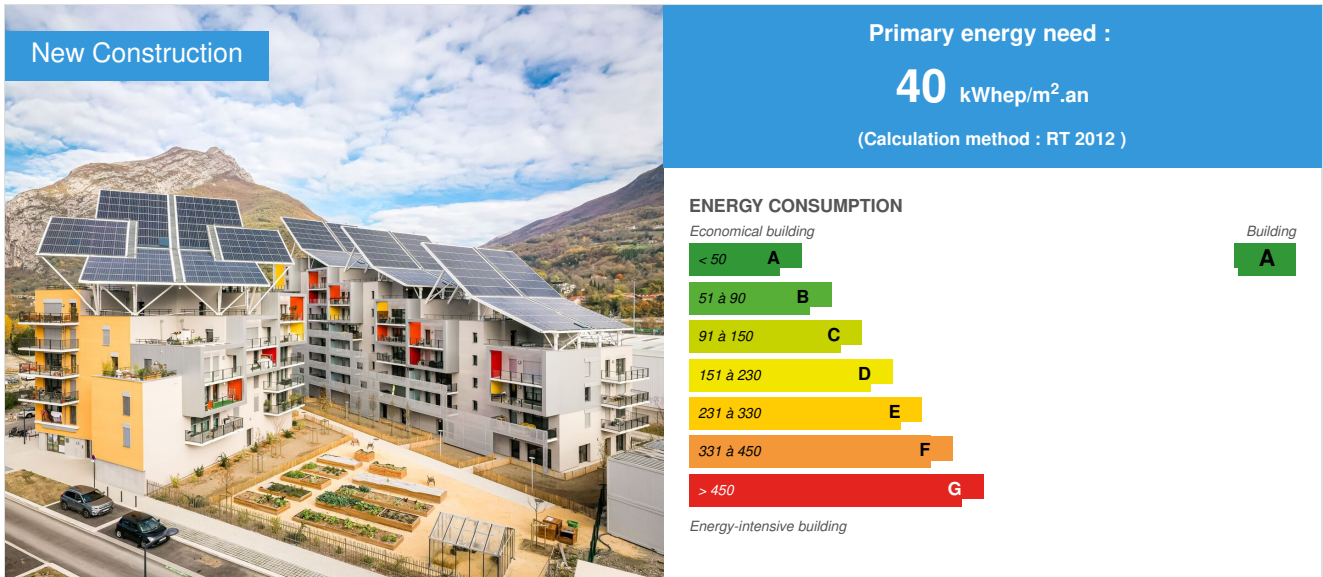


ABC building

by EMILIE TOURENNE / 2021-03-17 14:07:00 / France / 10319 / FR



Building Type : Collective housing < 50m
Construction Year : 2018
Delivery year : 2020
Address 1 - street : 2 rue Winston Churchill 38000 GRENOBLE, France
Climate zone : [Cwa] Mild, dry winter, hot and wet summer.

Net Floor Area : 5 000 m² SHON
Construction/refurbishment cost : 13 460 000 €
Cost/m2 : 2692 €/m²

Certifications :



General information

ABC consists of two buildings, representing a built area of 5,000 m², with 62 dwellings: 42 intermediate rental dwellings and 20 social rental dwellings. It aims to achieve unprecedented levels of water and energy autonomy. With 70% self-sufficiency, its objective is to **reduce its footprint on urban infrastructure by a factor of 4**.

Through this demonstrator, Linkcity is developing **a global approach to sustainable, self-sufficient housing with high social value, bringing together innovations that can be applied to the city of tomorrow**. Conceived by Bouygues Construction R&D and developed in partnership with Valode & Pistre architects, Suez and Bouygues Bâtiment, ABC proposes a self-sufficient habitat that integrates all the environmental, technical, economic and social aspects of tomorrow's housing.

The main challenges concerning design and construction

"In architectural terms, ABC is a new paradigm. Whereas buildings have always been designed in opposition to the natural environment to protect

themselves from rain, sun or wind, ABC buildings seek to capture the sun's rays, recover rainwater and draw the energy necessary for their operation from their environment." Denis Valode, Architect

Challenges met:

- **Architecture for performance and well-being;**
- A global, participative and **engaging approach;**
- An exemplary and **reproducible concept** (monitoring of innovations, instrumentalisation of housing, support for residents, analysis of the building's life cycle, study of uses in partnership with the University of Grenoble Alpes, etc.);
- A project with a **high partnership value** (in the development phase): work in collaboration with the region's economic and political players + involvement of local start-ups (ma petite poubelle, ma ville verte, popcorn workshop, etc.) / in the construction and operation phase: involvement of 100% regional companies as subcontractors).

Proposed solutions and innovations

The first autonomous building in France

ABC is aiming for levels of water and energy autonomy never before achieved in the context of collective housing in an urban centre:

- Division of water consumption by a factor of 3;
- 70% energy autonomy targeted;
- 60% reduction in final household waste.

Objective: to reduce by a factor of 4 the footprint of a collective housing building on urban infrastructures.

Residents involved and supported for 5 years

Finally, ABC includes a thorough reflection on the societal aspects:

- Pooling uses, encouraging exchanges and social links (integration of an entertainment area, shared vegetable gardens, etc.);
- Making the inhabitants actors of their consumption and autonomy while preserving a level of comfort in line with modern standards;
- Validate the acceptability of technologies related to autonomy.

Grenoble-Habitat has set up a specific awareness-raising system from the marketing phase, supported by Linkcity's teams, through the organisation of information meetings, open house events, visits to sample homes, and time to discover the facilities to encourage future residents to adopt the ABC concept. This support approach will continue over the next two years:

- Deployment of **training sessions for residents to learn how to use the equipment;**
- The aim is to guide and support residents in reducing their consumption, sorting waste and encouraging the co-construction of collective actions;
- Animation and assistance **in getting to grips with the 360 m² of shared gardens** with the association Cultivons nos Toits for all residents;
- 50 m² **educational showroom** explaining the ABC concept, freely available to the inhabitants of the demonstrator and accessible to all during visits organised by the City of Grenoble;
- A **digital application** developed by Bouygues Construction teams that allows each resident to monitor the consumption of their home and the behaviour of their building in real time on their smartphone. Sensors measure building performance in real time.

At the same time, for five years after its delivery, all the teams will remain mobilised to monitor and analyse the operation of the demonstrator and the uses of its inhabitants. This feedback will allow us to capitalise on the future.

Low environmental impact construction principles

The construction of ABC is based on construction techniques designed to minimise design and construction costs (digital mock-up, prefabrication and industrialisation) and the building's carbon footprint.

How is the project innovative or supportive?

24 months of work were necessary to implement this idea of an autonomous building. To make it efficient, **many innovative technologies** were integrated, both in its **design** (Weber cork insulation, Vicat low-carbon concrete, solar farm composed of 688 photovoltaic panels, triple glazing, etc.) **and in the daily life of its users** (Lancey battery-powered radiators, recycling showers, consumption monitoring application, A+++ household appliances, etc.).

Thanks to its thinking well in advance, ABC offers :

Exemplary sobriety

- Building with a passive envelope
- A+++ household appliances
- Energy-saving sanitary appliances and recycling showers
- Objective: to save 1/3 of consumption

Efficient use of resources

- RE production > "All purpose" consumption
- Use of harvested rainwater

Integration of the circular economy

- Self-consumption of RE, including battery storage
- Reuse of grey water in the building

- Recovery of heat from grey water
- Optimisation of household waste (sorting and composting)

In concrete terms:

- **The electricity produced by the solar farm**, managed by GEG ENEr, is **stored in batteries** so that it is available in the evening, when the inhabitants are present in their homes;
- Part of the energy needed by the residents is also recovered from **the grey water, which is recycled and used for the toilets** and common areas, while **the rainwater is collected, purified** and used for the homes. This system is based on a water treatment plant set up by Suez teams.

Key figures :

1,130 m² of photovoltaic panels
 180 bicycle spaces
 360 m² of vegetable gardens

Labels obtained

In terms of its environmental programme, ABC is aiming for certification and labelling that will give it national and international visibility:

- **WELL certification - housing / GOLD level:** focused on the well-being and health of users, this certification puts the inhabitants and their comfort at the heart of the project. The project is part of the "housing pilot" approach: ABC would be the first certified residential operation in France and Europe.
- **The carbon energy label (E+ / C-)** in prefiguring the regulatory provisions of the new regulations to come. For the contractual provisions, given the innovative and experimental nature of this certification, the commitment will be to achieve an Energy 3 / Carbon 1 certification.

In order to ensure the visibility of the project and the high level of skills required, a specific partnership was set up with the architects Valode & Pistre from the outset of the project.

Sustainable development approach of the project owner

The environment at the heart of the project - WATER component

Within the ABC project, SUEZ is in charge of the "water treatment" part through the production of drinking water and the recycling of grey water, all on site. In concrete terms, this means

- **Optimising drinking water consumption from the municipal network**

For the production of cold water, part of the drinking water from the municipal network is replaced by rainwater. This rainwater is made potable in a short loop, i.e. on site, and is used for human consumption as well as for the production of domestic hot water.

In this quest to optimise water consumption, part of the drinking water from the municipal network is also replaced by recycling grey water.

This recycled grey water is used to supply the toilets, but also as industrial water for cleaning the premises or for watering the green spaces.

- **The integration of a circular economy through the reuse of water on the site**

The demonstrator seeks to show the relevance of this system with a view to extrapolation and implementation on sites that do not have easy access to a local water network.

- **Energy optimisation**

Grey water, with a temperature of about 25°C, has a high energy potential which is exploited for the production of domestic hot water. Indeed, the buildings are not equipped with a traditional boiler room running on gas or oil but with a heat pump. This energy recovery reduces the carbon footprint by reducing the consumption of fossil fuels. The process envisaged is similar to the Degrés Bleus® technology developed by SUEZ.

- **The enrichment of databases on rainwater quality and the characteristics of grey water and recycled grey water**

All these data will make it possible to control the performance of the processes implemented. The analyses will cover about 150 parameters and will represent, in total, over the five years, almost 400 series of analyses.

The environment at the heart of the project - ENERGY component

ABC is aiming for a minimum annual energy autonomy of 70% and the achievement of a "BEPOS All Uses" level. To achieve this, the building relies on

- **Energy production from the photovoltaic panels offsets the amount of energy consumed**

For regulatory consumption (heating, domestic hot water, air conditioning, lighting, ventilation) and specific uses (cooking, refrigerator and freezer, dishwasher, washing machine and dryer, ironing, Hoover, small household appliances, as well as all consumption items from multimedia and communication equipment, etc.).

- The electricity consumption of the users (common parts and private parts) is similar to that of a conventional building with the conclusion of an **electricity contract with the energy supplier GEG**. The building and its uses nevertheless benefit from the low amount of energy required as a result of **the design of the building and the pre-equipment with low-energy equipment** (LED bulbs, kitchen equipment, etc.) and, consequently, a reduced consumption bill.

The environment at the heart of the project - WASTE component

The "Waste" component is based on proven good practices:

- **Sorting at source** will be encouraged by installing selective sorting bins in homes and by providing a Grenoble-based sorting aid application, "Ma petite poubelle", which assists residents in their waste management to help them reduce their waste production;

- **Giveboxes**, a self-service system where people can drop off items they no longer need, will be installed in common areas to create a place for exchange and sharing while promoting reuse;
- The organisation of **seasonal recycling stands** promoting the collection of textiles or toxic waste will be organised in the common areas;
- **Compost bins in the kitchens** as well as composters installed in the outdoor areas will encourage composting at the foot of the building and the use of compost in the shared vegetable gardens;
- **Bin weighing units** will be installed in each of the three household waste rooms in the project, making it possible to reinforce the involvement of residents in waste management and to measure it.

Architectural description

Architecturally, ABC is a new paradigm. While buildings have always been designed in opposition to the natural environment to protect themselves from rain, sun or wind, ABC buildings seek conversely to capture solar rays, collect rainwater and draw water. energy necessary for them to function in their environment.

ABC aims to constitute an urban habitat. It is also an opportunity to establish a new relationship with the inhabitant. Each architectural or technical solution is assessed against its social value. It is first of all a matter of looking at how it is an opportunity to facilitate the appropriation of places, to make the user more concerned by their environment, to facilitate conviviality and to adapt to the new forms of life that characterize the evolution of our urban society

If you had to do it again?

This is an experimental demonstrator which will be followed and which aims to initiate other projects. It is therefore good to do it again, taking into account the improvements that will appear necessary.

Photo credit

Nicolas Grosmond

Stakeholders

Contractor

Name : LINKCITY

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<http://www.linkcity.com>

Construction Manager

Name : VALODE ET PISTRE

Contact : Denis VALODE

<http://www.v-p.com>

Stakeholders

Function : Company

BOUYGUES BATIMENT SUD EST

Sophie Prudencio - s.prudencio[a]bouygues-construction.com - 07 61 01 29 93

<http://www.bouygues-batiment-sud-est.fr>

General Enterprise

Function : Thermal consultancy agency

NERCO

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<http://www.nerco.fr>

Thermal study office

Function : Construction company

SUEZ

Picard, Nicolas

<http://www.suez.fr>

Installation of the rainwater purification system and reuse of gray water

Function : Certification company

ELAN

CHARTIER, Sylvain 0661952474

<http://www.elan-france.com>

Certification E+C-, Label Well

Function : Site manager

GRENOBLE HABITAT

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Social landlord - purchaser of the VEFA

Function : Site manager

GEG

Grehant Sébastien 06 99 08 59 51

<http://www.groupe.geg.fr>

solar farm operator

Function : Structures calculist

Exact Acoustique

Laurent FAIGET (EXACT ACOUSTIQUE) 06 09 94 62 84

<http://www.exact-acoustique.com>

BE Acoustics

Function : Assistance to the Contracting Authority

ATELIER POP CORN

amélie mariller 06 88 78 12 89

<http://www.atelier-popcorn.fr>

AMO Control of uses

Function : Site manager

SEM INNOVIA

Frederic Cacciali 04 76 48 48 09

<http://www.grenoble-metropole-amenagement.fr>

Operator of the local area and the showroom

Contracting method

Off-plan

Energy

Energy consumption

Primary energy need : 40,00 kWh/m².an

Primary energy need for standard building : 85,00 kWh/m².an

Calculation method : RT 2012

Envelope performance

Envelope U-Value : 0,47 W.m⁻².K⁻¹

More information :

20cm cork insulation - triple glazed exterior joinery

Building Compactness Coefficient : 0,27

Indicator : EN 13829 - q50 » (en m³/h.m³)

Users' control system opinion :

An application has been created for users to allow them to monitor their daily consumption, this application is well used and we have a positive feedback from residents.

Renewables & systems

Systems

Heating system :

- Electric radiator

Hot water system :

- Heat pump

Cooling system :

- No cooling system

Ventilation system :

- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Heat pump

Renewable energy production : 100,00 %

Other information on HVAC :

Electric heating, individual double flow ventilation inspirai R for the intermediate building and collective for the social building, no air conditioning - double orientation of the housing to facilitate natural ventilation and improve the BBIO.

Solar farm on the roof, and aérothermal energy with heat pumps.

Solutions enhancing nature free gains :

Meilleure isolation, double flux, menuiseries ext triple vitrage sans entrées d'air, cuisines équipées électroménager A++.

Smart Building

BMS :

Building management system, Human machine interface, Analysis and monitoring of the building over 5 years

Smartgrid :

Implementation of energy storage batteries controlled by artificial intelligence allowing storage optimization and load shedding.

Users' opinion on the Smart Building functions :

Welcome back, the application is being used well and the occupants are happy to be able to monitor their daily energy consumption.

Environment

Urban environment

Land plot area : 2 537,00 m²

Built-up area : 57,00 %

Green space : 360,00

The ABC project is part of the development of the new district of the Presqu'île de Grenoble.

At the confluence of the Isère and the Drac, the Grenoble peninsula, historically dedicated to scientific research, is undergoing rapid change.

Far from turning away from this specificity which is part of its DNA and which gives it international renown, the Presqu'île is also becoming a real place of life, while seeing its economic dynamism strengthen Ecocity Labeling, the district is part of a process ambitious environmental goals or sustainable mobility and energy transitions are the key words.

Costs

Construction and exploitation costs

Global cost : 10 700 000,00 €

Reference global cost : 2 400,00 €

Renewable energy systems cost : 900 000,00 €

Global cost/Dwelling : 172580.65

Reference global cost/Dwelling : 2400

Cost of studies : 1 650 000 €

Total cost of the building : 14 600 000 €

Subsidies : 2 180 625 €

Additional information on costs :

The costs may seem high but this is due to the doubling of the installations, the fact that ABC is a demonstrator, all the innovations are reversible to return to normal operation.

Health and comfort

Water management

Consumption from water network : 1 700,00 m³

Consumption of grey water : 2 600,00 m³

Consumption of harvested rainwater : 2 000,00 m³

Water Self Sufficiency Index : 0.73

Water Consumption/m² : 0.34

Water Consumption/Dwelling : 27.42

Rainwater is collected on photovoltaic panels. Water of appropriate quality is stored in 2 concrete tanks under the technical room. They are then pumped and undergo 2 treatment steps (filtration on activated carbon then ultrafiltration). Chlorination ensures disinfection. This drinking water is sent to the homes using booster pumps. The gray water is collected directly in a heat-insulated tank, or in a concrete tank (Building B). Part of the water is treated using a membrane bioreactor. Chlorination ensures disinfection. This recycled water is taken up by a booster. Another part of the gray water is used for the production of DHW. After filtration, they pass through a heat pump where they transfer their calories to cold water which becomes DHW. This DHW is then stored in 2 tanks.

Indoor Air quality

Double flow AHU with carbon filters and specific location if the occupants have particular allergies

Use of Activ Air plasterboard to absorb formaldehydes

Air quality test as part of the Well

Comfort

Health & comfort :

Air quality test will be carried out during the operational phase

Acoustic comfort :

Exterior triple exterior joinery

Impact noise L_{ntw} 39

Noise from L_{naT} 31 equipment

External noise insulation D_{nta} - 57

Daylight factor : calcul flj

Carbon

GHG emissions

GHG in use : 1 030,00 KgCO₂/m²/an

Methodology used :

ELODIE

Building lifetime : 50,00 année(s)

Life Cycle Analysis

Eco-design material :

Use of low carbon concrete - replacement of 15% of clinker by pozzolan

Use of a cork-based exterior insulation from Weber

Use of exterior wood - aluminum joinery

Contest

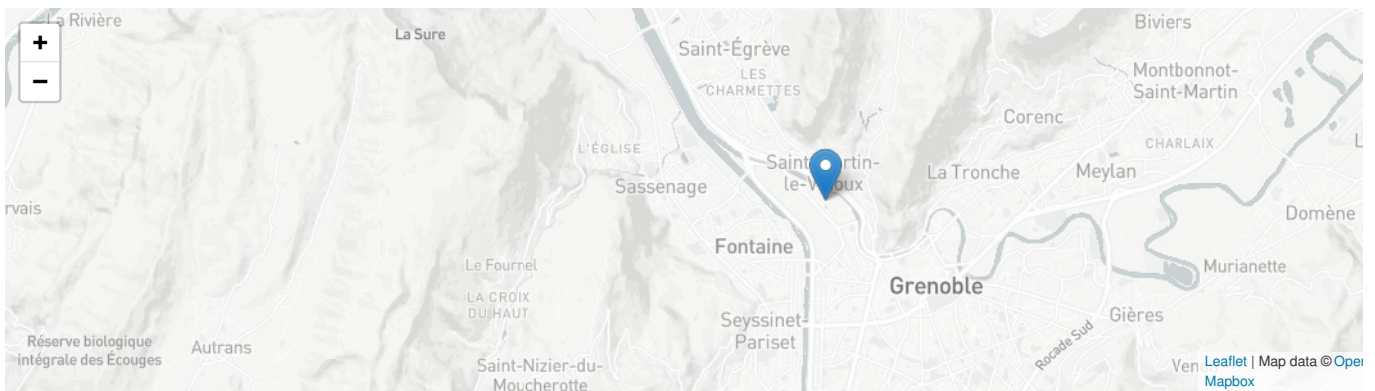
Reasons for participating in the competition(s)

- 70% Energy Autonomous Building
- Reduction of the carbon footprint through the use of bio-sourced materials
- Setting up a solar farm and achieving collective self-consumption - solar production > the annual consumption of the building
- Low consumption building 40 KWh / m² / year / SHAB
- Reuse of available resources - rainwater - heat recovery from gray water
- Monitoring of energy consumption via a Human Machine Interface and building analysis for 5 years
- Management of summer comfort through good insulation, a double east - west orientation and the installation of sun shades

Building candidate in the category



Energie & Climats Tempérés



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