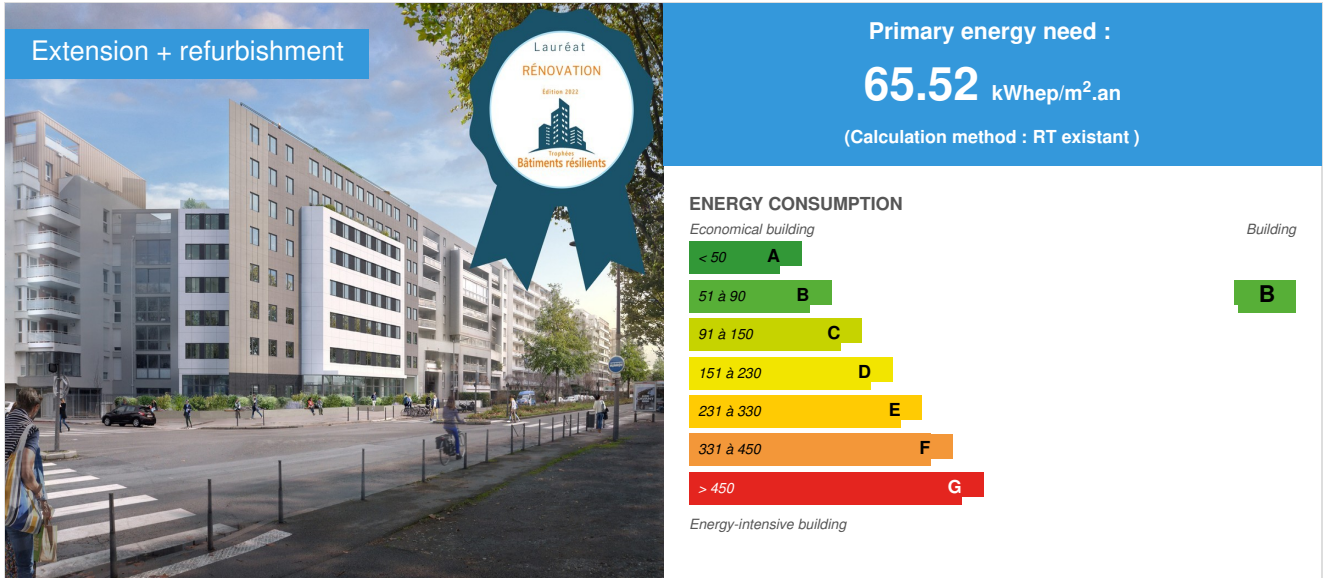


# Vela Verde building

by Marc Campesi / 2022-05-04 12:00:00 / France / 3366 / FR



**Building Type :** School, college, university  
**Construction Year :** 1987  
**Delivery year :** 2022  
**Address 1 - street :** 29 avenue Général Leclerc 69007 LYON, France  
**Climate zone :** [Cfb] Marine Mild Winter, warm summer, no dry season.

**Net Floor Area :** 3 100 m<sup>2</sup>  
**Construction/refurbishment cost :** 4 500 000 €  
**Cost/m2 :** 1451.61 €/m<sup>2</sup>

**Certifications :**



## General information

Transformation of an office building into a 3rd category ERP higher education school with **the aim of achieving excellent level HQE certification** . All available existing surfaces are used to contribute to urban densification and reduce urban sprawl. The project integrates a **biosourced elevation on R+8** associated with the establishment of a plant terrace and a vegetable garden and **an extension in the basement** for the creation of living spaces with a supply of natural light and the creation of patios .

The project is part of a **low-carbon and circular economy** approach (reuse, biosourced, geosourced, recycled or recyclable products) and calls on local players. It is **suitable for summer heat waves in urban areas** (cold production up to 55°C compared to +- 35°/40°C for conventional heat pumps) with extreme temperatures expected in the coming decades. It contributes to the **reduction of heat islands** by adding green surfaces at the foot of the building and on 3 terraces.

The energy process mixes a low tech and high tech design. It incorporates a technological innovation developed in France 20 km from the site: **a greenhouse gas-free heat pump** (negative GWP - Global Warming Potential) installed on the roof which covers 70% of the building's needs, **which operates without electrical resistance** and which **stores heat in winter and cold in summer**. This Pac is coupled with double flow ventilation and **an adiabatic unit (passive**

**cooling**). A self-consumption photovoltaic plant on the roof contributes to smoothing the electrical consumption of the process. It anticipates the tertiary decree and presents a **gain in energy consumption > 60%** compared to 2010. The building is **connected** for overall performance monitoring (energy, water, indoor air quality) with open access to users. Finally, it integrates an educational approach intended for the actors of the building site (**increase in competences**), the future students of the school and the local residents.

## Building users opinion

Le niveau de satisfaction est élevé de part des élèves, du corps enseignants et du personnel administratif. Le directeur témoigne dans la video du projet . Un accompagnement usager est mis en place

## If you had to do it again?

Dans l'ensemble peu de dysfonctionnement à l'exception de la finition des murs en peinture dans les salles de classes et dans les couloirs . Il eut été judicieux de placer des protections murales de pvide de mur. Compte tenu de la politique de sécurité informatique de l'école, l'ouverture de ports informatiques externes pour créer des accès extérieurs aux données environnementales ( énergie , QAI, commande des équipements ) est contraint par une procédure d'autorisation assez longue.

## See more details about this project

<https://www.diagonaleconcept.com/>

<https://podcast.ausha.co/green-solutions-solutions-pour-un-monde-durable/marc-campesi-diagonalconcept>

## Photo credit

Campesi

## Stakeholders

### Contractor

Name : Arioste Promoteur

Contact : Marc Pigeroulet : marc.pigeroulet@arioste.fr

<https://arioste.fr/>

### Construction Manager

Name : Diagonale Concept

Contact : Marc Campesi : dg.jhabitelaterre@gmail.com

<https://www.diagonaleconcept.com/>

### Stakeholders

Function : Construction Manager

Sophie Sturlese et Marc Campesi : Architecture et Eco-ingénierie

m.campesi@rgb.city

<https://www.diagonaleconcept.com/>

Filing of the building permit (modification of facade and change of destination)

### Contracting method

General Contractor

### Type of market

Realization

## Energy

### Energy consumption

Primary energy need : 65,52 kWhep/m<sup>2</sup>.an

Primary energy need for standard building : 99,02 kWhEp/m<sup>2</sup>.an

Calculation method : RT existant

Breakdown for energy consumption : Heating (electric) Cep = 21,1 kWhEp/m<sup>2</sup> (in French) Cooling (electric) Cep = 6.35 kWhEp/m<sup>2</sup> (electricity) Lighting (electric) Cep = 11.69 kWhEp/m<sup>2</sup> (electricity) Auxiliary (electric) Cep = 4.22 kWhEp/m<sup>2</sup> (electricity) Ventilation (electric) = 24.41 kWhEp/m<sup>2</sup>. Photovoltaic (electric) Cep = 2.26 kWhEp/m<sup>2</sup>.

Initial consumption : 187,12 kWhEp/m<sup>2</sup>.an

## Real final energy consumption

Final Energy : 25,40 kWhEp/m<sup>2</sup>.an

## Envelope performance

Envelope U-Value : 0,40 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

Composition of the envelope :

### WALLS

- Basement wall (interior insulation, biofib'Trio) U = 0.241 W/m<sup>2</sup>.°C
- Exterior wall on west and north facades (exterior insulation, rock wool + brick or ceramic cladding) U = 0.229 W/m<sup>2</sup>.°C
- Exterior wall East facade (interior insulation, biofib'Trio) U = 0.241 W/m<sup>2</sup>.°C
- Exterior wall on R+8 elevation (wood frame with Biofib'Trio insulation) U = 0,187 W/m<sup>2</sup>.°C
- Interior wall on unheated room (Biofib'Trio) U = 0,236 W/m<sup>2</sup>.°C

### CEILINGS

- R+8 / R+6 / R+1 terrace ceiling: reused compressed polyurethane insulation
- R+7 terrace ceiling: 30 cm Biofib'Trio insulation

### FLOORS

- floor on outside U = 0,237 W/m<sup>2</sup>.°C
- interior floor on unheated premises U = 0.271 W/m<sup>2</sup>.°C
- floor on ground level U = 0,003 W/m<sup>2</sup>.

The building envelope combines a controlled inertia with a strong external insulation of the facades (14 cm) dressed with a terracotta and ceramic facing which slows down the heat transfer in summer.

Solar factors of the external joineries (without taking into account the solar protections)

- vertical windows Sw = 0,35
- horizontal windows Sw = 0.15

The external solar protections on the exposed facades (West) are optimized to let the sun through in winter and to limit the solar gains in summer.

Indicator : I4

Air Tightness Value : 0,98

## Renewables & systems

### Systems

Heating system :

- Heat pump

Hot water system :

- Other hot water system

Cooling system :

- Reversible heat pump
- Others

Ventilation system :

- Nocturnal Over ventilation
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Other, specify
- Heat pump

Renewable energy production : 3,00 %

[☞ centrale photovoltaïque en auto consommation](#)

Other information on HVAC :

Greenhouse gas free (GWP <1)

- a self-consumption photovoltaic plant that will smooth out the consumption of the heat pump
- an energy storage module (hot and cold) of 14 kWh integrated in the heat pump which is recharged thanks to the self-consumption PV plant

Solutions enhancing nature free gains :

- module adiabatique permettant de rafraîchir de manière passive l'air extrait de la CTA double flux qui refroidit l'air entrant
- fenêtres en oscillant battant (sauf sur la façade pompier)
- surventilation nocturne (bâtiment à forte inertie)

## Smart Building

BMS :

The shutters are controlled by facade and level blocks in order to take into account the differentiated solar gains between the West and the East and the lower / upper floors of the building. Usage scenarios can also be set.

Air quality sensors are distributed in the building.

The air handling units have internal alarm systems that inform in case of defect or need of maintenance (filter change for example).

Some doors have access controls that inform the operator when they are not closed.

Access to this data will be online for public access users with a custom designed ergonomic interface.

[☞ Connection distance pour le paramétrage des PAC et CTA](#)

Smartgrid :

The online data of the PV plant is accessible on a digital platform with an ergonomic interface.

## Environment

### Risks

Hazards to which the building is exposed :

- o Flooding/Slow flood
- o Earthquake
- o Urban heat island

### Urban environment

Land plot area : 782,00 m<sup>2</sup>

Built-up area : 100,00 %

Green space : 239,00

### Near and far environment

The rehabilitated building is located **in the heart of downtown Lyon**, on the banks of the Rhône, **opposite the Confluence district**, at the crossroads of avenue Leclerc and rue des Girondins in Lyon 7th:

- o Vela Verde is the end of a linear built sequence of R+7 housing attached to the South gable ;
- o to the north, on the other side of the rue des Girondins, are the buildings of the military base of the Frère General Headquarters ;
- o to the west is Avenue Leclerc and the Berges du Rhône ;
- o to the east, a housing program has recently been built partly attached to the gable of the building.

This building is ideally located within a **mixed district in full mutation** .

Connected to the city, it is also connected to nature. Located along the quays of the Rhône, it benefits from **proximity to the requalified banks, the distant landscape and privileged views of the hills of Lyon** .

Access is easy thanks to the **proximity of bus stops, Velov' stations and the B Jean Jaurès metro stop**, which is only a few streets away. It is **smoothly connected to the hypercentre and transport hubs** .

## A complementary program to existing installations

Vela Verde is a project **integrated into its neighborhood**. It is part of the continuity of the logic of development of the 7th district, echoing the future campus of the green EM Lyon.

In addition, it is close to existing student residences and sports fields that will benefit future students on campus. **The establishment of the school will create a socio-economic dynamic beneficial to food, health and catering businesses** in the surrounding area.

The existing building is being transformed to meet a new use. This building formerly housing the offices of MACIF will soon house a higher education school. This is a **transfer from a school already established in the 7th arrondissement**.

In the basement of the building, the parking lots have been converted mainly into 2-wheel parking in order to **promote the possible soft movements thanks to the development of the traffic lanes on the upper and lower quays of the Rhône.**

The green spaces are increased in order to integrate into the green fabric of the district and enrich it.

**Vela Verde wants to generate a long-lasting positive local impact**, both environmental, social and economic, as well as being a source of inspiration on the scale of the 7th and the city.

## Products

### Product

Greenhouse gas-free heat pump with cold and hot energy storage

Veotherm

<https://www.veotherm.com/>

Product category : HVAC, électricité / ventilation, cooling

The VEOTHERM heat pump is an innovative solution that meets the current challenges imposed by climate change: ensuring the thermal comfort of building users while limiting the impact of heating and air conditioning equipment on the environment.

This heat pump operates over a temperature range of  $-35^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  and thus enables the building to be cooled whatever the outside conditions, including during heat waves. In addition, it has an excellent energy efficiency as shown by its A++ energy rating.

It allows the storage of thermal energy (heat and cold) thanks to the presence of phase change materials. This energy is free and produced mainly by the photovoltaic plant when it is not required.

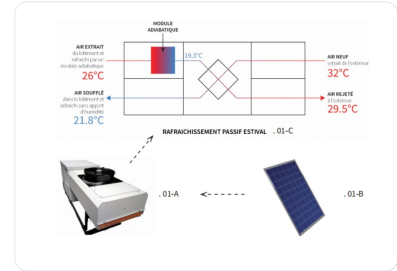
This heat pump does not emit CO<sub>2</sub> or other pollutants and its refrigerant has a GWP (Global Warming Potential)  $< 1$ .

It does not require electrical resistance in winter.

It generates little noise pollution: its sound level is around 42 dbA at full power.

The VEOTHERM heat pump can also be coupled to a direct current photovoltaic power supply.

It is locally manufactured: less than 20 km from the project, with a very high reparability index that limits dependence on imports.



Adiabatic

Souchier Boullet

01 60 37 79 50 / 01 60 37 79 89

<http://www.souchier-boullet.com>

Product category : HVAC, électricité / ventilation, cooling

The cooling of the interior of buildings is a major issue because it is associated with an increase in the use of air conditioning, which causes an increase in energy consumption.

ADIABOX NFG is a passive cooling solution by evaporation. Before using the heat pumps to cool the building, the adiabatic system will lower the temperature of the air blown by the double flow AHU by 5 to 6 without energy.

When hot air comes into contact with water (present in the wet exchanger of the equipment), it causes evaporation. The energy required to evaporate the water is extracted from the air, which then cools down. The efficiency of such a system increases with temperature (since an increase in temperature is accompanied by a decrease in relative humidity).

This cooling system makes the electrical consumption of the equipment negligible compared to a mechanical system equipped with a cold water coil. Its water consumption is also reduced. Rainwater could be recovered in a future approach. Its operation does not require any refrigerant gas and therefore does not generate any pollutants.

The design of the equipment is very simple and thus greatly reduces the risk of breakdown. Only a circulation pump, a water inlet solenoid valve and a drain valve are necessary for its operation. It has no compressor or high pressure refrigeration circuit.

The health of the users is also favored by a healthy blown air without micro-droplets and thus without risk of micro gutter.



Double flow air treatment unit (energy recovery)

France Air

<http://www.france-air.com>

Product category : HVAC, électricité / ventilation, cooling

The Powerplay dual flow unit from France Air is a high performance energy recovery system for hygienic and comfort ventilation with preheating and cooling of the supply air. This AHU is coupled with adiabatic on the extracted air to ensure the cooling of the building, as well as on the heat pump to ensure the heating of the building.

The health of the users is preserved thanks to the optimal quality of the blown air ensured by the pre-filtration and filtration of the fine particles ISO ePM1 80%.



Its impact on the environment is further reduced by its very low consumption motor and its Eurovent certified rotary exchanger (efficiency up to 90%).

Biofib Trio thermo-acoustic insulation (hemp, cotton and linen)

Biofib'

02 51 30 98 38 / isolation[at]biofib.com

<http://www.biofib.com>

Product category : Finishing work / Partitions, insulation

Biofib'Trio insulation is a thermal and acoustic insulation solution that respects the environment. Its very good thermal phase shift provides excellent comfort in both summer and winter. The hemp of the panels brings a natural regulation of hygrometry to the building.

Combining hemp, cotton and linen, this material is of natural and renewable origin and thus contributes to the preservation of the biosphere. It is certified as a Biosourced Product. The hemp and flax are of French origin and the cotton is recycled.

Biofib'Trio insulation is a healthy, VOC-free, non-allergenic and non-irritating product that contributes to the preservation of users' health, as evidenced by its A+ health label.



plates coals

MAPEI

<http://www.mapei.fr>

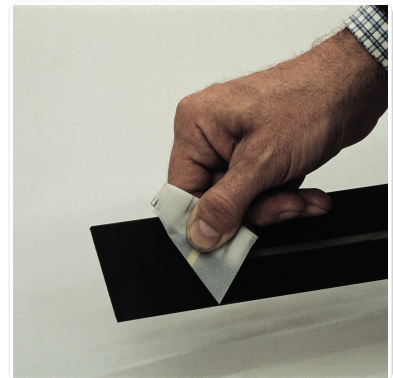
Product category : Structural work / Structure - Masonry - Facade

Mapei's epoxy resin impregnated carbon fiber pultruded sheets are a solution for repairing and reinforcing reinforced concrete elements damaged by physical-mechanical actions. It is an alternative to traditional structural reinforcements based on steel plates which are less environmentally friendly. These carbon plates also have the A+ health label.

LINA

<https://lina.fr/>

Product category : Finishing work / Partitions, insulation



## Costs

### Construction and exploitation costs

Renewable energy systems cost : 366 000,00 €

Cost of studies : 440 000 €

Total cost of the building : 4 563 000 €

### Energy bill

Forecasted energy bill/year : 36 000,00 €

Real energy cost/m2 : 11.61

Real energy cost/Pupil : 51.5

## Circular Economy

### Reuse : same function or different function

Batches concerned by reuse :

- Structural works
- Isulation

For each batch : Reused Materials / Products / Equipments :

GROSS WORK :

Gravel - 4 tons

INSULATION

Polyurethane foam - 50 sqm

## LIGHTING

Re-used lighting fixtures (under order)

### Field of use and material origin :

The gravel on the roof of the old building has been preserved. They protect the waterproofing and contribute to the aesthetics of the roof terrace (reuse in situ)

The polyurethane foam, insulator of the old roof, has been kept in part to insulate the terraces and raise the level of the terrace at R+1. (reuse in situ)

Luminaire made from old window frames reconditioned in France by a professional integration establishment.

## Economic assessment

Total cost of reuse : 4 000 €

Saving realised thanks to the implementation of reused materials compared to new materials : 1 000 €

### Purchasing process for reused materials :

- Purchase by the company from a reuse platform

## Health and comfort

### Water management

Consumption from water network : 1 608,00 m<sup>3</sup>

Water Consumption/m<sup>2</sup> : 0.52

Water Consumption/Pupil : 2.3

HQE reference method for calculating annual water consumption from the network.

Water quality analysis by a laboratory

### Indoor Air quality

9 sensors and online access for users

- fine particles, CO<sup>2</sup>, hygrometry, temperature, noise ;
- 3 CTA equipped with filters ;
- a preventive approach on low-emission materials (A+ label, EC1+ label, Excel, Floor Score) ;
- post-operational monitoring with critical threshold alerts.

## Comfort

### Health & comfort :

To guarantee the health and comfort of the inhabitants, here are the strategies put in place:

- A fitness trail staircase ;
- The creation of a "ZEN" break room without electromagnetic field and soft light ;
- The creation of an educational vegetable garden with an introduction to permaculture on R+8 ;
- The creation of green spaces planted at the foot of the building with pedestrian seats and 3 accessible vegetated terraces ;
- The creation of 125 bike and scooter spaces in the building ;
- The choice of heat pump on the roof with low noise emission to reduce noise on the roof.

### Acoustic comfort :

In order to guarantee the comfort of use of the premises in occupation the objective is to contain the reverberation time to a value below 0.8 seconds. These values are, in the case of the regulation for speech frequencies, i.e. covering the octave bands from 500 to 2000 Hz.

To achieve these objectives, false ceilings with high acoustic performance have been installed.

The entrance hall is a place of passage particularly prone to the effects of noise. This is why it has benefited from an additional acoustic treatment provided by a treatment of wood panels and biosourced acoustic insulation on the ceiling and walls. A planted wall also contributes to the acoustic comfort of the entrance hall.

**Daylight factor :** Dans chaque pièce du bâtiment il y a un très bon apport naturel et celui-ci permet d'être caractérisé comme « non éblouissant » car les FLJmoy sont supérieurs à 1,2 dans les bureaux et les salles de classes, mais ne sont pas trop importants car les FLJm

## Carbon

### GHG emissions

GHG in use : 3,07 KgCO<sub>2</sub>/m<sup>2</sup>/an

Methodology used :

Perimeter covered: all the building's energy consumption items (RT items, non-RT real estate, and furniture)

Standard: HQE

Calculation method: The CO<sub>2</sub> emission factors for the energy consumed are those taken from Appendix 3 of the "Energy-Carbon" standard for new buildings, expressed in kilograms of CO<sub>2</sub> equivalent per kilowatt-hour of final energy.

Building lifetime : 50,00 année(s)

## Contest

### Reasons for participating in the competition(s)

#### Candidature aux Green Solutions Awards 2022-2023

Le projet Vela Verde concourt aux Greens Solutions Awards pour **mettre en valeur des solutions efficaces et reproductibles visant à massifier des opérations de réhabilitation bas carbone et zéro énergie fossile**. Le chantier a été livré en septembre 2022, pour la rentrée des étudiants du campus ECEMA Lyon, Campus de Paris. La **collaboration et la bonne communication des parties prenantes du projet** en amont et tout le long du chantier ont permis de réaliser cette opération réhabilitation lourde **en moins de 12 mois dans un contexte sanitaire difficile**.

Le projet allie un **haut niveau de performance énergétique et environnementale** avec un recours généralisé aux produits biosourcés et une approche **confort usager, qualité de l'air intérieur et bien-être au travail**. Il **associe low tech** avec son enveloppe performante et ses systèmes passifs **et les dernières technologies en termes de production de froid et chaleur** et de production et de **stockage d'énergie**. **L'ensemble est monitoré** pour le **suivi en continu** de la performance énergétique, des consommations d'eau et de la qualité de l'air intérieur.

Le bâtiment est **conforme au décret tertiaire objectifs 2050**. Il **propose une innovation remarquable** développée en France près de LYON. Il s'agit d'une **nouvelle génération de Pompe à Chaleur PAC sans gaz à effet de serre**, **pouvant stocker de l'énergie (chaud et froid)** et fonctionnant dans des **conditions extrêmes de température de -35°C à +55°C**. En ce sens, l'éco-rénovation Vela Verde répond aux ambitions du concours en termes de développement durable et de lutte contre le changement climatique pour le secteur de la construction et de la ville durable.

Les îlots de chaleur urbains sont une préoccupation croissante dans les cœurs de ville et peu de solutions sont proposées dans les bâtiments existants. Le bâtiment est en mesure de satisfaire au confort des usagers en période de canicule et de préserver l'activité dans le bâtiment. Le stockage de froid permettra de limiter le fonctionnement des PAC qui ne font qu'aggraver la surchauffe urbaine. Enfin **l'augmentation notable de la surface végétalisée** au détriment des surfaces minérales participe au rafraîchissement urbain. La réhabilitation est un enjeu majeur, notre approche est viable et reproductible.

### Building candidate in the category



Prix du public

