

# A GAME CHANGER FOR BOTANIC SCIENCE

MAIN CONSTRUCTION COMPANY : FDC Construction & Fitout  
ARCHITECT : Architectus & Rick Leplastrier  
STRUCTURAL ENGINEER : PMI Engineering and SCP Consulting  
CONSTRUCTION VALUE : \$35 million



The new National Herbarium of NSW will protect 1.4 million botanical specimens and includes the construction of a new nursery and a state-of-the-art research and education facility which will accommodate six specially designed vaults, quarantine and specimen preparation areas, stores, freezers, drying room, DNA lab, microscopy and photography facility, computer lab, and office spaces.

**FDC Construction & Fitout** partnered with **Architectus, Rick Leplastrier, Craig Burton** and **Professor Max Irvine** in the design competition that led to them winning the ECI (Early Contractor Involvement) contract for the design and construction of the National Herbarium of NSW project, on behalf of the Royal Botanic Gardens and Domain Trust.

The ECI stage saw FDC carry out the design and project cost management, DA preparation and submission, user group workshops and detailed design for the main works. The team worked through significant adjustments to the project specifications including the introduction of additional vaults, whilst successfully maintaining project funding requirements, as well as an early works stage constructing a new scientific shadehouse and nursery complex. Progressing through to the main works saw the construction of the new Herbarium, including site geotechnical remediation for foundation and structure works for the buildings and vaults, designed and constructed for 100 year design life.

A major highlight of the project is the rammed earth vaults which are used to house and shield the botanical collection from bushfires, extreme weather events, and to maintain a tightly controlled internal temperature. Olnee Constructions were contracted to undertake this exciting part of the project. "The team at Olnee were brought onboard early in the design stage to ensure that we were partnering with the right subcontractor to deliver the perfect result," said Peter Stait, Senior Project Manager at FDC Construction & Fitout.

The thermal requirements were readily met by the rammed earth wall design, however, extensive testing was required to obtain fire and structural safety certification. The client was very invested in using this construction methodology and as a result, FDC Construction & Fitout spent considerable time during the ECI Stage, working with the Architect and Olnee to develop prototypes to be tested and certified to CSIRO standards. The Herbarium is now the first public commercial building in Australia to feature rammed earth walls as a certified fire rated, structural wall system. The rammed earth walls also embrace the



environmental ethos of the project. "Rammed earth was constructed of materials sourced locally to maintain the indigenous nature of the product, whilst significantly reducing the embodied energy of the building compared to concrete and steel, for instance."

The mechanical division of FDC developed a strategy that would further ensure the safety and integrity of the botanical specimens through strict mechanical controls. The strategy saw all mechanical equipment located outside of the vaults meaning any maintenance or repairs would be undertaken without the need to enter the vaults. Furthermore, each vault has their own mechanical unit in order to isolate any faults, as well as maintaining extremely tight tolerances for temperature, humidity and pressurisation.

The fly roof was another interesting feature of the project. The fly roof, which protects the vaults beneath, is a 5,000m<sup>2</sup> tensioned steel structure designed to harness ESD principles with the collection of rainwater for irrigation and re-use, along with optimising solar power and passive solar principles. "The fly roof basically floats above all the vaults. We erected the curved roof first which was put together



in modules, tensioned as required, and lifted exactly into place," explained Peter.

"The initial roof design was expanded to cover a larger area which saw the need to reevaluate the design to reduce the weight. FDC worked with Professor Max Irvine and team to rethink the entire structural strategy for the roof. This went from a framed roof structure to the implementation and testing of a tensioned roof design. This maintained Architectus and Rick Leplastrier's design vision for the project while reducing 80 tonne of weight from the roof structure," said Peter.

Independently owned and operated, and delivering reputable construction, fitout, refurbishment and building capabilities, FDC offers fully integrated Design and Construct services across a range of sectors. The team also bring a sustainable focus to everything they do.

*For more information contact FDC Construction & Fitout, 22-24 Junction Street, Forest Lodge NSW 2037, phone 02 8117 5000, email [sydney@fdcbuilding.com.au](mailto:sydney@fdcbuilding.com.au), website [www.fdcbuilding.com.au](http://www.fdcbuilding.com.au)*

**Below** Olnee Constructions built the six rammed earth wall vaults for the project which are 400mm thick and 4m high.

**The new National Herbarium of NSW, in Western Sydney, has been built to protect and preserve a collection of 1.4 million plant specimens.** Inspired by the seed pod of the Waratah, which is the floral emblem of New South Wales, the building is made up of six rammed earth wall vaults that will house the plants and protect them from bushfires and weather events.

Built from the earth on which they stand, rammed earth walls are the perfect solutions for a diverse range of architectural designs. Each rammed earth wall possesses its own distinctive qualities and radiates ambience, warmth, texture and timelessness that just can't be replicated by other materials.

Even before the National Herbarium of NSW build was completed, the rammed earth walls being built onsite quickly became the highlight of the project. The stabilised rammed earth walls that were installed are 400mm thick with some reinforcement through them. Wall heights are approximately 4m high and the material used was made up of indigenous soils and gravels sourced from the local area.

As with all of Olnee Constructions rammed earth walls, these were built to exacting specifications. In order to add to the sustainability of a project, Olnee Constructions will always aim to source materials as close to the site as possible, which reduces energy costs for cartage.

"Being a tier one sustainable product it fits the design brief and the brief set by the botanical gardens, using natural and indigenous materials that have a high sustainability and environmental element. It has a low embodied energy foot print which also fits the philosophy of both Olnee Constructions and the requirements of the Botanical Gardens," said Oliver Petrovic, Managing Director.

Olnee Constructions worked closely with FDC Construction & Fitout to carry out extensive research and development over a two year period to ensure the best possible result. This included testing of the material for fire ratings, compressive strengths and also looking for the right material which was found in the local region. The results were pleasing and saw the design team easily meet the four hour fire test.

The close working relationships that were established in the early stages of the project contributed to the success of the development. "We were able to establish great relationships with the architect, builder, engineers and the Botanical Gardens, this collaboration made way for a seamless outcome," said Oliver.

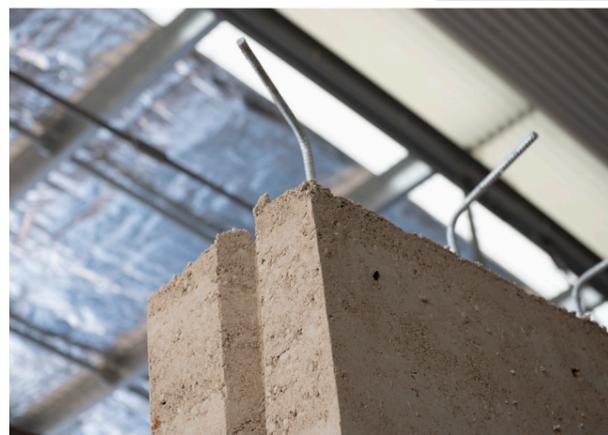
Olnee Constructions are extremely proud of their products. Their rammed earth walls have a high thermal mass meaning they have a high capacity to store energy as heat. During the day earth-built walls absorb daytime heat and release it for warming during the night.

The walls can be used for both interior and exterior designs to help maintain a constant internal temperature without the need for additional heating or cooling. Olnee Constructions rammed earth walls are also sustainable. They don't need to be painted or plastered, are very low in embodied energy, there is no out-gassing and they are non-toxic and non-polluting.

Olnee Constructions has been in business for 32 years and has a strong sustainability and innovation mantra. They are always striving for new ways to keep their product and company at the forefront of the industry.

The team have projects running in two states at the moment which includes new schools and high end residential developments.

*For more information contact Olnee Constructions, phone 03 9551 5149, email [info@olnee.com.au](mailto:info@olnee.com.au), website [www.olneerammedearth.com.au](http://www.olneerammedearth.com.au)*



Below SCP Consulting provided structural and civil engineering designs for as part of the civil engineering on the site.

Below Advanced Steel Design manufactured and installed the curved structural steel required for the unique project requirements.



SCP Consulting were engaged to undertake the structural and civil engineering designs for the National Herbarium of NSW. The civil engineering scope also included the relocation of the existing nursery that was on the Herbarium site prior to main works commencing.

The building will be used as a research and educational facility, as well as house 1.4 million plant specimens that will be securely stored in the uniquely engineered rammed earth walls. “The rammed earth walls are the highlight of this project and SCP are proud to be part of the team delivering this unique, state significant project alongside FDC, Architectus, Root Partnerships and the whole project team,” said James Clare, Associate Civil Engineer.

“Working with renowned architect Richard Leplastrier alongside the Australian Botanic Gardens has been an incredible experience on a unique structure that will be used to contain a fundamental part of Australia’s botanical history,” explained James.

Use of rammed earth is still evolving in Australia and as such, significant research and development was carried out by the project team to ensure that the product met the required structural and fire protection standards.

“Stormwater management from the fly roof was a big significant challenge for SCP due to the lack of a gutter system on the fly roof meaning water will spill onto the landscape area below. Wide dish drains and rain gardens have been used to convey the stormwater once it reaches the ground level,” said James.

SCP are currently completing numerous projects across Australia in the defence, education, aged care and, sport and recreational sectors. The Loftus Lane precinct has recently been completed, WINX Stand at Randwick Racecourse is nearing completion and Oakhill College Innovation Hub is moving into construction with FDC this month. BaptistCare Carlingford is the final site being delivered as part of the Social and Affordable Housing Fund Phase 1. SCP are proud to have delivered 500 beds across eight sites with BaptistCare and continue to support ongoing development across the aged care sector.

Several aquatic facilities are being undertaken by SCP currently, most notably Darwin Waterfront, Parramatta Aquatic Centre and Mount Gambier Aquatic Centre.

For more information contact SCP Consulting, phone 1300 757 364, email mail@scpconsult.com.au, website www.scpconsult.com.au

Advanced Steel Design had early involvement in the National Herbarium of NSW project assisting FDC Construction & Fitout with pricing options for a number of designs options. This process was undertaken over 18 months, and following a number of tender submissions, Advanced Steel Design were engaged to fabricate and install the structural steel for the project.

Advanced Steel Design had to reconsider the procurement of product from overseas due to the outbreak of COVID-19. “Part of the design included 42mm Macalloy bars which could only be sourced from Germany and the United Kingdom, however with flight restrictions this option was not viable due to costs and disrupted deliveries,” explained Michael Butler, Director. “After multiple discussions with local suppliers, we switched to Ronstan Bars which assisted with tight lead times and met the project requirements.”

The curved PFC rafters, which were in back to back profile to each rafter section, proved to be an interesting challenge on the project. As each radius had to match the opposing rafter section, the rolling tolerances had to be of the highest standards. “Each model had to have temporary cradles fabricated in the workshop and dispatched to site to allow each model to be erected individually. Advanced Steel

Design installed rafters, tie beams, bracing and purlins to complete each model before lifting. This process was conducted several times and once we had three models complete in their cradles, we required a 400 tonne crane to be set up onsite,” said Michael. “This process was undertaken across three days with day one seeing the set up of the crane, day two for the installation of the three models and a third day to demobilise from site.”

“We are grateful to be part of the team that collaborated with many stakeholders on the project which ultimately led to the success of the project,” said Michael.

The team at Advanced Steel Design are currently working on the Log Cabin in Penrith, Blacktown Animal Rehoming Centre and they have just commenced the detailing process for the Sydney Swans Headquarters.

For more information contact Advanced Steel Design, 6 Warren Place, Silverdale NSW 2752, phone 02 4577 3448, website www.advancedsteeldesign.com.au

# ULTRAFLOOR®

Below Axis Metal Roofing installed a unique sprung curved roof with soffit lining on the project.



Proud to be Associated with  
**THE NATIONAL HERBARIUM**  
– MOUNT ANNAN BOTANICAL GARDENS

#### THE ULTRAFLOOR SCHEME CONSISTED OF:

- Ultrafloor Commercial 250 beams spanning approximately 13.0m simply supported.

#### ULTRAFLOOR ADVANTAGES:

- Complete in-house design, manufacture and installation service
- Speed of installation (up to 800m<sup>2</sup> per day) – see video on the Ultrafloor website
- Optimal WHS outcomes achieved
- High quality suite of co-ordinated project drawings
- No formwork stripping
- Safe clean working deck, clutter free site
- Less rubbish and waste
- Less site labour
- Less concrete
- Less reinforcement steel
- Comprehensive co-ordination with other consultants
- Manufacturer's guarantee

Ultrafloor can offer the maximum advantages when considered early in a project's development. The team at Ultrafloor is happy to assist even at concept stage in order to provide maximum value, efficiency and sustainability benefits in the design developed for your project.



Axis Metal Roofing supplied and installed all Colorbond roofing and cladding for the National Herbarium of NSW project. The team worked with Bluescope Lysaght, Ampelite Australia, and Metal Roofing & Building Supplies to procure the perfect materials for the development.

"The finished product is very pleasing and our site team led by Paul Santry have done an amazing job. We were skeptical at first with some of the design choices but have to say that the end result is beyond what we expected and we are extremely proud and privileged to be part of this project," David said.

One of the key features on this project is the unique sprung curved roof with soffit lining that hovers over the rammed earth vaults. "The product chosen for the roof was Bluescope Lysaght 'Spandek' in Colorbond 'Shale Grey' finish. We also had some Ampelite fibreglass sheeting which was also sprung curved onsite to provide natural light to the internal area below," explained David Hanson, NSW State Manager, Axis Metal Roofing.

Axis Metal Roofing has worked on many iconic projects including Sydney's Telstra Stadium, Darling Harbor's IMAX Theatre, and the Olympic Velodrome. The team are currently undertaking work at Campbeltown Hospital, Randwick Hospital, TJX Warehouse (Marsden Park), Concord Hospital, Ocado Warehouse (Wetherill Park), HMAS Watson, and East Leppington Public School.

"The head of the roof had an interesting finishing detail where no cappings were used and instead the roof sheets were stepped to provide an aesthetically pleasing look which we have never encountered before. All flashing details were also very architectural and beyond what is normally required," said David. "It made the project both challenging and interesting having to work with the spring curving long length roof and soffit sheeting onsite while keeping in line with the 'out of the ordinary' architectural design requests."

For more information contact Axis Metal Roofing, Level 1, Building C, 209-211 Walters Road, Arndell Park NSW 2148, phone 02 9756 1477, email [info@axisbg.com](mailto:info@axisbg.com), website [www.axisbuildinggroup.com.au](http://www.axisbuildinggroup.com.au)

For all enquiries please call 1800 858 723 • [www.ultrafloor.com](http://www.ultrafloor.com)  
OFFICES • Rutherford (H.O.) • Sydney • Canberra • Melbourne • Brisbane