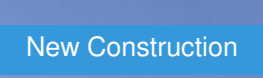



## SOLARWIND

by Guy Wagner / 2014-08-26 14:25:34 / Luxembourg / 18068 / FR

**Primary energy need :**  
227 kWhep/m<sup>2</sup>.an  
 (Calculation method : RGD du 31 août 2010 - bâtiment fonctionnel )

**ENERGY CONSUMPTION**

Consumption Range (kWhep/m <sup>2</sup> .an)	Grade
< 50	A
51 à 90	B
91 à 150	C
151 à 230	D
231 à 330	E
331 à 450	F
> 450	G

*Economical building* (A-C) / *Building* (B) / *Energy-intensive building* (D-G)

**Building Type** : Office building < 28m  
**Construction Year** : 2009  
**Delivery year** : 2011  
**Address 1 - street** : L-8399 WINDHOF (KOERICH), Luxembourg  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area** : 11 450 m<sup>2</sup>  
**Construction/refurbishment cost** : 18 500 000 €  
**Number of Work station** : 800 Work station  
**Cost/m2** : 1615.72 €/m<sup>2</sup>

**Certifications :**



### General information

The building has a gross floor area of approximately 10.000m<sup>2</sup>. It has 4 storeys above around which are designed for use as offices, along with a flat roof which is used, along with the plant rooms, for "Group" activities and to demonstrate the new technologies and provided training about them.

The building also boasts a mezzanine level (2.000m<sup>2</sup> net) which has a number of different uses, most notably as a fitness/wellness centre, a crèche and a restaurant.

Solarwind is intended to be a collaborative project. Right from the outset of the project, groups have been set up based around different topics and brainstorming sessions have been organised:

- materials choice,
- Waste Management - Purpose
- Schedule

- Educational aspects, renewable energy, facilities management
- Management - Green IT
- Logistics

## See more details about this project

<http://www.solarwind.lu>

<http://www.construction21.org/articles/fr/renewable-energies-winner-2015-solarwind-luxembourg.html>

## Data reliability

3rd part certified

## Stakeholders

### Stakeholders

Function : Contractor

In Der Laey S.A.

Romain Poules, 11 rue de l'Industrie L-8399 Windhof

<http://www.progroup.eu>

Client

Function : Thermal consultancy agency

Boydens Luxembourg sàrl

<http://www.boydens.be>

Function : Company

CBL S.A.

<http://www.cbl-sa.lu/>

Function : Company

Plafotech SA

Function : Company

POLYGONE

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

site waste management

Function : Other consultancy agency

PROgroup GEIE

rpoules@progroup.eu

<http://www.progroup.eu>

Building design, AMO HQE/BREEAM/DGNB, Project Management, Health and Safety Coordination

Function : Developer

Schulerimmo

X. Delposen

<http://www.schulerimmo.lu>

Developer/Building Operator

## Contracting method

Separate batches

## Owner approach of sustainability

A collaborative and inclusive project for stakeholders and future users (Schulerimmo and PROgroup), SolarWind is involved in a triple environmental certification process: BREEAM, HQE and DGNB (English, French and German), targeting high levels of performance. This all-encompassing approach helps to create a

building with a reduced environmental impact, throughout its entire life cycle, whilst also improving the comfort of its occupants, taking into account social and economic factors. The "green site" concept was used during construction, which aims to limit the impact of the site on the environment, local residents and the health of the workers. It reduces the risk of soil, water and air pollution, as well as reducing noise, waste and the use of resources (water, energy, minerals). The Windhof ecopark brings together businesses which are seeking to make progress on issues of sustainability by pooling their efforts: green energy, recycled paper, safety, etc. The ecopark is taking part in the INTERREG IV B European research project into Cradle-to-Cradle (C2C) applications in business parks. Socio-cultural aspects have also been developed, such as the Upcycl'Art festival (a contest for works of art made from construction site waste), the SolarWind educational trail and communications initiatives.

## Architectural description

The CRADLE TO CRADLE approach: An innovative approach which aims to ensure that human activity has a positive impact on the environment. It is based on 3 principles: plan for materials to be 100% reused right from the design stage: waste=food, renewable energy and diversity. The approach is in contrast to the current idea of consumption which involves extracting, producing, using and sending to landfill (Cradle to Grave). SolarWind dedicates areas to promoting certified products or those which support this philosophy (4th storey wooden structure, lino, carpets, aluminium window frames, furniture, etc.). The building contributes to the generation of green electricity and has made provision for the management of construction waste at the end of its service life.

## If you had to do it again?

We would take the same approach, taking into account the experience picked up during this exciting adventure and technological advances. The Sustainable Development approach and certification help to ensure, in addition to the environmental quality of the building, flexibility of use/assignment.

## Building users opinion

We have successfully incorporated a research laboratory into the building for one of our tenants whilst maintaining the overall environmental standard of the property and an acceptable energy performance (class B), versus the original energy rating (without the additional laboratory ventilation) of A/A.

## Energy

### Energy consumption

Primary energy need : 227,00 kWh/m<sup>2</sup>.an

Primary energy need for standard building : 374,00 kWh/m<sup>2</sup>.an

Calculation method : RGD du 31 août 2010 - bâtiment fonctionnel

Final Energy : 113,00 kWh/m<sup>2</sup>.an

Breakdown for energy consumption :

Heating: 181 MWh

DHW: 132 MWh

Cooling: 747 MWh

Ventilation: 95 MWh

Lighting: 189 MWh

### Envelope performance

Envelope U-Value : 0,28 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

external facades covered with wooden panels with 40cm of wood fibre insulation

Building Compactness Coefficient : 0,23

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

Air Tightness Value : 0,24

Users' control system opinion : OK for regulating the room temperature by zone (4 workstations): +/-2 °C from the pre-set temperature

## Renewables & systems

### Systems

Heating system :

- Geothermal heat pump
- Radiant ceiling
- VAV System
- Wood boiler
- Solar thermal
- Canadian well

#### Hot water system :

- Individual electric boiler
- Solar Thermal
- Other hot water system

#### Cooling system :

- Water chiller
- Geothermal heat pump
- VAV Syst. (Variable Air Volume system)
- Radiant ceiling
- Canadian well

#### Ventilation system :

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

#### Renewable systems :

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

#### Renewable energy production : 100,00 %

**GEOHERMAL ENERGY:** Several vertical geothermal boreholes (~3km in total, 76 boreholes at 27m, 22 and 39m beneath and around the building) connected to the heat pumps which are used to heat the building through pipes sunk into the concrete floor. Cooling is provided directly by water cooled by geothermal energy (geocooling) without using heat pumps. The ground becomes a heat/cold reservoir.

In winter: the heat from the ground is recovered, which cools the ground, and this cold is then used for cooling during the summer and vice-versa.

**GROUND-COUPLED HEAT EXCHANGER:** The air treatment unit for a zone of the building is connected to a ground-coupled heat exchanger which uses the constant temperature of the ground (+/-11°C) to cool the premises.

**BOILER:** The boiler supplies hot water, using biomass. It can burn either pellets or wood or miscanthus chips, stored in a 65m<sup>3</sup> tank. The pellets are compressed timber offcuts, with no binder; miscanthus is an innovative fuel with a higher calorific value than wood shavings. It is a type of non-invasive bamboo which is also known as "elephant grass". It grows quickly with no need for pesticides or fertilizer.

**SOLAR PANELS:** 375m<sup>2</sup> of solar panels have been fitted on the southern facade of the building which also serve as sunshades to reduce overheating in summer. These 58 panels provide some of the electricity that the building consumes through solar energy. Annual generation is estimated at ~45,000kWh/year.

**WIND POWER:** Three ground-breaking wind turbines have been installed on the roof which use the wind to generate electricity and to provide some of the electricity that the building consumes. By reducing noise and vibrations, this new technology is also effective as harnessing gentle winds. Annual generation is estimated at ~4,500kWh/year.

**VENTILATION:** The dual-flow ventilation is used to refresh the air whilst also contributing to regulating the temperature and humidity of the air, recovering energy from the air extracted. It uses technologies such as heat recovery, adiabatic cooling (spraying water into the extracted air to cool it) and heat exchangers (on the hot-water system), controlled by CO<sub>2</sub>, temperature and hygrometry sensors.

**HOT WATER/SOLAR PANELS:** Hot water is produced and controlled using a combination of technologies and a 20m<sup>3</sup> storage tank carefully designed to limit losses. It is powered by 30 solar panels positioned on the roof, the biomass boiler and the water heated by the geothermal heat pumps. Hot water is used to heat the building, for the showers and the kitchens.

#### Solutions enhancing nature free gains :

south-facing facade covered with sunshades (solar panels), the position and direction of which is calculated to maximise the solar benefits in the winter and to provide effective protection in summer

## Smart Building

#### BMS :

All of the building's operating parameters are monitored by a central system: the GTC (Central Building Management).

## Environment

### GHG emissions

GHG in use : 3,30 KgCO<sub>2</sub>/m<sup>2</sup>/an

### Water management

Rainwater is collected in a 50m<sup>3</sup> tank to supply the toilets and the adiabatic cooling of the ventilation. The appliances installed are very energy-efficient (push-button low-flow tap, low-flow toilet 2-3.5 litres per flush, water-free urinal, 0.8 litre urinal, etc.). The waste water is taken away to the separate communal sewerage system to be treated. The kitchens will be fitted with fat traps to pre-treat the water. Rainwater soaks in from the green roofs and the permeable surfaces of the external grounds. A storm basin is used to absorb excess rain.

## Indoor Air quality

Indoor air quality: The construction materials for the building were chosen whilst reducing as far as possible potential sources of emissions of pollutants into the indoor air, particularly in relation to formaldehydes and Total Volatile Organic Compounds (TVOCs). The criteria of the stricter German DGNB certification have been targeted; these aim for very low concentrations in the indoor air: TVOC < 500µg/m<sup>3</sup> Formaldehydes < 60µg/m<sup>3</sup> (analysis conditions before furniture is put in place, if the criteria for selection of internal partitions is complied with). To achieve these objectives, low-emissivity materials have been chosen, such as wood fibre, untreated wood (or with certified treatments), formaldehyde-free OSBs, low-emission eco-friendly fibreglass, plaster which removes VOCs, false floors made of calcium sulphate/cellulose, fitted carpets with A+ emissions rating (the highest rating), low-emission partitions (equivalent to natural wood), low-VOC paints, etc.

## Comfort

**Health & comfort :** cf. VOC measurement programme carried out in 2012 after commissioning as part of DGNB certification. Gutachten - Innenraumhygiene DGNB (Raumlufmessungen auf flüchtige organische Verbindungen (VOC) und Aldehyde/Ketone) Bürogebäude Solarwind 13 rue de l'Industrie L-8399 Windhof Luxembourg Messungen vom 18.10.2012

**Calculated indoor CO<sub>2</sub> concentration :**

Une bonne aération est primordiale dans un bâtiment très performant thermiquement afin d'éviter une mauvaise qualité de l'air. En effet, comparé aux anciens bâtiments, un bâtiment passif traite de façon très poussée l'étanchéité à l'air. Les surfaces total

**Calculated thermal comfort :** Les équipements techniques sont conçus pour garantir des conditions de température et d'humidité (hygrométrie) confortables. Ainsi la température de consigne du bâtiment est réglée en journée sur 20°C minimum (jusqu'à -12°C extérieur). En été même avec de

**Acoustic comfort :** Calculation of internal acoustics during the design phase: cf. note D2S: C1279N03\_A of 22/04/2010 "As built" inspection: measurement report D1279/N08 "Noise certification: Acceptance testing" - - D2S International - Dr Ir G Desanghere - 02/05/2013 Tested in accordance with standard ISO 140-5: "Field measurements of airborne sound insulation" The results have been categorised using standard ISO-717 "Ratings of sound insulation". The requirements to be fulfilled are described in note D1279/N03\_A, as per DIN 4109

## Products

### Product

Ecoose Technology

Knauf Insulation

Knauf Insulation rue du Parc Industriel, 1 B-4480 Engis

<http://www.knaufinsulation.be>

**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 = '9'

Acoustic and thermal insulation material made from sustainable rock wool with a natural binder containing no phenol or formaldehydes



In Belgium, Knauf insulation products are guaranteed by TGA technical approval.

Thoma Holz 100

Thoma Holz GmbH

Hasling 35, 5622 Goldegg, Pongau, Autriche

<http://www.thoma.at/>

**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 = '8'

4th storey for shared spaces such as meeting and reception rooms constructed with a solid timber structure that is pinned together with no adhesives.



The Thoma Holz 100 product has had C2C Gold certification since 2011.

STEICOzell and STEICOprotect wood fibre insulation

STEICO AG

Hans-Riedl-Str. 21 D-85622 Feldkirchen

<http://www.steico.net/fr/produits/isolants-en-bois/>

**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 = '8'

High-performance air-injected wood fibre insulation (40cm),



wood fibre insulation panels (STEICO protect) ready to plaster

STEICO products certified NaturPlus by Cologne ECO-Institut

Mila Soundmaster

DESSO / TARKETT

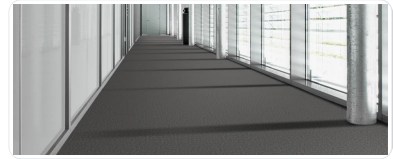
Taxandriaweg 15, 5142 PA Waalwijk - The Netherlands

<http://www.desso-businesscarpets.com/products/product-search/Mila/>

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 = '16'

carpet which ensures very high indoor air quality (dust-proof, very low in VOCs and formaldehyde) with sound absorbing properties

ECONYL-certified product (100% recycled nylon), CRI Green LabelPlus (Indoor Air Quality)



## Costs

## Urban environment

In order to preserve biodiversity on the site, plants were chosen with a preference for diverse local species, encouraging the presence of a variety of fauna. The external grounds and the landscaped pond, the planted roofs and building facades and the nest boxes all contribute to this goal. Three beehives were added to the green roof in 2014.

## Land plot area

Land plot area : 5 171,00 m<sup>2</sup>

## Built-up area

Built-up area : 56,00 %

## Green space

Green space : 1 924,00

## Building Environmental Quality

### Building Environmental Quality

- Building flexibility
- indoor air quality and health
- biodiversity
- consultation - cooperation
- acoustics
- comfort (visual, olfactive, thermal)
- water management
- energy efficiency
- renewable energies
- building process
- products and materials

## Contest

### Reasons for participating in the competition(s)

If we selected the "Renewable Energies" and "Health & Comfort" categories, then this was because we placed particular emphasis on both these aspects when designing, creating and developing Solarwind.

Moreover, in addition to the envelope having high-energy performance, the client wanted to diversify the energy supply sources and favour renewable energies. In so doing, the client wanted to showcase innovative technologies to visitors which they can apply and demonstrate how these technologies complement each other:

- geothermics
- biomass (wood pellet boiler / miscanthus)
- earth-to-air heat exchanger
- geothermal cooling
- adiabatic cooling on rainwater for the CTA
- solar thermal energy
- solar photovoltaic energy
- urban wind turbines

As for the health and well-being of those using the building, being the company occupying the block, PROgroup want to promote the well-being of its staff, on the one hand by organising "brainstorming" sessions to ascertain its employees' needs and wishes and on the other hand by very carefully selecting materials and technical solutions that would guarantee optimal interior air quality and high summer/winter hygrothermal comfort.

This aspect was brought into focus during the triple DGNB/BREEAM/HQE certification process, in particular by achieving HQE "Exceptional" certification level during the building phase and DGNB "Gold".

Furthermore, the requirements with regard to rental arrangements were set down in a contract so as to guarantee energy, acoustic and sanitary performance while the site is being operated.

## Building candidate in the category



Energies renouvelables



Santé et confort

