New ESIROI premises

by antoine perrau / 2022-05-03 00:00:00 / France / 6595 / FR

Primary energy need :

158 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 : 2018
Delivery year : 2020
Address 1 - street : ZAC Océan Indien 97410 SAINT-PIERRE , France
Climate zone : [Aw] Tropical Wet & Dry with dry winter.

Net Floor Area : 3 885 m²
Construction/refurbishment cost : 10 171 145 €
Number of Pupil : 654 Pupil

Cost/m2 : 2618.06 €/m^2

General information

The new building of the ESIROI (Ecole Supérieure d'Ingénieurs Réunion Océan Indien) is now located on the Terre Sainte university campus, in Saint Pierre on Reunion Island. One wing of the building also accommodates an extension of the IUT (University and Technological Institute) located on the same campus.

It offers innovative architectural solutions to cope with the vagaries of a humid tropical climate, while being as environmentally friendly as possible, while ensuring a working environment at the forefront of innovation and comfortable for these new users.

Its aeraulic operation studied and optimized thanks to studies in a physical wind tunnel, the choice of a mixed metal / light wall structure alternative to all-concrete, and the importance of vegetation within the project are examples of solutions that demonstrate our strong desire to reduce its environmental impact.

Like the future engineers who will be trained there, ESIROI demonstrates local know-how in bioclimatic design with low environmental impact.

Sustainable development approach of the project owner

With this new university building, the client's desire was to create a new training tool, which is as close as possible to environmental needs and the local economic area. In recent years, the University has been keen to set an example in the construction of its new buildings, which are always more innovative and respectful of the environment. We can for example cite the Bioclimatic Amhpithéâtre du Moufia, which is the first amphitheater in a tropical environment to operate only with natural ventilation, or the Enerpos building, the first building for university use to be in positive energy in a tropical climate.

Architectural description

1. Bioclimatic architecture with low environmental impact

Concerned about environmental quality and the importance of energy resilience, we have implemented **innovative design** strategies adapted to a **humid tropical climate** where temperatures and humidity levels can be very high, ventilation potential is high and solar irradiation is high all year round.

Some solutions are directly inspired by traditional Creole architecture: Protect from the sun /

ventilate / vegetate.

From the beginning of the project, important thought was given to the **orientation of the building** in order to take advantage of the intensity of the prevailing winds in the hot season, and to minimise it in the cool season. In addition, the work on the orientation makes it possible to create "blind" gables to the east and west, limiting solar gain on the façades. The shape of the building itself, in a "C" shape, optimises the play of pressure/depression, the driving force behind natural ventilation. It should be remembered that sufficient air velocity on the users allows hygrothermal comfort to be achieved even when temperature and humidity levels are high;

Work on **thermal zoning**. Grouping of rooms with the same cooling strategy. The classrooms and offices on the upper floors are naturally ventilated, with the use of fans when necessary. Only the practical rooms equipped with state-of-the-art professional equipment are air-conditioned and located on the lower levels of the building;

Passive solutions for ventilation: large openings manually adjustable by users on opposite sides of the building to create cross-currents of air, vacuum well systems. Installation of high performance air movers for large volumes to improve comfort in external common areas;

Use of **aeraulic engineering** to validate, optimise and dimension the natural ventilation of the premises;

Limitation of thermal overheating thanks to effective solar protection. The external common areas are also protected from the sun by the use of tensioned canvas. This required the roof structure to be sized to withstand possible cyclonic seasons;

Installation of **efficient equipment** to reduce internal thermal loads;

Dense vegetation around and inside the building to take advantage of all the benefits of vegetation such as evapotranspiration, shading, dust absorption etc.

Interior and exterior landscaping combining technical efficiency, environmental and aesthetic aspects (rainwater management, etc.);

Installation of **energy production** by photovoltaic panels, justified by the high solar irradiation all year round on the site;

Choice to use **mixed materials as an alternative to the all-concrete project** in order to reduce greenhouse gas emissions. The upper parts of the building are made of metal structures and light facades. An innovative translucent material was used in the façade to take advantage of natural light;

The possibility for users to access the building by soft modes of transport such as cycling or walking, thanks to the presence on site of changing rooms equipped with showers, individual secure lockers as well as adapted parking spaces for vehicles.

2. User involvement for an effective project

Through technical visits of the site to each class of students and administrative staff, **all users**

are made aware of the environmental aspects of the project.

3. A pleasant place to live

Offering pleasant, green, outdoor common areas that are comfortable and open to the Reunion Island landscape was a prerequisite for ensuring quality of life and teaching in this new building.

This new building therefore offers a working space adapted to the environment, friendly and planted to its users, and is intended to be a new example of local know-how in terms of bioclimatic building design.

Building users opinion

As the building was recently delivered, we have not yet been able to formally identify the opinions of users. However, by discussing with some people it emerges that the building provides a pleasant, friendly working environment, making it possible to convey the know-how necessary for each training course.

If you had to do it again?

We would have improved the exterior fittings in order to make the most of the shaded, vegetated and ventilated exterior spaces that have been designed.

See more details about this project

https://labreunion.fr/projets/esiroi/
https://esiroi.univ-reunion.fr/lecole/documentation/archives-actualites/annee-universitaire-2016-2017/le-nouveau-batiment-de-lesiroi-en-phase-conception-sur-le-campus-de-terre-sainte
Le projet a été étudié sur la base du référentiel PREBAT-REUNION, demarche de qualité,mis en place par l'ADEME Réunion, qui récompense les bâtiments à faible impact environnemental

Photo credit

Herve Douris

Stakeholders

Contractor

Name : Université de La Réunion
Contact : Jimy Ko-Kivok-Yun
https://esiroi.univ-reunion.fr

Construction Manager

Name : LAB Réunion
Contact : Cédric Delahaye, cd@labreunion.fr
https://labreunion.fr

Stakeholders

Function : Assistance to the Contracting Authority

SODIAC

Jean Pierre Wuillermoz

Client assistant

Function : Thermal consultancy agency

LEU Réunion

https://www.leureunion.fr/
Environmental design study office

Function :

LET Réunion

https://www.letreunion.fr/

Function : Other consultancy agency

INSET

Function : Company

GTOI

Function : Company

Castel et Fromaget

Function : Company

Climeo

Function : Company

Jardin Créole

Function : Company

Realis

Function : Company

ENGIE

Function : Company

Riviere Schindler

Function : Company

Athena

Function : Company

Soreplac

Function : Company

Hoareau Plafond

Function : Company

Cazal

Function : Company

SROI

Contracting method

Separate batches

Type of market

Global performance contract

Energy

Energy consumption

Primary energy need : 158,00 kWhep/m^2.an

Primary energy need for standard building : 330,00 kWhep/m^2.an

Calculation method : Other

Breakdown for energy consumption : Interior lighting: 6.9 kWh / m².year Outdoor lighting: 2.8 kWh / m².year DHW: 0.4 kWh / m².year Air circulators: 2.4 kWh / m².an Air conditioning: 17.4 kWh / m².year VMC: 1.8 kWh / m².year Office: 6.6 kWh / m².year Elevators: 0.4 kWh / m².year Other: 9.2 kWh / m².year

Real final energy consumption

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

More information

Standard building ratio: 100 to 120 kWh / m²SU / year

Renewables & systems

Systems

Heating system :

- No heating system

Hot water system :

- Solar Thermal

Cooling system :

- Water chiller
- Fan coil

Ventilation system :

- Natural ventilation
- Nocturnal ventilation
- compensated Air Handling Unit

Renewable systems :

- Solar photovoltaic
- Solar Thermal

A 100 kWp roof photovoltaic farm will soon be installed on site.

Environment

Risks

Hazards to which the building is exposed :

- Earthquake
- Wind / Cyclone

Urban environment

Land plot area : 3 550,00 m^2

Built-up area : 68,00 %

Green space : 1 300,00

1. Climatic master plan - topographical, solar and aeraulic bias

The site has been largely reworked (see soil study, several metres of fill), probably during the construction of the various buildings. However, there is a general North/South slope, corresponding to the slope of the sector, and a slope towards the East. It is also located in a high position and therefore its perception from afar will be strong.

A general organisation in strips parallel to the slope allows the optimisation of earth movements and the limitation of the visual impact of the buildings.

This orientation, linked to the topography of the land, is also the ideal orientation for teaching rooms, as it allows lateral lighting without visual disturbance (no low incidence).

Finally, this orientation also allows for good natural ventilation, optimising the SE directions of the trade winds in the hot season and minimising them in the cold season (eastern sector) and according to our aeraulic concept developed elsewhere.

The project thus offers blind gables to the east and west (except for the bridge building, whose west and east facades are protected by the canopy and a wood filter), limiting the contributions from these facades. From all points of view, this general orientation of the ground plan seems ideal.

2. Landscaping

The landscape design tends to emphasise the **building's crossing and traversing effect**. The Campus Mall runs alongside the ESIROI building at its heart, transcending and linking it to its **urban environment**. Thus, the landscape treatment reveals the **eminently intertwined character of the inside** / **outside** within the building.

The **geometrical organisation** of the layout responds to a **longitudinal logic** that underlines the main direction of the building's layout. **Slabs, planters and furniture** all respond to this direction. The play of offsets in the third dimension makes it possible to create a constructed and deconstructed landscape that is coherent and in **close dialogue with the architecture**. The planters sink or spring up, creating **games of sub-spaces**, the slabs on the ground become detached to offer seats, pierce to draw a basket, stretch to join a planter cut-out, incline to accompany a rainwater flow towards the gardens. **The lush, tiered vegetation** of the planters has its own three-dimensional play and will bring a touch of **poetic and joyful breath** to the rhythm of the development of life.

The campus mall connects from the RU (University Restaurant) to the UFR and the future centrality through the university park in the talweg. The other direction, perpendicular to the first, runs **towards the bottom of the campus** to connect to the pre-existing axis along which the forecourts (ENERPOS + ESIROI) are spread out. It allows to reach the IUT below.

This choice places ESIROI **at the heart of its campus**, while making it an **obvious passage**. Passage, but not incursion. Through the interplay between the architecture, the landscaped slab and **the subtle management of levels and flows**, the campus mall makes it possible to cross, observe and rub shoulders with the building without disturbing or disturbing it. Because of its location at the junction of the ESIROI and the IUT extension, **this landscaped and frequented line** creates a **seam** while emphasising the **distinction**.

As it passes through the heart of the building, the three-dimensional design motif flows into **the central space of the ESIROI, the canopy**. The overflow of the Corten steel planters towards the lower level of the building embellishes the whole with an abundance of vegetation. The thickening of the landscape treatment within ESIROI attaches the building to the rest of the campus like a swelling lung, **an independent educational and academic organ that is nonetheless essential to the functioning of the whole**.

The abundance of vegetation extends thickly to **the esplanade on the gully side**, giving an impression of **penetration of the natural space** of the gully towards the building.

Beyond these symbolic and aesthetic considerations, the vegetation plays a multitude of **functional roles** which contribute to **the smooth running of the building and the comfort of its users**:

- Refreshing the interior atmosphere;
- Shading of the exterior spaces (entrance square, rise from the IUT, connection to the RU, esplanade of the ravine, etc.)
- Temporisation of surface and roof rainwater within part of the planted areas to avoid the need for an underground network and minimise downstream discharges;
- Participation in a calm and gentle atmosphere;

- Participation in the organisation of the interior spaces and in the accompaniment of flows;
- Curtain reducing the strong prevailing winds at the level of the esplanade of the ravine;
- Dust filter and partial depollution of the interior spaces;
- Creation of a vegetated roof terrace above the IUT extension and all the advantages linked to such a choice (roof insulation, limitation of the project's impermeability, rainfall temporisation upstream of the outlets, etc.);

In general, outdoor gardens contribute to **rainwater management**. The idea is to limit as much as possible the creation of buried networks by keeping as much as possible on the surface **the path of the drop of water** which expresses itself and is thus understood through the landscape. Thus, obstacles to the planted areas calibrated to receive water will be avoided. The soils will be composed of mixtures of topsoil, earth and stone and cyclopean blocks in order to increase the temporization of the water while being favourable to the clinging of the plants.

Products

Product

Danpalon

EverliteConcept

https://www.everliteconcept.com/danpalon

Product category : Structural work / Structure - Masonry - Facade

Danpalon® panel is developed from a high quality synthetic material, polycarbonate, and its performance is certified by certification bodies. Its translucency allows excellent light transmission, which reduces the amount of artificial lighting required in the premises.

Costs

Construction and exploitation costs

Cost of studies : 1 330 000 €

Total cost of the building : 10 171 145 €

Health and comfort

Indoor Air quality

The concept of a building with natural comfort ventilation (only the practical work rooms located on the lower levels are air-conditioned) makes it possible to obtain excellent air quality. In addition, the green environment around the building, as well as the possibility for users to use environmentally friendly modes of transport, also participate in the capture and reduction of pollutants.

Carbon

GHG emissions

Methodology used :
TEC-Tec

GHG before use : 828,00 $KgCO_2$ /m^2

The calculation was made on the basis of a tool adapted to overseas departments as part of a study funded by ADEME and AQC.

Contest

Reasons for participating in the competition(s)

Ce nouveau bâtiment de l'Université de La Réunion a été pensé dans une optique de respect de l'environnement et de résilience énergétique. Les solutions mises en oeuvre sont **adaptées à un climat tropical humide** où les températures et le niveau d'humidité peuvent être très élevés, le potentiel de ventilation conséquent et l'irradiation solaire importante toute l'année. **Certaines solutions sont directement inspirées de l'architecture traditionnelle créole** : Protéger du soleil / ventiler / Végétaliser.

Le fonctionnement en **ventilation naturelle** est possible grâce à une réflexion dès les débuts de la conception sur l'orientation du bâtiment, sa forme et son implantation sur le site. La répartition des locaux et des espaces communs, ainsi que leur organisation permettent la création de courants d'air, issus des jeux de pression/dépression sur les façades. L'expertise locale des intervenants ainsi que l'expertise aéraulique de nos partenaires ont également

permis d'optimiser les principes de ventilation lors d'essais en soufflerie, en profitant de l'intensité des vents dominants en saison chaude, et en la minimisant en saison fraîche.

Le bâtiment est également très largement **protégé du soleil**, autant au niveau de ses façades qu'au niveau des espaces communs extérieurs,couverts par des systèmes de toile tendue. Ces protections supplémentaires permettent aux usagers de bénéficier d'emplacements conviviaux confortables, protégés du soleil et de la pluie mais pourtant ventilés, même en saison chaude.

Une attention particulière a été portée sur la **végétalisation et les traitements paysagers intérieurs et extérieurs** afin de combiner efficience technique, aspect environnemental et esthétique.

De plus, le choix de **matériaux mixtes** a permis de proposer une **alternative au bâtiment tout-béton**, encore trop présent dans les nouvelles constructions.

Il a été pensé suivant la démarche PREBAT-REUNION, **démarche de qualité qui récompense les bâtiments à faible impact environnemental, accompagné par l'ADEME Réunion.**

Building candidate in the category

Prix Tertiaire & Industriel

Édition 2022
Trophées
Bâtiments résilients

Date Export : 20230514130029