Building For the Future
Sustainable Spaces Advancing Education & Research

A ‘Group of Eight’ Sustainable Buildings Showcase
Building For the Future

Australia’s leading research universities know the leaders of tomorrow, ascend from the foundations of today.

At the forefront of an evolving educational landscape, the ‘Group of Eight’ continuously strive to inspire curiosity, challenge thinking, spark innovation and bring education to life through exceptional teaching in exceptional places.

This publication showcases a snapshot of those places: world-class, high-performance, sustainable facilities which redefine best practice in tertiary education buildings. Built for the future, these spaces move beyond basic environmental sustainable design principles; to demonstrate what is possible when clever technology and inspired design intersect.

From living laboratories to thermally sound environments, reusing the old to make new, and optimising for people and purpose — each building considers a number of sustainability aspects to foster and drive best performance from both its occupants and operating systems.

The ‘Group of Eight’ comprises
The University of Adelaide, Australian National University, Monash University, The University of Melbourne, The University of New South Wales, The University of Queensland, The University of Sydney and The University of Western Australia.
Who lives here: This nine-storey building is home to the Faculty of Engineering, Computer and Mathematical Sciences and provides world-class teaching, learning and research facilities. The building is used by more than 5,000 staff and students from the Schools of Mathematical Sciences, Computer Science, and Electrical & Electronic Engineering. The Kaurna name, meaning ‘place of learning or enquiry’, recognises the special relationship the University of Adelaide shares with the Kaurna people; the original custodians of the land on which the University is situated.

What’s inside: Innovative, modern and convenient amenities including study areas, computer laboratories, collaborative teaching suites, ergonomic height-adjustable desks, and an exhibition space for events and displays. The building caters to the changing needs of staff and students through flexible teaching and learning environments, and offers students 24-hour access to its major resources and support facilities.

The ground floor of the building features a café, study area, centralised student printing centre, computer aided teaching suites, and bike parking. More computer aided teaching suites can be found on the second floor where lecturers are able to switch between any screen during class to improve the learning experience. Sunrooms can be found in each corner of every second floor of Ingkarni Wardii providing an abundance of natural light to the building and a relaxing place for staff and students to take a break.

Significance to campus: Ingkarni Wardii was Australia’s first 6 Star Green Star building (Education v1.0 design) to be accredited by the Green Building Council of Australia in 2010. This was a significant achievement for the University and demonstrates its commitment to building outstanding teaching, research and learning facilities using sustainable construction methods.

SUSTAINABILITY FEATURES

Energy
- A 30kW solar PV system on the roof and gas-fired trigeneration plant reduces the building’s peak energy demand
- Energy efficient lighting throughout the building is controlled via a sensor system

Water
- A 600,000L underground rainwater tank collects rainwater diverted from the roof for use in toilets, irrigation and the building’s cooling towers

Waste
- Central waste and recycling stations are located on each floor. Waste is separated into general (LanDfill), cardboard, glass, plastics, and paper recycling

Health & Wellbeing
- Thermal chimneys run down the north face of the building and use convective action to naturally ventilate the building. 100% fresh air is available to occupants; none of the air is recycled to promote a healthy internal environment.
- Hydronic loops within the concrete floor (active slab technology) are combined with an under-floor air distribution system to achieve high quality ventilation. Heat rejection from computer server rooms is linked to the hydronic loops in the floor. This technology includes 7.7 kilometres of pipe work to cool and maintain the building’s temperature all year round.

Transport
- ‘End of trip’ facilities including bike storage on the ground floor

Construction
- The building’s east-west direction minimises heat gain during summer whilst maximising natural light. The northern façade is made from a low emissivity double glazed curtain wall and contains a number of decorative shadings to reduce heat load and blend the building with surrounding heritage-listed buildings
- The atrium roof is made from Ethylene Tetra Fluoro Ethylene (ETFE), a highly durable, lightweight and transparent film which allows the roof to inflate or deflate to stabilise air temperature using a pneumatic cushion system
- The jarrah timber installation on the wall of the internal stairwell was recycled from the roof of the original mathematics building which once occupied the site

AWARDS
2012 UNAA World Environment Day Awards: Green Building Award
2011 MBA Award for Excellence in Environmental & Sustainable Commercial Construction
2011 Australian Institute of Architects SA Architecture Awards: Public Architecture Commendation
2011 Australian Institute of Architects SA Architecture Awards: Sustainable Architecture Award
2011 AIARB Awards for Professional Excellence at State & National Level Commercial Construction
2010 Award for 6 Star Education v1 Rating Building Design
Jaegar 5

Mills Road, Acton Campus
Australian National University

Refurbishment

Who lives here: The Research School of Earth Sciences comprising academics, researchers, technical officers and students. The building is also home to a suite of SHRIMP (Super High Resolution Ion Microprobe) instruments — complex machinery capable of detailed rock analysis. The building refurbishment arose out of a need to house a new, large SHRIMP machine with a footprint of around 6m x 6m.

What’s inside: Rooms housing the SHRIMP instruments and support machinery, as well as offices, laboratory areas, collaboration and breakout spaces. The building is largely open plan with high ceilings to facilitate good natural ventilation, draw in natural light and create a bright, airy indoor environment for occupants.

Significance to campus: The building was purpose designed to have a low environmental impact and to blend appropriately with its surrounds. Being home to a specialist piece of equipment, Jaegar 5 frequently welcomes external parties who book the SHRIMP machine for their own sample analysis. Designed by the University, similar machines have been built and shipped around the world upon request.

SUSTAINABILITY FEATURES

Energy
- Low energy T5 light fittings feature throughout
- A central BMS system controls ceiling fans on a winter and summer mode to move air through building and draw cool night air into the building through operable louvres. This keeps the indoor climate comfortable and reduces reliance upon additional heating and cooling
- Building design intentionally features reverse masonry;
- Thermal mass insulation internally and lightweight framing externally to facilitate good thermal stability for occupants
- Heat recovered from SHRIMP laboratory cooling system condenser units is used to heat water for hydronic heating of upper floor slab

Water
- Low water use fixtures, fittings and appliances feature throughout building

Waste
- Waste and recycling stations are located throughout the building and separated into general (landfill), comingled recycling (mixed), and paper & cardboard recycling

Health & Wellbeing
- Unique design and flow of roof encourages movement of air within building and enhances ventilation of internal space
- Central corridor features an abundance of roofline windows which attract natural light into the building reducing the need for additional lighting and providing a bright central space for occupants

Construction
- High levels of insulation incorporated into every aspect of building envelope to reduce thermal gain / loss including; honed and sealed concrete floors for mass storage, reverse masonry walls, a high density 150mm thick foam roof and double glazed windows

Building design intentionally features reverse masonry; thermal mass insulation internally and lightweight framing externally to facilitate good thermal stability for occupants.
Who lives here: Business administration and Heads of Department for the Research School of Earth Sciences. The building is the main entry point for the Research School and its Jaegar precinct. Prior to construction, there was no formal entry point for visitors to the School.

What’s inside: Administrative offices, teaching space including two lecture theatres, meeting/seminar rooms and student collaboration areas. The building also features a boardroom, flexible exhibition and interaction space and rock storage facilities.

Significance to campus: The building provides a visible and distinctive entrance for national and international visitors to the Research School. Located next to the Old Hospital Building (part of the original Canberra Community Hospital) the site is home to a number of historical and exceptional trees including Conifer and Eucalypt species dating back to the original Weston plantings of the 1930s.

SUSTAINABILITY FEATURES

Energy
- Energy efficient lighting features throughout
- High levels of insulation incorporated into the walls and roof to reduce thermal gain/loss. External shading reduces direct sun ingress
- Cool night air is drawn into the building through low level operable louvres. Air is further drawn through thermal mass of basement rock storage area to maintain a comfortable indoor climate without need for additional cooling
- Ceiling fans circulate naturally ventilated air throughout

Water
- Low water use fixtures, fittings and appliances feature throughout building

Waste
- Waste and recycling stations are located throughout the building and separated into general (landfill), commingled recycling (mixed), and paper and cardboard recycling

Health & Wellbeing
- Natural ventilation throughout building ensures excellent indoor air quality for inhabitants all year round
- Large floor to ceiling windows attract natural light into the building and provide good external views for occupants

Construction
- Building intentionally constructed and orientated according to ESD principles to optimise natural light and ventilation
- Brickwork from demolished section of the Old Hospital Building was recovered and reused in the façade of the new construction to minimise resource waste, and incorporate historical elements from the original site

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Building Area: 2,248m²
Cost: $10 million
Date of Completion/Occupation: December 2011
Architects & Designers: Collard Clarke Jackson
Builder: Construction Control
Green Chemical Futures

Who lives here: Over 1000 researchers, academics, students and administrative staff from the School of Chemistry specialising predominantly in Green Chemistry — a stream involving more environmentally friendly solvents and processes. The building brings together researchers from across the Faculty of Science and associated industry partners and creates a hub, showcase or focal point for the commercial application of Green Chemistry.

Considered chemistry of the future, the building is futuristic in its form and architecturally designed to mimic the shape of molecules. Internally, its colour scheme pays homage to the spectrum of colour seen during chemical analysis.

What’s inside: Student teaching and research laboratories for over 1000 students and 100 industry partners as well as office space, student breakout areas and a large central atrium equipped with display screens to host informal talks and tutorials. The upper levels feature open deck areas which invite occupants outside to enjoy the view over campus.

Significance to campus: Construction of this building and its surrounding landscaping transformed the north–west precinct of the University’s Clayton campus. Significantly opening up the space, it introduced a major pedestrian walkway to the science precinct which has improved connectivity and way-finding. Its construction also facilitated the creation of the nearby ‘Geology Rock Garden’ — a living education landscape for students and visitors to enjoy.

Sustainability Features

Energy
- Low pressure variable speed air handling units installed to ensure energy intensive processes of moving air around the building (for laboratory fume hoods) is as efficient as possible. Air-handling systems were selected to improve internal air quality.
- 80% of the building’s heating and cooling is from roof of building and surrounding landscape for use in toilet flushing, cooling towers and irrigation.
- Large angled building windows facilitate good external views for occupants and views into the building from outside improving overall connectivity with surrounding landscape and community.
- Operable windows in meeting rooms allow direct fresh air intake.
- Low VOC paints, adhesives and sealants were intentionally selected to improve internal air quality.

Transport
- Located near campus bike arrival station which hosts bike parking for 100 as well as locker and shower facilities.

Construction
- As air handling systems were crucial to the building’s overall energy efficiency, air movement around the building was prioritised. Configuration of air handling units and duct work through the building was laid out first, with architectural form working around these mechanical systems.
- Building was designed to intentionally avoid any exposed west facing windows. The western facade of the building is instead dedicated to plant equipment.
- 80% of the building’s construction waste recycled.

AWARDS
2015 Victorian Architecture Awards: COLORBOND® Award for Steel Architecture
2015 Victorian Architecture Awards: Educational Architecture
Logan Hall
at Sports Walk, Wellington Road, Clayton
Monash University
New Build
2015

Who lives here: 250 University students in self-catering studio apartments 20 to 30m² in size. The ground floor is home to mixed retail space including two restaurants and a supermarket.

What’s inside: Student accommodation set within a seven-storey building divided into two wings. The building also features communal kitchens, dining areas, music, games and entertainment rooms, a communal laundry, BBQ courtyard area and individual mailboxes for residents.

Significance to campus: Built to meet growing student demand, the Logan Hall residences were the first (of now four) centrally located student accommodation buildings to be built right in the heart of campus. Named in honour of geographer and university administrator Emeritus Professor Malcolm Ian Logan AC (who was also Vice-Chancellor and University President from 1987–1996), the residences offer a more flexible lifestyle for students living on campus. Located metres from the campus Sports & Recreation centre and with a supermarket and restaurants on the ground floor trading late each evening — the Logan Hall precinct has activated campus outside of traditional teaching hours and provided a vibrant destination for students, staff and the wider community.

SUSTAINABILITY FEATURES

Energy
– Energy efficient fixtures and fittings feature throughout
– Solar hot water collectors installed on the roof reduce need for additional heating of water
– High performance glazing as well as horizontal and vertical external shading on windows reduces thermal heat gain/loss and internal glare for occupants
– The building uses passive design principles to minimise energy use requirements. Other energy saving strategies include: the absence of air conditioning, thermal stacking and passive ventilation. Additionally, precast concrete cladding was optimised to minimise heat loss.

Water
– Water efficient fixtures and fittings feature throughout
– Water collected from the roof is dispatched to a 45kl rainwater tank for use in toilets, laundry and irrigation. The building also receives a supply of non-potable water from a 500kl underground tank interconnected with the campus water harvest network and nearby lake catchment

Waste
– Waste and recycling stations are located throughout the building with waste separated into general (landfill), comingled recycling (mixed), and paper and cardboard recycling

Health & Wellbeing
– Prominent stairways to encourage active movement of occupants throughout building
– The building is located metres from University Sports & Recreational complex and features a supermarket and two restaurants on its ground floor
– Every room features good external views for residents through large windows which attract natural light and are operable for fresh air intake
– Drinking fountains feature throughout
– Low VOC paints, adhesives and sealants were intentionally selected to improve internal air quality

Transport
– Residents have access to ‘Unicycle’, the University share bike system whereby bicycles can be picked up and dropped off around campus
– Residents have access to ‘Flexicar’, a car parked on site and available for hire
– Bike storage available for 50 bikes

Construction
– The building was purpose designed to fit into an existing native tree-scape to provide residents with treetop views and shading during summer. A conscious effort was made to minimise the number of trees removed as a result of construction
– 48% of the building’s construction waste recycled

Awards
2016 Australian Institute of Architects — Multi-Residential Interior, Dulux Colour Awards, Multi-Residential Exterior
2016 Australian Institute of Architects — Multiple Housing: Australian Institute of Architects — Multiple Housing: National Award
2016 Australian Institute of Architects — Victoria Chapter Awards, Winner
2016 Best Owner Award for Residential Architecture (Multiple Housing)
2016 Dulux Colour Awards, Multi-Residential Exterior
2016 Dulux Colour Awards, Multi-Residential Interior, Commendation

The building uses passive design principles to minimise energy use requirements.

Building Area: 9,687 m²
Sustainable Building Certification: 7 Star Green Star “Design” and “As Built” (Green Building Council of Australia)
Cost: $41 million
Date of Completion: December 2015
Architects & Designers: McBride Charles Ryan
Builder: Brookfield Multiplex

IMAGE CREDITS: MONASH UNIVERSITY
Who lives here: Monash University’s Buildings & Property Division responsible for managing all aspects of its asset portfolio; from campus planning to new construction, maintenance of buildings, gardens and grounds.

What’s inside: A bright, open plan office filled with natural light thanks to reinstatement of an existing sawtooth roof and high clerestory windows. In addition to workspaces, the building houses a mix of formal and informal meeting areas, a multi-purpose fitness/yoga room, the University mail room and archive room.

An alfresco dining area features a large eucalyptus tree which was carefully incorporated into the deck during construction. The tree provides shade for the outdoor space and the northwest corner of the building.

Significance to campus: This project saw Passive House design methodology applied to an Australian office building for the very first time. An impressive example of adaptive re-use, the building has evolved from an asbestos-clad delivery warehouse to the most efficient building in the University’s portfolio. Choosing to work with existing materials (in particular, the carbon intensive concrete and steel frames) significantly reduced the embodied energy of Building 56 and cleverly demonstrated how old buildings can be retrofitted and repurposed into high performance, productive, inviting spaces. An impressive example of adaptive re-use, the building has evolved from an asbestos-clad delivery warehouse to the most efficient building in the University’s portfolio.

SUSTAINABILITY FEATURES

Energy
- Energy efficient fixtures and fittings feature throughout including lighting (LEDs) and mechanical equipment (HRV)
- A 70 kWp rooftop solar array fulfills 65% of the building’s annual energy requirements

Waste
- Centralised waste and recycling stations are located throughout the building

Health & Wellbeing
- Building features a group fitness/yoga room with staff gym memberships also subsidised by the University
- Healthy meals vending machine and fruit boxes provided in tea room

Transport
- End of trip facilities including shower facilities and lockers to encourage cycling as an alternate means of transport to and from the building

Construction
- Repurposed an existing building. All existing materials recycled and reused (except asbestos cladding)
- Carpet tiles selected for the building are made from recycled material

AWARDS
2016 Winner Green Gown Award ‘Built Environment’
2016 Winner Sustainability Awards ‘Large Commercial Use’
2016 Finalist Premier’s Sustainability Awards

Building Area: 1,885m²
Cost: $5.2 million
Date of Completion/Occupation: December 2014
Architects & Designers: McGlashan Everist Architects
Builder: ISIS Group

An impressive example of adaptive re-use, the building has evolved from an asbestos-clad delivery warehouse to the most efficient building in the University’s portfolio.
Melbourne Brain Centre

Who lives here: Melbourne University’s Department of Neuroscience as well as a number of leading institutes including The Florey Institute of Neuroscience & Mental Health. Dedicated to the advancement of research excellence in the field, the building brings together almost 500 neuroscientists and specialists working to better understand and develop cures for a range of serious diseases affecting the brain.

What’s inside: The building features environment-controlled research and testing laboratories as well as state-of-the-art medical equipment including custom-built Magnetic Resonance imaging (MRI) facilities. Two internal light wells provide an abundance of natural light throughout the building, whilst prominent steel stairways encourage active movement and interaction of occupants across floors. The building also features a 250-seat auditorium, a café and the Dax which houses an art collection commemorating and celebrating the importance of art in the treatment of mental illness.

Significance to campus: The Melbourne Brain Centre is the focal point of neuroscience research for the University and the largest of three neuroscience centres in Melbourne, the other two residing at The Royal Melbourne and Austin hospitals. Such is the public significance of the Centre to the University and public alike that construction was partially funded by philanthropists and both State and Commonwealth governments. The site upon which the Centre stands has been owned by the University for over 160 years and was the former site of the Biochemistry building.

Sustainability features

- Energy: - The building is partially powered from this unit is used to heat 95% of the domestic hot water used throughout the building
- Energy efficient lighting is equipped with occupancy sensors to reduce energy waste
- Building analytics are used to ensure continuous operational improvements

- Water: - Rainwater collected from 1,960m2 of roof space is stored in a 50,000L basement tank for irrigation and toilet flushing
- Low flow water efficient taps and fixtures are installed throughout the building to reduce potable water use
- Waste: - Mini bins are located on all floors and staff are encouraged to empty these into centralised waste and recycling stations located on each floor. Waste is separated into general (landfill) and recycled (mixed) with voluntary compost collection containers available in some kitchens around the building
- A battery collection bin is provided as are specialised medical and hazardous waste collection bins
- An e-waste/hard-waste collection system is available via ‘Campus Assist’ and soft plastics collection facilities are located in the loading dock

Health & Wellbeing

- Highly visible stairs within the building encourage active movement of occupants throughout the building
- Clever design minimises accumulation of internal heat to optimise occupant comfort. Additionally, automated and manually controlled windows provide natural ventilation to administration spaces reducing reliance upon energy-intensive cooling systems
- Building occupants enjoy good levels of natural daylight and external views from their rooms and offices

Transport

- The building houses secure bicycle ‘end of trip’ facilities in the basement (101 spaces) including changing rooms, showers and lockers
- Located on the edge of Melbourne’s CBD, the Melbourne Brain Centre is easily accessible by public transport

Construction

- Designed to minimise sun intensity, the building’s façade reduces heat gain and internal glare through a combination of double glazing, concrete panels and sunshades affixed to the north, east and west

The Melbourne Brain Centre is the focal point of neuroscience research for the University and the largest of three neuroscience centres in Melbourne.

Construction Area: 23,000m2

Stylistic Building Certification: 5 Star Green Star (Green Building Council of Australia)

Date of Completion/Occupation: April 2011

Architects & Designers: Lyons

Builder: Brookfield Multiplex Constructions

Cost: $105 million

The University of Melbourne

30 Royal Parade, Parkville

The University of Melbourne

New build
The Peter Doherty Institute for Infection & Immunity

792 Elizabeth Street, Melbourne
The University of Melbourne. New build

**Significance to campus:** Built at the site of Melbourne’s iconic Ampol building (later converted to Elizabeth Towers Hotel), the Peter Doherty Institute is located within the Parkville medical precinct at the edge of Melbourne’s central business district. This location, along with the exceptional facilities on offer at the institute, provides an ideal context for meaningful collaboration in the biomedical field resulting in outstanding researchers and students attracted to the University each year.

From a broader perspective, the Institute is also a critical public health resource in the event of an infectious disease outbreak.

**Building Area:** 25,500m²

**Sustainable Building Certification:** 5 Star Green Star (Green Building Council of Australia)

**Cost:** $207 million

**Date of Completion / Occupation:** November 2015

**Architects & Designers:** Grimshaw, Billard Leece Partnership

**Builder:** Brookfield Multiplex Construction

**Who lives here:** The Peter Doherty Institute for Infection & Immunity and six leading organisations specialising in microbiological and immunological research, education and public health.

The building brings together world class laboratory scientists, academic microbiologists, immunologists, epidemiologists, computing experts, infectious disease physicians, research nurses and pathologists; each bringing different skills and perspectives to joint programs at the institute.

**What’s inside:** State-of-the-art biomedical research laboratories and equipment including containment and support facilities for a number of public health, research and training laboratories. An open design includes an expansive foyer and upper-ground mezzanine which allows laboratories to be viewed directly from the street. Laboratory facilities are located centrally on each floor surrounded by meeting and office space. The building also features teaching areas including a 200 seat lecture theatre.

**Sustainability Features**

**Energy**

- The building is partially powered by a co-generation unit which reduces its carbon output by 2,474,970kg of CO₂ annually.
- 100% of the waste heat from this unit is used for domestic hot water use throughout the building.
- Energy efficient lighting throughout the building is equipped with occupancy sensors to reduce energy waste.
- In the warmer months, the building is cooled with cool external air overnight and — when conditions are suitable — during the day as well to reduce reliance upon cooling systems and consequently, energy use.
- Building analytics are used to ensure continuous operational improvements.

**Water**

- Grey water from the building is filtered through a rooftop garden before being returned to a 30,000L holding tank for toilet flushing throughout the building.
- This rooftop biotreatment system features 900 plants and sand filters and creates a picturesque green garden aspect which is overlooked from the boardroom.
- A 100,000L rainwater tank in the basement supplements the grey water system to flush toilets throughout the building.
- Low flow water efficient taps and fixtures are installed throughout the building.

**Waste**

- Mini bins are located on all desks and staff are encouraged to empty these into centralised waste and recycling stations located on each floor. Waste is separated into general (landfill) and commingled recycling (mixed) with voluntary compost collection containers available in some kitchens around the building.
- A battery collection bin is provided as are specialised medical and hazardous waste collection bins. An e-waste/hard-waste collection system is available via ‘Campus Assist’ and polystyrene/pallet/cardboard collection facilities are located in the loading dock.

**Transport**

- The building houses secure bicycle ‘end of trip’ facilities on the ground floor including showers, change rooms and lockers.

**Construction**

- Designed to minimise sun intensity, the building’s façade features the ‘Okalux’ double glazing system which comprises fixed timber battens between two panes of glass. This design provides solar protection during summer but allows sunlight to penetrate during the cooler months saving on heating and cooling.

**AWARDS**

2015 Asia Pacific International Property Awards in Kuala Lumpur: Five-Star Award for ‘Best Public Service Architecture Australia’

2014 Australian Timber Design Award: Sanderson Memorial Trophy

2014 Australian Timber Design Award: Excellence in the ‘Use of Timber Products’
Who lives here: The University’s Faculty of Architecture, Building & Planning. Dedicated to the education of future architectural leaders and experts, the building was purpose designed to inspire, influence and shape the thinking of its occupants and to encourage questions through exploration of its spaces and features. A pedagogical tool in its physicality and deliberate use of raw and exposed materials, the building is a place from which students can literally learn from the walls around them.

What’s inside: Highly adaptive teaching spaces flexible to meet evolving curricular requirements including lecture theatres, exhibition and meeting spaces. The building also features a library, a fabrication laboratory and a multitude of informal collaboration spaces including amplified corridors and floor areas which offer hot desks, working counters, and seating areas for students to own and use in an ad-hoc way. The building is also home to a number of purpose-built architectural features including:

- A large open atrium space functioning as a gathering place for students across disciplines and year levels
- A ‘wellbeam’ concrete beams in the library basement
- Branching ‘y-stairs’ connecting levels 1-4 of the building
- A historic ‘box’ Bank of NSW façade integrated into the building’s west façade
- A wooden three-storey structure, suspended from the roof’s wooden beams
- A cantilever structure spanning three-stories at the building’s northeast corner
- A river-like platten pattern running along the building’s east-west egress which pays homage to an underground riverbed formerly at the site
- A Japanese Room and Terrace offering a contemporary interpretation of traditional Japanese interior and garden design, reflecting the Faculty’s long-standing connection with Asia
- The concept of ‘pedagogical building’ whereby students are taught through the built environment around them.

The building features no false ceilings and materials left in various levels of fresh to prompt questions and provoke thought.

Significance to campus: The building fulfills a number of roles for both the Architecture faculty and the broader community. Intentionally designed as a building ‘in the round’, its visual transparency opens it up to the entire campus population and it hosts thousands of people from the University community each year as well as dozens of functions for the broader built environment profession.

Sustainability features

Energy
- Full control energy-efficient lighting allows for effective zoning and dimming throughout the building and works in conjunction with occupancy and daylight sensors to reduce wasted energy.
- Windows in studio and office spaces can be opened to allow internal temperature control. The eastern glass front of the atrium space can also be opened to draw fresh cool air through the building when required. Additionally, sensors throughout the building constantly monitor internal temperature, opening and closing ventilation accordingly to reduce reliance upon heating and cooling.

Water
- A 750,000L water tank located in the basement harvests rainwater which is recycled for use in toilets throughout the five-storey building, the surrounding garden and a heat rejection system located on the roof.
- Water efficient fixtures installed throughout the building reduce unnecessary water use.

A pedagogical tool in its physicality and deliberate use of raw and exposed materials, the building is a place from which students can literally learn from the walls around them.

Building: Brookfield Multiplex

Building Area: 15,300m²

Sustainable Building
Certification: 6 Star Green Star ‘Design’ (Green Building Council of Australia)
Cost: 202 million
Date of Completion / Occupation: October 2015
Architects & Designers: John Wardle Architects, NADAAA
Builder: Brookfield Multiplex

Awards
- 2015 AIA Victoria Awards: Best Educational Architecture
- 2015 AIA National Architecture Awards: Daryl Jackson Award for ‘Educational Architecture’
- 2015 Australian Timber Design Award
- 2015 AIA Victoria Awards: Best Interior Architecture

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Sustainability Features

**Energy**

- A 126kWp rooftop solar array meets up to 25% of the building’s load demand, reducing the need to draw electricity from the grid.
- Timer and motion activated lighting throughout the building ensures lighting is only on when required to reduce energy waste.
- A tri-generation system generates low carbon electricity for the building. As part of this system, waste heat is captured to generate hot and cold water for the building.
- A concrete thermal labyrinth set into the building’s foundations cools and heats air circulated through buildings by up to 4°C (depending on the time of year), reducing reliance upon air-conditioning and heating.

**Waste**

- Exterior terracotta louvres on the building’s façade provide solar control all year round and reduce heat gain in summer.
- Large, hundred-year-old fig trees were carefully preserved during construction of the building — some with main roots just two feet from the building.

**Wastewater**

- Bore water from UNSW’s aquifer provides non-potable water to the building for irrigation, bathroom toilets and cooling towers. 80% of water collected from University rooftops is fed back to the aquifer for treatment and re-circulation.

**Construction**

- Aluminum window frames are thermally broken to improve window insulation reducing heat loss and gain.
- A dedicated ‘end of trip’ facility features parking for 120 bikes as well as shower and change facilities to encourage active transport to and from the building.

**Building Area:** 15,000m²

**Cost:** $123.5 million

**Date of Completion/Occupation:** January 2012

**Architects & Designers:** FJMT

**Builder:** Brookfield Multiplex Constructions

Who lives here: Researchers, students, teaching and administrative staff from the Faculty of Engineering and its nine schools, with some co-location with the Faculties of Business and Environment. By direct intention of former Dean, Graham Davies, seating of senior research students within the building is randomised to break down silos and encourage cross-collaboration and innovation between areas of different expertise.

The building is also home to the University Solar Racing Team ‘Sunswift’ — a team with a number of world records including the current Guinness World record for the fastest solar powered vehicle.

The building features design attenuated atriums which lead to the building including ‘Bar Navitas’, a bustling café located on the ground floor.

Significance to campus: The University’s Engineering School has fostered a number of significant engineering advances over the years. Now commercially available, many of these initiatives were incorporated into the construction of the Tyree building itself including the Vanadium Redox (flow) battery, green steel, fly ash concrete tiles and photovoltaics from Suntec — a company founded by a former UNSW Engineering student.

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The building is also home to the University Solar Racing Team ‘Sunswift’ — a team with a number of world records including the current Guinness World record for the fastest solar powered vehicle.
A world-class facility, the building brings together an extensive combination of research knowledge which has led to a number of high profile and productive research outcomes for the University.

What’s inside: A flexible and evolving research facility housing PC2 biomedical laboratories, flexible study, teaching and collaboration spaces, communal breakout areas as well as a number of support services including advanced imaging, microscopy and tissue culture facilities, animal research facilities, bio banks, administrative services and stores.

Significance to campus: The building was the first to be constructed in the University’s Biomedical Precinct and paved the way for subsequent developments including the Biological Sciences Building and the Wallace Wurth redevelopment. A world-class facility, the building brings together an extensive combination of research knowledge which has led to a number of high profile and productive research outcomes for the University.

SUSTAINABILITY FEATURES

Energy
- A 750kW gas engine-powered cogeneration installation in the building generates low carbon electricity and captures waste heat to generate hot water for heating and domestic hot water use
- High-efficiency fluorescent fittings operated by comprehensive computer control include daylight and occupancy sensors to reduce energy consumption

Water
- Bore water from the University’s aquifer provides non-potable water to the building for use in bathroom toilets and cooling towers
- Water efficient fixtures feature throughout building

Waste
- Waste is collected and transported to a 3rd party facility where it is sorted to achieve high rates of recycling and minimise waste to landfill

Health & Wellbeing
- Research write-up areas located within 6m of natural light ensuring external views for occupants and reduced reliance upon artificial lighting

Transport
- ‘End of trip’ facilities available to encourage active transport to and from the building

AWARDS
2011 Commendation, Public Architecture Australian Institute of Architects (NSW Chapter)
2011 Best Public Service, Architecture Australia
International Property Awards (Asia Pacific Region)
2010 Public Buildings Category, Randwick City Council Urban Design Awards
2010 Tertiary Buildings (over $50m), Master Builder Association Awards

Who lives here: University scientists and students along with researchers from affiliated research organisation the Children’s Cancer Institute. Together, they work collaboratively across areas including cell biology, biochemistry, genomics and proteomics to understand cancer and discover new treatments. The facility is the only integrated childhood and adult cancer medical research institute in Australasia.
Who will live here: Scientists, researchers, teachers and students in the fields of biology, environmental science, earth science and biomedicine along with administrative and support staff. A state-of-the-art facility, the Biological Sciences Building will bring together leading bio-scientists from across the world to collaborate, knowledge-share and reinforce research synergies between the fields.

What will be inside: The building will feature premier research and academic work spaces for 350 researchers as well as world-class PC2 teaching laboratories for the School of Biological Earth & Environmental Sciences, and the School of Biotechnology & Bio-Molecular Sciences. It will also house tissue culture and microscopy facilities on each floor, laboratory preparation rooms, student break-out areas, a centrally located staff common room and co-located shared facilities for analytical services, animal research, waste management, laboratory support and supplies.

Complete with a soaring glazed roof atrium spanning varying heights (from 4 to 6 levels), the Biological Sciences Building will be immediately distinctive and drenched in natural light. It is proposed that the atrium will eventually house a range of specimens on loan from the Australis Museum.

Significance to campus: Together with the Wallace Wurth School of Medicine and the Lowy Cancer Research Centre, the Biological Sciences Building, once finished, will complete the University’s Biomedical precinct. Biomedical research is one of UNSW’s key strengths and attracts significant research funding for the University each year.

SUSTAINABILITY FEATURES

Energy
- A rooftop solar array with a peak output of up to 100kWp
- High-efficiency fluorescent and LED fittings operated by comprehensive computer control will allow for effective zoning and dimming throughout the building and work in conjunction with occupancy and daylight sensors to reduce energy waste

Water
- Bore water from the University’s aquifer will provide non-potable water to the building for use in bathroom toilets and cooling towers
- Water efficient fixtures and fittings will feature throughout the building to reduce water waste

Waste
- Waste is collected and transported to a 3rd party processing facility where it is sorted to achieve high rates of recycling and minimise waste to landfill

Transport
- ‘End of trip’ facilities for cyclists will be available and feature secure bicycle storage, showers and change rooms
Global Change Institute

Who lives here? The Global Change Institute — a collaborative hub of social scientists, economists, lawyers, marine biologists, physicists and medical practitioners working to develop solutions to global challenges. In particular, the Institute aims to address the global impacts of climate change, technological innovation and population growth through advanced research focused upon healthy oceans, food systems, sustainable water and clean energy.

What’s inside? Flexible teaching, and clean energy.

Food systems, sustainable water through advanced research and innovation and population growth to address the global impacts of climate change, technological solutions to global challenges. Practitioners working to develop biologists, physicists and medical economists, lawyers, marine hub of social scientists, Change Institute — a collaborative

Sustainability Features

Energy
- The building is cooled via natural ventilation 88% of the year and a mix of evaporative cooling and in-slab cooling the rest of the year
- An operable sun-shading system minimises building heat gain and also directs air to the central atrium where warm air is discharged through a thermal chimney and cool air is drawn from the basement below
- Made from translucent Ethylene Tetra Fluoro Ethylene (ETFE), the atrium roof insulates from the sun’s heat whilst still allowing natural light to penetrate through to the interior. The two external panels can inflate and compress like a cushion to block or expose sunlight, depending on conditions
- A 128kWp PV system located on the roof (and adjacent Steele building) provides energy to the building. This system is linked to a 288kWh flow battery for a trial period

The building is cooled via natural ventilation 88% of the year and a mix of evaporative cooling and in-slab cooling the rest of the year.

Building Area: 3,779 m²
Sustainable Building Certification: 6 Star Green Star ‘Design’ and ‘As Built’ (Green Building Council of Australia)
Cost: $31.6 million
Date of Completion/Occupation: August 2013
Architects & Designers: HASSELL
Builder: McNab Constructions

Water
- A 60,000L rainwater harvesting tank collects water used for showers, toilets, comfort evaporative cooling and irrigation of the green plant wall located in the atrium
- Waste: Waste and recycling stations are located throughout the building. Waste is separated into general (landfill), corrugated recycling (mixed), and paper and cardboard recycling

Health & Wellbeing
- Building-wide monitoring systems track the building’s environmental performance. This data is communicated on touchscreens in the atrium, making it accessible to all users, occupants and visitors everyday
- Natural ventilation ensures excellent indoor air quality for inhabitants all year round
- The building features an abundance of natural light, external views and large central atrium

Transport
- A dedicated ‘end of trip’ cycling facility features 36 bike racks, 36 lockers, separate showers and toilets as well as clothes drying facilities to encourage active transport to and from the building

Construction
- Low embodied energy materials were used throughout the building’s construction including Geopolymer concrete*, recycled timber and re-purposed carpet.
- More than 94% of the atrium green wall is made from recycled materials which would otherwise have been sent to landfill. No PVC products were used in the construction of the building.
- The Global Challenges Institute building was the first globally to use Geopolymer precast concrete structurally. Made in Queensland, the production process does not create heat, does not produce CO2 and imparts waste materials.

AWARDS
2016 Property Council of Australia Innovation and Excellence Awards: Award for ‘Best Sustainable Development – New Buildings’
2015 Australian Institute of Architects National Awards: David Oppenheim Award for Sustainable Architecture
2015 Australian Institute of Architects National Awards: National Award for Interior Architecture
2015 Australian Institute of Architects (Queensland) Awards: Harry Marks Award for Sustainable Architecture
2015 Australian Institute of Architects (Queensland) Award, Steel Excellence in Buildings – Large Projects
2013 BPN Sustainability Awards: Winner, Innovation of the Year

2014 BPN Sustainability Awards: Winner, Public Building and Urban Design
2014 Australian Steel Institute QLD & NT Awards: Winner, Steel Excellence in Buildings – Large Projects
2013 BPN Sustainability Awards: Winner, Innovation of the Year

1 Geopolymer concrete* is a material made from industrial by-products such as fly ash and slag, making it a low embodied energy solution.
Advanced Engineering Building

Building 49, Staff House Road, St Lucia
The University of Queensland

New build

Who lives here: University of Queensland’s Faculty of Engineering, Architecture and Information Technology.

Home to researchers, teaching staff and 3600 students, this world class facility was designed from the ground-up to be a ‘living building’ and a subject for study in its own right. It features an interactive open design with visible strain, movement and temperature gauges embedded within its roof, walls, floors and columns to inspire curiosity and encourage analysis of its many structural and sustainability attributes.

Designed to interact with the natural environment, the building measures and monitors internal and external conditions daily to make informed decisions and calibrations which dramatically reduce energy consumption.

What’s inside: Active learning laboratories, student spaces and contemporary research facilities which connect students, researchers and industry through collaboration and complex problem solving. The building also features the GHD Auditorium which seats 500 (one of the largest teaching facilities at the University), a large central atrium, and a ground floor café.

Significance to campus: The Advanced Engineering Building sits upon the site of three former engineering laboratories and a hydraulics testing area originally built in 1959. When the area was cleared in 2010 a design competition was held to turn the ‘living laboratory’ vision into a reality. Entrants needed to propose a building which embodied interactive learning, offered the most advanced teaching methods and incorporated state-of-the-art green technology specifically suited to the Queensland climate. The resulting world-class facility was partially funded by both State and Federal Governments and engineering firm GHD.

Sustainability features

Energy
- A mixed mode ventilation system allows the building to operate largely without air conditioning. When the outside air is of an appropriate temperature and humidity, louvers open to allow cross ventilation of the teaching and office spaces.
- Individual desk air vents are filled by a ‘passive cooling system’ consisting of a thermal labyrinth and phase change materials which dramatically reduce heat gain.
- High performance glazing element heating is mostly used changing areas to encourage active movement.
- A dedicated ‘end of trip’ facility features 100 bike racks, 40 lockers, 5 showers and changing areas to encourage active transport to and from the building.

Water
- A combination of water saving measures including a 60,000 l rainwater harvesting tank, water efficient fixtures, and a water re-use program reduces the overall water consumption of the building. Toilet flushing is facilitated by water from the rainwater tank and any overflow from this tank is redirected to a second storage tank for use in irrigation.

Waste
- Waste and recycling stations are located throughout the building. Waste is separated into general (landfill), compostable recycling (mixed), and paper and cardboard recycling.

Health & Wellbeing
- Building wide monitoring systems track the building’s structural and environmental performance. This data is communicated on touchscreens in the building’s lobby, making it accessible to all users, occupants and visitors.
- Internal building layout is specifically designed to encourage active movement of occupants. Stairs are located centrally with lifts tucked away from the main building entry.
- High performance glazing upon the roof of the large central atrium draws natural light down through four floors of the building creating a light filled interaction space. A mechanical system controls the tinted glass sunshades on the roof to ensure the atrium is optimised for the time of day and season.

Transport
- A dedicated ‘end of trip’ facility features 100 bike racks, 40 lockers, 5 showers and changing areas to encourage active transport to and from the building.

Construction
- Recycled materials such as wood, rubber and fibres incorporated throughout timber facades, flooring and structures of the building.
- The GHD Auditorium’s 220-tonne exposed timber truss roof is made from mixed hardwoods grown locally in the Maryborough region.

Awards
2014 National Award for Sustainable Architecture (AIA)
2014 Emil Sodersten Award for Interior Architecture (AIA)
2014 Sir Zelman Cowen Award for Public Architecture (AIA)
2014 Australian Timber Design Awards: Engineered Timber
2014 Australian Timber Design Awards: Recycled Timber
2014 Master Builders Brisbane Region Housing and Construction Awards: Health and Education Facilities
2014 Australian Interior Design Awards: ‘Best in State’
Queensland – Commercial Design

Building Area: 22,294m²
Sustainable Building Certification: 5 Star Green Star – Educational Design v1 (Green Building Council of Australia)
Cost: $133 million
Date of Completion: Occupation: May 2014
Architects & Designers: Joint venture between Richard Kirk Architects and HASSELL
Builder: WATPAC Construction

The resulting world-class facility was designed from the ground-up to be a ‘living building’ and a subject for study in its own right. It features an interactive open design with visible strain, movement and temperature gauges embedded within its roof, walls, floors and columns to inspire curiosity and encourage analysis of its many structural and sustainability attributes.

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Abercrombie Business School complements an area dedicated to attracting, inspiring and fostering the world’s future business leaders and professionals.

Who lives here: Sydney University’s Business School comprising students, academics, researchers and administration staff.

What’s inside: Flexible teaching spaces (lecture theatres, seminar & case study rooms, 24hr computer labs), offices, communal break-out areas and open, interactive study hubs equipped with wifi, recharging stations and audio visual screens. The ground floor hosts retail space whilst the building’s top floor features a meeting and function room complete with expansive city views.

Significance to campus: The Abercrombie Business School was built to centralise and bring together a school previously dispersed across different parts of campus. Located adjacent to new studio apartment student accommodation, the Abercrombie Business School complements an area dedicated to attracting, inspiring and fostering the world’s future business leaders and professionals.

SUSTAINABILITY FEATURES

Energy
- A 79kWp PV solar system on the roof provides a minimum of 177,326kWh clean solar energy each year (an annual saving of approximately 98 tonnes CO₂-e or $18,500 for the University)
- Full control energy efficient lighting (LEDs & T5) allows for effective zoning and dimming throughout the building and works in conjunction with occupancy and daylight sensors to reduce energy use
- High performance glazing, external shading and adjustable blinds in offices and teaching spaces reduce building heat gain/loss and internal glare for occupants

Water
- Rainwater collected from the roof is directed to a 160,000L rainwater tank used for landscape irrigation and cooling towers
- Water efficient fixtures installed throughout the building provide an annual saving of approximately 4,700kL, or $17,400 for the University

Waste
- Centralised waste and recycling stations are located on each floor. Waste is separated into general (landfill), comingled recycling (mixed), and paper and cardboard recycling

Health & Wellbeing
- Internal air quality sensors control fresh air ventilation throughout the building
- A prominent internal staircase connects people and spaces, reduces lift use and encourages active movement of occupants
- The building features an abundance of natural light, external views for occupants and a large central atrium
- Water bottle refill stations and drinking fountains are available in multiple areas
- Low VOC paints, adhesives, sealants, flooring and carpets were intentionally selected to improve internal air quality

Transport
- ‘End of trip’ facilities include bicycle parking for 398 (120 secure), 58 lockers and eight showers

Construction
- The building comprises re-used and recycled timber from sustainable sources, steel from environmentally responsible steel manufacturers and green concrete (made from flyash — a waste product of power stations)
- 96% of the building’s construction waste was recycled
Who lives here: The Reid Library is an essential part of the UWA experience. A place for individual and group study, the library houses a range of student support services, rare books, special collections, journals and monographs, foreign language resources, University archives and collections for the Faculty of Arts, Social Sciences and Humanities. The library is home to a number of library staff and is also open to the general public.

What’s inside: Refurbishment has transformed the ground floor of the library into a state-of-the-art, sleek and modern space featuring a clean, open-plan design filled with natural light. The number of student spaces for collaborative and informal learning has increased from 350 to 700 and there has been improved access to wifi, power points and locker space.

The renovation has also resulted in upgraded bathroom facilities and a new café (Quobba Gnarning) which opens directly onto a refurbished northern terrace.

Sustainability Features

Energy
- LED light fittings complete with built-in motion sensors ensure lights operate only when required reducing energy consumption by 25% each month (approximately 60,000kWh or 46 tonnes of CO2-e)

Water
- Bathroom fittings were replaced with water efficient alternatives such as push-button timed flow taps, low-flow urinals and dual flush cisterns. Hot and cold taps in some basins were replaced with cold water only taps

Waste
- Waste and recycling stations are located throughout the library and adjoining terrace. Waste is separated into general (landfill), comingled recycling (mixed), and paper and cardboard recycling

Health & Wellbeing
- Renovated areas feature an abundance of natural light and external views for occupants

Transport
- ‘End of trip’ facilities including shower facilities and lockers installed encourage cycling as an alternate means of transport to and from the library

Construction
- Bricks recycled from the original Reid Library site were re-used for a feature wall in the new café to reduce waste and retain historical narrative. Similarly, some of the furniture and finishes from the original library were recycled on the upper floors. All furniture, fixtures and fittings for the refurbished spaces were selected with durability of use and maintenance in mind
- Ground floor windows replaced with 8mm glazing to reduce thermal heat gain/loss without compromising natural light

The building was constructed in a new-classical style to compliment the adjacent Arts Building which was commissioned at the same time.

(Academic Libraries), High Commendation
2017 Australian Institute of Architects: Interior Architecture Award, Commendation
2017 Australian Institute of Architects: Enduring Architecture Award
1964 Royal Institute of British Architects (RIBA) Award, Bronze Medal

AWARDS
2017 Australian Library & Information Association: Australian Library Design Awards

IMAGE CREDITS: PETER BENNETTS PHOTOGRAPHERS
Who lives here: More than 350 researchers working across the areas of oceanography, marine ecology, fisheries, geochemistry, governance, marine technologies and engineering. The purpose-built research facility is home to three major organisations including the Ocean’s Institute Group (part of the University of Western Australia), the Australian Institute of Marine Science and CSIRO.

Dedicated to the study of the Indian Ocean, the facility is the first of its kind and brings together a wealth of marine research experience to facilitate collaboration and build collective understanding around this unique and diverse ocean.

What’s inside: Offices and workstations for researchers, technicians and post-graduate students, open collaborative spaces, wet and dry laboratories with PC2 capability as well as the National Geotechnical Centrifuge Facility. It also houses a multi-purpose lecture theatre on the ground floor linked to a large interaction space complete with external courtyard. Other external features include undercover field-staging areas, loading bays, technical areas and boat storage.

Significance to campus: A state-of-the-art facility, the Indian Ocean Marine Research Centre attracts significant international interest to the University from scientific communities far and wide both for its collaborative marine research and proximity to the Indian Ocean. Healthy oceans are vital to the survival of life, and as such, the Indian Ocean Marine Research Centre is dedicated to delivering sustainable, ocean-based solutions to key global challenges such as sustainable fishing and ecosystem resilience; the significance of which is substantial not only for the University, but all humankind.

SUSTAINABILITY FEATURES

Energy
- A strong solar design aspect (north/south facing with an east/west axis) ensures internal areas are mostly sunlit during the day. Additional lighting is provided by energy efficient lighting equipped with motion sensors
- Underfloor displacement air conditioning provides efficient heating and cooling to internal spaces
- Ductwork and pipework velocities have been selected to minimise system pressure losses and lower fan and pump power consumption

Water
- Water efficient fixtures and fittings throughout building reduce water waste
- Storm water is collected on site in soak walls and returned to ground water
- Irrigated ground water is used for the University fire service
- Instantaneous hot water is available on-demand and heated only when required

Waste
- Centralised waste and recycling stations are located on each floor. Waste is separated into general (landfill), commingled recycling (mixed), and paper and cardboard recycling

Health & Wellbeing
- Building features a dedicated parent room equipped with baby change facilities. Staff also have access to the University’s child care centre on campus
- Prominent central stairway and standing desks at work stations promote active movement of occupants
- 20% of the building’s office areas feature standing desks
- Internal office walls are made from glass to facilitate transparency throughout the building and ensure light-filled spaces with an abundance of external views for occupants
- Air conditioning systems within the auditorium, laboratory and office spaces on level one and above are supplied with 100% fresh outside air

Transport
- ‘End of trip’ facilities including shower facilities and lockers encourage cycling as an alternate means of transport to and from the building

Construction
- External finishes of building predominantly feature concrete, aluminum, glass and stainless steel — all chosen with minimal maintenance in mind
- The colour palette of the building is deliberately in keeping with its surrounds so as to enhance its environment whilst remaining consistent with the rest of campus