


## Ecooffice

by Claire Lheureux / 2015-06-30 11:37:03 / Belgique / 12565 / FR



Primary energy need :

## 47.9 kWhep/m<sup>2</sup>.an

(Calculation method : )

**ENERGY CONSUMPTION**

*Economical building*

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

*Energy-intensive building*

**Building Type** : Office building < 28m  
**Construction Year** : 2013  
**Delivery year** : 2014  
**Address 1 - street** : Avenue Robert Schuman, 71 1401 NIVELLES, Belgique  
**Climate zone** : [Cfb] Marine Mild Winter, warm summer, no dry season.

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**Net Floor Area** : 3 690 m<sup>2</sup> SHON  
**Construction/refurbishment cost** : 4 107 000 €  
**Number of Work station** : 249 Work station  
**Cost/m2** : 1113.01 €/m<sup>2</sup>

Certifications :



Proposed by :



### General information

A project studied from every angle!

The "Ecooffice" results from a research project laréalisation liability and sustainable commercial building DESBUREAUX the same cost as standard. It is certified liabilities and labelisé BREEAM "Very Good" for its sustainable building qualities.

This project is unique because all its parameters were studied and optimized manièresystématique by the partners to make a modèlereproductible, flexible and versatile. The research aimed to determine desoptima between functional requirements, technical choices, critèreséconomiques and principles of sustainable construction.

The parametric analysis focused on constructive energy and environmental aspects, through general themes as varied as implantation and building form, structure and choice of materials, the insulation level, performance and choice of system design, lighting issues and natural light, etc.

In addition, a monitoring procedure has been set up by leCSTC: it began with the monitoring of future occupants in their actual offices and will continue for three years after their installation in the new offices.

#### Implantation

Work on the implementation and the shape of the building permitted to optimise contributions in natural light while reducing heat losses. The optimization of solar gains, natural lighting and ventilation needs has reduced the heating requirements in winter and the risks of overheating in summer.

The project was installed in the ground in a north-south orientation; it uses the existing height difference to separate the parking building. The remarkable trees have been preserved and integrated into the project.

Initially a simple compact rectangle shape in the length was divided to form two strips, which were shifted to improve the penetration of natural light in the heart of the plates. An atrium is even used to strengthen this objective. In doing so, the blind nucleus (where sanitary and vertical circulations) was reduced in favor of peripheral offices.

#### Functionality and template

The design process has incorporated from the outset the energetic aspects and lighting. All work spaces have natural lighting, a guarantee of operational economy.

The design of the structure, technical installations and facades sought to preserve the greatest possible flexibility in the use of space. The template has been optimized and corresponds to trays of  $\pm 1\,000\text{m}^2$ , which accommodate as well as landscaping the cellular offices.

The party retained the north-south orientation, reducing faces is the most difficult to control in terms of overheating). Facades to the north and correspond to the same frame openings (randomly distributed in a semi-circle), but the side facing to the north is slightly glazed. In front, a color scheme forms a set of pixels of different colors in the landscape.

#### Architecture

The parametric analysis focused on the constructive aspects, energy and environmental, through themes as varied as general implantation and building form, structure and material selection, insulation level, performance and choice of technical facilities, issues of lighting and natural light, etc.

In the evolution of the architectural approach, the natural liabilities associated with the logic of the building life cycle. He drove to invest in the particular durability of structures, walls and walls, as a project. Reducing space technologies for the benefit of their architecture represents a paradoxical challenge, which engaged them in a more built energy, low tech and less delivered technology. It is also in what the cadastre adopted Trias Energetica logic - "less better, otherwise", which control first reduce the need (energy, but also surface, materials, water, etc. .) by working on the form and matter, before considering the improvement of technical systems and the use has other forms of resources (renewable, etc.).

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#### Material

Several constructional variants were studied. The present variant improved cooling needs with intensive night ventilation and helps mitigate the temperature peak during heat waves.

A typical analysis LCC (Life Cycle Cost) allowed the comparison of the impact of the facade on the basis of an LCA for two different life (30 and 60) and considering different scenarios of replacement.

The building is constructed of concrete frame and closed by a concrete block masonry traditionally. External insulation Neopor ENEPS is then reported and coated. The gables are covered with uncoated concrete blocks.

The building meets the passive standard with walls having U values between 0.17 and 0.23 W / m<sup>2</sup>K. The windows are fitted with triple glazed north, but double glazing to the south.

Ventilation is dual-stream, of course, and the wheel exchanger permits to regulate humidity. The inertia of the building is utilized by the partial false ceilings in the office areas.

#### Primary energy

Geothermal (natural and nightcooling) = maximum energy saving significant investment maiscoût and need an extra in summer. The solutionsretenues are:  
backup heating: gas condensing boiler and heater + ventilation: double flow with heat recovery wheel. VMC.surdimensionnée for intensive ventilation in summer  
(nightcooling) + extra cold: cold VMC Group.

## Comfort

The initial choice of a lightweight construction was abandoned in profitd'une heavy structure for its qualities of inertia and mechanical strength, but also for its cost to comparable environmental impact.

Particular attention was paid to occupant comfort, a guarantee of good use of the building. To allow bureaupar office regulation, the heat is distributed by a circuit traditionnelleet the extra hot water is provided by a condensing gas boiler. The system of ventilation is oversized to provide the necessary flow enventilation night intensive summer and a cold group is expected in réservepour possible heatwaves. Lighting installations are optimiséesgrâce choice of low-energy appliances and well positioned unerégulation by dimmers and motion sensors.

Passive and BREEAM certification label "Very Good" attest del'efficacité of the solutions and sustainability of the building.

One of the standard criteria tertiary liability is checking duconfort according to EN 13 251.

We must encode the building in a dynamic simulation program endécoupant trays by zones. This encoding also assess, Surle long term performance in naturally ventilated buildings. Cécritère is based on the comfort of theory of adaptive T °.

This model takes into account the adaptability of a building (and occupation) to external conditions. The passive building into the mind of an "adaptive" building, which allows interaction between the occupant and interior leconfort (opening windows, clothes fit for unepériode hot ...)

## Natural lighting

The lighting consumption are one of the commercial buildings plusimportants positions.

Daylighting simulations encoding the building in lelogiciel radiance and 3D models in the lab tests CSEC réaliséssous an artificial sky (mirror-box) were used to investigate the influence of light on puitsde daylighting .

More? : [Http://a2m.be/eco\\_office.html](http://a2m.be/eco_office.html)

## Building users opinion

Below are reported the opinions of office occupants from a series of interview: - Not really a priori but positive surprise; - The work environment has improved; - The heat is correct, we have not got cold despite the harsh winter; - Automatic blinds are well regulated; - The space is very well thought out, everyone has enough space; - It feels good, it's good to live; - It is gratifying to work in a nice building, beautiful, representing the image of the company. Link to interview: <http://www.ecoffice-building.be/>

## See more details about this project

[http://a2m.be/eco\\_office.html](http://a2m.be/eco_office.html)

[http://a2m.be/2013\\_publication\\_febelcem\\_sur\\_ecoffice\\_et\\_haren.pdf](http://a2m.be/2013_publication_febelcem_sur_ecoffice_et_haren.pdf)

## Data reliability

3rd part certified

## Stakeholders

### Stakeholders

Function : Designer

A2M

[willem@a2m.be](mailto:willem@a2m.be)

<http://a2m.be>

Mission complete

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Function : Other consultancy agency

CSTC

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<http://www.cstc.be>

Monitoring, control and project studies

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**Function :** Other consultancy agency

IMTECH

M.Hoebeke ; colin.hoebeke@imtech.be

Special Technical Bureau

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**Function :** Contractor

Thomas & Piron et Holcim

## Contracting method

Other methods

## Owner approach of sustainability

As part of assisting innovative companies in the Walloon Marshall Plan 2.0 Green, the company Thomas & Piron has managed to bring together a consortium of architects, engineers, researchers and companies to study "in vitro "and detailed optimization of all parameters of a passive tertiary project. This pilot project has led to the construction of a passive and sustainable office building achieved at the same price as a standard desktop. It is occupied by the company Holcim. This project of "liability for all" is detailed on the [www.ecoffice-building.be](http://www.ecoffice-building.be) site. This project is certified Passive (certificate of a third party) and BREEAM assessed.

## Architectural description

Concept of "design facade" The facade is designed based on a module of 1.20 m The volume set is accentuated by the inclinations of the parapets. Finally, dressing plays with an impression of the site before work. The image has been pixelated to reach a resolution to the size of the building frame. The result illustrates the work done on the report of nature and architecture which is inscribed.

## Energy

### Energy consumption

**Primary energy need :** 47,90 kWh/m<sup>2</sup>.an

**Primary energy need for standard building :** 250,00 kWh/m<sup>2</sup>.an

**Calculation method :**

**Final Energy :** 25,88 kWh/m<sup>2</sup>.an

**Breakdown for energy consumption :**

Heating: 11.2 kWh / m<sup>2</sup>.year (43%)

ECS: 0.00

Lighting: 9.22 kWh / m<sup>2</sup>.year (36%)

Domestic: 0.00

Auxiliary 5.1 kWh / m<sup>2</sup>.year (20%)

Cooling 0.36 kWh / m<sup>2</sup>.year (1%)

**More information :**

The calculation method used is the PHPP 2007 software.

### Envelope performance

**Envelope U-Value :** 0,33 W.m<sup>-2</sup>.K<sup>-1</sup>

**More information :**

Structures and concrete floors sails (prédalle air deck with concrete cast in place) and coated outer insulation. The building meets the passive standard with walls having U values between 0.17 and 0.23 W / m<sup>2</sup>K. The windows feature triple glazing to the north, but double glazing to the south.

**Building Compactness Coefficient :** 3,32

**Indicator :** n50

**Air Tightness Value :** 0,30

## Renewables & systems

## Systems

### Heating system :

- Condensing gas boiler

### Hot water system :

- Condensing gas boiler

### Cooling system :

- Others

### Ventilation system :

- Nocturnal Over ventilation
- Double flow heat exchanger

### Renewable systems :

- No renewable energy systems

## Smart Building

### BMS :

The building is intelligent because first it was thought so as to have reduced requirements. Then the building intelligence resides in the same energy use. The precise regulation of the atmosphere (external blinds, ventilation, etc.)

### Smartgrid :

Followed by live internet interface of building consumption

Users' opinion on the Smart Building functions : Automatic blinds are well regulated. Link to interview: <http://www.ecoffice-building.be/>

## Environment

### Urban environment

The tenant of the project, the company Holcim, the project wished implanted near the seat she currently holds in Europe Gates Park located in Nivelles near the E19 motorway. The functioning of the company requires indeed close to the motorway and car use. However, the bus 76 connects the Business Park to the town of Nivelles. The project was installed in the ground in a north-south orientation; it uses the existing height difference to separate the building from its parking. The remarkable trees have been preserved and integrated into the project.

Land plot area : 10 000,00 m<sup>2</sup>

Built-up area : 10,00 %

Green space : 8 842,00

## Products

### Product

Steelroc

HOLCIM

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<http://www.holcim.be>

Product category : Gros œuvre / Structure, maçonnerie, façade

Metal fiber-reinforced concrete



Neopor

BASF

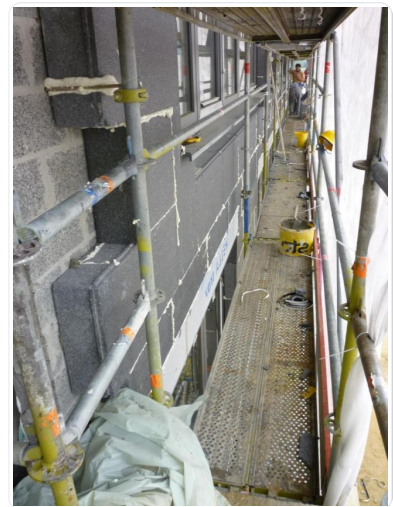
-

<http://www.basf.be/>

Product category :

EPS graphite insulation

Easy application



Dual flow ventilation unit

Swegon

[info@swegon.fr](mailto:info@swegon.fr)

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

Product category : Génie climatique, électricité / Ventilation, rafraîchissement

CTA including a comfort ventilation High efficiency with low energy consumption (85% and 0.45 Wh / m<sup>3</sup> certified by PHI) despite significant usage rates (up to 9000 m<sup>3</sup> / h). This type of group is very suitable for passive tertiary buildings.

Validated



Gas condensing boiler

Remeha

[info@remeha.be](mailto:info@remeha.be)

<http://www.remeha.be>

Product category : Génie climatique, électricité / Chauffage, eau chaude

Gas condensing boiler

Validated



Insulation for thermal breaks

Foamglas

info@foamglas.be

<http://be.foamglas.com>

Product category : Second œuvre / Cloisons, isolation

This product is used to achieve the thermal breaks junction walls (wall / roof, wall / floor slab; lambda value about 0.05 W / mK)

Validated



Chassis (frame)

Salamander

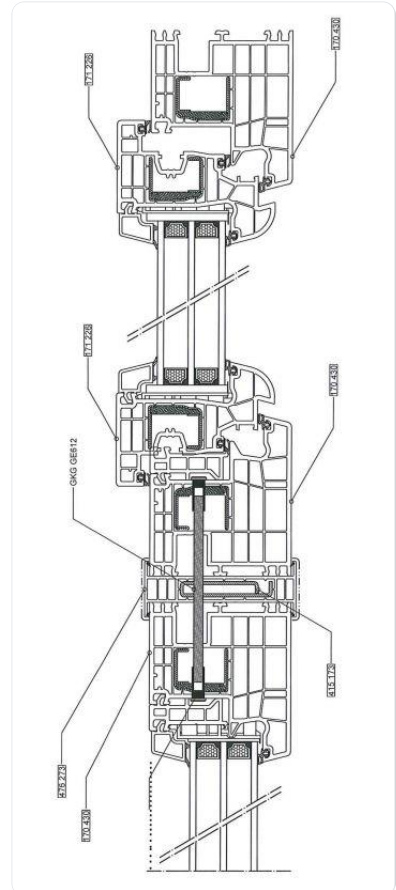
jckaes@sip.de

<http://www.sip-windows.com>

Product category : Second œuvre / Menuiseries extérieures

Performance PVC frame ( $U_f = 0.89 \text{ W} / \text{m}^2 \cdot \text{K}$ )

Validated



Triple glazing

Sprimoglass

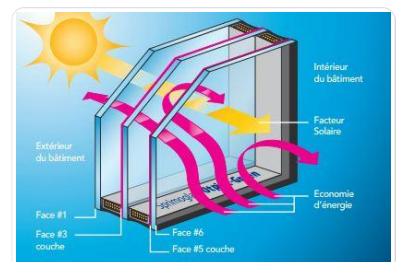
-

<http://www.sprimoglass.be>

Product category : Second œuvre / Menuiseries extérieures

Triple glazing with high energy efficiency ( $U_g = 0.6, g = 0.61$ )

Validated



## Costs

### Construction and exploitation costs

Total cost of the building : 4 107 000 €

## Health and comfort

## Water management

Consumption from water network : 550,00 m<sup>3</sup>

Water Consumption/m<sup>2</sup> : 0.15

Water Consumption/Work station : 2.21

As the exact number of building users is not yet known (some still to be rented), the volume of water consumed in the use phase was estimated based on the building's surface (approx. 4000m<sup>2</sup>) with 550m<sup>3</sup> of water / year. This figure comes from measurements collected for 71 office buildings in Belgium between 2006 and 2010 and the surface-consumer relationship that was deducted (internal study).

## Indoor Air quality

Room ventilation is ensured by a system D (with recovery and evaporative cooling). Ventilation is therefore constantly monitored. Air filter unit which maintenance should be ensured The double flow units are equipped with filters.

## Comfort

**Health & comfort :** The initial choice of a lightweight construction was abandoned in favor of a heavy structure for its qualities of inertia and mechanical strength, but also for its cost to comparable environmental impact. Particular attention was paid to occupant comfort, a guarantee of good use of the building. To enable desk-regulation, the heat is distributed by a traditional hot water circuit and the support is provided by a condensing gas boiler. The ventilation system is oversized to ensure the necessary flow rates in intensive night ventilation in summer and a cold group is expected in reserve for possible heat waves. Lighting installations are optimized through the selection of well positioned with low consumption appliances and regulation by dimmers and motion sensors. Passive and BREEAM certification label "Very Good" attest to the effectiveness of the solutions and sustainable building character. One of the standard criteria tertiary liability is checking comfort according to EN 13 251. We must encode the building in a dynamic simulation program by cutting the trays by zones. This encoding allows to assess the long term performance in naturally ventilated buildings. This criterion is based on the comfort theory of adaptive T °. This model takes into account the adaptability of a building (and occupation) to external conditions. The passive building into the mind of an "adaptive" building, which allows interaction between the occupant and the interior comfort (opening windows, clothes fit for a warm period, ...) Daylighting simulations of a building in the software encoding radiance and 3D models in the lab tests CSEC made under artificial sky (mirror-box) were used to study the influence of skylights on natural lighting.

**Calculated thermal comfort :** Entre 0 et 95 heures au dessus de 25°C sur le temps d'occupation selon le local

**Acoustic comfort :** Within the framework of BREEAM, an acoustic control was carried out to ensure compliance with the criteria.

## Carbon

### GHG emissions

GHG in use : 12,86 KgCO<sub>2</sub>/m<sup>2</sup>/an

**Methodology used :**

Calculation of CO<sub>2</sub> emissions from heating consumption, ECS, lighting and auxiliary using conversion factors of primary energy / CO<sub>2</sub> (0.198 kg CO<sub>2</sub> / kWh EP for gas and 0.29 kg CO<sub>2</sub> / kWh for EP electricity)

### Life Cycle Analysis

On the lifecycle Ecooffice building (for a lifetime of 60 years), the impact of the materials considered more important than the impact associated with energy consumption if we consider that the positions covered by the PEB or similar gra

## Contest

### Building candidate in the category



Smart Buildings



**Green Building  
Solutions Awards 2015**

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Bâtiment zéro énergie



Santé et confort



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