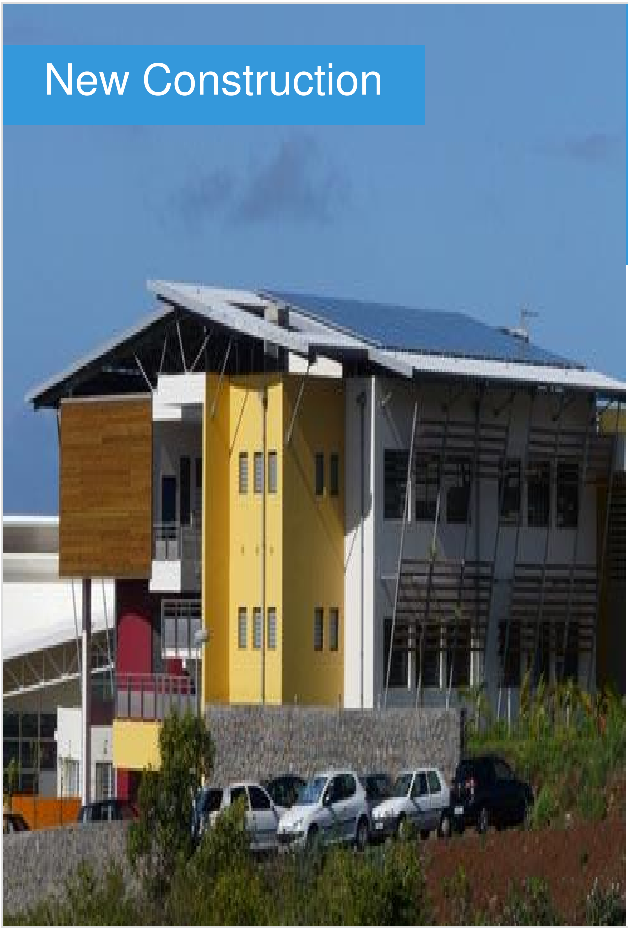
# Enerpos

by Maeva Tholance / 2014-08-27 00:00:00 / France / 9983 / FR



New Construction

**Primary energy need :**

**-142** 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** : 2008
**Delivery year** : 2008
**Address 1 - street** : 40 avenue de Soweto 97455 SAINT PIERRE, France
**Climate zone** : [Csa] Interior Mediterranean - Mild with dry, hot summer.

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**Net Floor Area** : 739 m$^2$ SHON
**Construction/refurbishment cost** : 2 372 000 €
**Cost/m2** : 3209.74 €/m$^2$

## General information

- Positive Energy building
- Building consistent with PERENE (Current label in La Réunion)

The operation “IUT bâtiment ENERPOS” located in the ZAC (urban development zone) OI in Saint Pierre is integrated in a heterogeneous campus accessible from the highway on north.

The first phase of the teaching facilities delivered in 2008 was pursued through an environmental approach in the context of “ENERPOS” (for positive energy building) program.

The contractor was surrounded by experts to test, realize the construction and monitor scientifically the operating results of the building as part of a non certification HQE (high environmental quality).

## Sustainable development approach of the project owner

- Positive Energy building
- Building consistent with PERENE (Current label in La Réunion)

ENERPOS is the only positive energy teaching building in tropical environment referenced by the International Energy Agency (http://www.iea-shc.org/task40). It represents a proof that using current technologies with additional cost of around 9%, allows to realized a building that consumes ten times less than a standard building of the same type and produces six times its own consumption. It has been shown that air conditioning could be avoided even during the hottest days. The design is innovative because the simulation tools have not been used for dimensioning systems, but to model and optimize the building in passive mode. Finally, the greatest innovation was to reintroduce in a modern builgin the basic principles of vernacular tropical architecture which are cross natural ventilation and effective sunscreens. air blowers are one of the key factors of success of this building because they can significantly reduce the cooling period. Another key factor is awareness of the occupants because the challenge is to have a passive building in which users are active rather than a positive building with passive occupants. To achieve this goal, the occupants should be made aware so that they adopt an ecological and economic behavior while maintaining a satisfactory level of comfort.

Comfort
Use of comfort zones of Givoni (on the diagram of humid air). Scenarios prepared under Design Builder.
Comfort (summer and winter) evaluation, quality of use: During the first 3 warm seasons of use, a survey on thermal, airflow and visual comfort was conducted on the students and their

teachers (2000 questionnaires over about 600 people). At the same time, the main parameters of comfort were recorded (air T, globe T, humidity, air velocity, lightness). This survey has given a satisfactory return. The air conditioning has not been used during the first three years of use of the building since air blowers and natural ventilation were sufficient to achieve comfort in classrooms and offices. In computer rooms, air conditioning appears necessary only during the 6 hottest weeks of the year (jan-feb).

User involvement in the operation:
Means of user involvement: Energy consumption display: a regular display of energy consumption, production and savings is set up to inform users and motivate them to continue their efforts. Awareness actions: a charter of eco-user was distributed to teachers who are in charge of pass on the information to students. Information meetings were organized to explain the particular operating mode of the building. Concerning the involvement of users, the main difficulty lies in the fact that the building is used for several formations (IUT and ongoing training). Therefore students are often different and it is difficult to explain each times the operating mode of the building.

## Architectural description

R+2 university building consists of 2 buildings

Bioclimatic aspects: vegetation around the building (endemic plants) - 2 buildings with reduced width to encourage cross natural ventilation (opened on both main facades for classrooms / venetian blind in the office area) - high porosity (30%) - North-South orientation to naturally ventilate thanks to the thermal breezes - natural lighting (autonomy of 90% according to scenarios of use)

Construction method: poured concrete

## See more details about this project

http://www.enertech.fr/bepos/fiche.php?id=22

# Stakeholders

## Stakeholders

Function : Contractor

Université de la Réunion

http://www.univ-reunion.fr/

Function : Contractor representative

ICADE G3A

http://www.icade.fr/

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Function : Others

DDE Réunion

http://www.developpement-durable.gouv.fr/DDE-REUNION.html

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Function : Designer

Thierry Faessel-Bohe

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Function : Structures calculist

Réunion Turra Ingéniérie

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Function : Other consultancy agency

INSET

http://www.inset.fr/

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Function : Assistance to the Contracting Authority

TRIBU

http://www.tribu-concevoirdurable.fr
AMO HQE

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Function : Assistance to the Contracting Authority

IMAGEEN

http://www.imageen.re/
AMO MOE Environment

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Function : Company

LEON GROSSE

http://www.leongrosse.fr/

## Energy

## Energy consumption

Primary energy need : -142,00 kWhep/m$^2$.an

Primary energy need for standard building : 462,00 kWhep/m$^2$.an

Calculation method : Other

CEEB : 0.0003

Breakdown for energy consumption : The construction is not submitted to the RT2005 because of its location in La Réunion island; however, a calculation has been made on Excel sheets developed in-house and indicates
-142 kWhep/m²SHON.year included photovoltaic production
- and 119 kWhep/m²SHON.year without photovoltaic production (all purposes).

Primary energy needs for a standard building were established on the basis of the framework PERENE 2009.
Physical calculation of consumption: (Measurements on 12 months).

The energy consumption post “socket” (which includes office automation, home appliance and desk lamps with LED) represents 44% of total consumption of the building. Then come outside lighting 7%; lift 7%; video projectors + watering + automatic gates 2%. The importance of post “lifts” can be explained by the fact that there was no standby mode for the elevator (the inland lights stayed on); a rewiring has been made and helped reduce consumption by half.

## Real final energy consumption

Real final energy consumption/m2 : 16,00 kWhef/m$^2$.an

## Envelope performance

More information :

External walls: polystyrene external insulation and wood and sheet metal cladding; concrete without insulation (only concrete wall and sunscreen) on north and south main facades
Roof: polystyrene insulation on terrace + roof comprising of integrated photovoltaic panels.
Solar factor = 0.005 (4 times less than the PERENE label)
Glazed walls: aluminum joineries with movable slats (venetian blind) and sunscreen with horizontal wood slats.

## More information

Measured consumption for RT purposes: 44 kWhEP /m²shon/ year
Comment: total consumption for all purpose; measures over 12 months (April 2010 - March

2011). Cost of monitoring: Cost of BMS: 76 k€. This cost includes energy meters by use of T and humidity in all rooms and offices, with a recording every minute + a "totem comfort" that measures key parameters of thermal comfort.
Measuring method: energy meter and power meter by type of purpose, temperature and humidity sensors, motion detectors in all rooms and offices on the BMS of the building.

Measured Production of electricity: 291 kWhEP/m²shon/year
Comment: measures over 12 months

## Renewables & systems

### Systems

Heating system :

- Others

Hot water system :

- No domestic hot water system

Cooling system :

- VRV Syst. (Variable refrigerant Volume)

Ventilation system :

- Natural ventilation

Renewable systems :

- Solar photovoltaic

Other information on HVAC :

Heating: Air blowers in all classrooms and offices (1 for 10 m²)
Ventilation: Cross natural ventilation (30% porosity)
Refreshments: Air Conditioning with VRV system in offices and 2 computer rooms

370m² of photovoltaic panels

### Smart Building

BMS :

Monitoring consumption by BMS

## Environment

## Urban environment

Periurban implantation

# Costs

## Construction and exploitation costs

Total cost of the building : 2 364 800 €

# Carbon

## GHG emissions

GHG in use : 10,80 $KgCO_2/m^2/an$

Emission calculated for the energy consumption of the building in use

## Life Cycle Analysis

Eco-design material : Wood

Date Export : 20230316162803