Low carbon townhouses

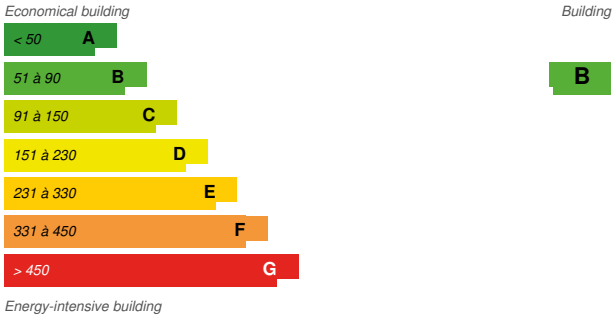
by Patrice Cros / 2021-03-19 12:58:44 / France / 4198 / FR

Primary energy need :

62 kWhep/m².an

(Calculation method : RT 2012)

ENERGY CONSUMPTION



Building Type : Terraced Individual housing
Construction Year : 2016
Delivery year : 2017
Address 1 - street : 8 rue du Père Christian Roussin 94800 VILLEJUIF, France
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 277 m²
Construction/refurbishment cost : 587 349 €
Number of Dwelling : 3 Dwelling
Cost/m2 : 2120.39 €/m²

General information

This operation diversifies the housing offer in an old residential area. It is part of the current context of densification of this district following the evolution of urban regulations. This eco-construction project offers townhouses within a condominium whose outdoor spaces constitute the common areas. It has 3 very compact low-energy units of 70 m2 each, one house in simplex and two in duplex. The project thus refers to a unitary but open urbanity, from within the plot itself.

Location of housing

The first construction is located at the back of the plot backing onto the northern dividing line of the land. Its main openings face south towards a part of the private garden and access is from the street, through the passage cleared by the elevation of the 2 other dwellings.

This elevation also allows the development of a private parking area for residents. Each is installed on the property line. The plot being narrow, the proximity of the facades of the 2 raised buildings is managed by a subtle distribution of openings avoiding vis-à-vis. Thus, while the second house is mainly open on the east facade with a terrace upstairs, the third opens in the same way to the west. The privacy of the housing units is preserved while pooling the outdoor spaces (garden, bicycle room, waste room).

Engineering design

The green terraces are accessible for maintenance via a roof window with overhead lighting integrated into the roofs. The solar gains were highlighted, in particular by the specific painting of the embrasures of the roof windows according to a color code specific to each house (reference to the neoplasticism of the

DeStijl movement). The exterior walls of the building have been treated with a white mineral-look plaster forming geometric volumes underlined by the anthracite metallic lines, with large thermally efficient windows, sometimes sliding or hinged, favoring an optimal solar contribution.

The exterior landings for access to the houses as well as the terraces accessible to the upper floors have been treated with grating and covered with composite slats in a light wood color. For the house placed on the ground, a larger wooden slatted terrace was created, completed by a sterile strip made above a peripheral drainage at the foot of the facades.

Dry construction and environmental approach.

It is a lightweight construction using mixed wood-metal-concrete, low-carbon, thermal inertia and reinforced insulation frame panels. The envelope of the houses with its large bay windows is thermally efficient, promoting optimal solar gain as well as effective solar protection.

Sustainable development approach of the project owner

Program and context

Located in an old suburban district close to the city center, this project proposes a renewal of the urban habitat in this district by a soft densification which takes into account the new lifestyles (in particular of the young households).

Architectural description

Each house is a variation of the others and all have equivalent qualities. The outdoor spaces are shared (garden, bicycle room, waste room) while preserving the privacy of the homes.

The homes are equipped with low-temperature heated floors (gas boiler), domestic hot water by thermodynamic tank (electric), remote-controlled electric shutters and access control by intercom, as well as green roofs with rainwater recovery in buried diffusion-retention tanks for the maintenance of gardens and common areas.

Building users opinion

The objectives of thermal and energy performance lead to a certain compactness of homes. This architectural density is well accepted by the occupants who appreciate the transparency towards the shared gardens, the air quality and the intimacy of the interior spaces as well as the changing qualities of natural lighting throughout the day.

If you had to do it again?

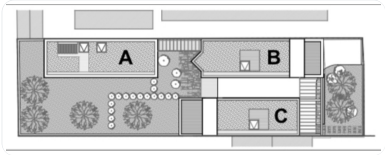
The coordination of the batches by a demanding project management is essential in order to ensure a good interface between the concomitant GO batches.

See more details about this project

https://www.architectes-pour-tous.fr/patrice-cros-etudes-de-projets-realisations/habitat-intermediaire-villejuif

Photo credit

Patrice Cros



Stakeholders

Contractor

Name : PRIVÉ
Contact : Contact Patrice Cros 0661305826
http://www.architectes.org/p.cros

Construction Manager

Name : P. CROS ARCHITECTE
Contact : Patrice Cros 0661305826
http://www.architectes.org/p.cros

Stakeholders

Function : Thermal consultancy agency

ERTC

Pascal TCHENGANG

Thermal study

Function : Other consultancy agency

CIB SARL

Luc Rempenault

Concrete structure engineering

Function : Other consultancy agency

VERBEKE

Guillaume Botte

Geotechnical studies

Contracting method

Separate batches

Type of market

Global performance contract

Energy

Energy consumption

Primary energy need : 62,00 kWhep/m^2.an

Primary energy need for standard building : 71,00 kWhep/m^2.an

Calculation method : RT 2012

Breakdown for energy consumption : Average of the 3 dwellings: Heating 39.70 kWh / m2 / year Hot water 16.20 kWh / m2 / year Ventilation 2.50 kWh / m2 / year Lighting 3.50 kWh / m2 / year

Envelope performance

Envelope U-Value : 0,37 $W.m^{-2}.K^{-1}$

More information :

The load-bearing envelope was designed as a lightweight modular construction using mixed wood-metal frame panels. The exterior walls and exterior floors have reinforced ITE and ITI insulation as well as the green roofs (for the recovery of rainwater in buried diffusion-retention tanks for watering the gardens and the various maintenance uses of the parts. municipalities). The large bay windows are thermally efficient, promoting optimal solar gain as well as effective acoustic and solar protection (remote-controlled roller shutters). Acoustics and thermal inertia are reinforced on the internal faces by the concrete screed of the heated floors. Green roofs are technically accessible via the overhead lighting integrated into the roofs. Natural lighting was particularly emphasized.

Building Compactness Coefficient : 3,80

Indicator : n50

Air Tightness Value : 0,64

Users' control system opinion :

The architectural project includes 3 very compact units of 70 m2 each, a simplex house and two duplexes. There is no home automation system but common functions controlled by thermostat, external sensors and non-centralized electrical controls: the homes are equipped with PCBT (low temperature underfloor heating), domestic hot water supplied by thermodynamic tank, simple hygroB flow ventilation, electric roller shutters and intercom access control, as well as green roofs with rainwater recovery in buried diffusion-retention tanks for watering gardens and various maintenance uses common areas.

Renewables & systems

Systems

Heating system :

- Individual gas boiler

Hot water system :

- Individual electric boiler

Cooling system :

- No cooling system

Ventilation system :

- Humidity sensitive Air Handling Unit (Hygro B

Renewable systems :

- Heat pump

Other information on HVAC :

Underfloor heating low temperature (PCBT) and auxiliary radiator on the floors. HygroB single flow ventilation centered on wet rooms.

Thermodynamic BEC

Solutions enhancing nature free gains :

Le projet architectural comporte 3 unités très compactes de 70 m2 chacune. L'acoustique et l'inertie thermique sont renforcés en faces internes par la chape béton des planchers chauffants basse température (gaz)

Environment

Urban environment

Land plot area : 367,00 m^2

Built-up area : 40,00 %

Green space : 150,00

This project is located in an old suburban district near the city center of Villejuif, undergoing major changes due to the development of the urban network of the Grand Paris Express and the creation of a station near the Gustave Roussy hospital center. Public gardens are rare in this sector, but the development of the PLU calls for the development of more vegetated island cores.

The operation is part of a reasoned approach to the gentle densification of this popular suburban district, on the scale of a land unit.

Products

Product

Lightweight composite wood-metal frame panel and incorporated insulation

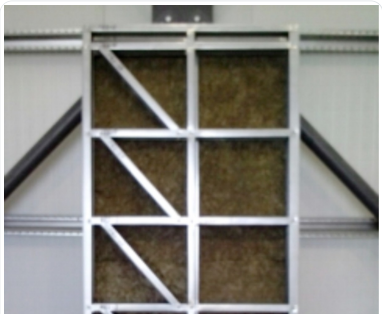
CH

Contact Patrice Cros 0661305826

Product category : Structural work / Structure - Masonry - Facade

Horizontal and vertical wall kit preassembled lightweight construction. Can be combined with a classic metal structure. Site dry sector, limitation of site waste, possible deconstruction. Kit price / m2: 52 € HT / m2 Supply and installation included.

Coordination by project management essential to ensure a good interface between the concomitant GO lots.



Costs

Construction and exploitation costs

Global cost : 696 133,00 €

Reference global cost : 709 900,00 €

Renewable energy systems cost : 3 500,00 €

Global cost/Dwelling : 232044.33

Reference global cost/Dwelling : 709900

Cost of studies : 58 384 €

Total cost of the building : 678 733 €

Additional information on costs :

Thermodynamic BEC

Health and comfort

Water management

The green roofs allow the regulation of the flow of rainwater, which is connected to the retention tanks (underground sumps) for watering and for low diffusion on the ground of the plot. A high overflow, provided in each sump (semi-clay soil), nevertheless allows the evacuation of rainwater to the public collector in the event of heavy rainfall.

Indoor Air quality

A hygroB single flow CMV has been installed for each house, with the possibility of alternating at any time with natural cross ventilation.

Comfort

Health & comfort :

The total bay area of each house (22m2 on average) is more than 82% higher than the regulatory value (12m2 on average). If the objectives of thermal and acoustic comfort may have led to a certain compactness of the dwellings, the occupants nonetheless appreciate the transparency towards the shared gardens, the quality of the air and the intimacy of the interior spaces as well as the qualities natural lighting that changes throughout the day.

Measured indoor CO2 concentration :
ND

Calculated thermal comfort : Température conventionnelle d'été 26°
Measured thermal comfort : ND

Acoustic comfort :

The enclosure of the enclosed-covered enclosure in mixed wood-metal panels with reinforced ITE and ITI insulation provides acoustic insulation, with large acoustically efficient bay windows.
The concrete screed of the heated floors completes the internal acoustics and thermal inertia.

Daylight factor : La surface totale des baies de chaque maison (22m2 en moyenne) est supérieure de plus de 82% à la valeur réglementaire (12m2 en moyenne).

Carbon

GHG emissions

GHG before use : 12,00 $KgCO_2 /m^2$

Life Cycle Analysis

La stratification verticale des matériaux et de l'isolation thermique est basée sur leur exposition l'humidité, et par ordre croissant de sensibilité à l'eau de ces matériaux : construction légère sur fondations superficielles béton, plancher béton non c

Contest

Reasons for participating in the competition(s)

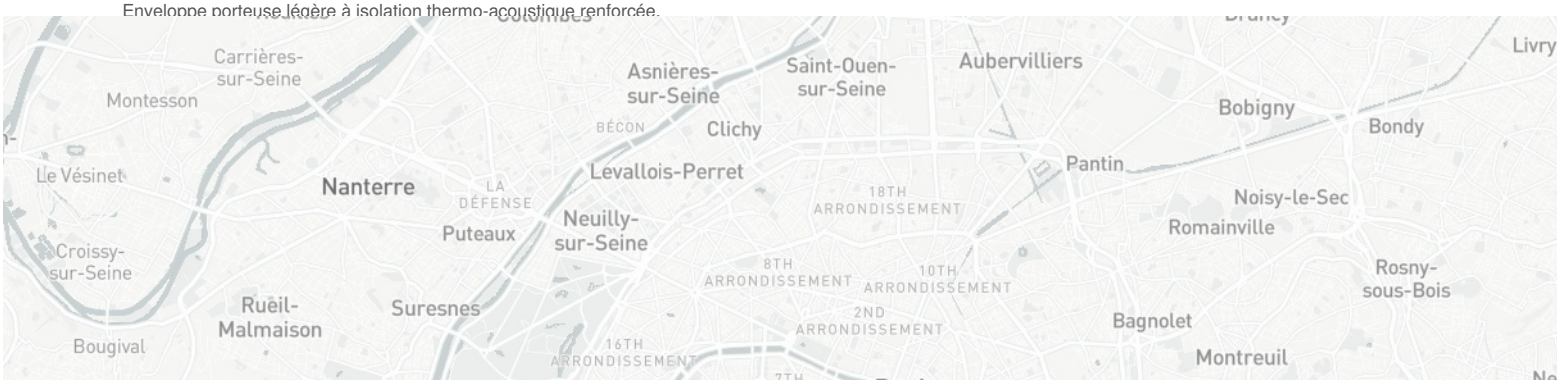
Construction en filière sèche et approche environnementale.

Il s'agit d'une construction légère par panneaux d'ossature mixtes bois-métal-béton, bas carbone, à inertie thermique et isolation renforcée. L'enveloppe des maisons avec ses larges baies vitrées est thermiquement performante, favorisant un apport solaire optimal tout autant qu'une protection solaire efficace.

RT 2012 : Perf conso nrj B et émission GES C.

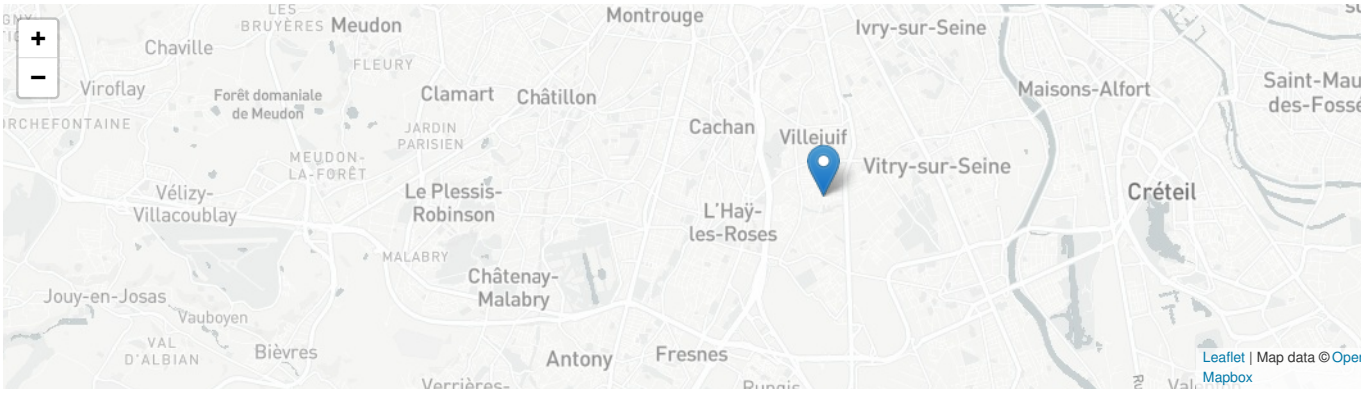
Filière sèche et limitation des déchets de chantier, déconstruction propre à terme.

Enveloppe porteuse légère à isolation thermo-acoustique renforcée.



Building candidate in the category

Bas Carbone



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