

# ECOCAMPUS Provence : New and Renewable Energies Training and Learning Center

by Elisabeth LETEISSIER / 2020-07-10 16:13:05 / France / 13011 / FR



New Construction

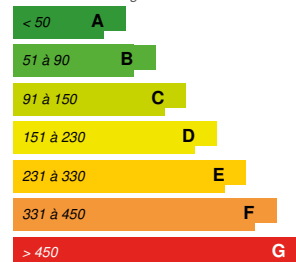
Primary energy need :

**38** kWhep/m<sup>2</sup>.an

(Calculation method : RT 2012 )

## ENERGY CONSUMPTION

Economical building



Building

**A**

Energy-intensive building

**Building Type** : School, college, university

**Construction Year** : 2016

**Delivery year** : 2018

**Address 1 - street** : 445, rue Gabriel Besson 04 SAINTE TULLE - MANOSQUE, France

**Climate zone** : [Csa] Interior Mediterranean - Mild with dry, hot summer.

**Net Floor Area** : 4 099 m<sup>2</sup> SHON RT

**Construction/refurbishment cost** : 7 460 000 €

**Cost/m<sup>2</sup>** : 1819.96 €/m<sup>2</sup>

Certifications :



## General information

This building was awarded the Sustainable Construction Grand Prize of the Green Solutions Awards 2020-21 at the national level; and a mention for the same category at the international level.

The Ecocampus Provence, New and Renewable Energies Training and Learning Center, is part of a **global urban development operation** in the town of Sainte Tulle (04) including the establishment of economic activities, the construction of housing and the development on the **site of the former "Ecole des Métiers" of EDF** of tertiary activities and training dedicated to new and renewable energy professions. The establishment will accommodate 350 to 400 learners. The level V to VII training offer is supported by CCIT 04 and will subsequently be extended by level V to I training courses offered by other partners.

The Ecocampus Provence is designed as an **emblematic building**, a driving force that will bring a new dynamic to the campus site and more generally

contribute to the development of the "Vallée des Energies Nouvelles": Manosque / La Durance / Cadarache.

**Exemplary in terms of sustainable construction**, the CFA Energies Nouvelles et Renouvelables is the architectural expression of scientific research carried out in the environmental field and promising for the future. The building is **structured around an interior street and two covered patios**, buffer spaces, giving access to the different entities, designed as places of relaxation, exchanges (forum of trades, exhibitions, meetings of partners) and experiments. for learners. These **inter-climatic distribution spaces** are the establishment's reference points, user-friendly, educational, representative of the project's inclusion in a sustainable concern.

Our desire for **the building to participate in the pedagogy provided by the CFA** guided the design choices allowing learners to **test full-scale devices relating to new energies** and taking into account the comfort induced for all:

- **Strong bioclimatic design** of the interior street and patios.
- Focus on **solar energy** (solar heated floors) and **photovoltaic production** in the glass roof.
- Use of **natural ventilation** (Provencal well), **vegetation** on the roofs and in the patios under photovoltaic glass roofs, **possible misting** of the patios for **summer thermal comfort**.
- **Connection to raw water** for watering green spaces and green roofs .
- Installation of the **wood-** fired boiler on the technical teaching platform.
- Location and accessibility for all of the **technical and green terraces** .



## Building users opinion

Overall through the BDM OR monitoring over 3 years (still in progress) of this project, user feedback is rather favorable except for the level of administration at R + 1 or during the heatwave period of the last summer (2019), the occupants complained about the constant high temperature: it was proposed the installation of air fans and night ventilation (which had not been put in place due to intrusion of insects and other animals that set off the alarms). In progress.

It should be noted that the innovative project approach initiated by the Client (DLVA) was ambitious. However, this type of construction requires the implementation of rigorous management with monitoring (partly provided by the BDM mission) and the setting up of maintenance companies throughout the process. Building maintenance and upgrading interventions have been recommended but have not always been implemented.

## If you had to do it again?

The structural problem of timber construction in a very strong seismic zone (localization on the fault) requires special attention from all the actors throughout the operation, forcing them even more than usual to work in consultation: architects, design offices and companies in the design phase as well as during the execution. Incorporating the earthquake-resistant provisions has repercussions on many structural works but also on the envelope and therefore concerns many building trades. Everyone's attention and collaboration is therefore essential to enable the construction of a building that guarantees the safety of its occupants during a major seismic event. We are satisfied with the result and the synergy of all the teams, but the operation required a significant investment from all stakeholders in order to achieve this achievement under the best conditions, taking into account the ambitious environmental objectives that had been set. posed from the outset and which constituted an additional constraint. In addition, concerning the finishing of the building envelope, the Project Owner (DLVA) absolutely did not want exterior wood cladding (neither pre-gray wood or autoclaved): we therefore opted for opal polycarbonate which gives the interior wood structure a transparent view. But the installation of such a material remains very demanding and delicate.

## See more details about this project

<https://www.leteissier-corriol.fr/projet/cfa-energies-nouvelles-pour-lecocampus-de-sainte-tulle-04/>

[http://www.leteissier-corriol.fr/wp-content/uploads/2015/01/architecte-marseille\\_leteissier-corriol\\_version-definitive\\_forum-bois-nancy\\_cfa-sainte-tulle\\_leteissiercorriol.pdf](http://www.leteissier-corriol.fr/wp-content/uploads/2015/01/architecte-marseille_leteissier-corriol_version-definitive_forum-bois-nancy_cfa-sainte-tulle_leteissiercorriol.pdf)

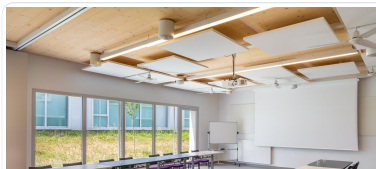
<https://www.leteissier-corriol.fr/ecocampus-prix-de-la-construction-bois-2020/>

<https://www.leteissier-corriol.fr/ecocampus-provence-sainte-tulle-amc/>

<https://www.leteissier-corriol.fr/avancement-chantier-de-lecocampus-de-sainte-tulle/>

## Photo credit

Lisa RICCIOTTI and Florent JOLIOT



## Stakeholders

## Contractor

**Name** : DLVA (Durance Lubéron Verdon Agglomération) Manosque (04)

**Contact** : Stéphane SALVADOR (04 92 70 34 00)

<https://www.dlva.fr/>

## Construction Manager

**Name** : R+4 Architectes Forcalquier (04)

Contact : Bernard BROT (04 92 75 70 70)

<https://www.rplus4.com/>

## Stakeholders

Function : Construction Manager

LETEISSIER CORRIOL Architecture & Urbanisme associé Marseille (13)

Elisabeth LETEISSIER (04 91 48 04 00)

<https://www.leteissier-corriol.fr/>

Function : Thermal consultancy agency

ADRET Embrun (05)

Chantal LAROUTURRE (06 78 12 27 74)

<http://www.adret.net/>

Fluids / SSI / Environmental Quality / BDM process monitoring

Function : Structures calculist

GAUJARDTECHNOLOGIE SCOP Avignon (84)

Mariette GOUGER (04 90 86 16 96)

<http://bet-gaujard.com/wp/>

Timber structure in strong seismic zone (fault)

Function : Company

ARBONIS Verosvres (71)

Christophe EGLIN (06 71 27 69 17)

<http://www.arbonis.com/>

Wooden structure and exterior polycarbonate cladding

Function : Certification company

Bâtiments Durables Méditerranéens (BDM) Marseille (13)

Frédéric CORSET (04 95 04 30 44)

<https://www.envirobatbdm.eu/index.php/jevaleur-mon-projet>

BDM GOLD level approach

Function : Site manager

ECOCAMPUS PROVENCE - 445, rue Gabriel Besson Sainte Tulle (04)

Thierry BENVENUTI - Responsable du pôle formation - CCIT Alpes de Haute Provence - (04 92 70 75 23)

<https://www.ecocampusprovenceformation.fr/>

Person who was responsible for monitoring and setting up maintenance - User contact within the framework of BDM monitoring.

## Type of market

Global performance contract

## Energy

### Energy consumption

Primary energy need : 38,00 kWh<sub>ep</sub>/m<sup>2</sup>.an

Primary energy need for standard building : 52,00 kWh<sub>ep</sub>/m<sup>2</sup>.an

Calculation method : RT 2012

Breakdown for energy consumption : 127,000 kWh<sub>ep</sub> heating / 16,100 kWh<sub>ep</sub> ventilation / 14,600 kWh<sub>ep</sub> lighting / 6300 kWh<sub>ep</sub> DHW / 3500 kWh<sub>ep</sub> server air conditioning and 500 kWh<sub>ep</sub> auxiliary.

### Real final energy consumption

Final Energy : 40,00 kWh<sub>ep</sub>/m<sup>2</sup>.an

## Envelope performance

Envelope U-Value : 0,36 W.m<sup>-2</sup>.K<sup>-1</sup>

### More information :

See environmental notice below (pages 18 to 22): wall insulation of 250 to 300 mm of wood wool + mineral wool / roof insulation of 400 to 440 mm of wood wool + mineral wool / insulation under slab slabs PSE Up = 0.15 / aluminum window Uw = 1.4 and polycarbonate Ug <0.78.

Building Compactness Coefficient : 0,33

Indicator : I4

Air Tightness Value : 1,00

Users' control system opinion : The manager of the ECOCAMPUS site (Thierry BENVENUTI) is very satisfied with the GTB.

<https://www.construction21.org/france/data/sources/users/5415/6179evastdconfort.docx>

## More information

The Ecocampus building is still undergoing a BDM operational phase evaluation (duration over 3 years). In fact, there are 3 phases in the BDM process: the project has been assessed BDM OR in the design and construction phases. We have been evaluating all consumption for almost 3 years to draw the balance sheets by the end of 2020.

## Renewables & systems

### Systems

#### Heating system :

- Water radiator
- Low temperature floor heating
- Radiant ceiling
- Wood boiler
- Solar thermal

#### Hot water system :

- Individual electric boiler

#### Cooling system :

- No cooling system

#### Ventilation system :

- Nocturnal Over ventilation
- Free-cooling
- compensated Air Handling Unit
- Double flow heat exchanger

#### Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Biomass boiler

Renewable energy production : 100,00 %

#### Other information on HVAC :

The actual consumption of the heating project is 30 KWh / m<sup>2</sup> (SHON RT) per year.

A DIALUX study was carried out (attached in PDF) for the installation of solar masts for outdoor circulation: these masts have been installed and the ECOCAMPUS therefore operates with 100% autonomous solar outdoor lighting, which is not not so common for public equipment.

#### Solutions enhancing nature free gains :

Orientation Sud/ circulation rue intérieure + patios couverts.

## Smart Building

### BMS :

Building management system with 35 meters: electricity, calories and water / temperature and humidity probes in 7 rooms brought back to the building management unit. Hourly management of solar protections with central locking / management of natural ventilation of the patios in summer or winter mode.

## Environment

## Urban environment

Land plot area : 13 797,00 m<sup>2</sup>

Built-up area : 27,00 %

Green space : 3 707,00

See "Description" and "Environmental note" tab.

See also the presentation of the project at the Nancy wood forum.

## Products

### Product

LVL (lamibois) of beech (interior street poles).

BAUMUCHE de POLLMEIR

Nous sommes allés visiter l'usine en Allemagne et réceptionner in situ les poteaux pour en garantir la finition.

<https://www.pollmeier.com/fr/Produits/a-propos-du-BauBuche>

Product category :

Beech (lamibois) LVL is a glued laminate, that is to say it is very dense, offers great resistance in an interesting visual finesse. Another advantage, and not the least: there is no loss of wood in this process.

The use of beech LVL made it possible to resolve structural problems inherent to the site while retaining a certain finesse for these supporting posts of the interior street.



### BIOFIB'TRIO ISOLATION

Biofib'trio, isolant bio-sourcé à base de chanvre de la marque Biofib'isolation

<https://www.biofib.com/biofib-trio/>

Product category : Second œuvre / Cloisons, isolation

Biofib'isolation is a leading brand in the bio-sourced hemp-based insulation market. Its products are made from renewable plant fibers which are increasingly appealing to artisans and consumers. The range, which consists of bulk, rigid or semi-rigid products, is capable of responding to all construction applications. Biofib'isolation insulation is made from renewable plant fibers from local agriculture. All the products in the range provide undisputed thermal performance, which naturally leads to energy savings.

In addition to their recognized and certified performance (ACERMI), the insulators guarantee genuine installation comfort for all building professionals.

Their 100% natural fibers are recyclable, perfectly healthy and non-irritating.

The absence of dust at the installation level facilitates installation and does not require any special precautions.

Today this insulating product is available in all stores in France.

This thermo-acoustic insulation is made of hemp, linen and cotton. ACERMI certified and under technical advice, it is highly appreciated for its breathing and regulating powers, which provide the home with a healthy, stable and comfortable atmosphere

The CFA Energies Nouvelles was designed as an emblem in which the materials selected express a strong relationship with nature. All of the products used were installed with a concern for the durability, longevity and scalability of the building.

On the insulation side, the use of hemp was prescribed by the architects and the owner to be the basis of the insulation. Hemp is a plant resulting from a sustainable and annually renewable culture, which offers technical and structural advantages that are increasingly appreciated: good regulation of hygrometry, phase shift and optimum thermal resistance. To date, Biofib's insulation is the only brand to offer insulating products made from hemp, ACERMI certified and under technical advice. A guarantee of quality and performance which made the difference on this project.



### Autonomous solar street lights from LUMIN'IN

LUMIN'IN FRANCE

<http://www.lumi-in.fr/>

Product category : Aménagement extérieurs / VRD, assainissement

It is rare in the context of the construction of public equipment to be able to install autonomous solar lights in full outdoor lighting, notably reducing energy consumption for users.

As already integrated ("Energy" tab), the DIALUX study made it possible to convince users and the Client of the validity of this proposal for autonomous exterior night lighting.



## Costs

## Construction and exploitation costs

Global cost : 13 000 000,00 €

Reference global cost : 14 000 000,00 €

Renewable energy systems cost : 562 500,00 €

Global cost/Pupil : 32500

Reference global cost/Pupil : 14000000

Cost of studies : 952 760 €

Total cost of the building : 9 968 000 €

Subsidies : 5 295 000 €

Additional information on costs :

See the 3rd PDF document in "Description": overall cost analysis of the project.

## Energy bill

Forecasted energy bill/year : 17 000,00 €

Real energy cost/m<sup>2</sup> : 4.15

Real energy cost/Pupil : 42.5

## Health and comfort

### Water management

Consumption from water network : 863,00 m<sup>3</sup>

Water Consumption/m<sup>2</sup> : 0.21

Water Consumption/Pupil : 2.16

Installation of raw water for watering outdoor spaces and green roofs.

### Indoor Air quality

Double flux ventilation.

Use of low VOC emissive products during the construction site.

### Comfort

Health & comfort :

Work has been carried out on thermal comfort and particularly summer comfort through the realization of an STD which was a design tool. The main principles are:

- Efficient sun protection for each orientation (see plan P41 of the environmental guide)
- An average inertia provided by the slab.
- Natural or mechanical night ventilation depending on weather conditions
- Strong greening of the surroundings
- A green and ventilated roof
- Crossing classrooms and practical work
- A covered patio promoting natural ventilation in the classrooms by creating a fireplace effect
- Vegetation and fresh air supply from the VS with outdoor air intake in shaded area for the patios.

Another comfort has been worked on is visual comfort and in particular on the natural lighting of the classrooms. To benefit from natural light, the project opted for the construction of two covered patios, to consider the hall and the main circulation as an interior street between built and unbuilt parts. These devices allow natural light to be brought into the circulation areas. All circulations benefit from natural lighting: the main street, the vertical circulations of the administration building in R + 1. For the ITER hall, the installation of a translucent polycarbonate is planned in addition to the glazing so that this space is widely lit in a natural way while avoiding the risk of dazzling. For practical work rooms and noisy activity rooms, light tubes are provided to bring light to the back of the room. A visual comfort simulation on DIAL + was carried out in the classrooms. This work made it possible to integrate factors of reflection in the choice of interior materials. see environmental notice page 43

Air quality was also a focus of work through the ventilation systems put in place and the choice of interior linings. See enclosed environmental notice page 23 and page 31 to 33.

The coatings put in place are

- Floor: concrete or linoleum
- Walls: A + paints and VOC <1g / l or chipboard classified E1.
- Ceilings: chipboard E1, or wood + mineral wool A + EUCEB.

It was indicated in the CCTP painting that the vitrifier on the interior wooden staircase will be European Ecolabel or Nature + or equivalent with a VOC rate <1 g /

I.

For paints or wood stains, same requirement with a VOC rate <5 g / l. For paints on rigid plastic, NF ENVIRONNEMENT or ECOLABEL with a VOC rate <30 g / l is requested.

These elements were targeted during the construction phase and implemented.

**Calculated thermal comfort :** STD : ne dépasse pas 28°C sur plus de 50h dans l'année dans la partie enseignement et 90h dans la partie bureau voir "Note environnementale" pages 33, 41 et 42.

**Measured thermal comfort :** Durant le suivi, les deux premières années ont été très chaudes. La STD a été refaite sous les fichiers météo de cette première année chaude. Il a été proposé des améliorations comme brasseurs d'air dans les bureaux administratifs du R+.

**Acoustic comfort :** See attached acoustic note: "NOTICE ACOUSTIQUE\_ECOCAMPUS" previously attached (ENERGY tab).

**Daylight factor :** FLJ moyen >2 dans la majorité des locaux ; voir "Note environnementale" pages 43 à 45.

## Carbon

### Life Cycle Analysis

**Eco-design material :**

Bio-based insulation, wood frame and structure,

The calculation of bio-sourced materials was also carried out in accordance with the decree of December 19, 2012 relating to the content and conditions for awarding the "bio-sourced building" label. The level obtained is the most efficient: level 3 with 54 kg / m2 of floor area. Level 3 for a teaching / office type building is obtained as soon as 36 kg / m2 of floor area are exceeded. The floor area of the project is 3,927 m2.

## Contest

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

The design and implementation of the BIOTOPE project were carried out following a strategy of resilience in the face of climate change, mitigation and adaptation.

& nbsp;

& nbsp;

**Mitigation contributing to the fight against climate change by limiting its carbon emissions:**

& nbsp;

BIOTOPE is a high energy efficiency building limiting its consumption thanks to a bioclimatic design (orientation, double skin facade with a buffer role, sun shade). This virtuous concept is coupled with high-performance energy systems based on renewable energies (groundwater geothermal energy, geocooling, connection to the heating network with an energy mix soon at 50% RE). This entire approach has been enhanced by the E + C- (E2C1) label, foreshadowing the future 2020 environmental regulations.

& nbsp;

Thanks in particular to its pole structure / beams, BIOTOPE was designed as a modular and adaptable building improving its durability. A change in the use of the building would therefore require less work that generates waste and emits carbon. & Nbsp; & nbsp;

& nbsp;

Biotope also contributes to limiting the impact of waves of heat by creating an island effect of freshness on the scale of the building but also of the district. The incredible biophilic density of the project will help reduce temperature peaks thanks in particular to the 3000 m<sup>2</sup> of green space, its water points on the terraces and its green balconies.

& nbsp; < / div>

& nbsp;

**An adapted building anticipating the future effects of climate change to be more resilient:**

& nbsp;

BIOTOPE ensures the thermal comfort of these occupants. A dynamic thermal simulation was able to demonstrate this from the design phase and was confirmed by tests carried out by a third party when the building was delivered. In order to guarantee this thermal comfort throughout the life cycle of the building, these simulations carried out took into account a meteorological file of climatic anticipation by 2050. The thermal comfort was thus validated thanks to the indices of the targeted environmental certifications. / div>

& nbsp;

The large vegetated areas of the project, in addition to the benefits already mentioned and the improvement of the building's inertia, makes it possible to facilitate the management of rainwater by limiting it the discharged flows (evaporation in particular).

& nbsp;

The structure of the building has also been designed to best respond to climatic hazards (snow, wind), earthquakes and temperatures extremes.

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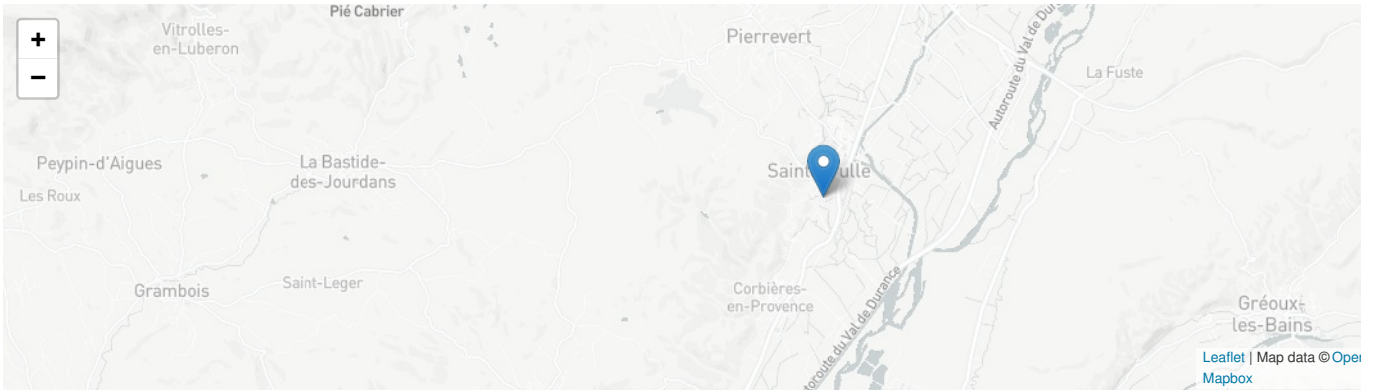
BIOTOPE ensures digital resilience thanks to the redundancy and the quality of its connected services, verified by the WiredScore label. & nbsp;

& nbsp;

### Building candidate in the category







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