StoraEnso

Partner of Stora Enso

WO2

Arboretum
Nanterre, France

Welcome to Arboretum - the largest solid wood complex under construction in Europe, and could be a turning point in the development of construction.

You can trace a thread through the history of architecture where a new material or construction methods changed the course of urban design. Breakthroughs, such as bricks and cast iron, changed how we live forever as new structures like skyscrapers and long-span bridges took shape. But, for a new architectural style to become mainstream, it takes much more than launching a new material.

Like any widespread positive transformation, at least five factors are required. They are not complex, but the following have proven over time to be essential ingredients in making long-lasting transformations:

-Simplicity and ability to be easily repeated

-Sustainable, affordable, and accessible to all

-Aligned with climate and cultural needs

-Relatively rapid process

-Enjoyment for users

Located on the River Seine in Nanterre, Paris, Arboretum reimagines the concept of an urban office block and challenges many ecological, economic, regulatory, and technical possibilities of using sustainable wood for large-scale structures on the largest scale to date. More importantly, Arboretum interconnects all five essentials of how we could all be building for generations to come.

SIMPLICITY AND ABILITY TO BE EASILY REPEATED

Ground-breaking achievements can only catch on if they can be easily duplicated. Arboretum, while on first blush, might look complicated with five interconnected buildings with 125,000 m² of offices and services, including eight restaurants, a conference centre including an auditorium, sports club and three 200 m² of vegetable garden and orchard space surrounded by forest and bike paths, it is in fact based on a straightforward floor beam structural system.

The installation process was unfussy due to the very smart design from stakeholders and could easily be replicated using glued-laminated timber (GLT/Glulam) beams and cross-laminated timber (CLT) floors that slot together. Prefabricated, off-site construction dramatically reduces waste, making it a sustainable building method. The components are cut to size in a factory before they are transported to the building site.

While WO_2, Mathis Construction Bois, and Stora Enso are world-renowned experts in low-emission building, many of the collaborators on this project had no prior know-how of working with wood. The ease and simplicity of the design meant that everyone from city officials to new apprentices could quickly cooperate with the material and building method even during the pandemic and while labour shortages remain high.

SUSTAINABLE, AFFORDABLE, AND ACCESSIBLE TO ALL

Typically, new office blocks consist of massive amounts of concrete and steel, which are a large part of why construction and use of buildings amounts for a staggering 37% of all global energy-related carbon dioxide emissions (UN Environment Programme). And a third of all the European Union's yearly waste by weight is generated by construction debris! So, for a building to pave the way for the future, sustainable materials that are readily available and affordable are in high demand. Arboretum consists of 32,400 m³ of solid wood from sustainably managed forests-a material accessible to all that keeps growing back. 20,686 m³ of that is from Stora Enso's Sylva™ CLT kit. The total carbon footprint to produce the wood Sylva kit was 1,088 tonnes of CO_2e but if the non-renewables had been used instead such as steel and concrete (the most common construction materials today) it would have emitted, 23,644 tonnes of CO_2e (SLU). When we consider that we need to get to net zero emissions to stop global heating, every kilogram counts a lot.

CLT is a mass timber product steadily replacing concrete in modern construction. It is a particularly popular solution for floors, roofs, walls, and stairs due to its strength, appearance, and versatility. Several layers of solid wood bonded with a structural adhesive make it lightweight and exceptionally strong. The real genius of building with mass-customised elements like Sylva™ (prefab walls, floors etc.) is that you can pre-order ready-to-fit building doors, walls and roofs delivered just in time to a construction site, increasing efficiency and cutting down on construction costs.

ALIGNED WITH CLIMATE AND CULTURAL NEEDS

The planet will add floor space the size of New York City every month until 2060 (Global Alliance for Buildings and Construction). Many are rightfully concerned that new buildings will end up literally costing us the Earth. If we continue to build at the same rate and in the same way, that number could double. Today less than 1% of buildings are net zero. Arboretum's CLT frame, in contrast, is in step with the rising demand for low emission architecture.

OTHER ENVIRONMENTAL STATISTICS INCLUDE:

-all of the wood provided by Stora Enso is third-party verified from sustainable sources and PEFC Certified from Central European forests.

-no part of the trees harvested went to waste. What wasn't used to make the CLT in Arboretum was used to make other sustainable wood-based products and bioenergy.

-the forests where the wood came from to build Arboretum were duly regenerated with seedlings and retention trees using native tree species suitable to the soil type.

-80% less transport emissions. CLT is light-weight as a construction material so it requires 80% fewer transport emissions than concrete (Waugh Thislton Architects). Arboretum had 480 deliveries but with non renewables like steel and concrete that number could have been 1,920 polluting vehicles in the urban centre of Paris.

-Arboretum is designed to be long lasting. If the occupant's needs change in the future, the mixed-use design concept is so flexible and adaptable that it can be repurposed instead of demolished (which is so hard on the planet).

-47% less carbon emissions over the campus lifecycle (cradle to grave, including carbon storage from the wood) compared to conventional construction, as calculated by WO2 based on the methodology from France's Association for the Development of Low Carbon Building (BBCA).

-Construction upholds the latest city and Federal environmental policies (some of the most advanced and ambitious in the world) such as the RE2020 building environmental regulation. This is reflected in Arboretum's design specifications for an excellent rating by the BBCA.

-43% of energy consumption compared to the French Tertiary Decree 2030

-15,762 tonnes of carbon dioxide was removed from the atmosphere while the trees were growing and are now stored in Arboretum for the duration of the building's lifecylce. That's the same as 2,010 European's carbon footprint in a year.

Planned environmental efforts include:

-80 tonnes per year of bio-organic waste transformed on-site into 16 tons of compost

-20,000 m³ of drinking water saved per year through the use of rainwater

RAPID PROCESS

When investors Ivanhoé Cambridge and Icamap decided to build all five towers of Arboretum at once, the project delivery time needed to be quick to see a return on investment and this was only heightened as the pandemic brought an increased demand for remote work. On-site construction with mass timber is often five times faster than building with steel or concrete but building with wood on this scale has never been done before (Leclercq Associés). Although Stora Enso digital tools and building solution planning confirmed it was possible, how exactly a project of this scale would be completed within sixty weeks was yet to be seen. The job required delivering around eight x 50m³ loads of precision-packed wood materials from Stora Enso mills every week for one year and two months. Only the exact elements required at that stage of the build needed to arrive JIT.

One of the experts that was key to the success is Susanne Andersson, Stora Enso's Supply Chain Coordinator for North/West Europe. She was the logistics coordinator for the 480 flat-packed JIT shipments of sustainable CLT. 'In all that time only two pieces were not correct,' said Andersson. This successful result is a testament to the high level of collaboration among everyone involved in the project and the dedication of each team member, from the forests to the sawmills to project management. Reflecting on the process, WO_2 remarked, '...it is such a luxury to work with Stora Enso'.

ENJOYMENT FOR USERS

At the heart of the design was the office workers' well-being. Architects Nicolas Laisné Architectes, Dimitri Roussel, and Leclercq Associes worked to ensure that over 1,000 new trees were planted in the park around the buildings to create a true arboretum. The extensive vegetable garden and orchard will cater to the eight restaurants. The sports centre, 40km of routes for pedestrians and cyclists and an outdoor amphitheater will further enhance the physical and educational well-being of the occupants. Within the offices, François Leclercq, a partner architect with Leclercq Associés was deliberate about the biophilic (connecting to nature) effect on the individuals using the space. We 'wanted to break with the traditional codes of closed offices: with spacious ceiling height, direct access to nature for each workstation, these offices mark a new stage in the relationship between employees and companies.'

The office floors go up to 4,000 m² and are designed so that they can be repurposed over time using a modular frame. The interior spaces are flexible, warm and bright with 3.10 m of ceiling height and 2.5 m of glazing. Furthermore, research has proven that anyone who has ever worked in an exposed wood building felt that wood improves comfort and reduces stress. Hundreds of workers have already traded their pandemic home offices and signed up for a spot in the 350,000 m² of office space, proving that this is so much more than a place of work. It is a community by design. In short, Arboretum demonstrates the very latest in what is possible with industrial processes to reduce the embodied emissions from buildings by utilizing wood. Efficient construction employing prefabricated CLT have never been taken to this scale before in Europe. The results breathe fresh thinking and optimism for a new low-carbon architecture for all in the future.

SPECIFICATIONS DESIGNED TO MEET:

BBCA (Low Carbon Building) Excellent level and level E2C2 of the E+C- label

Watch a video about this project and the rise of mass timber construction

Learn more about the benefits of building mass timber Download the 2024 whitepaper

General

Delivery year

2023

Building type

Office

Area (m²)

125,000

Storeys

5

Units

5



Photo credit: ©Patrick Raffin /Mathis Construction Bois



Photo credit: Arboretum - WO2 ©Patrick Raffin

Products

Products and Services

Sylva™ CLT Floors and Roofs

Product quality

Precoated with insecticide

Product volume (m³)

20,686

Number of deliveries

480

StoraEnso

Team

Partner of Stora Enso

WO2

Developer

Investor: Ivanhoe Cambridge
Investor: Icamap
Developer: WO2

Architect

Nicolas Laisné Architectes
Leclercq Associes
Dimitri Roussel

Structural Engineer

Terrell Group

MEP Designer

Interior design of collective space: Saguez & Partners

Main contractor

GCC

Specialist Timber Subcontractor

Mathis Construction Bois