Green box on the roof

by Marc Campesi / 2020-06-23 17:49:19 / France / 11600 / FR

Primary energy need :

59 kWhep/m².an

(Calculation method : RT 2012)

ENERGY CONSUMPTION

Economical building — *Building*

< 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	

Energy-intensive building

Building Type : Office building < 28m
Construction Year : 2019
Delivery year : 2019
Address 1 - street : 1 rue Jacques Monod 69500 BRON, France
Climate zone : [Cwa] Mild, dry winter, hot and wet summer.

Net Floor Area : 917 m² SHON RT
Construction/refurbishment cost : 1 550 000 €
Cost/m2 : 1690.29 €/m²

Proposed by :

diagonale concept
GREEN BUILDING

General information

Elevation timber frame of an office building in occupied site.
See

Sustainable development approach of the project owner

This is a property development operation under renovation. The aim is to extend the building by adding a floor on the existing roof and on the occupied site. - To use the building's potential for elevation (building potential without new footprint) - To build in less than 6 month with a dry (low carbon) solution in occupied site and without overloading the structures (lowering of limited loads) - Creating healthy premises comfortable for future users - Achieving an excellent level of energy performance and low-carbon value for buyers - C is the second project in renovation "green building" Ariosto after the own renovation of its premises labeled BBC renovation in 2016.The Green Box on the Roof project is a technical and architectural feat achieved in record time (6 months) with a high level of performance (Bepos E2C2 level without ENR). The context of the site is particularly difficult: several offices (on the lower floors) are occupied during the duration of the works.

The existing equipment of the lower levels of ventilation and heating are located on the terrace where the elevation is located. Heating and ventilation should not be stopped during the construction period (December to June 2019) or moved. The building is in moderate seismic zone, which induces constraints in terms of structure and slab piercing. The wood frame construction is an asset for the reduction of overloads: the roof terrace is not a carrier, it is necessary to rely on the structure post & beam existing lower floors to create a wooden platform receiving the new construction. off-site manufacturing reduces assembly time, user inconvenience and transportation. Insulants bio-sourced prove very successful in hot weather, companies on site testified to their effectiveness during the hot days of May and June. It feels good in the premises, the natural light is widely diffused and the acoustics are excellent, no "resonance" in the empty premises. The exterior views are clear at all points of the offices. The large green terraces contribute to a feeling of well-being at R + 2. The building is accessible to the PRM via a glass lift created in a plant and artistic path. The building is monitored for monitoring of comfort and energy performance measured.

Architectural description

The elevation is a very elongated building of 80 mx 15 m wide outside terraces. The bioclimatic design is a strong element of the project. The comfort, the health of the users and the measured environmental performance are the priority targets of the project. The new construction has a long facade facing east with a beautiful view of the Alps and a west facade overlooking a business park. The choice of curtain wall in the East is conditioned by architectural criteria for the harmonization of the construction with the existing, by criteria of energy performance and user comfort (natural light and unobstructed view). The choice to install a curtain wall East facade allows a significant amount of natural light (TL 89% and FS 28%) with a limited greenhouse effect in the morning in opposition to the west facade (southwest) less glazed and very exposed to effects of sunstroke. The facades are protected from heat flows by a reconstituted wood cladding type envelope (+ 80% wood fiber) completed by a compact laminated cladding. The south and north terraces are equipped with awning sun-breaks and shading terraces. For the comfort of users, the use of insulation hemp & linen contributes to summer comfort (phase shift) and the natural regulation of hygrometry. The implementation of open wood joinery allows each user to ventilate his workspace naturally. Generous terraces accessible in reconstituted and vegetated wood will reduce summer overheating.

Building users opinion

In the course of finishing

If you had to do it again?

The addition of BSO on the West facade would have been timely. Production in self-consumption was studied but was not selected by the developer given the local prices of the real estate market. The roof was designed to later receive a PV installation installed by the purchasers.

See more details about this project

https://www.diagonaleconcept.com/realisations/eco-renovation-surelevation-immeuble-de-bureaux/
https://youtu.be/ijnv0DIBa5Y
https://www.construction21.org/france/articles/fr/green-solutions-green-box-on-the-roof.html

Photo credit

state-of-places-studioericksaillet.
Other Marc campesi photos

Stakeholders

Contractor

Name : Arioste 1 quai Jules Courmont 69002 LYON
Contact : Marc Pigeroulet
http://www.arioste.fr/

Construction Manager

Name : Diagonale Concept 12, rue Cavenne 69007 LYON
Contact : m.campesi@rgb.city tel 04 37 41 11 99
https://www.diagonaleconcept.com/

Stakeholders

Function : Designer

Sophie Sturlese (architecte) et Ressources Green Building rgb (Marc Campesi : Design global de bâtiments durables)

Marc Campesi m.campesi@rgb.city tel 04 37 41 11 81

Architectural, environmental and technical design

Function : Thermal consultancy agency

Emcon Engineering rue de Gerland 69007 LYON

Mr Dupré David

Fluid and thermal study

Function : Company

Diagonale Concept

M. CAMPESI Marc tél 04 37 41 11 99

https://www.diagonaleconcept.com/
General contractor

Function : Company

Industherm 54 route de Brignais 69630 CHAPONOST

M. BULLY

Double flow ventilation, heating and cooling

Function : Company

JLC MENUISERIE ZI La Plagne 42123 St-Cyr-de-Favières

M. ALEX Laurent

http://www.jlc-menuiserie.com
Carpentry, Interior and exterior carpentry

Function : Environmental consultancy

BIOFIB

M. MERLE

http://www.biofib.com
Supplier of ecological insulation materials

Type of market

Realization

Energy

Energy consumption

Primary energy need : 59,00 kWhep/m^2.an

Primary energy need for standard building : 110,00 kWhep/m^2.an

Calculation method : RT 2012

Breakdown for energy consumption : heating 12 - air conditioning 18- lighting 17 * - PECS 5.5 - Auxiliary 6.10 (for information except RT 2012: office automation 12) * overestimated value by real software between 6 and 8

Real final energy consumption

Final Energy : 48,00 kWhef/m^2.an

Envelope performance

Envelope U-Value : 0,22 $W.m^{-2}.K^{-1}$

More information :
Wood frame wall: reconstituted wood cladding or compact laminate + by rain + biofib trio insulation (hemp & linen & cotton) 145mm + 45mm vapor brake from biofi trio

Ceiling
Steam brake + 200m insulating Biofib + chipboard + vapor barrier + 100 rigid polyurethane foam (PU)

Wood carpentry uw 1.4 with inner screen

Curtain wall: solar glazing (solar factor = 28%) (light transmission 58.9%).

Building Compactness Coefficient : 1,01

Indicator : I4

Air Tightness Value : 0,42

More information

Monitoring start end of June 2019 / Final energy consumption (regulatory values = energy + lighting + cooling and auxiliary heating) or 23 Kw / m2.an

Renewables & systems

Systems

Heating system :

- Heat pump

Hot water system :

- Other hot water system

Cooling system :

- VRV Syst. (Variable refrigerant Volume)

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Heat pump

Other information on HVAC :

The heat pump has a COP of 4 and the use of an electric back-up is not necessary down to -20 °.
The cooling and heating system is coupled with dual flow ventilation. This allows a great flexibility of office facilities (little fluid network ceiling). Main distribution in rigid and secondary sheath in soft acoustic gai. Each blow mouth is motorized and regulated. The PAC is oversized as a precaution but is variable speed to adapt to real needs and reduce consumption.

Smart Building

BMS :

Two main equipments
- The Air Zone control which allows to control by office every mouth of blowing (summer / winter) of the double flow ventilation which is coupled with cooling and heating. The speed of the air is reduced.

Monitoring:
Energy, comfort and health data that are accessible online by users with access rights
-Multi-measures ambience sensor Air (CO2, T °, HR, Brightness, Passage)
- Air quality sensor: CO2, TEMP., HUM., VOC, PM1
- Optical sensor for electric meter (all energy and regulatory consumption RT2012)

Environment

Urban environment

Existing business park.

Products

Product

Hemp insulation of walls and ceilings

Biofib

Olivier Merle

https://www.biofib.com/

Product category : Second œuvre / Cloisons, isolation

Insulation made from biosourced materials such as hemp, wool and linen.

Positive feedback of a product that does not irritate, arises easily and ecologically. Significantly improves summer comfort compared to conventional insulation. French product.

Air Zone Control System

http://www.airzonefrance.fr/

Product category : Génie climatique, électricité / Ventilation, rafraîchissement

System allowing to regulate by room for indoor units in "ducted system".

Ease of adaptation for the installation or modification of non-partitioned offices with regulation by rooms or areas. The use of flexible sheaths makes it easy to change the location of mouths in case of new partitions unlike commonly used systems.

Reconstructed wood cladding Neolife

Neolife

https://neolife.fr/

Product category : Gros œuvre / Structure, maçonnerie, façade

Reconstituted wood with 82% fiber

Product from recycled and healthy sawmill waste

Sealing Epdm Rubber

Firestone

https://www.firestonebpe.com/fr/produits/etancheite-de-toitures/commercial/rubbergard-epdm

Product category : Gros œuvre / Charpente, couverture, étanchéité

Rubber product, easy to install by bonding and without heating (on wood frame) to avoid any risk of fire

Ventilation double Flux

France air

https://espacepro.france-air.com/

Product category : Génie climatique, électricité / Ventilation, rafraîchissement

Coupled system on blowing with indoor air conditioning units.

Inverter heat pump easy VRF inverter Max 2

Atlantic Fujitsu

https://www.atlantic-climatisation-ventilation.fr/climatisation/vrf/vrf-atlantic-fujitsu-unites-exterieures/

Product category : Génie climatique, électricité / Ventilation, rafraîchissement

Variable power adaptable to real needs with double motor for safety

Monitoring

https://www.advizeo.io/?utm_source=email&utm_medium=signature

Product category : Second œuvre / Equipements électriques (courants forts/faibles)

Installation of CO2 sensors, hygrometry, temperature and display of electricity consumption.

Mapei tile adhesive

Mapei

https://www.mapei.com/fr/fr-fr/page-d-accueil

Product category : Second œuvre / Revêtements de sol

Glues and smoothing (soft floor / tiles / faience)

Tile adhesive with very low VOC emissions

Solar glass COOL-LITE XTREME

Saint Gobain

https://fr.saint-gobain-building-glass.com/fr/controle-solaire-selectivite-extreme-6028-ii

Product category : Second œuvre / Menuiseries extérieures

East curtain wall without blind

Cool-lite xtreme 60-28 solar panel with high sun protection (0.28) for high light transmission (60%).

Costs

Construction and exploitation costs

Reference global cost : 1 700,00 €

Reference global cost/Work station : 1700

Cost of studies : 78 000 €

Total cost of the building : 1 470 000 €

Additional information on costs :
The cost includes the creation of an elevator to the basement and the extension of two spiral helical staircases and the outdoor terraces (plant 180M2 and 265 of terraces wood reconstituted)

Energy bill

Forecasted energy bill/year : 2 500,00 €

Real energy cost/m2 : 2.73

Real energy cost/Work station : 33.33

Health and comfort

Water management

Consumption limited to sanitary. Faucet and flush dual control.

Indoor Air quality

Air quality design in consultation with the companies and mentioned in the specifications

- The equipment

  - Vmc double flow with F7 filter with temperature and hygrometry control
  - Continuous monitoring of VOCs, CO2, PM1 (fine particles), hygrometry, temperature and brightness
  - Manual opening of wood windows

- Airtightness at 0.42 m3 / h.m2 for a reference value of 1.7, reduced risk of mold - Materials

  - Low emissivity paint for A + label, VOC <1g / liter
  - Tile Adhesives EC1 +
  - GUT label carpet
  - EC1 + chipboard
  - Bio sourced insulation without VOC emissions

Comfort

Health & comfort :

- Indoor air quality (tab above)
- Natural light: + 19% glazed area, curtain wall only to the East to preserve a soft light in the middle of the day and the apm
- Quality of artificial lighting: LED luminaires with mesh ugr <19 to reduce glare
- Continuous measurement of illumination, temperature and hygrometry to control the actual performance of equipment in place
- Acoustic insulation: reduction of equipment noise by reinforcing insulation of the walls separating the offices of the technical rooms, acoustic ducts for double-flow ventilation
- Acoustic comfort: ceiling with alpha αw from 1 to 500 hz, soft floor with αw = 0.15 Iso 11654 standard and 24db impact sound attenuation (reduced pitch noise). Spring effect of steam brake and hemp in doubling and ceiling
- Thermal summer comfort: thermal separation of the walls from 7 to 9H (Biofib data), curtain wall only in the east with solar lite Xtrem Cool lite, double flow ventilation coupled with cooling, wood joinery limited the cold wall effect
- Winter thermal comfort: building highly insulated level E2 in Bepos simulation and airtight, heat pump oversized compared to the theoretical needs (with inverter system)
- Quality of the external views (mountain view to the east and vegetal terrace to the west)
- Well-being of the collaborators: large terraces with a vegetated part and an awning for shading. Generous and neat common areas with the intervention of a Street Art artist.

- Accessibility PMR with the creation of a glass elevator (including doors) for the approval of users taking into account phobias

Acoustic comfort :

See health and comfort

Carbon

GHG emissions

GHG in use : 715,00 $KgCO_2/m^2/an$

Methodology used :
Clima-Win 4.8 build 4.8.2.1 SYNTHESE e+c-

Building lifetime : 50,00 année(s)

ie 21% below Eges max of reference for the carbon level 2 of the bepos (907.63)

Life Cycle Analysis

Eco-design material :

- **Bio-sourced materials:** 330m3 of wood and 325 m3 of hemp & flax of Biofib
- wood floors: Douglas solid wood (Rhône Alpes) + chipboard 30 mm (Europe)
- Wall frame walls: Douglas and Epicea posts and beam (Rhône Alpes)
- Glued laminated (France or EU)
- Exterior wood joinery manufacture Rhône Alpes with Sylvester pine UE
- Biofib Insulation (Hemp & Lin & Cotton): France
- Composite wood cladding (+ 80% wood): France and EU close - brand Neolife
- **Recycled or recyclable materials** (with operational recycling plant)
- Technical local acoustic insulation: Ekeo brand from recycling polyester and recyclable. Manufacturing France
- Flooring outdoor decks made of wood (PEFC) composite fully recyclable
- tiling (recycling production waste).

Contest

Reasons for participating in the competition(s)

945 m2 SDP timber framing on the terrace of an office building (occupied site):

- **Wood structure & local dry chain** (**low-carbon wood construction)**
- **6 months off-site manufacturing** : wood walls and joinery / transportation reduction. Workshops from 20 to 60 km
- **Low carbon: Bepos E2C2 * level** (**unlabeled**) without ENR. * C2 lowest level carbon.
- **Energy consumption for regulatory purposes 23 Kw ef** / **m2.an** (final energy)
- **Dual flow coupled with cooling & heating:** Innovative technologies of cooling and heating with motorized regulation (Easyzone) reducing the consumptions and the equipment in ceiling (common networks of blowing). No electric booster up to -20 ° c.
- **Bio-sourced materials:** floors, walls, roofing, insulation and joinery 330m3 of wood and 325 m3 of hemp & flax of Biofib
- **Recycled or recyclable materials** (with operational recycling plant): acoustic insulation, exterior terrace floors, tiling (recycling of production waste).
- **Reuse of deconstruction materials** in partnership with a local association (Mineka)
- **Circular economy: consulting** firms and Local businesses (TPE). Local materials (brand *"wood from here"*) or French in priority and failing CE.
- **Resilient building** : adapted to increase the frequency of heat waves (high thermal expansion of the walls 7 to 9 hours outside the glass walls, greening of the terraces, roofing and waterproofing adapted to the future installation of photovoltaic or solar thermal panels (overload and fixing). EPDM rubber sealing resistant to high thermal amplitudes.

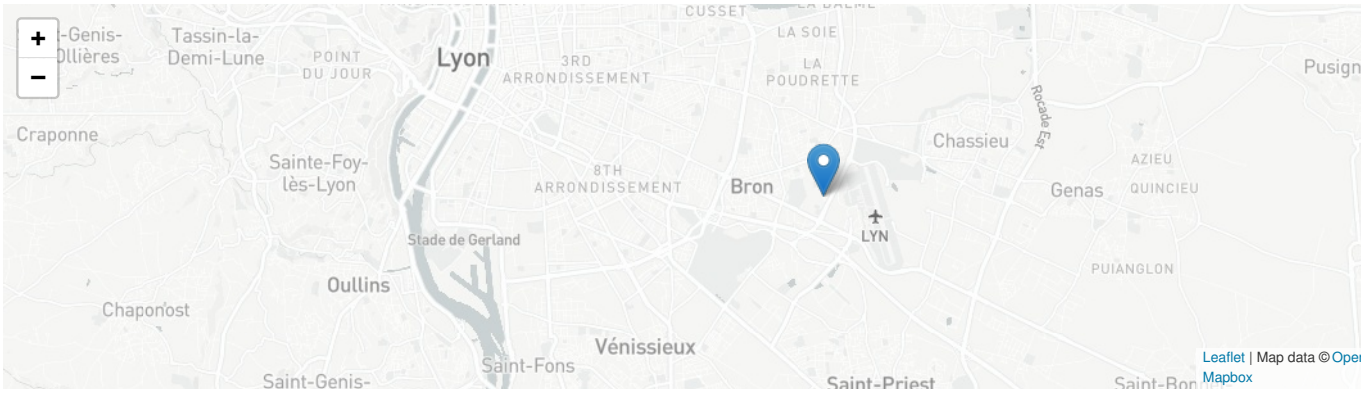
For users:

- **Monitoring for user comfort** and **energy performance** : continuous VOC measurement,, hygrometry, CO2 rate, all-purpose energy consumption and heating ... with data display on workstations
- **Air quality:** preventive approach: Double flow ventilation with F7 filtration, non-emissive materials and all joinery with one opening leaf except 1 curtain wall. High performance air tightness.
- **Quality of life:** large glazed area (natural light 18% compared to the floor area)) with exterior view of workstations, UGr <19 anti-dazzle LED luminaire with mesh, acoustic quality (floor, wall, ceiling), large green terraces and shaded.
- **Cultural and educational dimension:** local artist intervention of "Street Art" in the common areas. Public display of environmental performance in the buildings and visual frieze of the building site
- **Service to users, mobility and accessibility** : Electric vehicle charge. Access to PMR with elevator (glazed) from the basement and created during the project

Building candidate in the category

Prix tertiaire & industriel

Trophées
Bâtiments résilients



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