



In the 6 star Green Star One Shelley St, glass-walled meeting rooms appear suspended within the atrium space..

Out of the box

It is a rare building indeed that simultaneously reinvents the modern workplace while driving down its environmental impact. Add a traditionally conservative institution as major tenant and you can begin to understand how One Shelley Street has reshaped the template for commercial office buildings. As **Sean McGowan** explains, the result is spectacularly successful.

Nothing about One Shelley Street is simple. From the striking steel of its façade to the 6 Star Green Star ratings it has achieved, the building is a triumph of sustainable design and imagination.

Located on a previously developed brownsfield site a block from the shores of Darling Harbour, this Brookfield Multiplex construction committed itself to environmental sustainability from the earliest stages of its planning.

Despite originally being conceived as a mixed-use residential and commercial property, the project was changed to a

wholly commercial building part-way through construction when a long-term lease with the Macquarie Group was negotiated.

Featuring two towers of 10 and seven stories bridged by a glass atrium, the building is wrapped in a diagonal grid of 3,000 tonnes of steel, which not only holds the structure and glass façade together, but delivers an open floor space of some 33,000m free of supporting columns.

The basement car park of five levels, originally designed for residents, has been made into a coach layover facility with

room for 55 coaches. On street level a café, bar and restaurant services both the building's occupants as well as the general public.

But it is the combination of an activity-based working environment – along with a suite of sustainable initiatives – that has drawn attention to the building.

6 STARS. NO BOLT-ONS

Designed by architect Fitzpatrick and Partners, One Shelley Street set out to be among the largest projects of its kind to achieve a 6 Star Green Star rating for Office Design and As-Built.

Engaged by Multiplex Developments before the initial building design, WSP Lincolne Scott was initially asked to compile a base building brief to attract prospective tenants, before being engaged for the mechanical, electrical and ESD design of the base building, among other fields.

With Macquarie Group committing as sole tenant early on, the unusual fit out – designed by Dutch architectural firm Veldhoen + Company, technology consultant Philip Ross, LA-based architect Clive Wilkinson and local architects Woods Bagot – dictated much of the design of the building's mechanical systems.

‘The decision to use chilled passive beams was made after a number of alternatives were considered, including low-flow VAV, displacement and active chilled beams.’

This team worked with the Macquarie Group to create an innovative workspace and the first example of activity-based working in Australia – quite the departure for an organisation that was previously accommodated in a traditional office environment.

The design included glass-walled meeting rooms that appear suspended within the atrium space across nine levels (apparently the original idea was that they be mechanically “called up”, taking inspiration from the nearby docks.)

Adhering to the sense of community being sought, the fit-out on each floor was designed to break away from traditional designated offices. Rather, a range of different spaces were designed to allow employees to work from laptops wherever they felt most comfortable on any given day.

These included open social areas, couches, coffee-shop-style booths, communal tables and carrels offering a degree of isolation.

Themes were given to a number of floors, including “library”, “playroom” and “garden” – themed floors kitted out in furnishings and decorations to match.

According to WSP Lincolne Scott director John Osborne, this unusual fit-out meant

The contractor speaks

We had a few questions for Glenn Hughes, construction director for Hastie Australia, about the firm's work on the project.

Eco: Similarly, did the non-traditional fit out (the activity-based working concept) impact on the mechanical services installation?

GH: We believe the impact was specific to occupancy rate variations within the space that may occur due to the occupants not having dedicated work spaces.

Eco: What are the challenges of installing mechanical services within a space that has been designed to offer so much flexibility in how and where occupants work, gather and move?

GH: Ensuring that system capacity requirements due to occupancy variation could be met throughout the building whilst not posing operation issues such as turndown (over-cooling) and low load related issues.

Eco: How was the geothermal harbour loop installed, and what systems are used to circulate cold water through the building to the chilled beams?

GH: The harbour heat-rejection system provides heat rejection from the closed loop condenser water circuits associated with the chilled water plant and closed-loop tenants condenser water systems. Heat is rejected through titanium plate heat exchangers.

Primary seawater is circulated through underground pipework to and from the harbour. Some of the underground pipework was installed by others under another contract – our works were associated with extending and connecting to the existing pipework and provision of the associated plant including heat exchangers, primary and secondary pumps, automatic filters and strainers.

A dedicated high-temperature chilled-water reticulation system is used to circulate water through the chilled beams. This system is provided water via dedicated high – temperature chillers with low-load catered for using a plate heat exchanger and low-temperature chilled water.

One of the dedicated high-temperature chillers was selected and piped into the system such that it could provide low-temperature chilled water to the system on failure of one of the dedicated low temperature chillers

Eco: How is heating supplied to the building?

GH: Via three gas-fired condensing hot water generators with associated heating water reticulation system. Perimeter trim heating was provided using electric duct heaters. Some preheat within the air-handling plant was provided using condenser water coils within the air-handling units.

Eco: Was the high ventilation rate and 100 per cent outside air easily achieved?

GH: It was 100 per cent outside air with 100 per cent outside air improvement. We utilised central chilled water plant with air-handling units. The air-handlings units used have four coils, these being, high-temperature chilled water (pre-cool), low – temperature chilled water, condenser water (pre-heat) and heating water.

the HVAC design needed to be flexible and respond efficiently to varying loading.

“The floor plates combined a number of different work settings,” Osborne says. “We reviewed each work setting and its intended usage, together with potential out-of-brief operation. Based on this review we optimised the services design.”

The chosen HVAC solution was passive chilled beams connected to a harbour heat – rejection system.

Like other buildings using the Sydney Harbour’s geothermal properties, One Shelley Street’s is an open system that draws harbour water through a heat exchanger before being returned to the harbour via a discharge nozzle.

“Reducing potable water consumption was the key driver behind the implementation of this system,” Osborne says. “We also aimed to increase energy savings by taking advantage of reducing average condensing temperatures.”

The decision to use chilled passive beams was made after a number of alternatives were considered, including low-flow VAV, displacement and active chilled beams.

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Osborne says passive chilled beams were chosen for a variety of reasons, including that they maximised the net lettable area by allowing the development of an additional floor plate within the building’s established height limit.

He says this increased floor plate efficiency to 94 per cent.

“The passive chilled beams also lent themselves to this development, as they provided significant IEQ benefits to the tenant over other systems, are energy efficient, and their passive design aligned itself with the project’s ESD aspirations.”

The heating for the building is supplied via the primary air supply system, which has two roles: dehumidification and heating. Heat is also reclaimed from the condenser water to assist in heating.

Air handling units installed throughout treat the outside air and control moisture levels within the building, while high-temperature chilled water is used in conjunction with traditional cooling coils to condition the outside air.

“The outside air quantities represent a 100 per cent improvement over standard,” says Osborne, adding that the temperature introduced to the floor plate is at a “fairly neutral” temperature depending on capacity requirements.

FEATURE



The building is wrapped in a diagonal grid of 3,000 tonnes of steel.

This is one of the challenges of designing for energy efficiency within a space that offers so much flexibility in how and where the occupants work and gather.

He says for this reason, the design was continually tested against the desired energy performance criteria.

“There was a finite capacity within the building, and it was not possible to provide flexibility by simply adding capacity,” Osborne says. “Instead, we looked at opportunities to re-use and reclaim capacity. It was important to forecast the outcomes to the design team and business groups.”

The HVAC design contributed significantly to the building’s 6 Star Green Star ratings for Design and As-Built.

Unusually, however, this rating – of which One Shelley Street is just one of three buildings in New South Wales to achieve – has been met without any form of onsite energy generation.

Although onsite generation was originally reviewed, with the services designed to include micro-turbines combined with an absorption chiller, these were not installed due to budgetary considerations and revised tenant requirements.

Osborne says for the building to achieve its 6 Star Green Star ratings without these “bolt – ons” is testimony to its design and the commitment shown by all stakeholders.

ROUNDING OUT THE GREEN

In achieving the 6 Star Green Star ratings, the building received perfect scores from the Green Building Council of Australia for ESD points such as water conservation, environmental management, integrated fit-out, indoor environment quality and PVC minimisation.

Other initiatives contributing to the “world leader” rating included recycled timber sourced from the Alexandria Woolsheds, which was used in flooring, external decking and ceiling timber. Roof supports were similarly recycled from telegraph poles and from a disused fuel dump in Gladstone on the Queensland coast.

Fritted and low-emissivity glass panels in the façade help reduce the building’s heat load. They are coated to eliminate the need for external shading mechanisms, with internal blinds used only to assist with daylight glare control.



The building received a perfect score from the GBCA for its integrated fit-out.

PROJECT AT A GLANCE

The professionals

Architect (Base building):
Fitzpatrick+Partners

Architect (interiors):
Clive Wilkinson, Woods Bagot, Veldhoen + Company

Structural engineer: **Arup**

Head building contractor:
Brookfield Multiplex

ESD, mechanical and electrical consultants:
WSP Lincoln Scott

Independent commissioning agent: **Lee Tolley, Commtech**

Mechanical contractor:
Hastie Australia

Owner/tenant:
Macquarie Group

The equipment

Air-handling units: **Trane**

BMS: **Johnson Controls**

Chilled beams, Passive: **Frenger**

CO₂ sensors/controls: **Johnson Controls**

Condensing Gas-fired hot water generators: **Rendamax**

Electric chillers: **Trane**

Fans: **Fantech**

Heat exchangers: **Alpha Laval**

Swirl diffusers: **Krantz**

High-frequency ballasts, appropriate acoustics, the use of low-VOC materials, formaldehyde minimisation and tenant exhaust risers all contribute to the building's high indoor environment quality.

As might be expected, bicycle racks and showers are provided to promote the use of forms of transport other than cars, while the building is also located in close proximity to major public transport routes.

Rainwater collection and recycled site water supplies almost all of the water required for landscape irrigation, while dual pipe work has been fitted to allow for full recycling of grey and black water in the future.

COMMISSIONING AND POST-OCCUPANCY

According to Osborne, metering was an important part of building tuning, and as such an intricate sub-metering system was selected to assist in this regard.

In total, more than 150 sub-meters have been installed to monitor power, energy, demand, voltage, current, power factor and harmonics.

Additionally, the design team decided early on in the project to keep the BMCS, metering and lighting control separate, so as to take advantage of the full potential of each individual system.

"Our aim was to avoid losing functionality by duplicating systems on the BMCS," he says.

"The systems, however, do incorporate a high-level interface to allow monitoring from the BMCS, with all programming performed at the individual head ends."

A detailed commissioning program was instigated on the One Shelley Street project, which included the engagement of an independent commissioning agent who provided point-to-point checking of all systems and had input into all aspects of the project.

Furthermore, the passive chilled beams were subjected to onsite smoke testing in order to witness the convective patterns they created.

It is now two years since Macquarie Group took occupancy of the building, and Osborne happily reports that both Brookfield Multiplex and the tenant have been pleased with how the building has operated to date.

With WSP Lincoln Scott still involved with the day-to-day operations of the building, he says the HVAC system has been geared to serve the tenant and its changing needs.

"We are confident with the ongoing commitment that the building will perform as expected and meet original expectations," he says.

Although Macquarie Group's employees are said to have taken some time to adjust to their new workspace, productivity levels were recently reported to have increased by 15 per cent.

Along with being agreeable to the 2,500 professionals who occupy the building daily, the Green Building Council of Australia has also looked favourably on One Shelley Street, awarding it with a 6 Star Green Star – Office As Built v2 certified rating in July.

One Shelley Street is only the 10th building in Australia to achieve this certification. ■



The unusual design partly dictated design of the mechanical systems.