Chengdu school group

by Hugo Stragier / 2015-07-07 17:33:56 / Francia / 11171 / FR

Primary energy need :

37 kWhep/m².an

(Calculation method :)

ENERGY CONSUMPTION

Economical building — *Building*

< 50	A	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 : 2012
Delivery year : 2014
Address 1 - street : 34000 MONTPELLIER, France
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 2 644 m²
Construction/refurbishment cost : 8 800 000 €
Number of Pupil : 300 Pupil
Cost/m2 : 3328.29 €/m²

Certifications :

Bepos 2013

Proposed by :

étamine

General information

The school group Chengdu has very high energy performance, it is part of one of the new eco-neighborhoods of the city of Montpellier, the Eco-district Parc Marianne. This 3,080m² school group he positive energy building school regroups a kindergarten and an elementary school, for a total of 11 classes. The school is connected to the wood trigeneration urban heating network of Montpellier and is built in constrained site (important effects masks linked to neighboring buildings) has 290m² roof solar panels that can produce 20% more energy than the total consumption of school.

The school was designed and built so that comfort is ideal in summer as in winter while reducing energy requirements. The school complex is equipped with various innovative equipment (room control, GTC for heating, solar shading, natural ventilation, CO2 probe, counts and under counts, lighting dimming, window contact on windows shutting down the heater in case opening ...) allowing it to guarantee such results.

Coaching of the various users of the building was carried out to allow an appropriation of operation of the building and to help optimize comfort and energy savings. A guide for users has been set up and an explanatory comic for pupils. This school was the recipient of the call for Ecocity project launched by the state.

Chengdu The school is part of the Eco-district Park Marianne

Sustainable development approach of the project owner

Objectives: Positive Energy Buliding + 20%, all energy in a stress plot: 2000 sqm plot and large mask (Ground floor + 12 and Ground floor + 8 in the south), very tight deadlines.

Contractual objectives:

1- Heating needs of 13kWh / m2
2- Natural lighting Autonomy 70% minimum,
3- Renewable energy production: 120% minimum consumption
4- Level of air-tightness less than 0.8m3 / h / m2

This is the 3rd positive energy building built by the city of Montpellier; the first had been carried out internally by the services of the city of Montpellier and the second was carried out by architect contests and works contract in separate trades

Architectural description

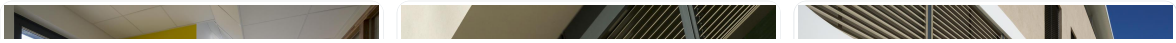
The Chengdu school group is located in the ZAC Parc Marianne of the city of Montpellier. It fits completely in the dynamic of the place by presenting an urban and attractive architecture.

The heights, the colors, the materials, and the stratified architecture participates to the integration of the building in its environment. Built in ground forces (small plot of 2000m², surrounding high buildings) this school has been able to be optimized to accommodate students of 11 classes of the school group, and presents an interesting compact to limit the heat loss of the building.

The school is built on 3 levels and has intermediate levels with playgrounds and a bioclimatic garden. Each element of the frame has been designed to optimize space and contribute to user comfort. Sunscreen premises is ensured by wide overhangs roof and adjustable sun breezes. The south orientation of the main facade of the school allows a high amount of natural light and heat in winter. Circulations are located in buffer zones north of the building.
The 300m² of photovoltaic cells were incorporated into the roof of the R + 2.

See more details about this project

http://www.coste.fr/projet.html?projet=ec169



Stakehol

Stakeholders

Function : Designer

AGENCE COSTE ARCHITECTURES

ANDRÉ ARIOTTI - 04 67 61 00 81 - ariotti@coste.fr

http://www.coste.fr
Architect

Function : Contractor

VILLE DE MONTPELLIER

Michel IRIGOIN

http://www.montpellier.fr
Project management - Energy Management and Technical Resources

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Function :

BOUYGUES BATIMENT SUD EST (BBSE)

Olivier DEQUATRE

http://www.bouygues-batiment-sud-est.fr
General Company

Function : Thermal consultancy agency

ETAMINE

Sébastien RANDLE - 04 37 45 34 27 - sebastien.randle@etamine.coop

http://www.etamine.coop
Thermic studies

Function : Other consultancy agency
BETOM Ingénierie

Franck RIVORY

Contracting method

General Contractor

Type of market

Table 'c21_spain.rex_market_type' doesn't exist

Energy

Energy consumption

Primary energy need : 37,00 kWhep/m^2.an
Primary energy need for standard building : 87,00 kWhep/m^2.an
Calculation method :
Breakdown for energy consumption : Energy kWh EP/m2/an
- Heating : 17,1 ;
- Cooling : 0 ;
- DHV : 2.3 ;
- Lighting : 12.3 ;
- Hot Water/Ventilation : 4 ;
- Auxilliaries (pumps) : 0.3 ;
- Others (consommations non conventionnelles) : 23.4

Real final energy consumption

Final Energy : 27,00 kWhef/m^2.an
Real final energy consumption/m2 : 27,55 kWhef/m^2.an
Real final energy consumption/functional unit : 27,55 kWhef/m^2.an
Year of the real energy consumption : 2 015

Real final energy consumption/m2 : 27,74 kWhef/m^2.an
Real final energy consumption/functional unit : 27,74 kWhef/m^2.an
Year of the real energy consumption : 2 015

Envelope performance

Envelope U-Value : 0,51 $W.m^{-2}.K^{-1}$
More information :
thermal envelope
exterior wallITI: Ground floor overlooking public space, development zone constraints:
- Concrete wall 20cm
- Complex Placomur 13 + 160- Λ = 0.032 W / mK; Acermi No. 03/081/361- R = 5.00 m²K / WITE

other outer walls:
- Polystyrene 20cm polystyrene Sto-panel PS 15 SE-λ = 0.038 W / m • K; technical sheetR = 5.3 m²K / W
- Concrete Wall 20cm: 0.18
- low floor full earth

Insulation under slab scope:
- Concrete 20 cm
- Insulation 10cm KNAUF Therm Dalle Range-λ = 0.038 W / m • K; Acermi 11/007/730R = 2.6 m²K / W 0.29

low floor outside
- Concrete: 30cm
- Polystyrene: polystyrene Sto-panel PS 15 SE 15cm (same exterior wall)- Λ = 0.038 W / m • K; technical sheet- R = 3.95 m²K / W 0.25

roofing current zone:
- Concrete slab 30 cm- 20 cm insulation Eurothane- Λ = 0.024 W / m • K; Acermi No. 03/003/127- R = 8.6 m²K / W+- 6 cm insulation Topox Cuber- Λ = 0.031 W / m • K; Acermi No. 08/107/532)- R = 2.05 m²K / W- Let R = 10.65 total m².K / W

"Gutter" area:
- Concrete slab 30 cm- 20 cm insulation Eurothane- (Λ = 0.024 W / mK; Acermi No. 03/003/127)- R = 8.6 m²K / W0.10

Glazing
- aluminum carpentry with thermal bridge
- Argon reinforced insulation glazing 4/16/4
- Thermal calculations joinery:Uw average R-1 = 1.538 W / m²KUw average DRC: 1.529 W / m².KUw average R + 1: 1.542 W / m².KUw average R + 2: 1.476 W / m².KUw = 1.60

Exterior sunshades, adjustable and retractable.Managed automatically to optimize free contributions winter and summer protection (provisional waiver by users).

Building Compactness Coefficient : 0,44

Indicator : I4

Air Tightness Value : 0,61

Users' control system opinion : No complaint, so the equipments work as expected

More information

Corrective actions after the delivery of the building:
- 1-optimization of heating control and the temperature of the boiler,
- 2-optimizing speed variation breakdowns,
- 3-optimized presence / light detector settings;
- 4-changing communication gateway between heating and GTC regulation;
- 5-changing a warranty UPS;
- 6- hot water (DHW): returns the first ball of heat network does not exceed 25% (see: significant distance delivery points) to remedy and given very low needs of ECS, he was replaced by an electric ball

Renewables & systems

Systems

Heating system :
- Urban network

Hot water system :
- Individual electric boiler

Cooling system :
- No cooling system

Ventilation system :
- Double flow heat exchanger

Renewable systems :
- Solar photovoltaic

Renewable energy production : 125,00 %

https://www.construction21.org/france/data/sources/users/7500/chengu-photo-vue-du-ciel.docx

Other information on HVAC :
Heating Exchanger on the heating network in Montpellier, radiator distribution, temperature regulation room by room through a temperature sensor and presence; Action by 2-way valves; Networking heated volume

DHW: For electric water heaters with reinforced insulation for the kitchen.2 small electric water heaters for very low use
NOTE: Performance on the first balloon heating network did not exceed 25% (see: significant distance delivery points) to remedy and given very low needs of ECS, was replaced by an electric ball

Heating network using a minimum of 90% biomass

Solutions enhancing nature free gains :
Brise-soleil automatique orientable et relevable

Smart Building

BMS :
For HVAC: Regulation piece by piece; BMS by SAIA system with ergonomic visualization of each equipment and control parameters

Environment

Urban environment

Land plot area : 2 000,00 m^2

This project wishes to integrate into its environment without being concealed from the public eye. It is indeed important that such equipment can be perceived and seen by everyone. A school is a vital program within a neighborhood. It is unifying, it plays a leading role in society.

The proposed site, relatively "landlocked" in the center of the BIA Marianne Park, located in the heart of a vocation of housing environment.
Rectangular in shape it has a building zone enough stress, both by its grip by its height. The buildable area in relatively small ground and architectural recommendations of the BIA have naturally led us to propose a project that is fitted to all available grip:
- Project Implementation on the entire floor area available
- Device Cradle "full" on the North and East facades
- Court and classrooms in the South
- Use of the possibility of semi bury rooms to offer for a perfect internal organization

This school project is rooted in a real urban neighborhood. It must meet its immediate environment as by its architecture and its volumes.

ZAC of about 2000 dwellings and land with buildings in ground floor + 12 and ground floor + 8 south side.

Products

Product

Directional control of sun breakers

SOMFY

50 avenue du Nouveau Monde 74307 Cluses Cedex

https://www.somfy.fr/

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '10'

Automatic control of the opening / closing of solar shading exterior windows into four zones

Provision by the software manufacturer and the formation of a city officer

Sealing air building

ENEXCO

contact@enexco.fr

http://www.enexco.fr/

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '10'

Throughout the phase of construction, Enexco accompanied all stakeholders concerned with good airtightness of the building:
1 - Step with educational slide show presentation of the importance of air sealing (including the smooth operation of double air handling units flows)
2 - Definition and trials with fellow responsible for the installation of glazing, good compribande seal affixed between the joinery and the frame (four tests were needed to confirm the right product)
3- air tightness test on a classroom test including smoke, with the room depressurization to visualize abnormal air inlets
4 - Test on a third of the building with the same procedures and measurements of air tightness (required value less than 0.8 V.h / m² under 4 Pa)
5 - Test the entire school and after various corrections obtaining a value of 0.5

Excellent contribution as a pedagogical and technical in particular to show the corrections to be made in phase construction as the choice of good materials and good procedures to get the right result

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Presence detector and brightness

BEG

Mr RENAUDI Claude, claude.renaudi@orange.fr

http://www.begfrance.fr/

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '17'

Room by room management of lighting according to the natural outdoor light and the presence of the occupants: the lighting is switched on if these two conditions are met.

In the classrooms, the detectors are two areas (corridor side and side window) and also the auxiliary contact is controlled by the presence detector and permits in the absence of stop heating from 9.00

Remote control for the adjustment of these detectors and training for city staff responsible for its maintenance.

Water regulation

NEOPERL

info@neoperl.ch

http://www.neoperl.ch/fr/retail/home/distribution.html?cId=NL&fId=FR

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '14'

Placing all of flow control valves 8L / min (showers), 6L / min (offices and washing point) and 1.7L / min (sinks)

Control rates obtained by the technician in charge of water and regular checks on the possible scaling (including flow regulators to 1.7 L / min)

Center double flow air handling

CIAT

Stéphan GIRARD, s.girard@ciat.fr

http://www.ciat.fr/

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '19'

Implementation of air handling units with double flow with energy recovery wheel: recovery yield of 80%

The optimization of the operation of these plants dual flow was achieved in particular by laying G5 type filters instead of F7 initial filter which helped very significantly reduce pressure drop in the material and thus minimize power consumption

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Remote management of climatic equipment

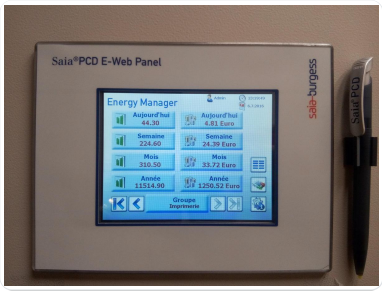
SAIA

9 avenue du Marais Parc des Algorithmes Bâtiment Sophocle 95100 Argenteuil

http://www.saia-pcd.com/fr/saia-burgess-controls-ag/

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '18'

1 - Establishment of a system of regulation and metering of all the school's consumption with control room by room regulation (indoor temperature, vacancy off, modulation of the air flow by CO2 detector probe stop in case of window opening). Measurement of all consumption of heating, electricity and school water: counters dealers (purchase and resale of electricity, district heating and two water meters (green space and building))



This regulation allows using a touchscreen boiler rooms drivers can know the time (locally or remotely over the Internet) the proper functioning of equipment, visualize on a block material in place and to be alerted in case of malfunction (by email). This tool set in particular the technician of the energy department of the city of Montpellier, enabled rapid appropriation of such equipment. The BEPOS control of the building is done monthly for all types of energy and verified that the building was well BEPOS + 20% on a full year.

Assistance Mission project owner from upstream to downstream of the construction site

IZUBA énergies

Stéphan BEDEL, stephane.bedel@izuba.fr

http://www.izuba.fr/

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '33'

SHI was chosen by the city (Izuba) to:
- 1 - Define the contractual performance as would ensure the MOE (four targets to achieve 20% of which BEPOS, airtight, light factor of the day and BBC - 20%).

- 2 - Each failure criterion was amenable to a penalty of 15000 (e) in case of non compliance.
- 3 - This AMO has accompanied the city throughout the construction phase and during operation the first years.

This support has been extremely beneficial for the city to ensure the quality and performance as the frame as well as equipment to help us start-up of facilities and monitoring of performance required

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Photovoltaic panels

SUNPOWER FRANCE SAS

12, Allée du Levant 69890 La Tour-de-Salvagny;Tél.: 0 805 090 808

http://www.sunpower.fr

Product category : Table 'c21_spain.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '29'

To be building positive energy + 20% the Chengdu school has 290m² of photovoltaic panels on two separate roofs. The 177 modules produced 75.8 MWh in 2015, despite a binding region (many masks). PV production is closely monitored. To detect an inverter default interface, available online, has not been established to monitor production in real time and check the efficiency of the inverters. Cleaning of the panels is carried out once a year to ensure better productivity.

Photovoltaic panels to ensure performance building positive energy of the school. A production monitoring is important.

Costs

Construction and exploitation costs

Renewable energy systems cost : 220 000,00 €

Total cost of the building : 9 400 000 €

Subsidies : 1 300 000 €

Energy bill

Forecasted energy bill/year : 14 484,00 €

Real energy cost/m2 : 5.48

Real energy cost/Pupil : 48.28

Health and comfort

Water management

Consumption from water network : 168,00 m^3

Water Consumption/m2 : 0.06

Water Consumption/Pupil : 0.56

Counter specific green space: consumption 0 m3 in 2015

Indoor Air quality

Ventilation is controlled room by room, by action on a register based on the data provided by CO2 sensors, occupancy sensors and opening windows.

Comfort

Measured thermal comfort : in winter 19°C (heating instructions); in summer temperatures are below 28°C apart from exceptional cases (4.7h for elementary classes, 0 for kindergarten classes)

Carbon

GHG emissions

GHG in use : 1,70 $KgCO_2/m^2/an$

Methodology used :

Building consumption

Building lifetime : 50,00 année(s)

Contest

Reasons for participating in the competition(s)

Energy & Temperate Climates : The Chengdu School Group, built in a constraint urban environment, is a real positive energy building, the photovoltaic production covers 120% of the total yearly consumptions of the building. Different technologies were used in this building to reach great winter and summer comfort while achieving low consumptions. For winter comfort, the building is insulated from the outside, the glass bays have reinforced insulation, the sub-station is linked to the SERM heating urban network using biomass renewable energy and hot water heaters; heating regulation is done room by room, depending on presence and indoor temperature. For summer comfort, the building offers strong inertia and automated orientable mobile sun-breakers to efficiently protect from the sun.

Building candidate in the category

Energie & Climats Tempérés

Coup de Coeur des Internautes

Date Export : 20230526044343