

Press Kit

ABC: Autonomous Building for Citizens

BOUYGUES CONSTRUCTION INVENTS THE HOUSING OF TOMORROW



BOUYGUES
CONSTRUCTION

Shaping a **Better Life**

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Introduction

The ABC concept – standing for Autonomous Building for Citizens – is the result of Research and Development programmes carried out by Bouygues Construction in partnership with Valode & Pistre Architects. It seeks to achieve self-sufficiency in water and energy and to optimise waste management on the scale of a building or a neighbourhood, the aim being to dispense with connections to the traditional networks.

It incorporates the most technically and architecturally innovative solutions, optimises construction processes and introduces a new vision of housing based on “living better together”.

The first ABC (Autonomous Building for Citizens) concept demonstrator will be built as part of the Grenoble Presqu’Île eco-neighbourhood in eastern France.

Reasons for self-sufficiency and limits of network supply

As a responsible global player, Bouygues Construction designs and constructs buildings and structures and develops sustainable, innovative and efficient services. In conjunction with its customers and partners and through the dedication of its employees, the Group is contributing to the creation of a more harmonious living environment for the well-being of all.

The development of the ABC concept illustrates this ambition.

Bouygues Construction is proposing a new vision of housing, which will allow people to live better alongside one another, in harmony with the environment.

Today’s supply systems for water, electricity and heating are starting to reach their limits and are generating both a considerable wastage of resources and increasingly high costs of construction and operation:

- **Energy:** Approximately 7% of electricity generated is lost during transmission and distribution in France (source: RTE). Investments in maintaining, renewing and developing France’s electricity network cost more than €4 billion in 2012 (€1.3 billion for RTE and €3.1 billion for ERDF).
- **Water:** 24% of water is lost in the pipes: for every 4 litres of water entering the network, 1 litre is not distributed (source: eaufrance). In France, this amounts to 120 litres of water per person per day. The estimated cost of refurbishing all the country’s drinking water networks is €100 billion (source: Batiweb).
- **Waste:** Only 54% of household waste is currently recycled in France (source: ADEME – ITOM 2008). The cost of transporting organic waste that can be converted *in situ* could be saved.

The ABC concept: a global approach to sustainable housing

ABC is based on a global approach to sustainable housing that will revolutionise market conventions. The concept incorporates environmental, technical, economic and social aspects of the housing of tomorrow.

A for Autonomous

For the first time, the ABC concept aims to improve a building's performance in three key areas: energy, water and waste.

Self-sufficiency in energy

ABC aims for energy autonomy by combining:

- **Reduced energy consumption:**

- Thanks to the use of low-consumption equipment and effective system management within the building (presence detectors, etc.), the electricity consumption of an ABC building will be approximately 20% lower on average than that of a recently built traditional apartment (applying 2012 thermal regulations).
- Heat consumption will be reduced on average by 30% because the building envelope will be passive and heat will be recovered from wastewater.

- **Local energy production:**

- Using renewable energies, with energy sources chosen specifically for each project following a study of available resources. These may include:
 - solar panels
 - wind turbines
 - hydro-turbines
 - biogas
- For supplementary energy during the winter period, it will be possible to use cogeneration (fuel cell or biomass cogeneration), which produces both electricity and heat.

- **Energy storage:** massive energy storage facilities will accompany the energy production installations to offset the irregularity of renewable energies. Several systems are envisaged for both short-term storage (such as batteries) and long-term storage (hydrogen for storing electricity or thermo-chemical salts and phase-change materials for storing heat). To improve energy storage, Bouygues Construction will draw on Research and Development programmes conducted worldwide, such as the Eco2Charge programme.

These three solutions should make it possible to achieve self-sufficiency in energy, without any need for the residents to modify their patterns of energy usage.

Self-sufficiency in water

An ABC building must be capable of meeting all its residents' water needs using only rainwater resources. The architecture of the building therefore maximizes its potential for rainwater recovery.

Average rainwater resources in France amount to 20 litre per person per day. To achieve self-sufficiency in water, a solution has been designed on the basis of two complementary procedures:

- **A reduction of water consumption without residents modifying their water usage:** networks will be designed to avoid waste and more water-efficient appliances will be installed, enabling a reduction in water consumption of around 40% per resident, from an average of 120 litres per day to 75 litres.
- **The water cycle:** rainwater will be recovered thanks to vast capture systems, which will direct it into reservoirs where it will be filtered and treated to make it drinkable before being used in the building for purposes that require drinking water (kitchen sink, washbasin). The rainwater will then be recycled several times, for other predefined uses. Mature technologies such as microfiltration and UV lamps will be applied to make the water reusable.

Although the technical solutions exist, current regulations only authorise the use of rainwater for the specific purposes of watering plants and flushing toilets. The ABC concept will therefore have to demonstrate perfect safety in order to be able to propose changes to the regulations, offering the same level of guarantee for recycled water as for non-recycled water.

Optimisation of waste management

In France, every inhabitant throws away on average 375 kg of household garbage every year. The ABC concept aims to divide the quantity of non-recycled waste thrown away by three. Waste management will be optimised in several ways:

- **Improved waste sorting:** waste recycling is often badly carried out, resulting in a substantial potential for recycled waste estimated at 40%. The design of areas specifically used for waste storage and collection, along with communication on recycling, will incite residents to improve both the quantity and quality of their waste sorting.
- **Energy recovery from putrescible waste:** putrescible waste (bio-waste, food-soiled paper and card, sanitary products), which constitutes around 30% of domestic waste and sewage, has the potential to be methanised. It can be converted to energy in the form of biogas. The residue from the methanisation process can also be recovered for use as compost.

These measures will result in a reduction in household garbage generated annually to 100 kg per person.

B for Building

The global approach to housing characteristic of the ABC concept entails a comprehensive reworking of the act of construction, which requires building contractors to profoundly reconfigure their processes. The aim is to take inspiration from methods implemented in the industrial sector in order to build more quickly, more cheaply and with a better intrinsic quality of finish.

This is the first time that a collection of innovative technologies and areas of know-how have been brought together to enable the building to be freed from constraints imposed by networks while improving services to residents.

For the architect, Denis Valode, who has designed the demonstrator project, the ABC concept constitutes a radical departure. It is both “traditional”, in that it creates a context that encourages community life and contact between people, with a respect for nature, and “futuristic”.

C for Citizens

Changes in lifestyles, advances in society and national environmental commitments mean that we have to find a new way of designing cities and buildings.

The ABC concept looks beyond technical issues, and takes account of the new aspirations of citizens, who desire homes that are open to their environment, that are conducive to well-being. They want more space to be able to entertain their family and friends, garden areas, social rooms. The apartments will therefore be adapted to each form of usage, and specially equipped communal zones will encourage contact between residents and reinforce social links.

Social questions are at the heart of the ABC concept, which depends on the collaborative efforts and commitment of the residents to function. Constantly updated on their consumption, they share responsibility for achieving self-sufficiency.

Improvements to quality of life in ABC buildings will be principally based on:

- research carried out by Bouygues Construction in the Minatec Ideas Laboratory on the site of the CEA research centre in Grenoble or in the Group's Sustainable Construction Clubs (study on leisure time and the urban dynamic),
- innovations in housing developed by the Group (e.g. the Energy-Pass[®] tablet that allows residents in Bobigny to monitor their consumption),
- initial feedback from Energy Performance Contracts in housing (such as Vitry-sur-Seine),
- research and industrial partners in the Grenoble Presqu'Île EcoCité project, within which the ABC concept demonstrator is incorporated.



The first ABC demonstrator in Grenoble

In order to bring this concept to life, Bouygues Construction has joined forces with a partner sharing the same spirit of innovation: the first ABC demonstrator will be built in Grenoble, which was ranked the world's 5th most inventive city by Forbes in 2013.

Michel Destot, Mayor and MP of Grenoble, and Yves Gabriel, Chairman and Chief Executive Officer of Bouygues Construction, have signed a research, development and innovation partnership agreement for the construction of an experimental demonstrator in the form of a block of approximately 90 apartments that will aim to achieve self-sufficiency in water and energy and optimised waste management.

Between 30% and 40% of this complex will consist of apartments for social housing rental and private rental. For a period of five years, the performance of the apartments will be closely monitored and support will be provided for residents.

The ABC demonstrator in Grenoble will be specific to the geographic and climatic characteristics of the site where it will be built. The technologies that will be used to achieve the environmental performance and comfort for users will be industrially producible and repeatable, in order to limit costs and encourage the development of businesses creating new jobs. ABC is a concept that welcomes external expertise, whether drawn from technical, economic or social sectors.

In addition, the concepts and components of the technological showcase of French know-how will be exportable, particularly to countries that have no existing infrastructure networks but face a need to provide housing for their populations without increasing their energy dependency or exhausting their water resources.

Through this project, the two partners are pooling their know-how in sustainable urbanism and architecture in the case of the City of Grenoble and in sustainable construction in the case of Bouygues Construction. Their goal is to anticipate the city of tomorrow, offering a high level of comfort and a low environmental footprint.

Grenoble, the city of tomorrow



The first ABC demonstrator will form part of the wider context of the Grenoble Presqu'Île joint development zone. It will be at the heart of the urban demonstrator of the city of tomorrow, integrated in the EcoCité programme by the City of Grenoble. Standing on a 250-hectare site, the Grenoble Presqu'Île will clearly focus on the future, with the three aims of creating a city that is more human, more attractive and more inexpensive; a new relationship between nature and the city; and housing that can continually change and evolve to meet the needs of people of all ages.

Innovations in the Grenoble Presqu'Île EcoCité programme include a systemic vision of urban planning which incorporates issues of uses and services and of bringing nature into the city for the benefit of the residents and their comfort right from the design stage of the neighbourhood; a global approach to mobility with a comprehensive multimodal offer operating interactively according to traffic and a single "Mobility Pass" subscription; and a global positive energy target for the neighbourhood with non-fossil fuels and energy recovery directed by a multi-fluid smart network (Smart Grid) in which residents become energy producers and players in the energy balance of their neighbourhood. The Grenoble Presqu'Île project, awarded the EcoCité label by

the French government, intends to become a showcase for the city of tomorrow. The construction of the first 500 homes, 30% of which will be for social rental occupancy and 10% for social ownership, as well as a Mobility Building, will be launched in late 2014, with handover running between 2016 and 2018. The ABC project is perfectly consistent with the principles of innovation and sustainable development that characterise the Grenoble Presqu'Île EcoCité programme.

A word from Denis Valode of Valode & Pistre Architects



"Architecturally speaking, ABC is a new paradigm. While buildings have always been designed in opposition to the natural environment to provide protection from the rain, the sun or the wind, ABC buildings do just the opposite: they seek to capture sunlight, recover rainwater and draw on their environment to acquire the energy they require to function.

The intention of ABC is the creation of an urban habitat. It also gives an opportunity to establish a new relationship with residents. Every architectural or technical solution is evaluated in terms of its social value. In the first place, we consider to what extent it promotes appropriation of the space, makes the user feel more concerned by his or her environment, makes social contact between people easier and helps them adapt to the new forms of living that characterize the changes that are occurring in our urban society."

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