1200 Buildings

CASE STUDIES

500
Collins Street

500 Collins Street is an excellent example of the substantial refurbishment of a building conducted to achieve energy /water efficiencies whilst maintaining high tenancy levels.

Built
1970's
NLA
Office 26,000 m² approx
Tenancy
Office, retail, basement car park
Building owner
Kador Group
Property manager
ECS Property Group
Refurbishment project timelines
2004 - 2011
Project team
Project manager: Lend Lease Facilities Manager: ECS Property Group ESD consultant: SBE
NABERS Energy
Target: 5.0
NABERS Water
Target: 5.0
Key refurbishment features
• Energy efficient variable speed drive chillers • Gas fired boilers • Chilled beams (passive and active) • Solar panels servicing 25% hot water requirements • T5 light fittings • Water tanks collecting rainwater and condensate for landscape irrigation • Waterless urinals and dual flush cisterns • Flow restricting devices on all fixtures.
Energy saving
Not yet determined
Water saving
Not yet determined
Greenhouse saving
Not yet determined
Project costs
Not provided
Annual saving
Not yet determined

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Background

The construction of 500 Collins Street was completed in the 1970s. For many years, it enjoyed an enviable reputation for its quality of construction, reflecting modern building standards and services of the time. As a consequence, it attracted a high tenancy profile.

By 2002 however, when the building was put on the market, it had deteriorated to a low B-grade standard through general aging and obsolescence.

Despite its general decline, the building had managed to retain its tenants. This was due to its size and configuration, its first-rate location, good design and sound building management.

It was these attributes that led the building's new owner, the Kador Group, to decide that it was suitable for a substantial refurbishment.

Prior to refurbishment, the building comprised a total of 23,500 m^2 of office space, five retail shops and 140 car parking spaces.

The refurbishment project began in mid-2003 and was completed in early 2011.

Objectives

The main objectives of the refurbishment were to:

- achieve an A-grade building standard
- attain a high degree of environmental efficiency, both during the upgrade works and post-upgrade operations (this objective was set before NABERS and Green Star ratings were in place)
- maximise tenant retention during the upgrade to maintain optimum cash flow and provide a potential pool of long-term tenants
- elevate tenancy profile by increasing the average size of tenancy, length of tenure and quality of tenant
- achieve a commercially justifiable return on investment.

Planning

The master-planning phase of the project, beginning in mid-2002, took almost a year to finalise. This was due to the complexity of the project.

The Project Manager, Bovis Lend Lease, led a large project team, which included an environmentally sustainable design (ESD) consultant. Other team member services included architecture, engineering, planning, quantity surveying, building surveying, disability, façade engineering, hazardous materials, waste management, acoustic, car park, traffic, landscape design, and owner representatives.

An independent commissioning agent (ICA) was also appointed, and engaged to work through all phases of the project, including monitoring ongoing building performance and tuning the building after the refurbishment project was completed.

When the project began in 2002, most project consultants had not worked on a project with sustainability at its core, or with an ESD consultant who had a significant voice in a project.

During the planning phase, a wide range of options were discussed and tested against broad ESD objectives (this was prior to a NABERS or Green Star rating system against which anticipated performance could be measured).

The team's master-planning phase was not hurried, and this was important so the project could evolve in a cohesive and coordinated manner. As a result, the team expressed confidence in the project outcomes which fostered the development of a team 'environmental culture'.

Some refurbishment elements were left for further investigation to analyse their environmental and commercial merit, particularly the question whether variable air volume (VAV) was more energy efficient than chilled beams for the heating, ventilation and cooling (HVAC) system.

Implementation

The project was divided into three stages in order to allow for the almost fully occupied building to operate while the project was underway.

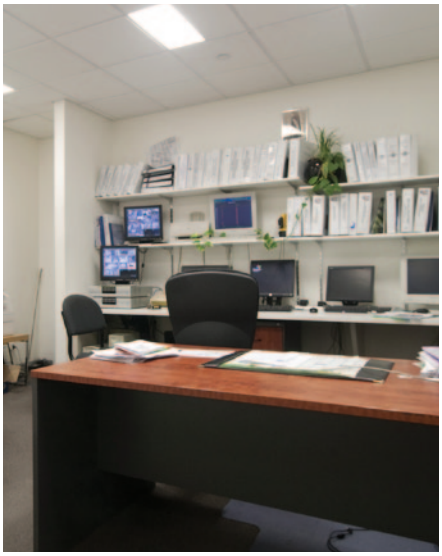
Stage 1: Plant replacement and upgrade, and renovation of the building façade.

Stage 2: Maximisation of the retail space and reconfiguration of the car park.

Stage 3: Office floor upgrades. This was rolled out progressively as leases expired. The work included completely stripping out each floor (including lobbies and amenities) and replacing them with new finishes and chilled beam air conditioning.

The floor-by-floor upgrade required a great deal of planning, as it could only be realised when tenants vacated their space. Generally, this was achieved three floors at a time.

It also meant, as much as possible, minimising the impact of the building construction on the tenants who were still in the building. This was achieved by having several lifts dedicated to the builders; demolition work being completed out of hours; old carpets laid on the concrete floors to deaden the noise for the tenants below, and so on.



Features

Building

As a chilled beam solution was chosen for the HVAC, it was necessary to check the air tightness of the building prior to installation. This is fundamental to the performance of this type of system, otherwise condensation can accumulate on the beams and drip on people and equipment. Consequently, an air pressure test for each floor of the building was conducted to reveal any leaks, but the building was found to be very airtight.

The building façade was upgraded by replacing glazed spandrel panels with aluminium wall panelling, repairing and refurbishing vertical columns, and repainting the whole façade.

Part of the building refurbishment also included changes in the floor structure, which resulted in an increase in the office net tenantable area to approximately 24,400m^2 with eight additional shops (bringing the total to 13), a small decrease in car park spaces, and the addition of secure bicycle racks, change rooms with shower facilities and disabled access and amenities.

Foyer entries and public areas were also upgraded.

Level three was extended onto the podium of level two to create external meeting space and recreational landscaped areas.

HVAC

When the building was purchased in 2002, the HVAC plant had clearly reached the end of its life cycle.

The original HVAC centralised system pumped cold air down one duct, hot air down the other, and mixed them to get the right room temperature. This was not a very energy efficient system.

Consequently, the HVAC systems were completely renewed. This included the installation of:

- new energy efficient chillers with variable speed drives and more water efficient cooling towers
- gas fired boilers used for heating replacing oil fired ones.

As each floor became vacant, a chilled beam air conditioning system was installed.

This is a combined system – with active chilled beams that use fans to diffuse cool air around the building's perimeter where solar loads are high and passive in the interior spaces. The original central ducting was reused in the perimeter zones.

The chilled beam system reduced the number of fans for all air conditioning from four to two, which significantly decreases energy consumption.

At the time, chilled beam technology was relatively new. However, Bovis Lend Lease, the project managers, had previous experience with the Bond building in Sydney, and this proved beneficial for this project.

Because the building was occupied during the refurbishment, it was necessary to maintain the old dual duct air handling system while the new chilled beam system was being installed. This is now being dismantled.

Energy load

The overall energy load was reduced by:

- installing solar panels on the roof for hot water, supplying 25 per cent of domestic hot water
- fitting low energy T5 light fittings in all public and tenanted areas
- installing variable speed drives on major plant and equipment
- using chilled beam air conditioning.

Water

Water consumption was reduced by installing:

- waterless urinals
- three and six litre dual flush cisterns
- flow restricting devices on all fixtures
- rain water and condensate capture for landscape irrigation using large tanks in the basement parking area to store water
- baffles on the cooling tower preventing aerosol spray.

Waste

An audit was conducted on waste recycling, which led to a number of recommendations regarding management of the building's operational waste.

In addition, waste management was addressed during the construction phases whereby contractors were expected to meet targets with the recycling of waste materials. Approximately 80 per cent of total waste was recycled.

Environment

General environmental improvements included:

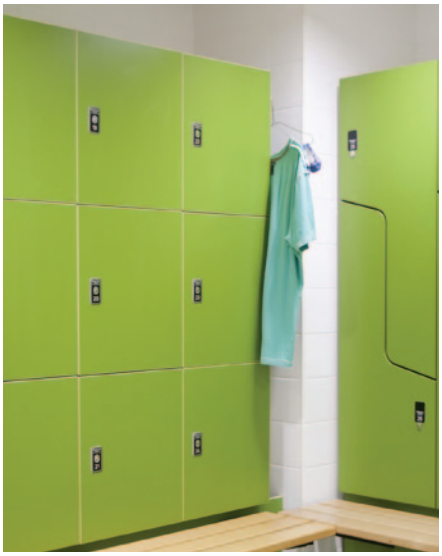
- minimising embodied energy of the building
- using PVC-free materials wherever possible
- using low volatile organic compound (VOC) materials
- preferring to use materials containing high-recycled content
- selecting materials for durability and from sustainable sources
- encouraging the use of bicycles by providing a secure bike compound for 82 bicycles, plus shower and change room facilities
- improving the indoor environment quality by increasing fresh air by 50 per cent, radiant cooling (chilled beams), low VOC materials and reduction in indoor ambient noise levels.

Building management and controls

The building controls system was completely renewed. The commissioning of this control system was an ongoing process as each floor was completed.

The main electrical switchboard was replaced, and tenancy sub-metering provided to enable effective energy monitoring.

The commissioning of plant and equipment is critical in this process so that building management understands how the building functions and is controlled for efficient operation.



Challenges

The major challenge in the project was the need to refurbish the building while it was almost fully occupied.

The early focus was on the upgrade (in most cases replacement) of the major items of the base buildings plant and equipment. This was complicated by the need to run existing plant in tandem with the new equipment so that the un-renovated floors were able to continue to operate. In many instances, the stages overlapped.

This meant a complexity in the project far beyond for example, the construction of a new building with new technologies and sustainable systems.

Outcomes

Energy

Modelled to achieve a 30 per cent reduction in air conditioning, 50 per cent reduction in lighting and 15 per cent reduction in hot water usage. This will be verified after completion of the final stage.

Water

Modelled to achieve 40–50 per cent savings in water consumption. This will be verified after completion of the final stage.

Social

Sustainability Victoria and the building owner conducted a productivity study in 2007-08. The study found:

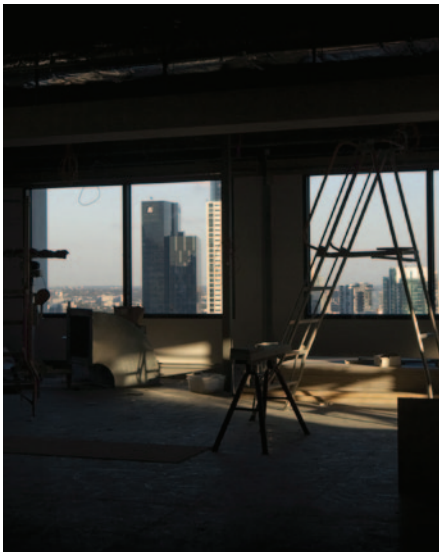
- 39 per cent reduction in average sick days per employee per month
- 44 per cent reduction in the average cost of sick leave
- 9 per cent improvement on average typing speeds and significant accuracy improvement of secretarial staff
- 7 per cent increase in billings ratio, despite a decline in average monthly hours worked
- 7–20 per centreduction in headaches
- 21-24 per cent reduction in colds and flu
- 16–26 per cent reduction in fatigue.

It is believed that these results are due to improved air quality and building amenity.

Maintenance

Reduced maintenance costs are due to:

- reduction in plant and equipment
- more efficient plant
- better monitoring of plant through the BMS.



Commercial

The rental value of the refurbished space has increased considerably.

Over the period of the project, the team was able to maintain the ongoing support of tenants with an occupancy rate not falling below 70 per cent. The building now has fewer tenants, meaning the number of larger tenants has increased.

Overall

The building has gained a Green Building Council of Australia (GBCA) 5 Star Green Star Office Design v1 rating.

Lessons

There were a number of lessons from this project, including:

1. The importance of communicating with tenants. A project of this magnitude generates a high level of disturbance, but this is minimised if there is effective communication with the tenants. Good communication ensures tenants are aware of what is happening in the project and can accommodate in advance any likely impact on their operation.

2. Strong project management leadership, so that the team understands the sustainability objectives of the project and works to assess all elements against the ESD criteria.

3. Carefully managing and controlling noise and temporary service shut downs.

4. Engaging an ESD consultant, who advocates for the ESD principles in the project team.

5. Engaging an ICA whose role is to specify commissioning and tuning criteria and timing of the project. Also overseeing the installation and commissioning of the building services during the construction stage, and monitoring the building performance beyond the project completion.

The future

Outstanding work in progress involves converting additional floor space, made available in the old plant room, to new office space.

There is continuous tweaking of the HVAC system now that all the floors have been completed. While the upgrade works were being done, two systems were being run in tandem. Now that all floors are operating on the chilled beam technology, the old chilled duct system can be removed.

There is also a need to fine tune the whole building. This process is being overseen by an independent commissioning agent.

A formal NABERS assessment will be conducted towards the end of 2011, once the building has been operating for 12 months after the final stage is completed.