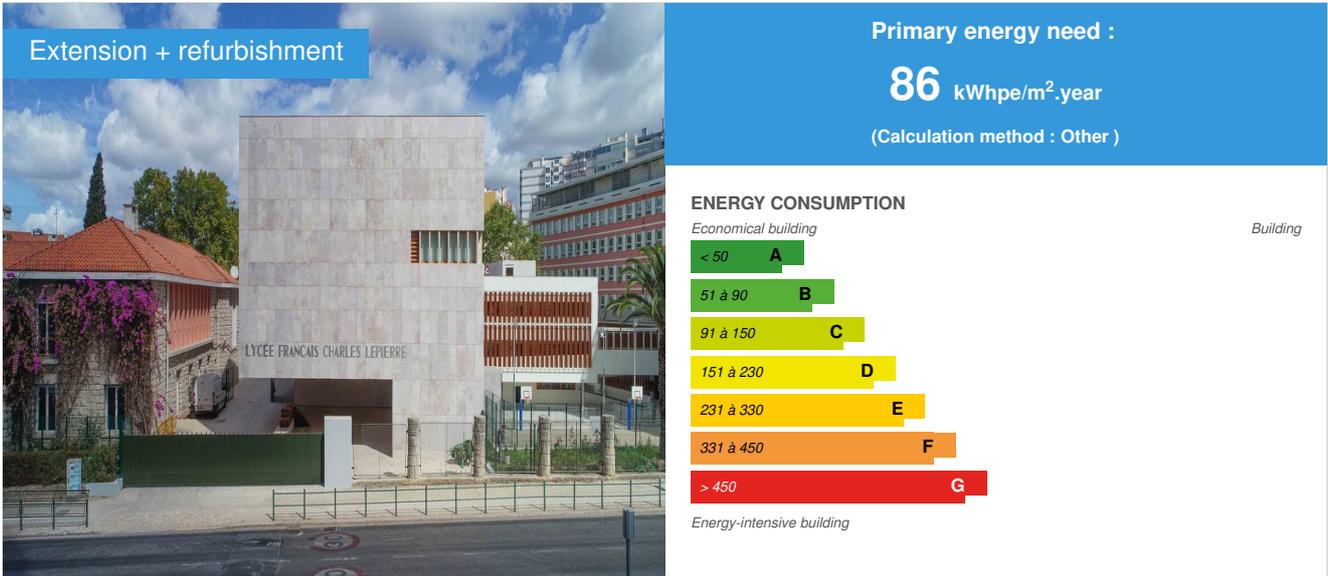


Charles Lepierre French highschool of Lisbon

by Yanis Boumbar / 2023-02-06 11:13:14 / International / 52 / EN



Building Type : School, college, university
Construction Year : 2020
Delivery year : 2022
Address 1 - street : Av. Eng. Duarte Pacheco 32 1070-112 LISBON, Portugal
Climate zone : [Csa] Interior Mediterranean - Mild with dry, hot summer.

Net Floor Area : 5 270 m² SHON (fr)
Construction/refurbishment cost : 7 300 000 €
Cost/m2 : 1385.2 €/m²

General informations

En français

The Charles Lepierre High School is located at the top of one of Lisbon's hills in the Campolide district. It is an old establishment on a triangular plot of land of about 22,000m² which faces the Amoreiras Shopping Center.

After seventy years of existence and in order to meet the growing demand of families, the French Lycée Charles-Lepierre in Lisbon wanted to expand and restructure its facilities. The playgrounds are already too small and the challenge is to keep the same space.

The project was the subject of an international competition to which several Franco-Lusitanian teams responded.

The Méandre etc' team won the competition by proposing a project that was both functional and clear in terms of flow, with the entrance to the school now separated from the entrance to the middle and high schools. The school welcomes more than 600 students every morning. This legibility is affirmed on the avenue by an imposing facade that integrates into the sequence of buildings opposite the Amoreiras towers and highlights the existing building and its bougainvillea. The trees are preserved. The orientation of the buildings, the constructive solutions of solar protection and the use of natural cross ventilation for all the new and existing buildings allow a significant reduction of the ambient temperature of the classrooms. But the strongest aspect of the project is to have succeeded, in a constrained plot of land, in constructing three new buildings while enlarging the playgrounds thanks to a solution that takes advantage of the slopes.

A look back at the design

Looking at the existing

Observe it with a loving eye, take its pulse, understand its suffering, its needs, its desires. This was the state of mind of Méandre etc' and Panorama during their first visit to the site of the French high school on one of Lisbon's hills. Campolide is a neighborhood that used to be agricultural, then residential for the workers of the Alcantara factories, and now mineral, surrounded by commercial towers that deprive it of a horizon without providing any shade, and a motorway avenue with such heavy traffic that it makes the arrival of students unsafe. The place is noisy from the passage of cars and the air corridor that passes right over it. These are the first observations.

However, when you enter the school, the atmosphere is calm, the main courtyard is paved with calzada, the playgrounds are shaded by large trees, and a sheltered outdoor walkway serves the three buildings from the 1950s: the administration, the kindergarten, the junior high school and the fifth grade classes. The elementary school is located on the first two levels of another building built in the 1970s and in temporary prefabricated buildings. The difference in design between the buildings is striking. Those of the 1950s are bioclimatic with north and south facing facades, sunbreakers, light shelves, through and upward ventilation with cupolas.

The building from the 70s does not have the same qualities at all. The main facade faces west. The surroundings are mineralized because of the underground parking. The classrooms are overheated. Finally, the prefabs of the 2000s are air-conditioned and heated with low performance convectors.

Low-tech solutions inspired by historical and vernacular architecture

The observation of buildings from the 1950s, discussions with Portuguese architects and engineers, and the specificities of local and national regulations for school buildings in particular, have fed our low-tech approach to new buildings and extensions. For example, the obligation to have a minimum ceiling height of three meters in the classrooms is a real asset for the quality of the indoor air. Interventions on the 1950s building, the kindergarten building, were reduced to the essentials with a few interior improvements related to acoustics, lighting and flooring in the classrooms and rest rooms.

On the other hand, on the building of the 70's, that of the elementary classes, only the structure was preserved. The facades, staircases, insulation, partitions and sunshades were restructured in a major way. The rooms were enlarged, the air quality and summer comfort increased by a natural ventilation system. By opening bays on the opposite façade, by positioning the rooms in such a way as to allow for a cross-current of air, by designing opening systems in the doors of the rooms in such a way as to allow for free cooling at night even with the doors closed.

The use of local materials

Cork insulation

Cork is a local rot-proof biosourced material that provides very good insulation and ensures the perspiration of the walls. This material, which does not deform much despite changes in temperature or even under the effect of the passage of time, constitutes a very perennial base for coating. The exterior insulation of the extensions and rehabilitated buildings was carried out with nine centimeters of expanded cork panels.

The underside of the courtyards covered with exposed cork gives off a very pleasant woody scent. Finally, the flooring of the classrooms, specially developed by the manufacturer for this project, is made of solid cork covered with a layer of solvent-free varnish. The use of cork allowed the objectives in terms of acoustic comfort, comfort of use, durability, air quality, proximity of supply and manufacturing to be met.

The façade of the main building covered with lioz

The stones for the main building were extracted from a quarry near the site. Called "Lisbon stone", lioz is widely used in the city. This everyday material, slightly pink and textured, is found in window sills, kitchens, sinks and washbasins.

Commitment of the client and the project manager

A pilot project for transitional architecture

With a network of schools in 138 countries around the world, France is the country with the most schools abroad. In fact, the Agency for French Education Abroad (AEFE), attached to the Ministry of Foreign Affairs, constitutes an international network established on all continents. French high schools are places where a culture of freedom, equality and fraternity is disseminated, where political thoughts and reflections take place, where elites are trained and where international friendships are made. As such, the AEFE has a role to play in the climate transition. In addition to its purpose of educating children of French families living abroad and welcoming foreign students, this network is a formidable instrument of influence. Aware of this impact, the AEFE's real estate department has taken on the mission of setting an environmental example in the construction of its schools. The future citizens that are the students can thus apprehend, learn and understand, from early childhood, the influence of the building on their quality of life.

The commitment of the real estate department is reflected in the choice of a contemporary bioclimatic architecture that prohibits the use of energy-consuming artificial air conditioning. This decision, taken for schools located in hot and tropical countries, gave the opportunity to offer a training course conducted by the ICEB (Institute for Eco-responsible Building Design) on the passive measures to adopt to ensure good thermal comfort without air conditioning. Following this training, a guide, in the form of a comic strip, was published for residents, building owners and designers. In this spirit, the Charles-Lepierre French high school project was envisaged as a pilot for an architecture of climate transition. The classrooms of the new school open onto playgrounds in an interweaving of interior and exterior in a soft atmosphere and a sense of freedom. The Lisbon project was an opportunity for the Méandre etc' agency to implement and transmit scientific knowledge, know-how, techniques and frugal bioclimatic provisions for buildings to be rehabilitated or built.

Photo credit

Telmo Miller

Contractor

Name : Agence pour l'Enseignement Français à l'Etranger

Construction Manager

Name : MEANDRE ETC

Contact : contact[a]meandre-etc.fr

Stakeholders

Function : Designer

MA.TERIA

Function : Other consultancy agency

LAIII

Function : Thermal consultancy agency

ALTO INGENIERIE

Function : Other consultancy agency

PANORAMA PAYSAGE

Function : Other consultancy agency

ACOUSTIQUE VIVIE ET ASSOCIES

Function : Other consultancy agency

RIO PLANO

Function : Others

VERITAS

Contracting method

Other methods

Energy

Energy consumption

Primary energy need : 86,00 kWhpe/m².year

Calculation method : Other

Initial consumption : 235,00 kWhpe/m².year

Envelope performance

More information :

Cork board insulation.

More information

The building was delivered in 2022. We have little information on its actual consumption.

Renewables & systems

Systems

Heating system :

- Low temperature gas boiler
- Water radiator

Hot water system :

- No domestic hot water system

Cooling system :

- No cooling system

Ventilation system :

- Natural ventilation
- Nocturnal ventilation

Renewable systems :

- No renewable energy systems

Products

Product

Cork board insulation

Product category : Finishing work / Partitions, insulation

Cork is a local biosourced rot-proof material that provides very good insulation and ensures the perspiration of the walls. This material, which does not deform much despite changes in temperature or even under the effect of the passage of time, constitutes a very perennial base for rendering. The external insulation of the extensions and the rehabilitated buildings was carried out with nine centimeters of expanded cork panels.

Costs

Construction and exploitation costs

Total cost of the building : 7 300 000 €

Health and comfort

Biodiversity approach

Urban environment :

Campolide is a neighborhood that used to be agricultural, then residential for the workers of the Alcantara factories, and now mineral, surrounded by commercial towers that deprive it of horizon without providing shade, of a highway avenue with traffic so dense that it makes the arrival of students unsafe. The place is noisy from the passage of cars and the air corridor that passes right over it. These are the first observations.

To breathe in the city, Lisbon, its Mediterranean climate, slightly humid in winter, dry and hot in summer with an average temperature of 28 degrees during the day, cool at night. Soaking up the site, its light, its atmosphere, spotting what makes its identity, the trees on the small squares, the calçada that follows the reliefs, that guides the flow of rainwater, getting to know the surrounding city, the habits, etc.

Resiliency measures in place

Heat wave: The sun and its race

The bioclimatic design uses the characteristics of the temperate subtropical climate to provide indoor comfort. The layout of the buildings and facades was chosen using the heliodon to visualize the path of the sun in different seasons. In this dense urban site, the surrounding high-rise buildings cast significant shadows on the school from fall to spring. Conversely, from spring to fall, the sun is higher and the shadows cast by the surrounding buildings are shorter and do not obscure the shadows cast by the high school, which must therefore be protected.

Cooling the building at night

To cool in summer, each classroom is also equipped with four secondary ventilation openings, two on the exterior façade and two on the wall facing the corridor. When they are open during the day, the breeze cools the bodies, and during the night, cool air fills the classrooms, cooling the thermal mass of the ceilings, floors

and walls.

Air movers were installed in the ceiling to ensure an air velocity of one meter per second and guarantee a comfortable feeling even above 28°.

For budgetary reasons, the bay windows in the corridors were removed, leaving them open to the air. This last resort solution was fully endorsed by the Portuguese health services, which saw it as an appropriate response to the air quality issue that came back to the fore after the covid-19 pandemic crisis. The fact that the corridors are now outside, sheltered but not closed, made it possible to harmonize the cross ventilation provisions with fire safety.

Land plot area : 22 000,00 m²

Built-up area : 30,00 %

Green space : 14 000,00

Mitigation actions on soil and biodiversity :

The Campolide district is emblematic because of the presence of a water table, an 18th century water reservoir, and an aqueduct that runs through the school site. Particular care has been taken to enhance the outdoor spaces, education and biodiversity. Thus, the infiltration of rainwater from the site is achieved through a choice of permeable soils. The playgrounds are real gardens where plants are an educational tool both in terms of vegetable gardens and fruit trees.

The observation of existing gullies, the recovery and reuse of calçada, the search for permeable soil materials with the landscapers to meet the regulatory obligation to infiltrate rainwater have been proposed, discussed with the owner. We organized visits, in particular to Campo Grande (landscaping carried out by the project's landscaper, Rio Plano), to an oasis courtyard in Paris with the principal, and to the nursery to choose local species adapted to the site. Finally, around the tree pits, bicycle and car parking spaces, the mineral soil materials were chosen for their porosity to improve rainwater infiltration.

The total surface area of calçada has been substantially increased and covers a large part of the kindergarten and elementary school yards because these limestones laid on a bed of sand create a flexible pavement that, like a fabric, follows the movements of the ground, guides the runoff of water, and is infinitely repairable. The remaining pavements, except for some traffic paths, are porous or fully permeable. The sports fields to the north and south are made of stabilized earth, and the cement pavers are laid on a sand bed. All these surfaces allow a maximum of water to infiltrate and recharge the water table.

Carbon

Carbon sink

Cork is a local biosourced material that has been used as soon as possible in the building industry. It can be found in exterior insulation but also in flooring and billboards.

Contest

Reasons for participating in the competition(s)

- Bioclimatic architecture that avoids the use of energy-consuming artificial air conditioning.
- Expansion of the school's capacity and playgrounds without increasing the artificialization of the land.
- Use of local bio-sourced materials.
- A qualitative urban environment preserved thanks to vegetation and permeable soils.
- An example for all schools in hot climates of the Agency for French Education Abroad.
- An opportunity to educate students, residents, project managers and designers, through a training course and a guide, in the form of a comic book.

