



Administration of nature and forests

by Tom Geelen / 2016-06-29 08:31:49 / International / 9638 / EN

New Construction



Primary energy need :

80 kWhpe/m².year

(Calculation method : DIN V 18599)

ENERGY CONSUMPTION

<i>Economical building</i>	<i>Building</i>
< 50 A	A
51 à 90 B	
91 à 150 C	
151 à 230 D	
231 à 330 E	
331 à 450 F	
> 450 G	
<i>Energy-intensive building</i>	

Building Type : Office building < 28m

Construction Year : 2012

Delivery year : 2015

Address 1 - street : 9233 DIEKIRCH, Luxembourg

Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 2 750 m² NGF (de)

Construction/refurbishment cost : 7 500 000 €

Cost/m2 : 2727.27 €/m²

Certifications :



General information

A sustainable, environmentally friendly planning concept played a crucial role in this new build for the Luxembourg Nature and Forestry Agency. This energy-plus building, which can produce more energy than it consumes, is one of the Ministry for Sustainable Development and Infrastructure's pilot projects. **The German Sustainable Building Council (Gesellschaft für nachhaltiges Bauen) supported the entire project throughout the planning process and once finished the building was awarded the DGNB Certificate in platinum.**

The building construction is comprised of three sections and altogether it extends over three full storeys: two regular, wooden buildings, both orientated to the north along the high street and to the south parallel to the walkway on the banks of the Sauer River.

With the directional angle predetermined by the building's position, together they form an inner core with a solid concrete structure providing a stabilizing element.

Innovative concepts were used such as taking water from the adjacent Sauer River to heat and cool the building, targeted ventilation and night cooling using ventilation flaps, a zone-controlled ventilation concept and architecturally integrated PV panels.

This Ministry of Sustainable Development and Infrastructure pilot project produces more energy than it consumes and uses water from the river to control the building's temperature; it has integrated photovoltaic panels.

For further information about this

project:<http://morph4.com/iindex.php/projekte/umbau-sanierung> (...) <http://www.revue-technique.lu/batiment-administratif> (...)

Data accuracy: Third party certified

[See more details about this project](#)

<http://morph4.com/index.php/projekte/umbau-sanierung-02/verwaltungsbaudiekirch/>

<http://www.revue-technique.lu/batiment-administratif-pour-administration-des-eaux-et-forets/>

Stakeholders

Stakeholders

Function : Designer

morph4 architecture

<http://www.morph4.com/>

Function : Designer

atelier b architecte Christian Barsotti

<http://www.atelierb.lu/>

Function : Others

Daedalus Engeneering s.à.r.l.

<http://www.daedalus.lu/>

Ingenieur (Statik)

Function : Others

Enerventis Lux S.A.

<http://www.enerventislux.lu/>

Ingenieur (HVAC)

Function : Others

E3Consult s.à.r.l.

<http://www.e3consult.lu/>

DGNB-Zertifizierung & Bauökologie

Function : Others

Interakustik GmbH

<http://www.interakustik.de/>

Akustiker

Function : Others

IFES GmbH

<http://www.ifes-koeln.de/>

Tageslichtsimulation

Function : Others

AIB Vinçotte Luxembourg

<http://www.aib-vincotte.lu/de/>

Brandschutzkonzept

Function : Others

Seco Luxembourg

<http://www.groupseco.com/en>

Kontrollbüro

Function : Others

HBH

<http://hbh.lu/>

Baustellensicherheit

Energy

Energy consumption

Primary energy need : 80,00 kWhpe/m².year

Primary energy need for standard building : 142,00 kWhpe/m².year

Calculation method : DIN V 18599

Envelope performance

Envelope U-Value : 0,15 W.m⁻².K⁻¹

More information :

Further information about the envelope: calculated U-value for the opaque building envelope: 0.15 W/m²K

Calculated U-value for the transparent components: 0.81 W/m²K

Building user opinions of the building management systems: The amount of electricity used by the building's technical systems in the construction project is measured and metered as is the electricity produced by the photovoltaic system. It is measured using electricity monitoring devices built into the various main and sub-distribution units.

The meters are linked up internally using M-Bus interfaces which means that the values can be summarized and analysed. Moreover, building users can see an analysis of these results, as well as a record of current values, displayed on a LED screen in the foyer.

The lighting system:

To reduce energy consumption when the lighting system is used and as far as possible to meet the needs of the building users, lighting for the ground floor, upper storeys and circulation areas is controlled entirely with an EIB/KNX system. The lights which are assigned to particular areas can be controlled automatically using EIB/KNX presence detectors, or manually with local EIB/KNX switches. Since there are mainly storage rooms and technical facilities rooms in the basement, here the lighting system is controlled using conventional presence detectors. Compared with switching lights off manually with a light switch, the advantage of the detector is that the light only remains switched on so long as a person is physically present in the area in question. The lights are equipped with the very latest LED technology and so contribute considerably to reducing energy consumption. In the office and circulation areas, light appliances have been selected which significantly highlight the sophisticated feel of the space. In particular this is achieved because the light appliances illuminate the spaces partly directly and partly indirectly. In addition, the lights in the offices and meeting rooms are fitted with dimmers, so that occupants can locally control the level of illuminance in individual rooms to suit their individual preferences.

Renewables & systems

Systems

Heating system :

- Heat pump
- Low temperature floor heating

Hot water system :

- Heat pump

Cooling system :

- Reversible heat pump
- Floor cooling

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Other, specify
- Heat pump

Other information on HVAC :

Heat transfer:

The building is heated with under-floor heating as well as five heaters. Given the building's orientation, two circuits were installed (NORTH and SOUTH) so that it is possible to keep heating and cooling in the circuits independent from each other. For both heating and cooling there is only a pipe network (2 conductors) and this is controlled on the distributor with switching valves. The under-floor heating in any given space is controlled with a thermostat. A temperature sensor compares the actual value with the desired value and regulates the temperature via a final controlling element in the under-floor heating circuit distributor. So that heating in individual spaces can be regulated, the building was divided into zones which were allocated room controllers. The sensors send their readings to the appropriate remote receivers which then in turn process this information. By using this energy-optimized wireless technology, the control panel provides its own electrical power from a 2cm² large solar cell.

Air-conditioning system:

In the Diekirch Nature and Forestry Agency building, the air-conditioning system is a combined supply air and extract air unit. By using a demand-led ventilation system, air quality sensors continuously measure whether the ventilated air needs to be replaced and by means of a regulator can modify the current amount of supply air to fit the actual (measured) requirements. The following input variables are used for air quality criteria: amount of CO₂; ambient humidity; ambient temperature. The amount of CO₂ in the ambient air increases in proportion to the number of people present in the space and how long they remain there and so this provides a measure for air quality. The air quality sensor in this area quantifies the ambient quality and so produces the input variable.

Circuit compound system:

In this heat recovery system the incoming fresh air and outgoing exhaust air are completely separated and are only connected to one another hydraulically. Here there are inbuilt registers for both the warm and the cold air flow. On the waterside, the registers are connected with piping and filled with a carrier medium. The warm air is transferred to the carrier medium and then a pump sends it to the second register and the energy is transferred to the cold air. The output can be infinitely variable with a mixing valve. One advantage that this circuit compound system offers is that this combination of the outdoor air heat exchanger and the exhaust air unit requires comparatively little space. The connecting pipe system makes this possible. Since the incoming fresh air and outgoing exhaust air are kept totally separated this avoids all possibility of any mass transfer of, for example, germs, harmful substances, odours or humidity.

Air distribution:

Air quality sensors control and regulate each zone.

Photovoltaic system:

Since energy production also plays an important role, photovoltaic systems have been installed on the roof areas, the south facades of the main building and on the car ports. The inverters for the photovoltaic system are located on the roof of the main building and are connected to a distributor also located on the roof. Energy produced by the photovoltaic systems is fed directly into the public grid and is counted accordingly.

Optimizing energy production using PV systems:

Photovoltaic modules (PV module) with a total peak output of 136.78kWp.

The amount of power generated annually from the PV modules is calculated at 117,399.86kWh/year.

The life cycle assessment provides proof that this is an energy-plus building:

Proof that this building is a genuine energy-plus building has been provided by the life cycle assessment which was carried out as part of the DGNB certification process.

The building's total primary energy consumption, which was calculated for the life cycle assessment by including all the above mentioned energy requirements over a 50-year life cycle produced a negative result of -35,841.7[kWh/year]. The building therefore uses 35,841.7[kWh/year] less than what will be produced by the PV system over the same period of time.

Environment

Urban environment

Located at the entrance to Diekirch directly opposite the railway station, only the pedestrian precinct separates this new building from the adjoining bank of the Sauer River. The plot is a narrow cuneiform strip of land between the high street and the Sauer and the building is comprised of two wooden constructions that fan out opposite one another and which are connected by a narrow building core. With the Sauer River and its river bank walkway at the back on the south side and at the front the high street with a continuous sweep on the north side, there are two axes that converge at a point and which give the concept its fundamental shape. A third axis has been established with the planned pedestrian passage from the railway station to the river walkway. Originally a perimeter block that stood at the entrance to Diekirch, this plot provided an opportunity to create a structure which would mark the entrance to the town. As far as transport connections are concerned, being part of the "Nordstad" development this prominent location is of even greater significance given that it is sited opposite the railway station.

Products

Product

Suspended acoustic panels (floating ceiling panels): Ecophon Solo

SAINT-GOBAIN Ecophon AB

info@ecophon.de

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

Product category :

In the work station areas rectangular board ceiling absorbers are SAINT-GOBAIN suspended from the ceilings which can reflect indirect lighting at the same time. Ecophon is made from colour-coated glass wool.

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Wooden roof frame: panel elements in the twin wall ceilings

Lignatur AG

info@lignatur.ch

<http://www.lignatur.ch/home/>

Product category :

The ceilings in the building's office sections are made with cavity panel elements with square or rectangular cavities.

These span over 6.00 m from the building core to the exterior walls. Underneath the cavity panels there are visible wooden surfaces. These cavity panels comply with all the guidelines for eco-friendly building, with the certification planned for the building, with fire protection features, with simple and flexible laying of technical cables, with vibration absorption and impact sound protection as well as with the thermal mass activation for the overall structure.

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Interior fittings – LivingBoard P2

Pfleiderer Holzwerkstoffe GmbH

info@pfleiderer.com

<https://www.pfleiderer.com/>

Product category :

Type P2 chipboard glued formaldehyde-free and therefore particularly low-emission, with decorative melamine resin direct coating on both sides in a single sheet



construction. Low-emission applications for interior furnishings and furniture, and especially suitable for items which need to comply with the DGNB's stringent requirements regarding lack of contaminants in indoor air.

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Acoustic panels & wall cladding: Agrop 3-layer European Spruce CE SWP/2 Top Nature

AGROP NOVA a.s.

vladimir.crhonek@agrop.cz



<http://www.agrop.cz/en/>

Product category :

AGROP multilayer panels are produced from coniferous sawnwood and are dried to 8% (larch 12%). Each layer consists of a solid wood lamella (top layer). The 3-layer panels have a middle layer, which is rotated by 90° relative to the two outer layers. AGROP multilayer panels are manufactured from natural wood in compliance with strict environmental standards. The adhesive used is water-resistant and gluing of the top layer is AW 100 and D4 conforming to international standard EN 204, and for this formaldehyde-free gluing is carried out.

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Wood wool panels: Troldekt – Wood wool panels

Troldekt Deutschland GmbH

info@troldekt.com

<http://www.troldekt.de/>

Product category :

Troldekt is the classic panel in the Troldekt range, comprised of a single layer it is used in many different types of buildings. Troldekt acoustic panels are CE-marked and comply with the requirements for fire protection classification B-s1,d0 (low flammability). Troldekt acoustic panels can be installed directly onto wooden battens or in a suspended profile system. These wood wool panels are composed solely of natural materials: wood and cement.

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Design screed: Variety-Floor design screed, Granidur Bianco/Nero

KORODUR International GmbH

info@korodur.de

<http://www.korodur.de/>

Product category :

Design screed Granidur Bianco and Granidur Nero is a cement-based resin-free building material. This is a factory-produced ready-to-use dry mortar for the production of polished, decorative screeds with a top layer of 15 mm average thickness. Given its high resistance to mechanical loads, its durability and anti-slip properties, it is especially suitable for office and administration buildings.

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Honeycomb fill: Fermacell

Fermacell GmbH

auftraege@xella.com

<http://www.fermacell.de/>

Product category :

Fermacell honeycomb screed is laid over all the wooden floor elements. Then the honeycomb and areas with fittings and piping are filled in with a fill. Finally sound insulation is laid over the honeycomb fill (Rockwool Floorrock SE). The fill is used to increase mass and optimize the noise absorption properties of the overall structure.

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Sound dampening: Rockwool Floorrock SE

DEUTSCHE ROCKWOOL Mineralwoll GmbH & Co. OHG

info@ROCKWOOL.de

<http://www.rockwool.de/>

Product category :

Sound dampening for ceilings underneath screed constructions. Restricted surface loading capacity with extremely good sound insulation. Sound dampening measurements of integrated slabs produce an estimated subsonic noise level of 73 dB. By using Rockwool SE a value of 53.4 dB can be achieved.

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Costs

Construction and exploitation costs

Total cost of the building : 6 250 000 €

Health and comfort

Life Cycle Analysis

Eco-design material : Eco materials: Sustainable building materials which are low in or free from harmful substances and which will provide the building's occupants with a healthy work environment.

To ensure that the requirements were fulfilled regarding the building materials which had to be used, an eco-building consultancy was included in the integral planning. The consultancy was responsible for integrating building material sustainability into the call for tender and was also responsible for monitoring that the correct materials were used on site in accordance with the tender documents and that they were of the contractually agreed quality. Subsequently an extremely accurate indoor air survey proved that the desired high indoor air quality had also been achieved by using sustainable building materials.

Using wood from certified sustainably managed sources:

To avoid uncontrolled deforestation of tropical, sub-tropical and boreal forests, as part of the DGNB certification process it was also stipulated that at least 80% of the wood used had to be FSC-/PEFC-certified.

The best possible rating was also achieved for the "environmentally friendly material production" criterion since 86.8 % of all the wood used was certified wood.

Water management

A rainwater cistern collects rainwater which supplies the toilets and urinals. When the water level in the cistern drops, the drinking water feed gets activated. For this to happen, a valve opens in the drinking water pipe which then feeds water into the

cistern. Furthermore, in the course of urban development further green spaces will be created with an extensive green roof to retain rainwater.

Carbon

GHG emissions

GHG in use : 12,81 KgCO₂/m²/year

GHG before use : 143,60 KgCO₂ /m²

, ie xx in use years : 11.21

Contest

Reasons for participating in the competition(s)

In Diekirch ist mit dem Neubau der Naturverwaltung ein Gebäudekomplex entstanden, der nicht nur mit moderner Architektur beeindruckt, sondern insbesondere auch mit seiner nachhaltigen Haustechnik. Im Mittelpunkt steht dabei eine Wärmepumpenanlage, die Energie aus dem Fluss für Heizung und Kühlung nutzbar macht. Das Konzept der Gebäudetechnik entwickelt sich ganz im Zeichen des zu erreichenden Plusenergie Standards durch minimalen Energiebedarf aller technischen Anlagen. Innovative Konzepte gezielte Durchlüftung und Nachtauskühlung durch Lüftungsflügel in den Fenstern und Fassaden und ein Zonengesteuertes Lüftungskonzept kommen zur Ausführung. Die Planung von massiven Bauteilen wie dem Stahlbetonkern und den Sichtestrich- Belägen spielen als Speichermasse vor allem bei der Gebäudekühlung eine wichtige Rolle. Die thermische Hülle verlangt beste Wärmedämmwerte ohne Kältebrücken an allen Bauteilen und die solaren Gewinne, ob durch transparente Bauteile oder Photovoltaik werden von vorne herein in die Architektur der Gebäudehülle planerisch integriert. Die Komplexität der Bauweise und Zielsetzungen verlangt u.a. 3-dimensionale Bauteil- Analysen welche konkrete Aussagen zu Tauwasserrisiken gibt und Wärmebrücken detailliert nachweisen lässt. Kritische Bauteile werden akustisch untersucht. Damit der Entwurf mit einer maximalen Energieeffizienz und unter dem Aspekt der größtmöglichen Nachhaltigkeit realisiert werden konnte, wurden in der frühen Planungsphase alle bauphysikalischen, lichttechnischen und energietechnischen Parameter, durch den Einsatz von Simulationsprogrammen optimiert. So wurde für die Bewertung der thermischen Behaglichkeit in den Büroräumen und zur Ermittlung der erforderlichen Daten für eine Heizung, Kühlung und Lüftung, eine thermische Gebäudesimulation durchgeführt.

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