Institute of Botany ULiège - B22 building

by Anne-Françoise Marique / 2022-05-18 00:00:00 / France / 1601 / FR

Primary energy need :

357 kWhep/m².an

(Calculation method : Other)

ENERGY CONSUMPTION

Economical building *Building*

< 50	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 : School, college, university
Construction Year : 1968
Delivery year : 2019
Address 1 - street : Chemin de la Vallée, 4 4000 LIèGE, Belgique
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 9 000 m² SHON
Construction/refurbishment cost : 5 360 500 €
Cost/m2 : 595.61 €/m²

General information

The case study concerns the energy renovation of the Institute of Botany of ULiège (Building B22). This building was designed in 1968, according to plans by Roger Bastin. It is **an important witness of modernist architecture in Belgium** and is listed in the Inventory of Walloon Cultural Real Estate Heritage.

After 50 years of life without major renovation, this building has been the subject of an energy renovation project aimed at ensuring its durability for decades to come and at **significantly reducing its energy consumption: -75% reduction in heating consumption and - 21% of electricity consumption** (excluding scientific processes). A circular approach, particularly around the issue of reuse, is central to the entire project process. **In addition to the installation of reused wood cladding (2,600m²), various construction elements were dismantled, inventoried, cleaned and reused in the renovation project.**

This project is part of the sustainable development policy of the University of Liège. It was carried out between 2015 and 2019, as part of the eeef energy renovation program which enabled ULiège to finance studies aimed at renovating 8 of these buildings, all dating from the 1960s, as well as the public lighting network of the campus. The work, financed by the University's own funds, is now all finished.

Photos, project presentation document, summary of costs and energy savings: https://dox.uliege.be/index.php/s/tRriniDv3bGsDsF .

Building users opinion

User feedback is positive. Winter cold problems are solved. The heaters hardly work anymore and the comfort of the building is improved.

The construction phase had been more complex, because the building remained occupied during the works (research activities, teaching, material impossibility of

emptying the building for 1.5 years), which involved a lot of nuisances (cold during the opening of facades, noise, dust).

If you had to do it again?

The project went very well overall, thanks in particular to the good collaboration of all the project stakeholders. If it were to be redone, two points would need to be improved: (1) finding buffer rooms in another building to spare the occupants during the work and (2) carrying out (which the program deadlines did not always allow) an overall renovation / upgrading of the building (partial lighting, refreshing of interior finishes, etc.).

See more details about this project

https://opalis.eu/fr/projets/linstitut-de-botanique-de-lulg
https://dox.uliege.be/index.php/s/tRriniDv3bGsDsF

Photo credit

Samuel Defourny for photos B22 (1), B22 (2) and B22 (3); ULiège for others

Stakeholders

Contractor

Name : ULiège (Patrimoine de l'Université de Liège)
Contact : Pierre WOLPER, Recteur et Anne GIRIN Administrateur, Anne-Françoise MARIQUE - afmarique[a]uliege.be - 32477192484
http://www.uliege.be

Construction Manager

Name : ULiège (Patrimoine de l'Univeristé de Liège) - Administration des Ressources Immobilières
Contact : Anne-Françoise MARIQUE et Michel PREGARDIEN - mpregardien[a]uliege.be - 32478441041
http://www.uliege.be

Stakeholders

Function : Construction company

Les Entreprises Gilles MOURY sa

Gwadamère GERARD GSM: 0491/71.27.67 ggerard[a]moury-construct.be

https://www.moury-construct.be/
General construction company in charge of carrying out the works

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Function : Thermal consultancy agency

TEEN CONSULTING

Vincent KOWALCZYK

https://www.teenconsulting.be/
Energetic audience

Type of market

Realization

Energy

Energy consumption

Primary energy need : 357,00 kWhep/m^2.an

Calculation method : Other

Breakdown for energy consumption : In FINAL energy BEFORE WORK: 804MWh/year in heating and 965MWh/year in electricity (-75%) AFTER WORK: 201MWh/year in heating and 765MWh/year in electricity (-21%, excluding scientific processes)

Real final energy consumption

Final Energy : 107,00 kWhef/m^2.an

Real final energy consumption/m2 : 107,00 kWhef/m^2.an

Year of the real energy consumption : 2 019

Envelope performance

More information :

insulation of the walls with 30cm of mineral wool, replacement of frames and glazing (Ug = 0.6 w/m².K), insulation of the roof (12cm PU) and insulation of the floor slabs.

More information

The audit and the technical studies led to a theoretical potential of -75% of heat consumption and -21% of electricity consumption. The University's energy and environment unit has carried out ad hoc measurement campaigns (before COVID) which confirm the savings. The installation of meters should be done soon to allow precise monitoring of consumption.

Renewables & systems

Systems

Heating system :

- Combined Heat and Power

Hot water system :

- Individual electric boiler

Cooling system :

- No cooling system

Ventilation system :

- Nocturnal Over ventilation
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Biomass boiler

Other information on HVAC :

Heat recovery (glycol water) - night cooling to avoid the use of a cooling unit.

Installation of photovoltaic panels on the roof + heating of the building by cogeneration pellets (centralized boiler room) on the Sart Tilman campus.

Environment

Risks

Risks measures put in place :

not applicable

Urban environment

Building B22 is located on the Sart Tilman campus of ULiège, of which more than 250 hectares are classified as a nature reserve. This campus was developed in the 1960s in order to preserve the forest massif and the natural area from real estate pressure and prevent the development of housing estates of 4 facade houses. A coordinating plan was produced by Claude Strebelle and still serves as guidelines for the development of the campus.

The campus covers nearly 760 hectares, a third of which is classified as a nature reserve.

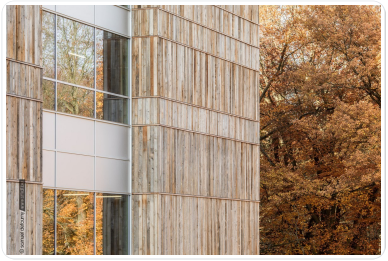
Products

Product

Reused wood (facade cladding)

Product category : Gros œuvre / Structure, maçonnerie, façade

Reused wood cladding - planks from old barns in Eastern Europe.



This type of project, on a large scale moreover, leads to fears as to the durability of the materials, their reception by the users, the ten-year guarantees, the conditions (temporal and financial) of implementation... The company, for lack of knowledge of this subject and familiarity with reuse practices, initially showed a form of reluctance (without however directly opposing the proposal). Here again, it is up to the author of the project to provide the arguments as to the technical feasibility of the file and its aesthetic qualities. A sustained and in-depth study of the entire project upstream obviously puts the company in the best possible position. Most of the questions raised can thus be anticipated. The technical qualities of the managers and their experience are also crucial in the constructive dialogue that ensues.

60/60 floor tiles and metal roof cladding

Matériaux existants sur site

Product category : Second œuvre / Revêtements de sol

Very good acceptance of the solution.

AZOBE decking boards

Product category :

Realization of an outdoor terrace in reused azobe boards (former Dutch docks).

Very good, but substantial work to level the terrace (planks of different thicknesses) by the company.

Costs

Construction and exploitation costs

Renewable energy systems cost : 68 000,00 €

Cost of studies : 56 000 €

Total cost of the building : 5 426 000 €

Subsidies : 30 000 €

Additional information on costs :

The preliminary technical studies (energy audit, stability, re-use study and LCA) were financed by the eeef program for energy renovation. The work was financed by ULiège in its own funds. A financial model (Net Present value) was developed to demonstrate the realism of the proposal and the return on investment times, integrating the evolution of energy costs and the maintenance work avoided thanks to the project. The entire project (studies, authorizations, specifications, site monitoring) was carried out by an internal team from the university's technical services (excluding stability and health and safety coordination).

Circular Economy

Reuse : same function or different function

Batches concerned by reuse :

- Roofing
- Facades
- Landscaping

For each batch : Reused Materials / Products / Equipments :

Implementation of reused wood cladding on the existing concrete facade (insulation with 30cm of mineral wool) > 2,600m² of cladding.

Realization of the terrace in azobé planks from old Dutch port docks, resold in Belgium > 140m².

Recovery, restoration and reuse of 60/60 floor tiles for the project and on another university site > 120m².

Recovery, restoration and reuse of metal roof cladding > 400 m².

Rehabilitation of ventilation infrastructure > 50,000m3 of ductwork.

Major renovation of an existing infrastructure rather than construction on a virgin site.

Field of use and material origin :

Siding - purchase via local supplier, materials from old farms in Eastern Europe.

Azobé - purchase via local supplier, origin = Netherlands (short distances from the construction site).

Floor tiles - materials recovered in situ.

Metal cladding - materials recovered in situ.

Sheathing - are part of the building.

Environmental assessment

Impacts avoided : water, waste, CO2 :

Categories	Avoided CO2 (kg)	Avoided water consumption (m3)	Avoided waste (kg)
Outdoor facilities	5973,738	26,710896	14827,17243
Exterior fittings / Locksmithing - Metalwork	0	0	0
Carpentry	0	0	0
Partitions	0	0	0
Coverage	0	0	0
Roofing / Exterior fittings	0	0	0
Lighting	0	0	0
Safety lights	0	0	0
Climatic engineering equipment	0	0	0
Electrical equipment	0	0	0
Facades	36766,34351	8847,744804	25467,16758
False ceilings	0	0	0
False floors	0	0	0
False ceilings	0	0	0
Structural work	0	0	0
Sanitary installations	0	0	0
Insulation	0	0	0
Exterior carpentry	0	0	0
Interior carpentry	0	0	0
Furniture	0	0	0
Paint	0	0	0
Plumbing	0	0	0
Floor coverings	0	0	0
Floor and wall coverings	0	0	0
Wall coverings	0	0	0
Building security	0	0	0
Locksmithing - metalwork	714,070531	8,850474704	470,6229617
VRD	0	0	0

TOTAL	Avoided CO2 (kg)	Avoided water consumption (m3)	Avoided waste (kg)
	43454,15204	8883,306175	40764,96297

	Km in a small car	**Nb of rectangular bathtubs**	**nb of years of household waste of a French person**
Equivalent	347633	59222	82

Equivalent trip Paris-Nice
395,0

The reuse operation saved the equivalent of 347633 kilometers traveled by a small car, or 395 trips from Paris to Nice, 59222 rectangular bathtubs filled with water and 82 years of household waste of a French person.

Economic assessment

Total cost of reuse : 520 000 €

Cost of reuse in percentage of the operation : 10 %

Social economy

Social economy and professional integration :

The materials were purchased and implemented by a local company.

Our specifications for works contracts impose a limitation of subcontracting to two levels and the signing by companies of a charter against social dumping.

Subcontractors and suppliers are mostly local.

Health and comfort

Indoor Air quality

Ventilation system sized at 900 ppm to guarantee indoor air quality - CO2 probes.

Comfort

Health & comfort :

Healthy, raw, minimally processed materials.

Modes of poses favoring assemblies rather than collages.

Acoustic comfort :

Not applicable other than the redevelopment of a lobby and student/exhibition space where acoustic wall panels have been incorporated into the design.

Carbon

GHG emissions

GHG in use : 39,00 $KgCO_2/m^2/an$

GHG before use : 53,00 $KgCO_2 /m^2$

Building lifetime : 50,00 année(s)

, ie xx in use years : 1.36

consumption in MWh multiplied by a coefficient in kgCO2/MWH according to the energy vector (coefficient of the CWAPE

Life Cycle Analysis

Eco-design material :

- reused wood cladding
- mineral wool
- reuse of original materials

Contest

Reasons for participating in the competition(s)

The energy renovation operation of the Botanical Institute seems to us to be exemplary for its integrated approach to sustainability and circularity at several levels:

- The renovation and reinvestment in the existing built stock, instead of new construction on a virgin site, is part of a strong approach to sustainable development and the reuse of existing infrastructure. The scientific literature has also highlighted the environmental benefit of major renovation compared to demolition/reconstruction operations.
- The project combines high energy and environmental performance with respect for the heritage character of the building, witness to the modernist architecture of the 1960s. of Liege.
- Energy performance (confirmed by measurement campaigns) has been greatly improved: -75% of heating consumption, -21% of electricity consumption (excluding scientific processes).
- Reuse and reuse have been at the heart of the approach since its conception (in particular life cycle analysis) which has made it possible to implement 2,600m² of reused wood cladding but also to restore and reuse, in situ or on other university sites, some original materials. The technical networks

(ventilation) were also partially reused.

- The project is part of the broader framework of an energy renovation program for ULiège's infrastructures. On the strength of this experience, a second wave of energy renovation will begin (as part of the recovery plan of the Wallonia-Brussels Federation).
- The project materialized thanks to the integration, communication, collaboration and mobilization of all the players (architects, client, companies, user representatives).
- The work was carried out in an occupied building.
- Budgets and schedules were perfectly respected thanks to precise and rigorous technical and administrative management.

Building candidate in the category

Bâtiments tertiaires / prix de la rénovation

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