UP STRAW building

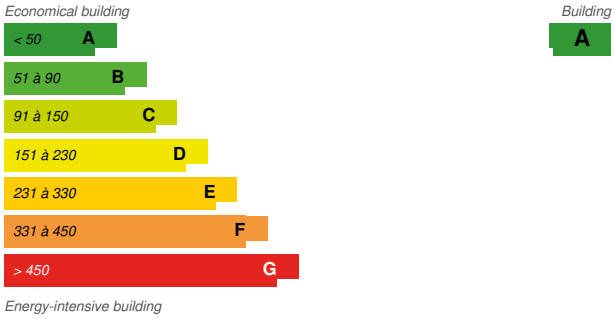
by Hugues Delcourt / 2021-02-15 16:38:02 / Belgique / 6487 / FR

Primary energy need :

71 kWhep/m².an

(Calculation method : PEB - Wallonie)

ENERGY CONSUMPTION



Building Type : Office building < 28m
Construction Year : 2021
Delivery year : 2021
Address 1 - street : 7 Avenue d'Ecolys 5020 NAMUR, Belgique
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 400 m² Autre type de surface nette
Construction/refurbishment cost : 694 000 €
Cost/m2 : 1735 €/m²

Proposed by :

General information

Our project is the result of the Eco-construction Cluster's desire to promote eco-construction and, in this case, to highlight straw construction. By creating this exemplary building, we want to show the evolution of straw techniques, deconstruct clichés and allow for the dissemination of construction possibilities to the various target audiences, not only through the promotion of this building, the location of the Cluster's offices and the possibility of coworking, but also through the numerous events that will be organised there. It is an integral part of the Cluster's theme to highlight bio and geo-sourced materials, companies (and the people in them) and techniques linked to eco-construction in all its aspects.

In this respect, this project is exemplary in more ways than one.

From the outset, team-building was favoured and is, in the Walloon context, a first element of innovation.

The innovative technique used, which makes little use of raw wood, as well as the straw insulation, make this a European, if not world, first.

Its ecological footprint is an additional asset.

The small footprint (construction on piles) and the choice of innovative materials (in addition to straw - insulation with grass) in short circuits and in circular

economy make it a building that can be easily deconstructed.

Finally, the architecture is also in line with the philosophy of straw construction, having as a concept the idea of the straw bale inscribed in the contemporary world.

Building users opinion

The building will be occupied from April / May 2021

If you had to do it again?

We are dealing here with innovation, and the development of a new construction technique can in some cases increase the time needed for implementation. From the idea at the start of the project to its implementation, a long process of fine-tuning and trial and error was required.
Moreover, team-building is an interesting tool, but it requires perfect collaboration between all the players and a clear understanding of the roles and obligations of each. It takes time to adapt.

Data reliability

Self-declared

Photo credit

helium3 Architects

Stakeholders

Contractor

Name : Cluster Eco-construction
Contact : Hervé-Jacques Poskin
https://www.ecoconstruction.be/

Construction Manager

Name : Groupement d'entreprises momentané M3H (Architectes et Entreprise)
Contact : Jean-Philippe Moutschen
https://www.mobicsa.be/

Stakeholders

Function : Designer

Hellium 3

Caroline Broux

https://www.helium3.be/
Lead architect

Function : Designer

HAVRESAC

Denis Delpire

https://www.havresac.be/
Co-contracting architect, straw construction expertise

Function : Thermal consultancy agency

HOMECO

Elie Delvigne

https://www.homeco.be/
BET Thermal and fluids

Function : Construction company

MOBIC

Jean-Philippe Moutschen

https://www.mobicsa.be/
Timber builder, General contractor

Contracting method

General Contractor

Owner approach of sustainability

The Cluster, as a representative of the professionals in the eco-construction sector, wanted a building that would represent the expertise of the eco-construction sector. As this project is financed under the INTERREG UP STRAW programme, it should obviously be made of straw. The specifications were drawn up in terms of performance requirements (thermal, acoustic, watertightness, daylighting, water saving, etc.) while aiming for the lowest possible building technology.

The procedure chosen for the contract is 'Design & Build' so that the expertise on straw construction can be shared with the whole of the project management team from the very first stages of the sketch.

Architectural description

The Eco-construction Cluster needed an innovative, inspiring building that reflected the values it stands for, to house its offices and training areas.

This Design and Build project was part of the Interreg UPSTRAW project, which aims to promote the use of straw in construction.

Inexpensive, from a renewable and local source, available in abundance, without conflict with agricultural needs, easily recyclable, straw can effectively store CO2. Moreover, the analysis of its life cycle reveals a much more advantageous balance than that of conventional building materials. However, it requires a lot of manpower on site and a composition adapted to the size of the bale, which can be an obstacle. To overcome this, an innovative method based on the prefabrication of 3D modules was developed in Wallonia for this project.

The construction principle is simple: a wooden supporting structure integrates the straw insulation. The innovation lies in the composition of the walls: the local wood logs were sawn in half and installed vertically. When joined together and split, they contain the loose straw, also local, inside the wall. The sawn side of the log thus acts as a cladding, both inside and outside the building, while the core of the log plays a structural role.

These 3D modules, which are entirely prefabricated in the workshop, are then assembled and placed on screwed piles on site. This construction method is economical, ecological and practical. It reduces the duration of the building site (and therefore the nuisance), production costs, journeys to the site and the consumption and transformation of raw materials (and therefore waste). The installation of the modules on piles makes it possible to do away with concrete and to preserve the soil as much as possible by reducing excavation/embankment and by limiting waterproofing.

Architecturally, a bale of straw was placed on a forest of wooden columns. A symbol, a signal, a claim. The various functions housed in the 3D modules are articulated on two levels around an open, generously glazed space. This central space, conducive to exchanges and meetings, echoes the very essence of the Cluster.

In addition to its exterior walls, the project integrates other aspects and materials of eco-construction. The photovoltaic solar panels installed on the roof and the overhang of the modules on the first floor over the glazed hall on the ground floor act as a fixed protection to limit overheating. The partition wall of the meeting room and the technical floors have been designed to offer greater flexibility in the use of the building over time. Finally, the partitions and floors are insulated with a grass-based insulation and the half-logs are used as stair treads.

Innovation, optimisation of resources and reduction of needs are the key words that guided the design choices.

The building is intended to be inspiring, didactic and welcoming, a showcase of the advantages and possibilities of eco-construction.

Energy

Energy consumption

Primary energy need : 71,00 kWhep/m^2.an

Primary energy need for standard building : 170,00 kWhep/m^2.an

Calculation method : PEB - Wallonie

CEEB : 0.0001

Final Energy : 28,50 kWhef/m^2.an

Breakdown for energy consumption :
Final energy consumption (kWh_ef / m².year) and distribution (%)
Heating: 8.3 - 29%
Cold: 5.5 - 19%
DHW: 3.6 - 13%
Lighting: 8.5 - 30%
Auxiliaries: 2.5 - 8.9%
HP: -4.1 / -14.5% of total consumption

Envelope performance

Envelope U-Value : 0,38 $W.m^{-2}.K^{-1}$

More information :

This building has enabled the development of an innovative technique developed for this project. The outer walls of the wall are made of ground logs assembled to form panels. The straw is compressed between these two panels to achieve the desired thickness and density.

Building Compactness Coefficient : 1,52

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

Rapport de test etancheite a l'air

Users' control system opinion :

The building programme included a low-tech approach. We therefore reduced the use of home automation systems as much as possible. A concession was made for accessibility management because the building's occupancy is variable: offices during the day and occasional events in the evening (meetings, conferences). Access control can be done from a mobile phone

Renewables & systems

Systems

Heating system :

- Heat pump
- Tape

Hot water system :

- Individual electric boiler

Cooling system :

- Reversible heat pump
- No cooling system

Ventilation system :

- Double flow heat exchanger

La CTA est quipe d'une PAC pour rafraichir l'air neuf en ete. La ventilation nocturne par ouverture n'est pas enviseable sur ce site.

Renewable systems :

- Solar photovoltaic

Renewable energy production : 14,50 %

Les panneaux solaires sont aussi utilises comme protections solaires des vitrages

Solar panels are also used for solar protection of glass facades.

Smart Building

BMS :

Wall monitoring is planned to follow the temperature and humidity of the straw walls. Monitoring of CO2 concentration

Environment

Urban environment

The building is located in the Ecolys business park dedicated to eco-construction, sustainable development, promotion of renewable energies, etc. Ecolys is located 7 km north of Namur.

The land is an old field located on the top of a plateau with unobstructed views of the surroundings.

Access is mainly by road: the site is located at the intersection of the E42 motorway and the RN4. Access by bus is possible via Line 32 Namur - Gembloux.

1 public house and a supermarket are located near the building.

All information on Ecolys: https://www.bep-entreprises.be/parcs/40/

Land plot area : 800,00 m^2

Built-up area : 200,00 %

Green space : 600,00

Products

Product

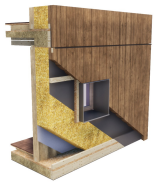
Half-crane wall

MOBIC S.A.

Jean-Philippe Moutschen

https://www.mobicsa.be/

Product category : Gros œuvre / Structure, maçonnerie, façade



Costs

Construction and exploitation costs

Cost of studies : 56 000 €

Total cost of the building : 694 000 €

Subsidies : 625 000 €

Health and comfort

Water management

An EP recovery system supplies the sanitary facilities and the outdoor watering system.

Indoor Air quality

The interior finishing materials have very low VOC emissions:

- The interior faces of the exterior walls are logs without any treatment

- The floor is made of heat-treated beech. No chemical treatment

- The interior walls are made of rigidur, low VOC paint

Ventilation is ensured by a double-flow system with heat exchanger and a monitoring of the CO2 level of the premises will be implemented.

Comfort

Measured indoor CO2 concentration :
Le bâtiment sera équipé de sondes CO2 mais il n'est pas encore équipé

Carbon

GHG emissions

GHG in use : 15,60 $KgCO_2/m^2/an$

Methodology used :
Belgian regulatory calculation PEB and TOTEM

Building lifetime : 60,00 an(s)

GHG Cradle to Grave : 949,00 $KgCO_2/m^2$

Calculation carried out on TOTEM, the 949 kg CO2eq / m² on a 60-year DVT include the emissions corresponding to heating and materials

Life Cycle Analysis

The LCA covers all structural elements, walls, floors, ceilings, floors, partitions, windows, doors, ... Not included are foundations on screw piles and special techniques (not available in Totem). The environmental impact is 36

Eco-design material :

The specificity of the building lies in its walls made of logs. The logs are minimally processed, they are cut in 2 and the rounded edge is ground. The logs used for the exterior are heat treated, no chemicals are used. The volume of wood per m2 of wall is similar to a traditional frame but the wood is much less processed.

Contest

Reasons for participating in the competition(s)

The timber construction company wanted to develop a more economical construction system than the traditional timber frame by using ground and assembled logs to form panels between which the straw is compressed. The volume of wood per m² of wall used by this construction system is equivalent to a conventional timber frame.

The company processes the wood itself. By using unprocessed logs directly, it also significantly reduces the cost of the wood. The quantities of wood used are ultimately of the same order of magnitude as a conventional framework and the wood used for this project comes from forests within a radius of less than 100 km from the sawmill.

Building candidate in the category

Bas Carbone

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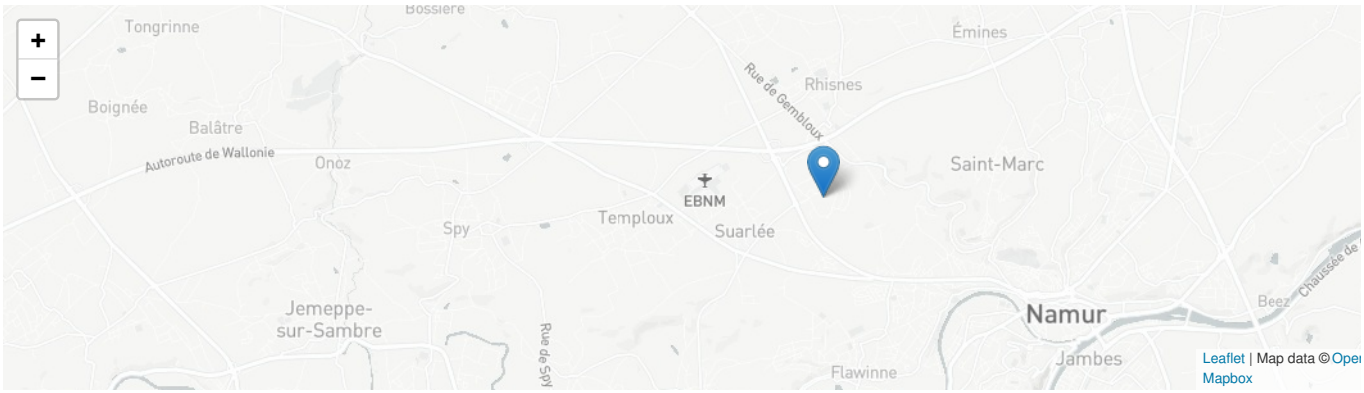

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