William McCormack Place Stage 2

Project type: Commercial

Location: Sheridan Street, Cairns, QLD Australia
Year Completed: WMP1 2002 | WMP2 2010
Total Gross Floor Area:
WMP1 4,000 m² | WMP2 14,500 m²
Project Cost: WMP1 $17 million | WMP2 $79.5 million
Energy Star rating:
WMP1 – 5 Star ABGR (now NABERS) Rating
WMP2 - Green Building Council of Australia(GBCA)(6 Star Green Star Office Design v2/As-Built v2/Interiors v1)

- **William McCormack Place (WMP) is the first office building in tropical Australia to achieve a Green Building Council of Australia 6 star rating (the highest rating, positioning the building as world class best practice)**
- **Leading edge technology using a mix of low water and energy consumption, air change effectiveness and lighting/ daylighting systems**
- **High degree of integration and collaboration by the local design team**
- **Tropical expertise delivered a world class building for tropical Cairns, raising awareness for efficient sustainable design within the city's population**

OVERVIEW

William McCormack Place (WMP) is an office precinct located in the central business district of Cairns. It comprises of two buildings built for the Queensland Government to provide flexible office space for government departments.

William McCormack Place 1 (WMP1) was carefully designed to achieve the highest environmental standards at the time and was the first office building in Australia to achieve 5 stars under the Green Building Council of Australia rating scheme.

William McCormack Place 2 (WMP2) followed and exceeded its predecessor. It is the first building in regional Australia to be awarded 6 Star Green Star ratings from the Green Building Council of Australia, representing 'World Leadership' in environmentally sustainable design. WMP2 is also one of a select few projects to have achieved 'triple six' ratings:

- 6 Star Green Star Office Design v2
- 6 Star Green Star Office As-Built v2
- 6 Star Green Star Office Interiors v1

Although Green Star achievements are not unusual in Australia's capital cities, such a rating had never been achieved in a regional or tropical location. The team's local expertise helped set a new benchmark for sustainable building design for hot, humid conditions.

As WMP2 is the newest building in the precinct, and this case study focuses on its features. For WMP2, the architects master planned and documented the building in close interaction with the client and other consultants to ensure the best outcome. The team provided a full service from assisting the client in formulating their brief, providing Green Star input and following the project through all design stages and construction.

PLANNING AND MANAGEMENT

The cohesive design delivers a 'whole of building' solution. The design process for WMP2 is characterised by an unusually high degree of integration and collaboration. The client, architects and engineers cut across traditional boundaries of responsibility in a series of design charrettes to ensure a structure within which all disciplines could excel. This interaction continued throughout design and construction.

The ongoing management of the building is assisted by a Building Management System (BMS) that centralises control and management. It includes all time scheduling, sub-metering of all energy and water and fault reporting on all systems. A touch screen is provided in the lift lobby on each floor for after-hours control of lighting, ceiling fans and air conditioning. Each zone is presented graphically to encourage ease of use.

SITE

The site was a dis-used brown-field site in a central location which allows good access to public transport infrastructure and access to conveniences in the central business district of Cairns City. The urban context was the starting point of the design for the building form, choice of materials, streetscape and environmental amenity.

WMP2 has been designed to balance the Net Lettable Area (NLA) and the government's preferred plate size with the site constraints, and to maximize the environmental performance of the façade with minimal material usage and subsequent cost. The final form is linear and rectangular on a broadly East-West axis. This allows maximum solar shading with minimum applied sun shading.

The WMP1 design provided green space on the street and a suitable scale to the street frontage, whilst WMP2 is a much larger building providing more density on the site, but is set back so that it doesn't dominate the regional city streetscape.

DESIGN

The building provides a healthy work environment, with tenants benefitting from improved air quality. There is a 50% increase in fresh air to office areas with significant reductions in indoor air pollution. High ceilings and windows, and light finishes, provide natural daylight for the vast majority of working requirements throughout the eight metre deep open-plan office zones.

The orientation of the building was carefully selected to minimise direct sunlight on the façade reducing the need for extensive sun shading. The length to width ratio is 3:1 with long sides facing North and South. The Western elevation has minimal windows. The East and West elevations incorporate stairs, thus eliminating the need for stairwell pressurization and providing a solid façade to limit solar penetration.

All facades have external shading systems designed to provide a total of 96% shading in

accordance with the Green Star assessment method. Targeted external shading and vacuum double-glazing minimises glare and heat gain from the windows.

Traditional dropped ceilings were avoided to encourage open plan space use rather than individual offices.

WMP2 provides a shaded and weather-protected outdoor lobby/cafe space for the amenity of workers instead of the more normal air-conditioned foyer. An overhanging 'living green wall', native plantings, and natural stone flooring imbue a cool natural relaxed tropical space.

The lobby's orientation catches natural breezes throughout the year, but for hot and still days, very large 'Big Ass' ceiling fans are provided to circulate air down and across the cool stone floor for effective but gentle cooling.

Structural engineering initiatives produced a streamlined and highly efficient post-tensioned structure, reducing concrete and steel use and allowing maximum flexibility for installation of efficient building services.

There is a high degree of natural ventilation to the covered car parking areas.

The key design solutions implemented along with other engineering initiatives have assisted in delivering the WMP2 project on budget and ahead of schedule.

MATERIALS

The Green Building Council of Australia Green Star rating system sets standards although WMP2 appreciates its local environment. Materials selection considered the construction process and sustainable materials were selected resulting in less demand on energy and local water supplies and supported local availability.

The lighting control system that has been installed is 'a world first'. It is a novel device designed and built by a Queensland company.
The design actively reduced concrete and steel use. The floorplates were designed to maximise

the efficiency of the structure, and a highly efficient post-tensioned system was used to minimise floor thicknesses and the amount of steel reinforcing. A 70% reduction in reinforced steel was achieved.

ENERGY

The building's energy saving initiatives will deliver approximately $450,000 per year in cost savings.
WMP2's design is predicted to reduce energy/emissions by approximately 60% (1,000 tonnes per year), compared to a normal office building and a 40% reduction in whole-building demand on the electricity grid.

WMP2 has a 64 kilowatt solar photovoltaic array producing electricity. There are also many energy demand reducing features. A 'daylight harvesting' system regulates the amount of electric lighting provided to open plan office areas based on the amount of daylight available in each space. Carefully placed 'indirect' lighting sensors are used to monitor the amount of light bouncing off the ceiling of the office, as well as smooth/slow dimming fluorescent lighting to provide a system that is both efficient and comfortable. As a result, lighting energy in the open plan areas is reduced by up to 60%.

Energy efficient, high output light fittings have been installed. Efficient placement of light fittings ensures sufficient lighting levels whilst minimising energy consumption. Lighting is managed through a lighting control system which is connected to the Building Management System.

A combination of air conditioning and high efficiency, low noise ceiling fans were used. The ceiling fans assist the air conditioning via a 'physiological cooling effect' (cooling by breeze over skin) – reducing cooling energy use by 20% and reducing the need for (wasteful) air conditioning during partial occupancy after-hours.

Ventilation rates are at 150% of statutory requirements. The buildings sensors and automatic management controls increase the rate of ventilation when high CO2 levels are measured on a particular floor.

The building has a decoupled pre- conditioning outside air (PCOA) system employing total enthalpy rotary heat recovery exchanger, dehumidification cooling coil and electrostatic spill air filters.
A 1.5 million litre stratified chilled water Thermal Energy Storage (TES) system chills water for the air conditioning system at night. The cooler night-time conditions allow the air-cooled chiller to operate more efficiently than traditional water cooling tower system would in the day.

There are variable speed drives to all air handling fans and secondary chilled water pumps.
A 1100 kilo Watt (kW) air cooled turbine chilled water generator in combination with the TES tank, provides sufficient capacity to serve a total maximum instantaneous building cooling load of 1550 kW.

Around 24% of the whole building's energy use occurs in the network off-peak period, reducing demand on electricity infrastructure, and also reducing 'indirect' emissions from transmission line losses.

All diesel fuel used by the two backup generator sets is logged as an energy source for the assessment of NABERS ratings.

WATER and WASTE

WMP2 achieves a 75% reduction in potable water use, an 80% reduction in water to the sewerage system and a 25% reduction in water the stormwater drains.

Potable water (water from the city's purified reticulated water storage system) use is reduced by about 75% (17ML/y), compared to an average GBCA 2.5 Green Star office building. This includes the 5ML/y saving due to the TES air-cooled chiller; the 55% reduction in all of the toilets potable water use due to rainwater re-use; and specially developed flow control solutions for water fixtures which exceeded Water Efficiency Labelling and Standards (WELS) scheme ratings.

A 75,000 litre rainwater tank stores harvested rainwater from the roof and is primarily used for flushing toilets. Harvesting rainwater reduces run-off to the city's drains and reduces the need for potable water to carry out some of the buildings sanitation needs.

The capture and re-use of the condensate (water) from the Pre Conditioned Outside Air (PCOA) unit is estimated at 170,000 litres per year. Along with grey water captured from showers and basins it is used as irrigation across the gardens and landscape. This system minimises the use of potable water and at the same time wastewater is diverted from the city's sewerage system (and ultimately the Great Barrier Reef). It is estimated that there will be a 20% (1 ML/y) diversion of grey water to the landscape instead of the sewer.

A 'smart' irrigation system balances the irrigation needs of each landscaped area with the available grey water Each landscaped area has its own soil moisture sensor so that only the required irrigation is provided.

PROJECT TEAM

Base building architect/ designer: CA Architects and Cox Rayner Architects
Other architect/ designer: Design Director Peter Hale
Project Director: Carlo Amerio
Project Architect: Jeremy Marsden
Project Architect: Stuart Withrington
Project Architect: Gisela Jung (Green Star)
Interior designer: Queensland Government, Project Services Office Interiors
Civil engineer (Site and traffic): ARUP
Structural engineer: ARUP
Services engineer (mechanical electrical, hydraulic, fire):
MGF Consultants – mechanical and electrical consultant
Gilboy Hydraulic Solutions – hydraulic consultant
ESD consultant: Turner and Townsend
Green Star rating consultant: Gisela Jung
Other consultants:
Landscape Architect – Gamble McKinnon Green
Cost consultant: RLB
Peer review of Green Star Submission - Viridis
Builder: Laing O'Rourke

Photographs courtesy of Robert Gesink and Christopher Frederik Jones

For more information visit: **www.jcu.edu.au/tsd**
www.greenbuild.com.au

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