1200 Buildings ▶

CASE STUDIES

182
Capel Street

Built

1984

NLA

1600 m²

Tenancy

Offices over 3 floors, basement

Building owner

FMSA / Bellatrix Holdings

Property manager

FMSA

Refurbishment project timelines

2008 – 2011

Project team

Architects: FMSA Architecture
Mechanical engineers: Cundal and Umow Lai
ESD consultants: FMSA

NABERS Energy

Current: 1.5
Target: 5.0

NABERS Water

Current: 1.5
Target: 4.0

Key refurbishment features

- Automated opening windows, connected to economy cycle and control system
- Automated external blinds
- Gas-fired VRF gas heat pump air conditioning
- LED and fluoro lamps connected to intelligent control system
- Rainwater collected in (Stage II) tanks located in basement for WC flush and irrigation
- Green wall (vegetated façade)
- Bokashi buckets for waste disposal, green façade nutrient
- Intelligent component control systems
- Additional building sealing and insulation
- Ceiling fans
- Fitout and construction with recyclable materials.

Energy saving

- Electricity saving 159 kWh/day per floor from 309 kWh/day per floor
- Gas usage 258 MJ/day per floor.

Water saving

Target saving 900 L of water / day from 1600 L / day.

Greenhouse saving

Saving 81 tonnes CO_2 / floor from 190 tonnes – 109 tonnes/pa

Project costs

$416,012 plus $1.4 million additional floor

Annual saving

$22,206

1200 BUILDINGS

Background

182 Capel Street is a small commercial office building constructed in the mid-1980s. The building is a pre-cast concrete structure supporting a lightweight steel frame that carries the concrete flooring. It has two floors and a basement car park.

Fooks Martin Sandow Anson (FMSA) purchased the building in 2003 with the intention of refurbishing it for sustainability outcomes.

The net tenantable space is 1200 m^2 but a new second floor, currently under construction, will bring this to 1600 m^2. FMSA is an architectural practice occupying the first floor (and eventually the second) and a separate tenant occupies the ground floor.

The building faces west, which offers excellent exposure to light but heat on the façade was a problem that needed to be addressed during retrofit. It is positioned near park land and combines commercial, retail and residential zoning.

The mechanical systems were at end of their life cycle – originally the building had its own generator and sub station, but the generator was removed.

As an architecture firm, FMSA has worked on a number of significant green buildings in Victoria, and saw this building retrofit as an opportunity to apply their expertise.

About 60 per cent of commercial buildings around the fringes of Melbourne would be similar in size and construction to this building.

Objectives

The objective of the retrofit is to significantly reduce the building's carbon footprint. The aim is to reduce carbon emissions by at least 50 per cent and aim for a 4.5 star NABERS Energy rating.

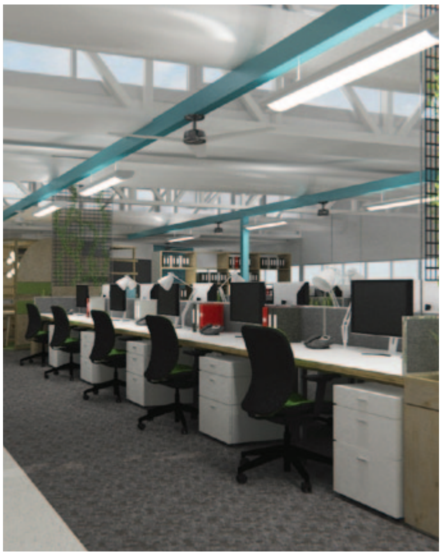
FMSA is confident that the first stage of retrofit will achieve their initial objectives. By introducing additional initiatives, they are hopeful of exceeding the 4.5 NABERS Energy star rating.

Planning

The retrofit which commenced in 2008 has not followed a set planning path as FMSA are familiar with design and building processes and paced the work around their own business commitments. However, the process took on more urgency when they received a grant from the Australian Government's Green Building Fund.

Although the grant does not cover all the retrofit costs, it makes an important contribution. In order to qualify, FMSA has to refurbish the building in such a way as to significantly reduce carbon emissions from an initial 1.5 star NABERS Energy rating.

FMSA worked with Cundall and Umow Lai Engineers to workshop, test, and develop the ideas for the building. Together they assessed the building to establish its potential and limitations to work out what best could be done.



Greg Anson, FMSA Director, calls this 'environmentally sustainable design (ESD) work-shopping'. The objective was to come up with a set of ideas while working within the constraints of the actual building, then costing these ideas to determine suitability and affordability.

Anson makes the point that all solutions have to be assessed against a finite budget and value managed within that context. Anson sees the greening of the building as a staged process.

Stage 1 will end with the completion of the third floor and all mechanical systems installed and operational. Lighting, water, external blinds and general environmental initiatives will also be completed.

Stage 2 will include further water initiatives and onsite power generation.

Implementation

July 2011 sees works about 80 per cent complete. This includes the base building works and the occupied floor mechanical systems and operable windows. The new floor is about 70 per cent finished.

The engineers and lighting specialists involved in the planning stage are involved in implementing their designs.

Once the HVAC was selected, a separate mechanical contracting company was engaged to design and install the system. This is currently being commissioned.

Features

Building

Minor structural changes were necessary to hold the weight of the new third floor, although this is not directly related to energy objectives.

A major feature of the new design is the operable windows which facilitate natural ventilation through the building. The windows are located on the western and southern facades. They are connected to a weather station which informs the mechanical system of changes to air temperature which in turn activates the air conditioning to turn on or off and open or shut the windows. A cross-ventilation system allows fresh air in during the day and purge of the building during the night.

FMSA has had experience using this system in a number of buildings they have designed and could see its application for their building. It is not easy to install in a retrofit but the building façade lent itself to the solution.

The building was already well insulated so no additional insulating work was necessary. The new second floor structure is being built leaving the existing roof intact, so air space between first and second floors will provide additional insulation.

The new floor is made of thick insulated Austral panels similar to cool room panels and which have excellent insulating qualities.

Once the top floor and roof is finished, the building will be completely sealed. Double glazing is used in the new floor, however, rather than retrofitting the existing floors with high performance (and expensive) glazing, FMSA has opted for automated external blinds, which can be manually closed during certain times of the year and at night.

The western side of the building is now a 'green façade' with vegetation nutrient boxes located on the balconies and wires which form a frame on which the vegetation can climb.

HVAC

After a good deal of research, FMSA decided on a gas fired VAV system, which has been installed and commissioned. There is one condenser for each floor, similar to a large domestic packaged system.

The gas engines are located at ground level allowing easy inspection, avoiding expensive structural costs and allowing effective noise control. The engine speed changes according to demand on the system. The amount of coolant varies according to the energy demand, and the air fan is kept constant. Each floor is currently manually zoned internally, and the system can be micro-controlled with a high degree of flexibility. This will eventually be controlled by a building management system.

Heating is provided through the same system. This system is not common yet in Australia, but it is more common in Europe and Japan. The advantage of the system is that it is highly efficient, offers greater flexibility and uses gas as an energy source, which in itself roughly halves the greenhouse gas emissions.

The system is currently being commissioned over a 12-month period.
Ceiling fans are also being installed to reduce cooling demands.

Energy load

Aside from significant energy savings in mechanical plant and passive systems, additional focus is on lighting power demand and energy efficient office equipment.

Water

Water efficient fixtures have been installed in bathrooms and toilets including waterless urinals and 4 - 6 stars WELS rated fittings for shower fixtures and dishwashers. Water usage overall is not high.

Water tanks are planned for the basement car park in Stage 2. Rainwater will be collected from the roof and stored in these tanks to be used for the green wall vegetation. FMSA is also investigating whether excess water can be used in the nearby park.

Waste

Waste food is put into Bokashi buckets. The buckets use aerobic yeast to break down the food matter. The product will be used to feed nutrients to the green wall.
www.bokashi.com.au/How-Bokashi-works.htm

The business uses recycled paper, plastics and other materials.

There is source separation of general waste and recycling.

Building construction has been designed to use modular construction components, thereby reducing waste.

Environment

FMSA believe they can influence three factors that impact the environment – the base building, the tenants and the business. They have the first two well in hand, and are now working on the third.

The ground floor tenants were about to move out to go to a green building, but when they realised the changes that were being made within the building they opted to stay.

FMSA believes there is positive value in occupants being able to open the windows, but it's hard to calculate what the value is. They will endeavour to measure this over the next 12 months of occupation.

Regarding the business, they are now looking at reducing their carbon footprint, particularly from travel. This will mean encouraging the use of public transport and bikes, but also offsetting interstate and international travel, and using conference calls.

The business is currently undergoing a carbon audit to benchmark and target areas of improvement.

Building management and controls

The project team decided to install a simple building management system. They opted for an intelligent control system, where all the components are intelligent in themselves rather than requiring a complex 'central brain.' They considered this to be simpler, more flexible, and more cost effective and appropriate for the scale of the building. It also means the occupant is more in touch with the building and how to operate it.

They will derive sufficient data from this system, and if needed, they can augment the system further by using portable and fixed meters. This will provide them with sufficient data to conduct a NABERS assessment.

Each floor will be metered separately and monitored.

They did not strike a green lease with the tenants, although this was considered. Instead, the lease was negotiated on the basis of enhanced building performance, which will have lower energy costs for them.

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Challenges

The main challenge was deciding what to do in the first place.

Then there were cost constraints. FMSA wanted to do a lot more, but financial constraints precluded this and therefore some good ideas had to be rejected. Other ideas that sounded good on paper were critically assessed and rejected because the costs could not be justified and it was not certain whether they would work.

According to FMSA, the smaller things, such as lighting and metering have to be looked at closely to see the cost benefits.

The other challenge was managing staff expectations about when the building construction was to be completed.

There were times when the building work was invasive. Doing the mechanical work and replacing the windows was complicated – working around the occupants as they occupied the space. Detailed programming was required to achieve this efficiently.

When the new floor structure was constructed, the tenants had to leave the building for a short time. Again, this was disruptive, and it was crucial to communicate and let them know what was happening.

Outcomes

Energy

It is anticipated that a NABERS Energy rating will be conducted towards the end of the 2011 calendar year with a target of 4.5 to 5 star NABERS Energy equating to a 50 per cent reduction in carbon emissions.

Water

Greater than 50 per cent reduction saving 900 litres per day.

Social

Tenants are happy with the potential for the building and have decided to stay. Staff are experimenting with the new systems. The building as a whole is a more marketable proposition.

Maintenance

The gas engines require service and oil change at 10,000 hours, indoor units are as per standard systems.

Mechanical maintenance will be reduced from $3,200 per annum to less than $1,000 per annum.

Lighting maintenance will be reduced from $1,200 per annum to $500 per annum.

Commercial

The project was driven by the requirement to achieve an eight per cent yield on investment. This has been achieved to date.

Overall

As building owners and occupants, FMSA believes they have demonstrated that real energy savings and green initiatives can be achieved with commercial budget. By making the right decisions, retrofitting green is not cost prohibitive and makes financial sense.

Lessons

There are several lessons when implementing green retrofits of small existing buildings:

1. Start with the building fabric, and see what can be achieved through modifications here.
2. Work within the constraints of a realistic budget, to make sure there are real returns on investment.
3. Ensure there is a project champion. In this case, FMSA wore so many different hats – architects, builders, tenants, landlords and clients – that it potentially over -complicated the process. It would have been better to have one clearly assigned project owner, who is in most cases, the client.
4. Organise high level input, contributing ideas before a budget is committed. This means letting the ideas drive the process and allowing the building to be what it should be.
5. Sometimes architects can push a building too hard, when it's just not going to work and money will be wasted. Decisions need to be value managed.
6. FMSA advise working closely with the inherent attributes of the building. This depends on the age, structure and fabric of the building. Workshop all the ideas as a team – engineers, architects, building managers and users working together in an 'ESD workshop.'

The future

The first objective is to complete the construction of the second floor. Then other initiatives can be taken including; sealing the building, installing external blinds, lighting, recycling captured water and conducting a NABERS Energy assessment.

Ultimately, the aim is to connect the building to a broader urban landscape to assist in greening the surrounding spaces.