

TTW

60 years ago our founding partner, Dick Taylor said "Our work is only as good as the minds behind it". Dick was known as a true gentleman and brilliant engineering mind, he maintained lasting relationships because our clients understood his passion for outstanding architecture.

Over the decades our consulting engineers have contributed ongoing award-winning designs to the built environment because we believe in his service philosophy; a personal approach to client relationships, developing the expertise of our team, tackling the tough jobs and leading with advanced technology.



Website: ttw.com.au/timber
Instagram: @ttwengineers
LinkedIn: Taylor Thomson Whitting (TTW)

SYDNEY

Level 3, 48 Chandos Street
St Leonards NSW 2065
+612 9439 7288
ttwsyd@ttw.com.au

MELBOURNE

Level 13, 379 Collins St,
Melbourne VIC 3000
+613 9602 1433
ttwvic@ttw.com.au

CANBERRA

103 Tennant Street
Fyshwick ACT 2609
+612 6285 1766
ttwact@ttw.com.au

INDONESIA

Graha Chantia L3
Jl Bangka Raya No. 6
Jakarta Selatan 12720
+6221 719 0011
ttw@ttwindonesia.com

Timber

Your Partner in Engineering

Timber with TTW

Since TTW's inception in 1958, our founding partners saw success as engineers through the use of modern materials and designing with cutting-edge technologies. Fast forward to 2019 and we are still applying this ethos to deliver some of the largest, award-winning projects across the Asia Pacific region.

We sit at the forefront of the industry in the use of mass timber materials for construction, with the collective

experience in **DELIVERING OVER 50 ADVANCED TIMBER PROJECTS** to date, and growing.

By reading this brochure, you've expressed an interest in learning more about timber, and how it can be used in your future projects. Through the in-depth experience of our TTW Timber Team, we can help you on this journey and deliver inspirational projects.

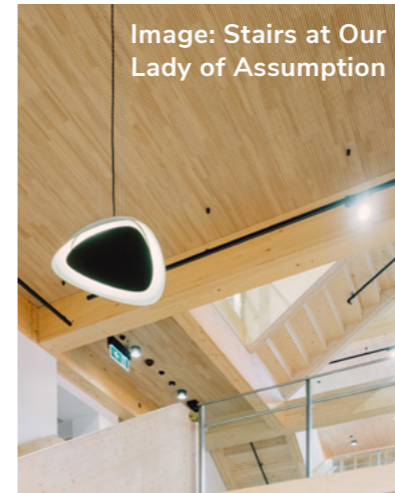


Image: Stairs at Our Lady of Assumption

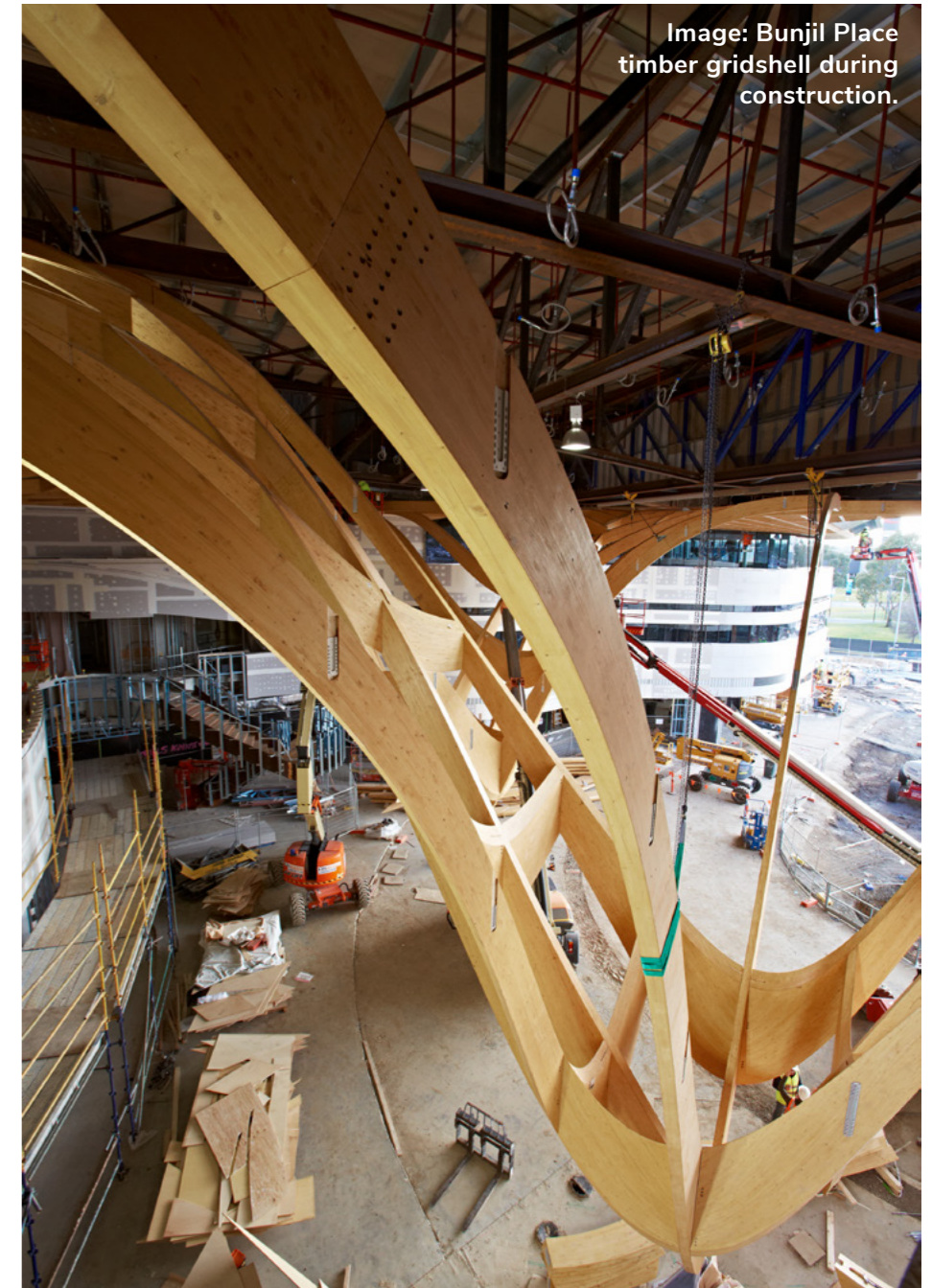


Image: Bunjil Place timber gridshell during construction.



Image: Seed House, ambitious cantilevers & hidden wall to floor connections located within all exposed CLT elements.

“The TTW Way is our commitment to building long-term relationships by providing the highest level of design and service. Our collaborative and hands-on approach brings our clients back time and again.”

Rob Mackellar,
Managing Director

Our Approach

It is safe to say that timber is on the rise as the go-to product within construction engineering, and timber is a material that we at TTW, are passionate about. We are excited by the industry's openness and enthusiasm to use mass timber as a viable construction material in the form of Cross Laminated Timber (CLT), glulam and LVL.

We have successfully used glulam on the **GEOMETRICALLY COMPLEX GRIDSHELL** for the award-winning Bunjil Place, which was the first of its kind built in Australia. The Incubator project at Macquarie University saw our team find smart solutions to achieve the many junctions required between cantilevering glulam beams, see below images.

Through their **WEALTH OF KNOWLEDGE**, the Timber Team understand the strengths and limitations of using engineered wood as a material, and the intricacies of designing and delivering mass timber projects. We follow the process from the early concept stage, through to the final detail designs of the last screw or bracket holding the building together. We understand the importance of build-ability, and having materials installed and built on site in the most efficient way possible.

Our team's approach to the design and detail of structures looks to **MAXIMISE THE PROCUREMENT OPPORTUNITIES** available for your project. By developing solutions with the flexibility to be

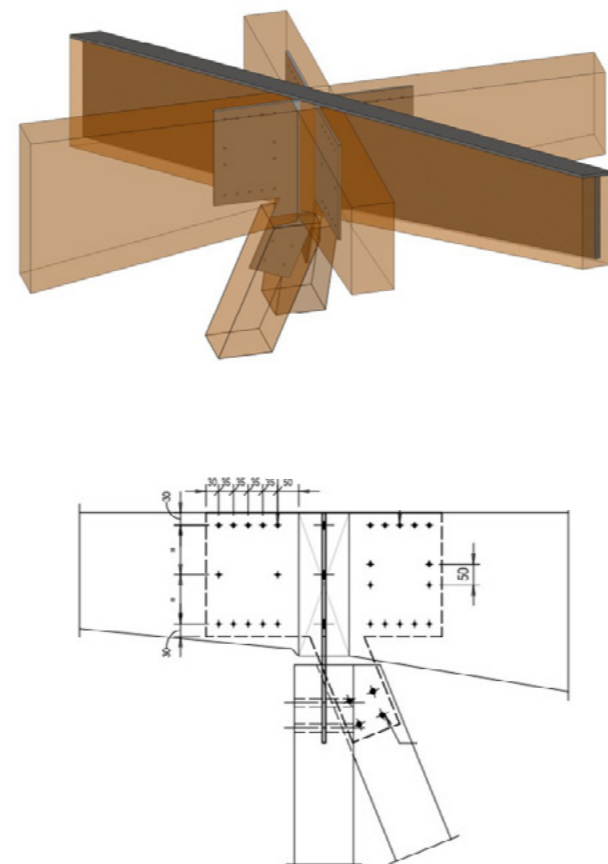
manufactured or sourced both locally and internationally, we do this through our intrinsic understanding of timber design from first principles.

WE HAVE DEVELOPED OUR OWN IN-HOUSE DESIGN TOOLS AND SOFTWARE that allow us to design agnostically and beyond the standard publications and guides commonly available. Further to this, our engineering and Building Information Modelling (BIM) systems are designed to ensure that prefabricated and modular elements are built and delivered to the stringent tolerances required.

This holistic and sustainable design philosophy seeks to minimise construction labour and time on site, reduce wastage of materials at fabrication, design transportable building panels and modules, and minimise crane hook time.

WHY WE CHOOSE TIMBER

Timber is cost effective, has higher structural efficiency, delivers on sustainability goals and is resistant to corrosive environments. At TTW we have developed in-house software to cater for the varying material properties unique to timber suppliers around the world.



Images, both pages: The Incubator, Macquarie University

Our Analysis

We are involved in advanced research and development and partner with industry experts to create smart solutions using engineered timber products.

Our Timber Team has been involved in **FULL-SCALE TESTS** with universities, builders and fabricators for the structural integrity of locally and internationally developed panelised systems. The challenge being that often there are no provisions available, our experts design with first principle approaches. To achieve national code compliance we understand and develop performance solutions, analyse the limits of the material and actively collaborate with testing authorities and universities to create solutions with engineered timber products.

We are involved in certifying fire performance solutions of systems and materials. This includes large-scale testing of panels and analysing the fire mode data to ensure the solutions are efficient.

Working intimately with UNSW, our engineers developed a bracing wall system using stud walls, by testing plasterboard and OSB lined walls. These were subjected to cyclic loading with numerous connection types. The results of these tests enabled us to apply these systems to low-rise buildings with engineered timber structural systems.

See fire testing image below.



Our ongoing success is driven by the mutual enthusiasm and passion for timber that we share with our partners. This joint interest in revolutionising the use of timber is the foundation of our long-term **INDUSTRY PARTNERSHIPS**, both locally and internationally.

Images: Multiplex, JCB and TTW in Italy to research materials for our timber project La Trobe University.

Timber Inspires

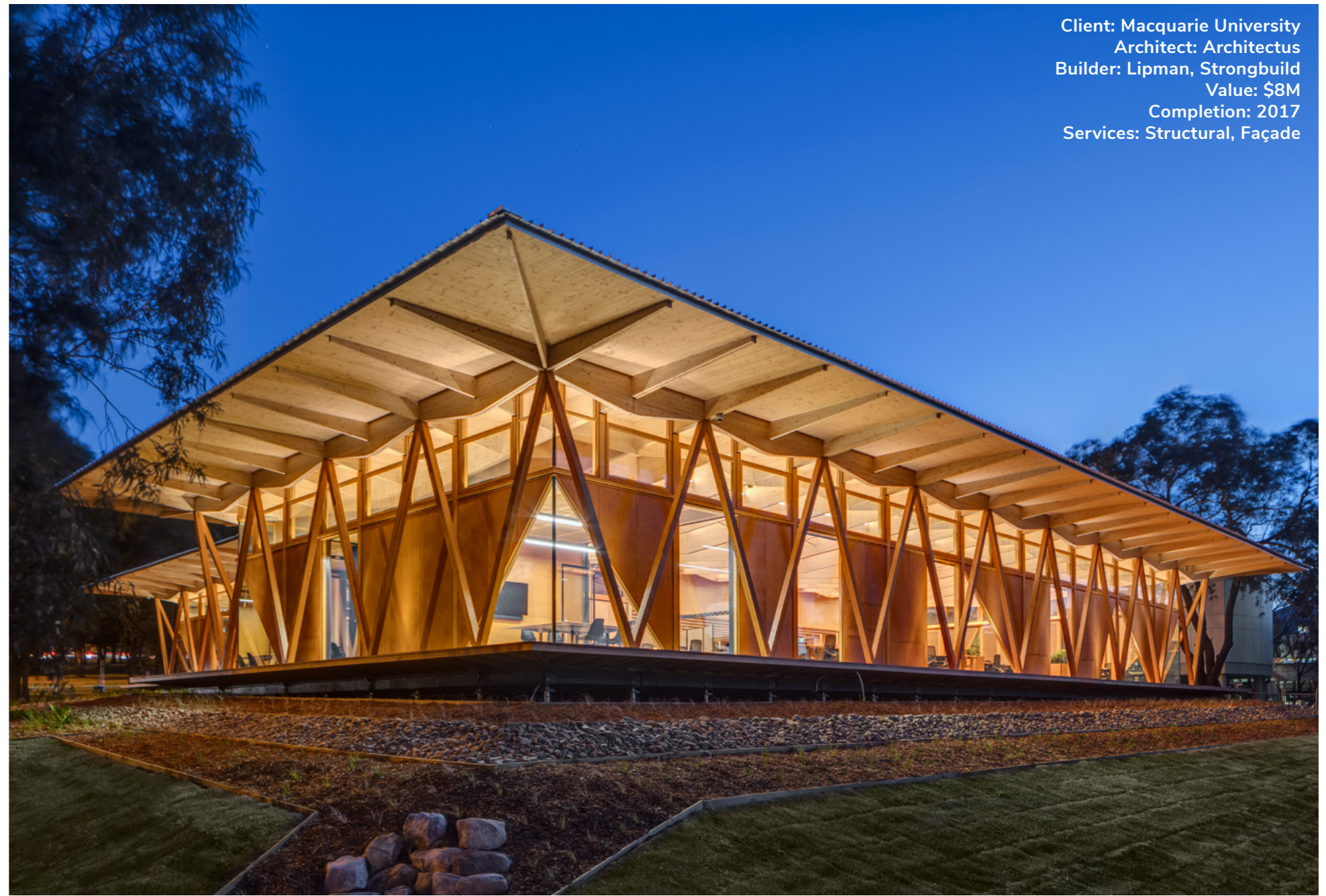
Client: Macquarie University
Architect: Architectus
Builder: Lipman, Strongbuild
Value: \$8M
Completion: 2017
Services: Structural, Façade

THE INCUBATOR AT MACQUARIE UNIVERSITY is an inspiring new space for students, researchers, staff, entrepreneurs and start-ups. The single-storey building is purpose-built and designed using **MODULAR CONSTRUCTION TECHNIQUES**, allowing it to be disassembled and relocated at the end of five years. It consists of two pavilions linked by a corridor, incorporating events and tutorial space, as well as meeting rooms.

The total roof length is 20m with slender tapering glulam roof beams spanning the learning space, and cantilevering a further 3m over the perimeter veranda. The beams are supported by V columns of Victorian Ash. The **ROOF TIMBERS SHIPPED FROM AUSTRIA** had to fit in 12m long containers, which presented challenges to achieve the many junctions required between glulam beams. TTW engineers determined the optimal solution involving internal fitch plates with steel dowels.

Our Timber team found solutions to deliver the architectural intent on; **CONTINUITY OF MULTIPLE TIMBER MEMBERS CROSSING EACH OTHER**, hidden connections whilst maintaining member continuity, large spans, large cantilevers, and slender members. Achieving the specified geometry, while splitting the structure into modular units for efficient transport.

Erected in just 37 days & taking home 18 award wins.



Early Delivery

The short build-time requirement for this project made it an ideal project for showcasing the innovative Cross-Laminated Timber (CLT) material.

The **AVEO NORWEST** building consists of ten storeys and was **THE COUNTRY'S LARGEST USE OF CLT TECHNOLOGY AT THE TIME**. Approximately 3,000m³ of CLT, the equivalent 4,156 panels, have been installed to produce a complex timber retirement village.

TTW engineers delivered a high-quality structure beyond a "standard box". The CLT floor had **A HIGH NUMBER OF COMPLEX JUNCTIONS** in response to the unique apartment layouts.

The design of curved and seemingly cantilevered balconies required a hybrid construction approach incorporating glulam beams and structural steel.

WINNER OF THE 2018 AUSTRALIAN TIMBER DESIGN AWARD MERIT - SUSTAINABILITY



Client: AVEO
Architect: Jackson Teece
Value: \$51M
Completion: 2017
Sector: Aged Care
Services: Timber, Structural

Using CLT enabled the project to be completed 13 weeks ahead of schedule compared with the option to utilise a concrete conventionally framed structure.

Complex Gridshell



Client: Casey City Council
Architect: FJMT
Builder: Multiplex
Value: \$125M
Completion: 2017
Sector: Government & Public, Art & Culture
Services: Timber, TTW Advance, Structural, Civil, Façade



BUNJIL PLACE provides the community with a cultural hub in East Melbourne. This innovative project has nine major award wins to date, including the **2018 AUSTRALIAN TIMBER DESIGN AWARDS – EXCELLENCE IN TIMBER DESIGN**.

The building's dominant feature is a timber gridshell, the first of its kind in Australia, that defines the main atrium. This impressive central area incorporates a 12m high glass Façade facing a large community plaza area beyond.

With the shell made from geometrically complex 3D forms, our team undertook a **DETAILED FORM-FINDING INVESTIGATION**, which required modelling of the timber grillage as a structural load-bearing element supporting the roof.

Our team worked alongside the chosen fabricator, Hess Timber, to develop an effective construction methodology that dealt with tight tolerances, a large number of connecting interfaces while protecting the exposed timber surfaces.

Sustainable Development

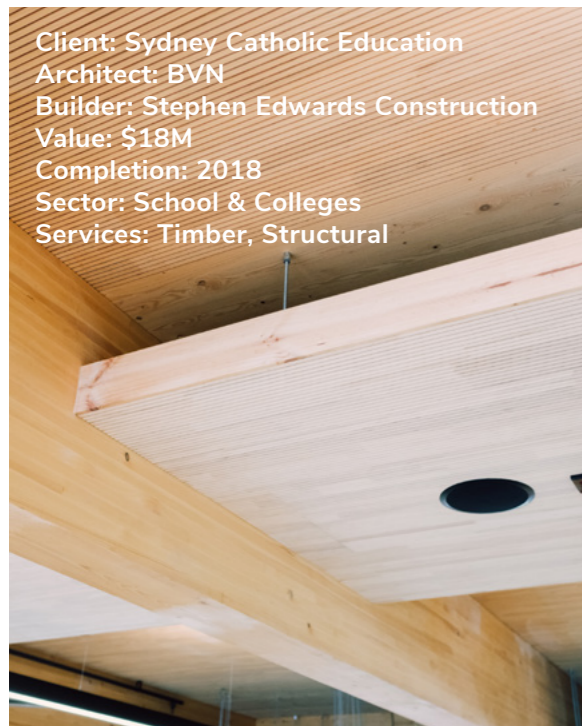


Sydney's first multi-storey school development constructed with engineered timber.

The **OUR LADY OF ASSUMPTION SCHOOL** in North Strathfield utilises an existing three-storey concrete frame base built in the 1970s (previously the Telstra Training Centre) and delivers four levels of flexible learning spaces and facilities, constructed using Cross Laminated Timber (CLT) and glulam post and beam structure.

Committed to **CUTTING-EDGE MATERIALS AND TECHNOLOGIES** the design team were eager to implement the innovative multi-level engineered timber system for the project. Associated time efficiencies and minimisation of on-site labour was another driver for the use of prefabricated mass timber construction technology. First designs were completed in 2014, so the introduction of the new timber structure system to Australia required extensive research, material investigations and collaboration with mass timber experts.

Catering for 450 students, the development showcases **THE BEST SUSTAINABILITY PRACTICES**, with a focus on natural ventilation and high-performance timber products. Movable screens and joinery allows for a multitude of teaching configurations, and large bi-fold doors open to the timber deck, bringing the outside and inside together to create an inspiring learning environment.



Client: Sydney Catholic Education
Architect: BVN
Builder: Stephen Edwards Construction
Value: \$18M
Completion: 2018
Sector: School & Colleges
Services: Timber, Structural

Timber Showcase

SEED HOUSE is a five-level development consisting of part new build. Built predominantly in timber, the Cross Laminated Timber (CLT) panels were sourced locally and pushed to their absolute limits with the lower pods of the house extended as far out as possible on the steep construction site.

The **CLT STRUCTURE** has ambitious cantilevers exposed internally, with hidden wall to floor connections located within all exposed CLT elements. A highly architecturally refined roof truss supports the kitchen with a top chord of composite CLT and steel. Large cantilevers and thin elegant structure is showcased through the building, utilising hybrid structural steel components where possible.

A key feature to the house is an exposed **CLT TREAD SPIRAL STAIRCASE**. Each tread was CNC machined and connected using hidden screw locations. Each tread was threaded over a central slim steel circular hollow section, creating the timber core through the centre of the stair.



Client: James Fitzpatrick
Architect: Fitzpatrick & Partners
Builder: David Campbell Building Pty Ltd
Value: \$5M
Completion: 2019
Sector: Residential
Services: Timber, Structural

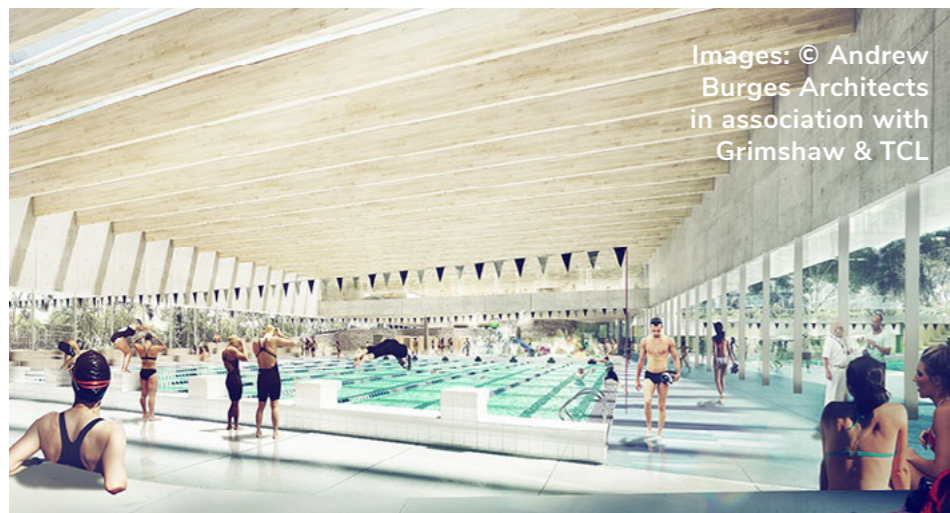


The side walls wrapping the **CLT CANTILEVERED PODS** used both the longitudinal layer direction and the transverse layer direction, acting as very deep beams to cantilever off steel portal frames.

Our engineers undertook vibration studies of the panels to ensure the bounciness of the cantilevered edge was minimised. CLT panels were created as a portal frame to stabilise the pod against lateral loads. The portal frame connection used a stiff steel angle and double fully-threaded screws.

Long-Span Timber

Currently under construction and set to become the largest pool complex constructed in Sydney since the 2000 Olympics.



Images: © Andrew Burges Architects in association with Grimshaw & TCL



Client: City of Sydney
Architect: Andrew Burges Architects
in association with Grimshaw & TCL
Builder: CPB
Value: \$83M
Completion: 2020
Sector: Sports & Leisure
Services: Timber, Structural



GUNYAMA PARK AQUATIC AND RECREATION CENTRE

is a new public community space in Green Square, Sydney. The facility will feature 50m and 25m pools, hydrotherapy and leisure pools, a gym, café, outdoor sports field and running track.

Unique to the project are 50m long steel trusses either side of the pool hall which support 36m long glulam mass timber beams. These beams are **THE LONGEST FREE-SPANNING MASS TIMBER BEAMS IN AUSTRALIA.**

Gunyama showcases innovation with the use of pressurised ETFE 'pillows' which form a translucent roofing membrane between glulam beams. This structural membrane for the roof, allows natural light to pass through into the pool hall.

Glulam beams have been used in a composite section with a CLT top panel to form a U-section which results in a more efficient structure over the large spans.

Accelerated Programme

LA TROBE UNIVERSITY STUDENT ACCOMMODATION project, valued at \$100M, will provide over 600 new beds and new student amenities, for the university's growing Bundoora Campus.

TTW was engaged by Multiplex as the principal structural engineer, following our earlier value engineering advice during the tender period. Leveraging our significant timber expertise and in-house bespoke design tools, our engineers developed innovative structural solutions that resulted in **SIGNIFICANT MATERIAL AND PROGRAMMATIC SAVINGS** without compromising the architectural design intent, which assisted Multiplex in their successful tender. Notably, our holistic design approach allowed all pile foundations to be removed, as compared to the reference design.

TTW delivered all key structural packages, including CLT and glulam, as well as concrete substructure packages, in less than two months from appointment, in order to meet the fast-tracked procurement and construction programme. **OUR TEAM ATTENDED DESIGN WORKSHOPS IN EUROPE WITH THE TIMBER SUPPLIER, TO FAST TRACK THE DESIGN** coordination and shop drawing process – underpinning our commitment to service our clients.



Client: La Trobe University
Architect: JCB Architects
Builder: Multiplex
Completion: 2020
Sector: Universities, Residential
Services: Timber, Structural, Façade
Images: © JCB Architects



Victoria's largest timber building currently under construction.

Timber Pipeline

Keeping our team busy are the many large-scale Timber projects in our pipeline. We are currently applying this material to the designs of upcoming commercial, residential, community spaces, education, airport, and major aquatic developments.



Client: Mulpha Norwest
Architect: Fitzpatrick & Partners
Completion: 2021
Value: \$55M
Sector: Commercial, Retail
Services: Timber, Structural, Civil, Façade
Image: © Architects Fitzpatrick & Partners, and David Duloy

PHOENIX APARTMENTS IN ROUSE HILL, consists of five and six storey apartment buildings and is **ONE OF AUSTRALIA'S LARGEST RESIDENTIAL TIMBER BUILDINGS, BY VOLUME**. The structure utilises a lightweight timber wall frame system using high strength LVL studs which allow a stud wall building to reach greater heights than traditionally achieved using MGP10 residential stud walls.

The walls were prefabricated at Strongbuild's factory with plasterboard and wall insulation thereby allowing wall panels to simply be craned into place once arriving on site. Manufactured in Europe by timber giant Binderholz, the Cross Laminated Timber (CLT) floors were shipped to Australia for final processing in Strongbuild's factory.



Client: Strongbuild
Architect: Turner Associates
Completion: 2019
Value: \$36M
Sector: Residential
Services: Timber, Structural
Image: © Architects Turner Associates

THE BOND, NORWEST features seven storeys of mass timber glulam frame supporting Cross Laminated Timber (CLT) floor and roof panels.

The 13,000 m² mass timber structure sits on top a 17,000 m² concrete podium, intended for the two levels of mixed-use retail and childcare, and three levels of basement car parking.

It will offer unique adaptable office space in the Norwest Business Park area, with the use of **NEATLY DETAILED AND EXPOSED MASS TIMBER INTERIORS**.