


MONTECO

by arthur Verdussen / 2022-11-22 16:05:07 / Belgique / 226 / FR

New Construction



Primary energy need :

138

kWh_{ep}/m².an

(Calculation method : PEB - Bxl)

ENERGY CONSUMPTION

Economical building *Building*

| | | |
|-----------|---|---|
| < 50 | A | |
| 51 à 90 | B | |
| 91 à 150 | C | C |
| 151 à 230 | D | |
| 231 à 330 | E | |
| 331 à 450 | F | |
| > 450 | G | |

Energy-intensive building

Building Type : Office building < 28m
Construction Year : 2021
Delivery year : 2022
Address 1 - street : Rue Montoyer 14 1000 BRUXELLES, Belgique
Climate zone : [Cbc] Mild, dry winter, warm and wet summer.

Net Floor Area : 3 689 m² Autre type de surface nette
Construction/refurbishment cost : 11 500 000 €
Cost/m2 : 3117.38 €/m²

Certifications :



General information

Situation

The **Monteco** building is located in the heart of the administrative district of Brussels in an area generously served by various modes of public transport and made up of infrastructures dedicated to soft mobility.

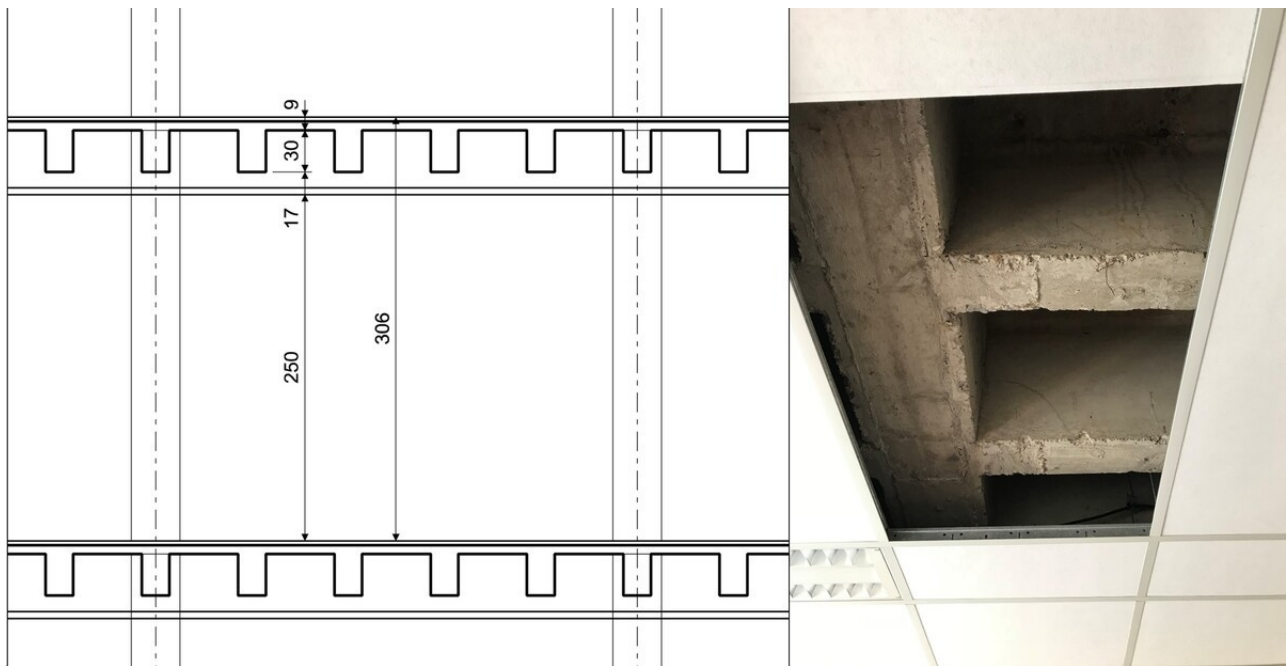
The fairly tight orthogonal cut of the district has given rise to rectangular islands which have been greatly densified over time and which have seen the appearance of relatively deep constructions on their peripheries in line with the office program defined at the PRAS. These two characteristics have created deep corner plots, having only two facades and which must give an answer to the socio-economic and technical requirements of the European market.

The streets of the district are lined with buildings with highly opaque facades and forming a solid built front ranging from 5 to 10 levels. These last years have been marked by an initial desire to reconnect buildings with the public space through architecture and programming. The second desire is to break away from this corbelled typology which characterizes the volumetry of the buildings in this district.



Existing building - Demolition / Reconstruction

The plot on which the existing building was located measures +/- 22m by 22m and faces south on its corner. With its ribbed concrete floors and a height under slab of 265 cm, the existing building had a restrictive configuration to meet today's energy, acoustic and comfort requirements. The choice was therefore quickly oriented towards a demolition/reconstruction while registering it in a sustainable approach by paying particular attention to the sorting of waste, to the methodology of deconstruction and above all by proposing a new wooden building that is efficient in its construction and its use.



The project

The project is part of a square-shaped plot and was composed on a 135 cm **module** .

The arrangement of the cores allows a maximum of useful surface taking into account the exiguity of the plot. These are installed in a rational way to free the facades and allow the circulation of cars in the basement.

The entrance to the building is marked by a **double height** responding to the scale of the building.

The volumetry of the building takes up the principle of cantilevered floors that characterizes the Belliard district while reinterpreting it. We opted for 2 floors set back in one piece in order to free up a large and generous **terrace** .

Except for the concrete core, the columns, beams and floors are constructed of exposed **wood** . The active ceiling zones have been implemented in such a way as to free up maximum height and view of the CLT ceilings. The wood is **structural and assumed** here, just like the concrete core, also left raw and apparent.

For the facades, full-height glazing connects the interior and exterior. In order to accentuate the **verticality** of this small corner building, long, clear and deep vertical metal profiles dress the facade to create plays of light and shadow throughout the day.

On the parts of the facades aligned with the neighbours, the **finely perforated sheet metal** cladding suggests, at nightfall, various bay windows imperceptible during the day.

In the same vein, the entrance hall on two levels and completely glazed extends **the public space** . It is designed as an open and lively space, directly connected to the bike room, workspaces, etc.



Towards a construction system in wood – the different challenges

The choice to build this wooden building was made by the Client and the Architect for several reasons.

The first is obviously **environmental** . Wooden constructions, during their lifetime, store the carbon absorbed by the trees in the atmosphere during the process of photosynthesis. This type of construction is therefore considered more environmentally friendly than buildings made from other materials such as concrete or steel, which have a much larger carbon footprint due to the energy required to build them. production. In addition, unlike concrete construction, wood does not resort to the use of water for its production. At an equivalent wood/concrete volume, 65,000 liters of water were therefore saved as part of this project. Out of concern for the environment, the use of fossil fuels was prohibited at the start of the project. The energy is therefore drawn from heat pumps and photovoltaic panels.

The second reason lies in the choice of a **construction method adapted to the context in which the project takes place** . In a neighborhood with high-intensity traffic, a restricted plot that does not allow the storage of material and close proximity to neighboring buildings, the choice of construction technique is essential for the smooth running of the site and the impact on the neighborhood life. The wooden construction allows the prefabrication of the elements in the factory and the assembly in situ in continuous flow upon arrival of the deliveries. In this way, the occupation of the roads is limited to the delivery of the structural elements and does not impact the life of the district. The impact on the neighborhood is also limited because wood construction is a so-called dry construction technique. Assemblies are made using flat metal, screwing and bolting, thus allowing no dust to be released and minimizing site-related nuisances.

The third reason is to provide **comfort** to the occupants of the premises. Whether it is the worker during the construction site or the worker after acceptance of the work, both evolve in a workplace made pleasant and comfortable by the aesthetic and physical properties of the wood.

A tall wooden building, a challenge

This office building has the particularity of being the **first building with a wooden structure considered high with regard to fire regulations in Brussels**. The constraints generated by the height of this building reside in the study of the forces between elements and the respect of the basic standards of fire prevention.

The principle of **prefabrication** is to disconnect as many elements as possible to transport and assemble them more quickly. However, in a tall building, the forces to be taken up are considerable in certain nodes. The Stability Consulting engineer and the company in charge of the execution therefore developed particularly effective but also meticulous details since some of these structural elements had to remain **visible**.

In terms of basic standards, two requirements had a significant impact on the project. The first concerns the **fire resistance** required in the standards. This practically requires the structure to be sized essentially for fire. Indeed, the column sections that were executed are of 40x40 cm sections whereas these only required a 28x28 cm section based on the dimensioning of the forces.

The second requirement is the **fire reaction** of the wood. The wood does not meet the reaction class required by the standards. Despite compensatory measures such as sprinkler coating, it was necessary to treat all the wooden surfaces that remained visible in order to meet the required class.



Building users opinion

Warm, original and work-friendly setting.

Compliance with the schedule which allowed the tenant to enter the premises on time.

See more details about this project

<https://www.archi2000.be/projects/montoyer-14>

<https://www.construirelwallonie.be/article/monteco-une-nouvelle-generation-dimmeubles-durables/>

<https://www.architectura.be/fr/actualite/monteco-premier-batiment-en-bois-de-bruxelles/>

<https://www.woodshapers.com/en/projects/monteco/>

https://www.linkedin.com/posts/bpcgroup-sa_monteco-activity-7040984860542291969-6x7e?utm_source=share&utm_medium=member_desktop

Data reliability

Self-declared

BIM approach

A general Revit model was set up during the adjudication phase. This integrated the models of the various design offices in order to obtain a reduced three-dimensional model of the future building.

This pooling work made it possible to carry out any clashes and to anticipate any problems that could have arisen on the site.

Some subcontractors also provided models (double walls, sprinkler system, metal structure sloped roof, etc.) which were integrated during the execution phase, thus providing the final model with a particularly interesting precision.

Photo credit

Laetizia Bazzoni

Stakeholders

Contractor

Name : Nextensa

Contact : Olivier.Vuyksteke@nextensa.eu

<https://nextensa.eu/>

Construction Manager

Name : ARCHi2000

Contact : arthur.verdussen@archi2000.be

<https://www.archi2000.be/>

Stakeholders

Function : Construction company

BPC

Vincent Peeters

<https://bpcgroup.be/nl/>

BPC and WOODSHAPERS worked in a temporary association on this project

Function : Contractor representative

ION

Peter Artois

<https://www.ion.be/en>

Function : Structures calculist

NEY - WOW

Pierre-Antoine Cordy

<https://www.bureau-etudes-bois.be/>

Function : Other consultancy agency

VK Engineers

Jamil Ben Abdejjaouad

<https://www.vk-architects-engineers.com/>

PEB - Acoustics - TS

Function : Construction company

Woodshapers

Katherine Vanormelingen

<https://www.woodshapers.com/en/>

BPC and WOODSHAPERS worked in a temporary association on this project

Contracting method

General Contractor

Owner approach of sustainability

for their productionThe choice to build this wooden building was made by the Client and the Architect for several reasons.

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The second reason lies in the choice of a **construction method adapted to the context in which the project takes place** . In a neighborhood with high-intensity traffic, a restricted plot that does not allow the storage of material and close proximity to neighboring buildings, the choice of construction technique is essential for the smooth running of the site and the impact on the neighborhood life. The wooden construction allows the prefabrication of the elements in the factory and the assembly in situ in continuous flow upon arrival of the deliveries. In this way, the occupation of the roads is limited to the delivery of the structural elements and does not impact the life of the district. The impact on the neighborhood is also limited because wood construction is a so-called dry construction technique. Assemblies are made using flat metal, screwing and bolting, thus allowing no dust to be released and minimizing site-related nuisances.

The third reason is to provide **comfort** to the occupants of the premises. Whether it is the worker during the construction site or the worker after acceptance of the work, both evolve in a workplace made pleasant and comfortable by the aesthetic and physical properties of the wood.

Architectural description

The choice to work with a **wooden structure** has a major role in the sustainability of the project. Indeed, wood is a natural and renewable raw material. This requires less processing and especially less water to be used for construction. Finally, the wooden structure can be dismantled and provides a real possibility of reusing its elements in the future. In terms of construction, wood made it possible to complete a project of this scale in just **14 months** . Fewer working days lead to less consumption and fewer kilometers traveled to and from the site.

The idea was to choose means of production that do not use fossil fuels, such as heat pumps and photovoltaic panels on the roof. These two means of production make it possible to cover the heating and cooling needs of the building, using **renewable energies** .

The project is aiming for a **BREEAM Excellent** . The project was monitored throughout its design and construction by a design office in order to integrate the concepts included in the BREEAM certification. This should be released soon.

For the facades, full-height glazing promotes **visual porosity between the interior and the exterior**. Accentuating the **verticality** of this small corner building, long clear and deep vertical metal profiles create plays of light and shadow throughout the day. On the parts of the facades aligned with the neighbours, the finely perforated sheet metal cladding suggests, at nightfall, various bay windows that are imperceptible by day in the same way as the wooden structure.

In addition to clearing a free **terrace** for users, the withdrawal of the last two floors allows the building to be less imposing.

The challenge of the plan is to establish a core allowing the operation of the car park while freeing up a maximum of surface area for the offices, on a **very cramped plot** .

The double height of the ground floor gives prestige to the reception area onto which the mezzanine opens. Located on the corner of the building, it is completely glazed, almost making the boundary between inside and outside disappear.

Energy

Energy consumption

Primary energy need : 138,00 kWh/m².an

Primary energy need for standard building : 208,00 kWh/m².an

Calculation method : PEB - Bxl

Breakdown for energy consumption :

Heating: 682,272.59
Cooling: 197 777.02
Lighting: 428 746, 24
Auxiliaries: 714 111, 51
Characteristic consumption of EP: 2,033,036.91
Characteristic consumption of reference PE: 5,301,222.42

Envelope performance

Building Compactness Coefficient : 4,13
Indicator : EN 13829 - q50 » (en m3/h.m3)
Air Tightness Value : 3,00

Renewables & systems

Systems

Heating system :

- Heat pump
- Radiant ceiling
- VAV System
- Solar thermal

Hot water system :

- Individual electric boiler
- Heat pump

Cooling system :

- Reversible heat pump
- VAV Syst. (Variable Air Volume system)
- Radiant ceiling

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Heat pump

Renewable energy production : 24,50 %

Other information on HVAC :

For the supply of heat, the floors are equipped with a reversible radiant ceiling emission system (hot/cold). The hot and cold water supply is via a 4-pipe system (O2 tight). The adjustment of these ceilings is done by means of 6-way valves equipped with a modulating servomotor.

6-way valves are provided for each 2 modules that can serve 3 modules via manifolds downstream of the V6Vs. Each V6V is associated with balancing elements that can be adapted according to the partitioning; The motorized valves are served by addressable controllers connected to the GTC by a communication bus. In the installation, an addressable regulator is provided by 8 facade modules of 1.35m as well as for each potential meeting room.

Air/water heat pumps for heat production (heating and cooling).

Solutions enhancing nature free gains :

High energy efficiency 4-pipe heat pump, ensuring hot and cold

Ventilation units fitted with a hygroscopic-type heat recovery wheel (perceptible efficiency of at least 70%) according to EN 308 and EPB conditions (see EPB note in the appendix for the calculation conditions)

Free cooling by means of ventilation groups.

Ventilation units in offices with variable air flow depending on occupancy.

Smart Building

BMS :

No Smart Building certification of the building in this project, but efficient electronic regulation of the installations is planned: in particular, an optimizer manages the production of the distribution of hot and cold fluids according to the exterior and interior conditions and the occupancy cycle of the building.

This regulation is supplemented by a BMS supervision station. The regulation allows, in a non-exhaustive way:

- Ordering and monitoring of HVAC technical equipment:
- Generations, collectors and possible substations
- Fan groups

- Terminal units
- Supervision of fire protection installations (smoke extraction, fire dampers, fire detection, etc.)
- Reporting and analysis of consumption:
- HVAC: Hot water energy
- HVAC: Cold water energy
- Electricity of large consumers
- ¼ hourly management including load shedding programming
- Yield of HVAC productions
- City water consumption
- Energy metering
- Control and monitoring of the main lighting circuits
- Reporting of the status and alarms of various techniques
- Reporting of the status and alarms of the HV cabin, TGBT, emergency network (generator, IT transformer, etc.)
- Reporting of elevator status and alarms (scenario selection according to calendar program)
- Reporting of the status and alarms of sanitary pumping units

All terminal unit regulation and adjustment devices are easily accessible. The terminal regulators are placed in a box with cover. Remote consultation and transmission of alarms are provided.

System structure:

Intelligence has been distributed between terminal unit regulators, main PLCs in technical rooms, supervisors and the GTC station itself, in order to allow optimal operation of the installations. The visualization of the technical equipment listed above by the imagery of the GTC will ensure precise management of the installations.

Environment

Biodiversity approach

If the entire plot is built and does not allow the integration of green spaces conducive to the development of biodiversity on the ground floor, the large **terrace** located on the seventh floor of the building and facing south is lined with **planters. to plants** . The choice of the different **species** planted in these containers was oriented towards local plantations and **promoting biodiversity** .

Urban environment

The building enjoys a very good location which allows it to be particularly well served by public transport. Indeed, the building is located a few steps from the **metro** (Trône and Arts-Loi stations) and a few hundred meters from the Brussels-Schuman **station** . The Central station is also accessible on foot for a few more minutes.

Monteco is also located near various **green spaces** . Thus, it takes two minutes on foot to reach the **Square de Meeûs** , five minutes for the **Square Frère-Orban** and only seven minutes to reach the famous **Royal Park** of Brussels.

Land plot area : 476,00 m²

Built-up area : 100,00 %

Green space : 100,00

Products

Product

DRINK

LTS

ltsbelgium@ltsbelgium.be

<https://www.laminatedtimbersolutions.be/fr>

Product category : Gros œuvre / Structure, maçonnerie, façade

Wooden constructions, during their lifetime, store the carbon absorbed by the trees in the atmosphere. This type of construction is therefore considered more environmentally friendly than buildings made from other materials such as concrete or steel, which have a much larger carbon footprint due to the energy needed for their production. In addition, unlike concrete construction, wood does not resort to the use of water for its production. At an equivalent wood/concrete volume, 65,000 liters of water were therefore saved as part of this project.



All those involved in the project had to pay particular attention to this relatively new method of construction in the building sector in Brussels. The challenge was taken seriously and everyone studied the project with the aim of obtaining an optimal result, both technically and aesthetically.

The dry and fast construction offered by the wood was also appreciated by the various workers. It is obvious that the building's direct neighbors suffered less inconvenience with this type of construction site than with a traditional concrete construction site.

Finally, the original and natural aesthetic offered by the wood left exposed was greatly appreciated by the users of the building. The warmth provided by the wood and the industrial side added by the concrete and the black painted metal elements offer a space in which it is good to work.

Square

Kvadrat

Erik Van den Broeck Sales, Architecture & End Users M +32 475 76 06 50

<https://www.kvadrat.dk/en>

Product category : Second œuvre / Équipements intérieurs

Conclusions on the performance of sun protection:

Sun protection performance - g-tot value (ZTA value):

- Reflective solar protections (metallic) considerably improve solar gain. The 202 SilverScreen 2% sunscreen performs best in this regard, with a reduction in g-value of 65% to 71%. The 203 SilverScreen 3% also exhibits a good g-value reduction of 62-68%.

- The different colors of the metallic shade type are the same, because the reflection of the metallic layer is the same regardless of the color of the inner side of the fabric.

- The thicker the inner sheet of the glazing, the smaller the improvement in performance due to solar protection, because the thicker inner sheet absorbs more heat.

Insulation performance - U-tot value:

- The application of metallized fabrics has a positive effect on the thermal insulation value, visible in the lower U-value. The calculation is based on a poorly ventilated cavity between the glazing and the shade. The effect is particularly strong with double glazing. The thermal transmittance (U-value) is improved by up to 35%. The thermal comfort of people working near the glazing is considerably improved. In addition, it allows to reduce the heating energy.

- Overall, the performance improvement is from 1.1 W/m²K without shading to 0.71...0.72 W/m²K with shading.

Visual comfort - LT value/ Glare control class/ Transparency:

- Both types of fabric offer very good glare control. Based on maximum viewing angle, diffuse light transmission and openness factor, they achieve class 4 (Excellent) for "glare control" according to EN 14501:2021 . The total light transmission is between 2 and 4%.

- Although the visual contact class according to EN14501:2021 for both blinds is 2 (on a scale of 0 to 4), which means medium, the 203 offers much better visual contact with the outside in the practical, partly thanks to its slightly higher openness factor.

Conclusions sun protection automation:

- The application of metallized fabrics has a positive effect on the thermal insulation value, visible in the lower U-value. The effect is particularly significant in the case of double glazing. The thermal transmittance (U-value) is improved by up to 40%. The thermal comfort of the occupants of the building is considerably improved.

- Without automation, shading is not optimal not only from an energy point of view, but also for the well-being of people in the office. For example, unnecessary artificial lighting is used when daylight and an unobstructed view are much better for people.

Benefits of automation:

▣ Helps prevent overheating (TO analysis)

▣ Saves energy, both for cooling and heating

▣ Increases the use of daylight and visual comfort



Costs

Construction and exploitation costs

Cost of studies : 2 000 000 €

Total cost of the building : 11 500 000 €

Health and comfort

Water management

Consumption of harvested rainwater : 9,00 m³

retention and buffer rainwater tank are calculated on the basis of the tools and recommendations of the Brussels Institute for the Environment (see appended calculation file). this water is used to supply certain toilets upstairs.

Indoor Air quality

The fresh air intakes comply with the requirements of the Royal Decree of 02/05/2019 - Royal Decree modifying the general basic requirements that workplaces must meet.

The residual air velocities in the occupied zone comply with category B according to appendix A of EN ISO 7730.

The open-plan office floors are ventilated on the basis of variable airflows; boxes with variable flow rates are present at the base to allow the development of two meeting rooms per floor. The opening and closing of these boxes are controlled by CO2 and temperature detection probes

For sanitary facilities, the extraction is minimum: WC: 50 m³/h per cubicle - Urinal: 25 m³/h per urinal - Showers: 50 m³/h per shower - Archive rooms: 1 volume/hour. -Bicycle room: 2 volumes/hour -Garbage room: 2 volumes/hour- For car parks: Mechanical comfort ventilation at a rate of 250 m³/h per location.

Comfort

Health & comfort :

Brightness

The building, facing south and largely glazed, brings a particularly appreciable natural light within the building. However, in order to avoid glare and overheating, smart blinds were placed in front of each module of the curtain wall. These adapt their position over the hours and the sunshine.

Transparency

The choice to create large full-height windows gives the building great transparency and an opening to the outside. This transparency is shared from the outside, especially at the end of the day, when the glazed corner offers an exceptional view of the wooden structure of the building.

Plant parenthesis during the day

The large terrace, perched on the seventh floor of the building, offers its occupants a panoramic view of the European district through the plantations that border it. The interior and exterior of this floor are dedicated to the relaxation of users throughout the day. The ideal orientation allows you to enjoy the outdoor space over a wide period of the year.

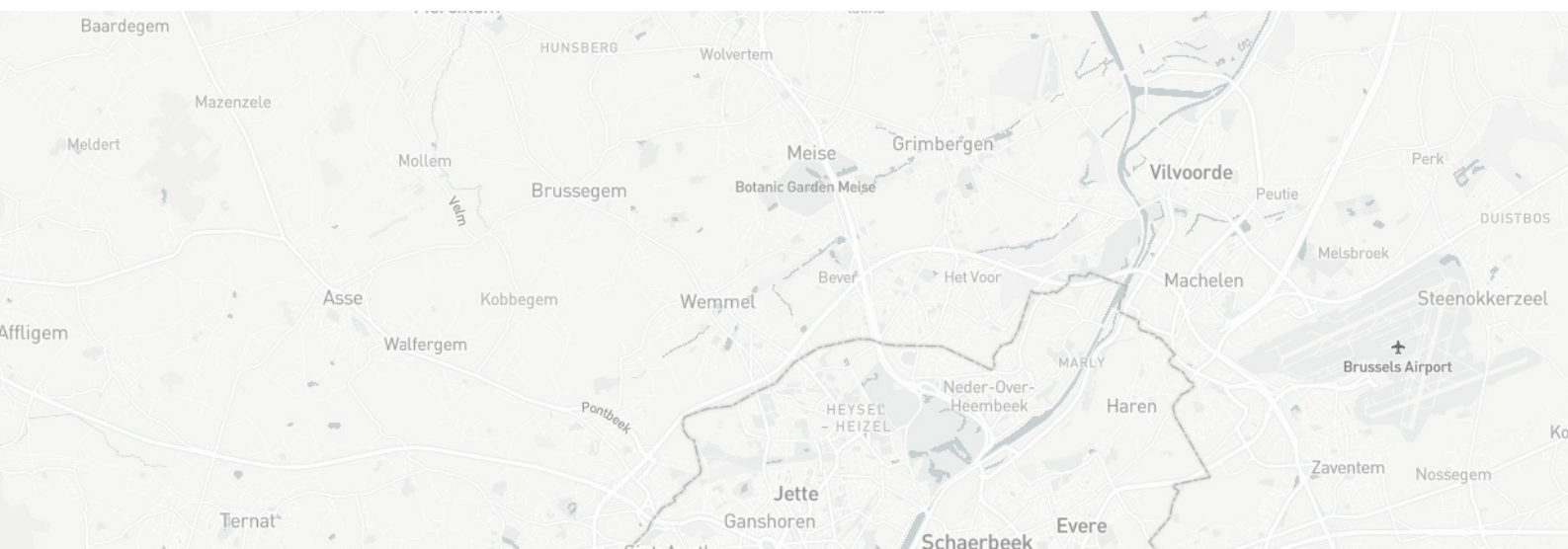
Acoustic comfort :

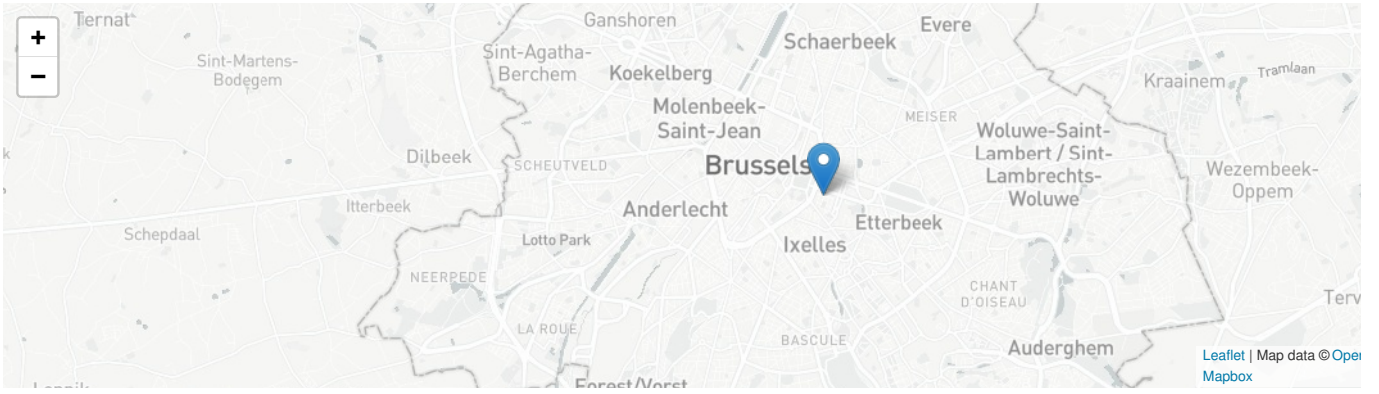
- *The project's acoustic design strategy consisted in identifying expectations and needs in terms of acoustic comfort from the very first phases. Criteria have been defined based on the acoustic standards in force, such as NBN S 01-400 [1977], NBN S 01-401 [1987], based on the GRO 2018 and the decree of November 21, 2002 relating to the fight against neighborhood noise. All five aspects of building acoustics were considered, including:*
- *Insulation of exterior facades (DAtr);*
- *Insulation against airborne noise and impact noise between rental spaces (DnT,w and LnTw);*
- *The noise levels of the equipment generated towards the neighborhood (LAeq,nT);*
- *The noise levels of the equipment generated in the project premises (LAinstal, nT);*
- *Reverberation times within rental spaces (Tnom).*
- *In coordination with the other aspects of the project, such as architecture, stability and the special technique, technical choices and construction concepts have been carefully selected to guarantee consistency between the different disciplines. The objective was to ensure compliance with acoustic criteria, taking into account the two major points of attention represented by the light CLT structure of the building and the high ambient noise level outside. To achieve this, several elements were taken into account, such as the composition of the glazing, the floor and roof complexes, the sound power levels of the technical equipment, as well as the sizing and choice of materials for the interior finishing.*

Contest

Reasons for participating in the competition(s)

Monteco, the first wooden structure building in the Brussels Region, is exceptional on multiple dimensions of sustainable development:





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