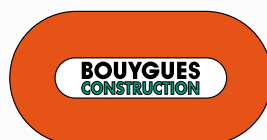




THE AMBITION **OFF-SITE**

Our approach to off-site
construction today and
tomorrow



BUILDING FOR LIFE

EDITORIAL

Tailor-made industrialisation, digitalisation, logistics, supply chain, off-site components...

A new vision of how to build

Off-site construction continues to develop, both in France and internationally. Stimulated by new technologies and new processes, it is now delivering real benefits, particularly in terms of decarbonisation, lead times, quality, and working conditions. For decades, Bouygues Construction has increasingly used off-site construction in all its forms.

Convinced that there is still a great deal of potential to be exploited, we are constantly innovating to bring together off-site, digitalisation, logistics and supply chain management in a comprehensive approach to industrialisation.



Philippe Jouy
Chief Executive Officer of
Bouygues Bâtiment France

Pierre-Éric Saint-André
Chief Executive Officer of
Bouygues Bâtiment International



“ Off-site construction means moving the production of building components to a factory and then assembling them on site ”

La force de la construction hors-site :

- Massification of **low-carbon and bio-sourced materials**
- Quick **turnaround on site**
- Better control of **quality, deadlines and costs**
- Increased **productivity**
- Reduction in **disturbances** to site vicinity
- Better **waste management**
- Improvement in **safety and working conditions**
- Boosting **the attractiveness** of the sector

20% of the world's buildings are expected to be built off-site by 2030*

* McKinsey study, 2019

Off-site solutions tailored to each project

We take an open and hybrid approach to off-site construction. With the support of our network of industrial partners and our in-house expertise, we are able to bring together and integrate a wide range of solutions:



Multiple products

Housing, offices, public facilities... new or refurbished.

Multiple materials

Concrete, wood, metal, biosourced or geosourced materials...

Multiple components

Façades, bathrooms, 3D modules, balconies, systems...

Multiple finishes

Finished or semi-finished, modules with or without fixtures & fittings...

Depending on the needs of each project, we are able to implement **all types of components defined by the Off-site Construction guidelines** (a working group of project owners who have signed the Charter for Off-site Construction):



1D components
(posts, beams...)



2D components
(walls, floors...)



3D components
(modular systems...)



Non-structural components
(bathrooms, service ducts...)

This approach enables us to address a **wide variety of challenges and objectives**, such as scalability, speed, adaptation to urban contexts, and compliance with technical, regulatory, and architectural constraints...



Accelerating the conditions for development

At Bouygues Construction, the development of off-site construction is organised around 5 key areas:

1

Anticipating and making design more reliable

Stabilise upstream studies by encouraging greater collaboration between clients, project managers, construction companies and manufacturers, right from the design phase. This anticipation enables us to identify industrialisation processes and bring onboard the right partners at the right time.

2

Industrialisation without standardisation

Standardise the invisible elements of the building to create the right conditions for replication while preserving the value and originality of the architecture. Our solutions can be configured to suit all types of projects.

3

Digitalising processes

Develop the use of digital tools in the design and production processes to improve the precision and coordination of projects and better control risks.

4

Structuring a logistics approach

Optimising flow management to supply construction sites with the right components, in the right place, at the right time. These sites become assembly points for solutions identified upstream and configured according to the project's needs.

5

Involving the entire supply chain

Supporting skill development for all stakeholders, contributing to the strengthening of the sector, and defining appropriate ways of working together.

Multi-disciplinary, high added-value expertise

Our cutting-edge expertise helps to anticipate, streamline and ensure the reliability of the integration of off-site solutions, in continuous collaboration with the project management and client teams:



A multidisciplinary engineering team
of over 1,000 employees.



A team dedicated to **innovative industrialisation.**



A centre of excellence in **wood construction** and **bio-sourced and geo-sourced materials.**



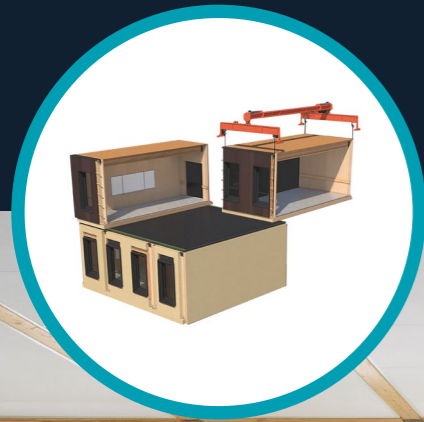
A network of 15 experts in **site logistics.**



Our innovative solutions

Modular wooden classrooms

To meet the needs of local authorities in education and address climate change challenges, Bouygues Construction offers an innovative solution of modular classrooms made from bio-sourced materials. **These classrooms, built and pre-equipped off-site** at our partner's factory, are ready to be deployed for all school projects.



ByWall: the industrialised insulating envelope

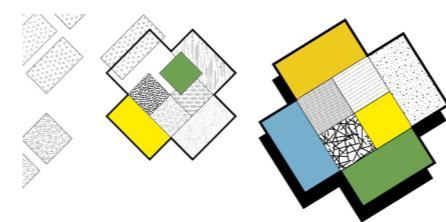
Bouygues Construction has developed **a concept of prefabricated, portable insulating façade panels made from bio-sourced materials** (wood for the structure, cotton wool for the insulation) to contribute to the large-scale energy-efficient renovation of housing.



CONTRIBUTIONS

Bouygues Construction, signatory to the Charter for the Development of Off-Site Construction

Initiated by contracting authorities in the Paris region, we are committed to working towards a profound change in the way we design and build, while respecting architectural creativity and the quality of construction. In this way, we intend to support the development of the off-site sector nationwide.



CONSTRUCTION HORS-SITE

Our industrial partners



Off-Site Campus partner company

As a member of the partner network, Bouygues Construction is helping all stakeholders involved to develop a sustainable off-site construction and renovation sector in France.



An opportunity to transform construction trades

With the development of off-site construction, the work of our craftspeople is enriched with new skills (wood construction, architectural trades, digital tools, etc.) and becomes more versatile. Factory production, in turn, offers better working and safety conditions, and helps to restore the attractiveness of the construction industry.



OUTLOOK

Moving from a site-based approach to an industrial approach



Prefabrication and off-site construction are just the first steps on the road to a more advanced industrialisation that will significantly transform our profession.

This means thinking of the building as a **collection of components** rather than as a collection of materials. The sector needs to move away from a purely bespoke approach, towards a **process of assembling configurable and mass-produced building blocks**. Only visible elements (façades, architectural trades, etc.) continue to be subject to specific treatments.



Made-to-measure approach
Assembly of materials on site



Off-site approach
Assembly of prefabricated components specifically for the project



Industrial approach
Assembly of standardised, prefabricated components in series

Ultimately, we draw inspiration from industries such as automotive, information technology, or aerospace, where each manufacturer assembles finished or semi-finished elements, mostly produced by equipment suppliers, manufacturers, or engine makers. With the Bryck approach (see opposite), **we are developing the same approach for buildings.**

Many buildings share common elements such as landing ducts, staircases, walls, slabs, and so on. By breaking down our buildings into «building blocks» and then industrialising their manufacture, **we can radically transform the production process.**

The ability to configure these components remains fundamental to adapting to the diversity of projects. However, their variability must be limited in order to create the conditions for replication required by industrial manufacturers. The aim is not to standardise, but to be able to adapt to specific geometries and requirements, while **preserving the benefits of industrialisation** (productivity, costs, quality, etc.).

BRYCK NEW WAY TO BUILD

This revolution is being led as part of «Bryck, new way to build», an unprecedented initiative launched in 2019 in partnership with Dassault Systèmes. Project teams are working on the technical development of around twenty building blocks and a digital platform for design, collaboration and project tracking.



Romain Vondière

Bryck and Industrialisation Project Director - Bouygues Construction

« Bryck is our approach to industrialising and transforming our profession. It aims to improve our productivity and decarbonise our activities by addressing the challenges of off-site construction, logistics, purchasing, prefabrication and digitalisation.

To achieve this, we use the digital twin of a building, breaking it down into 2D and 3D building blocks, known as industrialisation bricks. These are standardised elements incorporating as many building finishes as possible, which we can prefabricate off-site in factories run by industrial partners or near our construction sites in micro-factories. »

PROJECTS

Major references around the world



Scaling up at the right pace

Unik

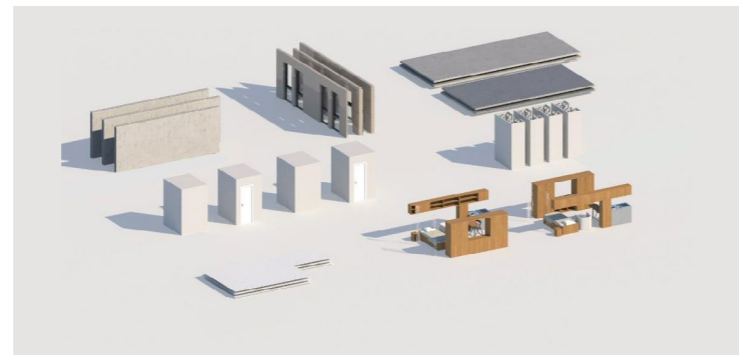
Multiple sites (France)

Client: Ministry of Defence

Construction of 65 residential buildings with between 25 and 130 beds, spread over 43 sites.

7 to 12 months of on-site work (depending on size) is required to complete each operation.

This performance is made possible by standardised design, extensive use of off-site construction and industrial partnerships.



Pierre Maurette
Agence Vincent Lavergne Architecture Urbanisme

« Unik pushes the boundaries of traditional construction by combining industrialised solutions with the specific needs of the army, with particular attention paid to the sustainability and functionality of the spaces. »

Getting ready for the start of the academic year

Riverside

Canterbury (United Kingdom)

Client: Canterbury City Council / Linkcity UK
Architect: PRC Architecture

A 491-room student residence made up of 430 prefabricated modules built in a Bouygues Construction factory in Morocco. The building was delivered after 9 months of on-site assembly.

14 weeks saved when compared with traditional construction methods.

OFFSITE AWARDS 2022 WINNER



Responding to the health emergency

Consultation Centre

Villefranche-sur-Saône (France)

Client: Villefranche-sur-Saône Hospital - Architect: CRR Écritures Architecturales



Construction of a hospital building made up of 200 modules manufactured off-site to optimise patient flow following the Covid crisis.

8 months elapsed between the installation of the first module and the commissioning of the new centre.



Lawrence Wong

Minister for National Development and Second Minister for Finance in the Government of Singapore

« The government commends the dynamic approach of Bouygues Bâtiment International, positioned at the forefront of the drive to increase productivity in the construction sector. »



SEE THE PROJECT
IN VIDEO

Adapting to local requirements

Clément Canopy Singapore

Owner: UOL Venture Development (Clément) Pte Ltd
Architect: ADDP Architects

In Singapore, Bouygues Bâtiment International built Clément Canopy: two 140-metre residential towers made of 1,900 concrete modules using the PPVC (Prefabricated Prefinished Volumetric Construction) process. The use of this construction process cut lead times in half.

2 tallest modular towers in the world
with 40 floors and 505 flats over an area of 46,000m².

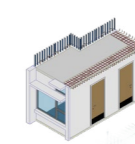
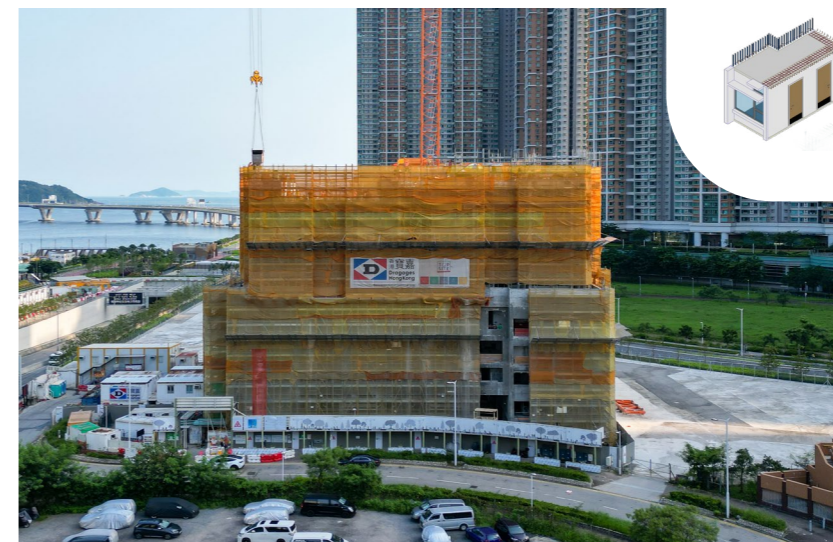
In Singapore, the government requires at least 65% of a building's construction process to be carried out off-site.



Building better and faster

Tseung Kwan O Hong Kong

Client: Architectural Services Department



The project comprises a fire station and ambulance depot, topped by a modular residential complex of 132 homes over 12 storeys. 80% of the structure is built using the Modular Integrated Construction (MIC) process.

648 modules have been implemented to meet quality and schedule requirements.

Securing deadlines

Prison projects

Multiple sites (France)

Client: APIJ

Construction of prison cells in concrete modules entirely manufactured and fitted out off-site by our teams.

1800 modules

are already produced or in the process of being produced in a specially designed factory.

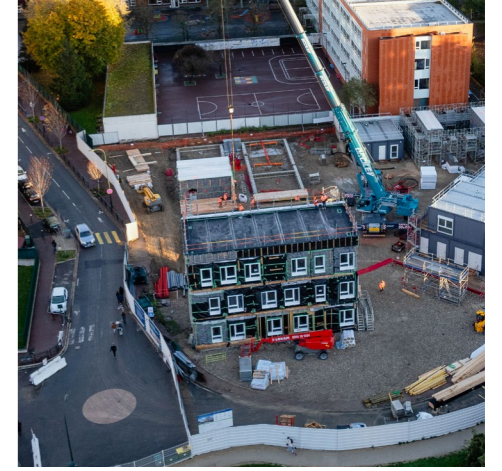


Temporary reception

Wooden modular school

Bagneux (France)

Client: Hauts-de-Seine Departmental Council
Architect: Atelier B2A



Construction of a temporary secondary school using over 100 prefabricated wooden modules by our partner TH.

The project incorporates almost **130 kg/m² of bio-sourced materials.**

A structure that can be dismantled and **over 80% of which can be reassembled.**

Renovating while limiting disturbances

Camus

Multiple sites (France)

Client: Maisons et Cités
Architects: BLAU / Red Cat Architecture

Energy renovation of 1,412 homes using the ByWall process (see p8). Building façades are renovated and insulated using prefabricated factory panels. Combined with an advanced logistical approach, this method saves time while minimising intervention time on-site.

7000 trucks and 315 tonnes of CO₂ avoided.



Getting ready for the start of the academic year

Student residence

Cuffies (France)

Client: OPAL de l'Aisne
Architect: Moon Architectures



Freddy Grzeziczak
Chairman of l'OPAL de l'Aisne

« This approach not only reduces our ecological footprint, but also enables us to offer quality homes that are quick to assemble and perfectly suited to the needs of the region and its residents. »



Adapting to a restricted site

Residence Paris Nation

Paris (France)

Client Gecina
Architect: Mars Architectes

The construction of 13 dwellings in the heart of the inner courtyard of a Parisian residence, made from 2D prefabricated wood modules (posts, beams, façade elements...).

Shortening lead times

Lilo

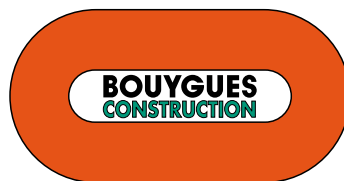
Puteaux (France)

Developer: Nexity
Client: FREO Group
Architect: Axel Schoenert Architectes

The construction of a residential building with 645 homes across 11 floors. This project is one of the pilot projects in the Bryck approach (see p10-11).

610 prefabricated bathrooms were installed to meet scheduling deadlines, with 153 days of production carried out off-site.





BUILDING FOR LIFE

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