2010 - bâtiment fonctionnel

Breakdown for energy consumption :

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More information :

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Envelope performance

Envelope U-Value : 0,11 $W.m^{-2}.K^{-1}$

More information :

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Users' control system opinion :

Renewables & systems

Systems

Heating system :

- Urban network
- Low temperature floor heating
- Wood boiler

Hot water system :

- Urban network
- Wood boiler

Cooling system :

- Others

Ventilation system :

- Natural ventilation
- Nocturnal ventilation

Renewable systems :

- Solar photovoltaic

Other information on HVAC :

Energetically, the project is based on the current directives of the Public Buildings with an alternative approach of regulation, ventilation, domestic technology and heat generation.
Heat production in the existing building is provided by wood chip heating. The new construction and an additional municipal building were connected to the district heating network.
In order to save energy and because they are used only during working hours, the classrooms are cooled by ventilation via motorised vents. They are activated during breaks, in the evening or when limit values are exceeded.
This system makes maximum use of ventilation by cooling the building structure at night, which stores the cold to ensure thermal comfort during the day.
A central ventilation system has been installed for the motor room, kitchen and catering area.
The motor room, due to its capacity of more than 150 people, is mechanically ventilated. This technique is essential to reduce heat losses due to fresh air supply.
The ventilation of this room and the"meal" zone are coupled because they are not necessarily occupied parallel or at least, the occupation is distributed between the 2 spaces.
The pulsed flow in the motor room can pass through and be reused in the dining rooms. In order to guarantee comfort during hot summer weather, the convection air in this area is treated and cooled.
For this purpose, a specific unit has been installed with energy recovery and adiabatic air cooling. This addition of cold makes the production of refrigeration energy by a chiller superfluous.
A 30 kWp photovoltaic installation installed on the roof completes this device.

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Solutions enhancing nature free gains :

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Smart Building

BMS :

Smart Building functions of the building : Classrooms, offices, staff rooms, library, refectory, evolution room and multi-purpose room are equipped with 360° presence detectors, installed on the ceiling.
The lighting is switched on automatically via the sensors and the lighting level is adjusted in real time according to the outside brightness. The switch-off is

automatic if no movement is detected for a certain period of time.
This adaptation of the luminous flux is done in 2 zones: on the façade and on the corridor side. Sensors are also installed in the corridors as well as in the toilets.
The choice of luminaires was made on the basis of energy efficiency studies in order to comply with low energy consumption standards and lighting standards according to ITM regulations.
A centralized management of blinds, by room and by façade, has been installed. It is controlled automatically by sensors located on the roof (light sensors, wind sensors, temperature sensors...).
A local control is provided for each room and for each façade.
To guarantee an optimal brightness level, the system does not allow manual lowering of the blinds if the climatic conditions are not accepted by the device. Blinds are therefore an integral part of the energy concept.
The building is equipped with on-line access control via a badge reader at the main entrance. The doors to the premises, excluding the kitchen and sanitary facilities, are equipped with off-line access control.
A video intercom was set up at the main entrance of the building. This device is in connection with other interior video-phones, installed in offices as well as in all classrooms.
Video intercom systems also allow remote control of external doors.

Smartgrid :

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Users' opinion on the Smart Building functions :

Environment

GHG emissions

GHG in use : 14,00 $KgCO_2/m^2/an$

Methodology used :

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Life Cycle Analysis

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Eco-design material : The insulation of the solid wood exterior wall was completed with straw thermal insulation. This sustainable building material, used for centuries, is the centre of CO2-neutral construction and an ecological and economical alternative to traditional fossil insulation materials.The constructive principle is based on wooden boxes, inside of which the straw iswilling. The energy required for its production is 77 times less than mineral wool and pollutes the environment by about 60 tonnes less CO2 emissions than conventional construction.The straw bales are naturally incorporated into the façade, retain CO2 more permanently and are 100% biodegradable. Compared to other insulators, straw is fire resistant. Compressed, it has very little oxygen inside, which allows it to carbonize only very slowly, protecting the supporting structure for more than an hour.Wood also has a high fire resistance. A carbonized layer is created on the surface and slows its progression. The core of the structure thus retains all its strength.
The straw
Current situation :

- Renewable resource.
- Easily accessible.
- 5,000 constructions carried out in France and 500 new constructions per year.

In construction :

- Almost zero grey energy.
- Certification and acceptance by approved experts.

In the circular economy

- Inert, recyclable and compostable waste.
- Easy disassembly at the end of the life cycle.
- Reuse after dismantling the building.

Comfort

Health & comfort :

Acoustic comfort :

Products

Product

Thermal insulation in straw bales

Baustroh GmbH

Benedikt Kaesberg

http://www.baustroh.de/

Product category : Second œuvre / Cloisons, isolation

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Costs

Construction and exploitation costs

Total cost of the building : 5 500 000 €

Urban environment

As part of the new the organization of the existing school has been redesigned to create maximum synergy between the two buildings.

The layout of the premises and The shape of the new construction thus offers a high quality outdoor space.

To create a set the new buildign's orientation and facade have been particularly well cared for.

The line slightly bent of the facade and the location of the relay house at the south-western end of the plot create continuity with the existing building but also protect children from noise poll ution from adjacent streets.

The playground has been completely reconsidered in the overall concept to offer children additional spaces, segmented according to ages and conducive to interactions. The natural enviro nment being one of the most favourable, the meadow located on the south-western border of the property has been preserved and decorated with shrubs and fruit trees.

Parking spaces

To the north of the site, parking has been redesigned with the creation of a new"KISS & GO" parking lot and a new parking area for parents.

Building Environnemental Quality

Building Environmental Quality

- Building flexibility
- indoor air quality and health
- acoustics

- comfort (visual, olfactive, thermal)
- energy efficiency
- renewable energies
- maintenance
- building end of life management
- integration in the land
- building process
- products and materials

Contest

Reasons for participating in the competition(s)

Meeting the strictest standards, this building has obtained the B/B energy classification.
The façade treatment and insulation meet the criteria of a passive house. The relay house consists of one classroom for early cycle 1, and 3 other classrooms for cycle 1. It is also equipped with five free function rooms for the relay house, two offices, annex and meeting rooms, a multifunctional"motor" room, a didactic kitchen and a refectory.
This complex has been designed by all stakeholders to be CO2 neutral through reduced technologies, including the highest level of use of renewable, environmentally friendly and recycled building materials, such as straw insulation.
The facilities selected allow children to learn how to use natural resources.
The mass of the concrete, which forms the structure of the building, guarantees the storage of thermal energy for later release and also makes it possible to reduce the energy consumption of the building, while improving thermal comfort. Heat production in the primary school is provided by wood chip heating, while the new construction has been connected to the district heating network. Ceilings act as temperature regulators in summer and floor heating minimizes heat loss in winter. A central ventilation system has been set up for the motor room, kitchen and catering area. The classrooms are cooled by night ventilation via motorised openings which are activated when the limit values are reached. The pulsed flow in the motor room passes between the different rooms. This is why a specific energy recovery and adiabatic air cooling unit has been installed.
A 30 kWp photovoltaic installation was installed on the roof. The full LED lighting concept minimises electricity consumption.

The building is equipped with presence detectors that automatically switch on the lighting. The brightness adjustment is made according to the external brightness. This adaptation is done in 2 zones: façade and corridor. This choice allows to have the most advanced technical concept in terms of artificial lighting.
A centralized management of blinds, by room and by façade, has been installed. It is controlled automatically by a weather station on the roof, which is an integral part of the energy concept. A video intercom system has been installed inside the building and in all the rooms, as well as on-line access control at the entrance to the relay house.
The straw thermal insulation principle of this hybrid concrete-wood construction is based on wooden caissons, inside which the straw is placed. Compared to all insulation materials, straw is very fire-resistant because it is compacted and therefore does not let air through. It is an ecological and economical alternative to fossil materials.
The relay house, 65 m long and 17.5 m wide, has a surface area of approximately 2,300 m². 10 cm thick plywood panels made of Larch, one of the most resistant woods, are used for the self-supporting construction of the external walls.
The building is composed of two continuous levels, in which part of the second floor has been designed as a flat roof, which offers a playground for children. The base of the building as well as the lower area of the north façade are covered with a clay plaster that children can play with.
The organisation of the existing school has been designed to create synergy between the two buildings and also to protect children from noise pollution.

Building candidate in the category

Energie & Climats Tempérés

Smart Building

Coup de Cœur des Internautes

Grand Prix Construction Durable

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