StoraEnso

Partner of Stora Enso

lendlease

International House Sydney Sydney, Australia

Australia´s first wooden office building at Barangaroo, Sydney was built with CLT by Stora Enso (2 454 m³) and Glulam (951 m³) . The office building called International House Sydney has won numerous awards including the prestigious Athenaeum and European Centre for Design Award for International Architecture.

International House in Sydney is Australia's first multistorey engineered timber office block.

It is located in the lively central business district of Barangaroo at the old Sydney Harbour - an area that, with its old quay and since demolished warehouses, has a long history of timber construction. The client (Lend Lease) had several reasons for choosing timber for the building: timber building sites are usually dry and generate very little dust or noise. A second reason was that people in neighbouring buildings, working on the site or passing by would experience less disturbance and, if they did, it would be for shorter periods Moreover, timber binds CO_2 and promotes the good health and well-being of the building users. In addition, the design for the office building involved a new type of hybrid beam made from beech laminated veneer lumber (LVL) and spruce glued laminated timber (GLT). Timber is used not only for the load-bearing structure but also for the building interior.

Ceiling and wall surfaces are left unclad and the lift shafts and stairwells are also constructed in timber. Timber surfaces define the atmosphere in all the interior rooms - with the exception of the sanitary areas. Furthermore, the material is a key component of the sustainability concept, as are the reused timber bridge beams in the columns on the ground floor, the PV modules on the roof and the LED lighting. **Structural concept** Structurally the International House Sydney consists of a single-storey concrete plinth with an intermediate floor and five office storeys above completely built out of GLT and cross laminated timber elements. GLT diagonals in all four facade planes provide the stiffening to the building. Columns out of recycled timber

The Y-shaped colonnade columns at the two retail storeys are comprised of a lower concrete component and two upper Australian eucalyptus (ironbark) timber elements. The latter are 420 ≈ 420 mm in cross section and each consist of four recycled timber beams recovered from disused railway bridges in Queensland. The columns form a compound section in accordance with Eurocode 5 with shear ring connectors and orthogonally crossed through bolts.

Hybrid beams out of soft- and hardwood The limited building height and the need to route building services pipes and ducts through the beams called for an innovative solution for the beam construction. Working with the timber suppliers Stora Enso and Hess Timber, and the Materials Testing Institute (MPA) at the University of Stuttgart, the structural engineers developed a hybrid solution out of particularly high-strength beech LVL and normal grade spruce GLT. The 480 ≈ 800 mm beams each consist of three GLT components, between which are sandwiched two vertical bands of LVL extending over the whole height and length of the member. T

he structural engineers used finite element analysis to model the stress distribution in the beams, in particular around the services penetrations. Physical tests to confirm load capacities and behaviour in fire were also carried out. The penetrations through the beams are much larger and the distances between them much smaller than the current guidelines - e.g. DIN EN 1995-1-1-1/NA and Eurocode 5 - recommend. MPA Stuttgart performed tests on sample beams to confirm the analyses and investigations during the preliminary design. The test results not only confirmed the accuracy of the finite element analyses but also showed that the penetrations through the beam did not adversely affect their behaviour under load, thanks to the two LVL bands. Prefabrication close to the site Because of the shortage of space on site and to reduce crane usage, the contractor decided to preassemble some of the timber components at an assembly works near the Barangaroo district and transport them as larger elements to the site. Prefabricated timber components manufactured in Europe were sent directly to the assembly works in order to reduce the need for storage on site. The timber lift cores and diagonally braced facade bays were preassembled off site and lifted into their final positions as complete elements.

This optimised the use of the main crane and increased the speed of the fitting out and services installation work. Learning processes during construction even though not one member of the installation team had any previous experience with prefabricated timber elements, the speed of installation improved from eight elements per day at the start of construction to a final rate of thirty-three elements towards the end. After an initial familiarisation phase, the 1,300 m² storeys were being completed at a rate of one per week - including all the GLT beams and columns, and the CLT walls and ceilings.

Text by Tim Bultlera structural engineer who was responsible for the design of the prefabricated timber structures for this and many other projects worldwide.

Awards

Australian Timber Design Awards 2017

- Grand Prix award
- People's Choice award
- Public or Commercial Building category
- Sustainability category
- Excellence in Timber Design
- Excellence Award for Public or Commercial Building
- Excellence Award for Sustainability

Property Council of Australia's Rider Levett Bucknall NSW Development of the Year 2019
- Commercial Architecture

World Architecture Festival 2018
- Best Use of Certified Timber in Commercial Architecture

Urban Task Force Excellence Award for Sustainable Development 2018
- Commercial Architecture

World Architecture Network 2019
- Commercial Project under 50,000sqm (Silver) Award
- Wood in Architecture (Silver) Award

Property Council of Australia 2019
- Australian Development of the Year Award
- Best Office Development in Australia Award

AIA National Award for Commercial Architecture 2018

AIA (NSW) 2018
- Milo Dunphy Award for Sustainable Architecture
- Sir Arthur G. Stephenson Award for Commercial Architecture

UDIA NSW Award for Excellence in Commercial Development 2018

Urban Taskforce Development Excellence Award 2018

Master Builders Association 2018
- Outstanding Construction Award
- Commercial Building up to $50M Award
- Innovation Award
- Excellence in Energy Efficiency Award
- Best Use of Timber Award

Chicago Athenaeum and the European Centre for Architecture and Design 2017
- International Architecture Award

World Architecture Festival - Best Use of Certified Timber Award 2018

Chicago Athenaeum and the European Centre for Architecture and Design - International Architecture Award 2017

Australian Timber Design Award - Peoples' Choice 2017

Photo credit: Lendlease

General

Delivery year

2016

Building type

Office

Area (m²)

7,200

Photo credit: Lendlease

Products

Products and Services

Sylva™ CLT Floors and Roofs, Sylva™ GLT Beams and Columns

Product quality

Industrial visible quality (INV)

Product volume (m³)

3,405

Photo credit: Lendlease

Team

Partner of Stora Enso

Lend Lease

Developer

Lendlease

Architect

Tzannes Associates

Main contractor

Lendlease

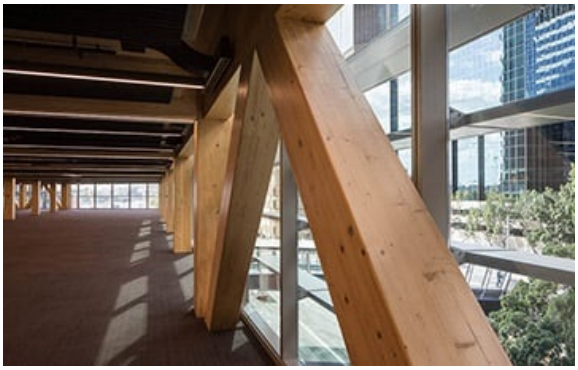

Photo credit: Lendlease