182 Capel Street, North Melbourne, Victoria

Building Profile

Building	182 Capel Street, North Melbourne, Victoria
Construction date	1984
Refurbishment date	2008 – 2011
Owner	Fooks Martin Sandow Anson (FMSA) / Bellatrix Holdings
Building Size	1,600 m² / 2 Levels
Refurbishment Team	FMSA Architecture Cundall Umow lai
Building Management	FMSA
Ratings	N/A

Overview

The 182 Capel St building in North Melbourne is a commercial office building constructed in the mid-1980s and refurbished during 2008-2011. The refurbishment is a good example of low-energy design focusing on providing an efficient envelope and passive design features in combination with energy efficient design elements. While the building has been occupied for less than a year, good building management practices are contributing to improved building performance through the commissioning phase. Occupants are provided with education on correct operation of the building and are also engaged in energy reduction targets through involvement in CitySwitch.

Long-term owner-occupiers FMSA renovated the building with the goals of increasing energy efficiency and achieving a NABERS energy rating, and of reducing greenhouse gas emissions by 50 per cent. An important contribution was made from the Australian Government's Green Building Fund for the refurbishment of the building.[1] FMSA has been closely involved in the refurbishment, which has encouraged a sense of ownership and enthusiasm for the development and success of the building as a whole.

[1] City of Melbourne (2011) *1200 Buildings Case Study – 182 Capel Street*, 1200 Buildings Program, online: www.melbourne.vic.gov.au/1200buildings/CaseStudies/Documents/182_Capel_Street_29_7_11_pdf.pdf, accessed 27/08/2012.

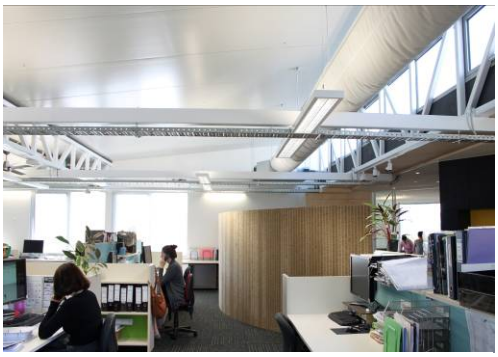
Design Elements

Monitoring and control technology

A simple Building Management System (BMS) comprising small, separate, intelligent systems was installed.[2] The BMS controls a number of building systems, including HVAC, windows and lighting.[3] It is connected to a weather station on the roof that monitors ambient conditions to facilitate optimal functioning of the natural ventilation strategy by controlling HVAC systems and window operation.[4] The BMS allows ongoing monitoring and reporting of energy data and will facilitate the data monitoring required to conduct a NABERS Energy rating assessment. Each floor is independently metered and monitored.

Lighting[5]

Lighting efficiency has been improved by using a combination of fluorescent and LED lights. Occupancy sensors are installed in some areas while others are controlled by manual switches. Clerestory windows supply natural light to the second floor of the building. During summer, there is often enough daylight through the windows and clerestory to remove the need for artificial lighting for most of the day.[6] Task lighting is available and is preferred by some staff.



Daylighting through clerestorey (Image courtesy of FMSA)

Heating, Ventilation and Air conditioning

A gas powered CAV air conditioning system was installed to serve both the heating and cooling components of the HVAC system. The advantages of gas systems are their ability to control energy output, and their lower GHG emissions per unit of energy produced. The temperature of the internal space is controlled by delivering a constant volume of air at varying temperatures.

Often mixed mode air conditioning systems are difficult to retrofit, but the building's layout enabled the installation of operable windows which are either controlled manually or automatically. The natural ventilation scheme is shown below in Figure 11. Yellow arrows display the modelled ventilation pathways and show how the cross ventilation works.

[2] City of Melbourne (2011) *1200 Buildings Case Study – 182 Capel Street*, 1200 Buildings Program, online: www.melbourne.vic.gov.au/1200buildings/CaseStudies/Documents/182_Capel_Street_29_7_11_pdf.pdf, accessed 27/08/2012.
[3] FMSA (2012) *182 Capel St: A Case Study in Sustainable Workplace Design*, AIRAH Forum, Melbourne, June 2012, online: www.airah.org.au/iMIS15_Prod/Content_Files/MelbForum/MF_190612_GA.pdf, accessed 27/08/2012.
[4] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.
[5] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.
[6] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.

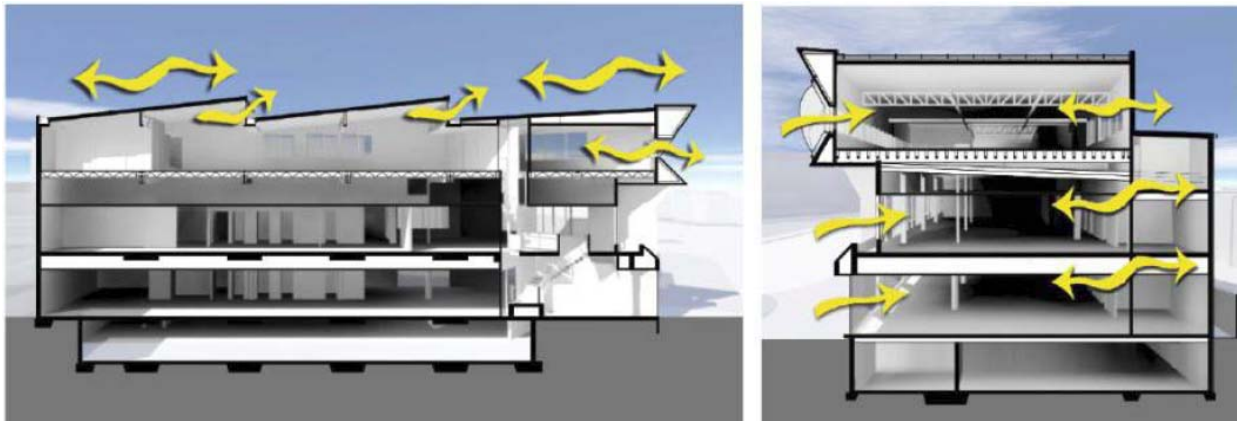


Figure 1: *Diagram of Natural Ventilation Pathways*[7]

Since refurbishment, the HVAC system has delivered greater energy efficiency through the use of mixed mode ventilation and gas powered air-conditioners. The gas system produces fewer GHG emissions than a comparable electric system and does not contribute to peak electricity demand. The combination of natural ventilation and mechanical HVAC is managed through a new Building Management System (BMS) which can also provide energy consumption information.[8]

Other Plant and Equipment

A water tank in the basement collects run-off from the roof and pumps all overflow to an underground community rainwater tank in a nearby park. A solar photovoltaic installation on the roof of the building powers the public tank irrigation pump to allow watering of community green space in the surrounding areas.[9]

Building Fabric

The building has been designed to employ mixed-mode ventilation and the design of the building fabric assists the natural ventilation strategy. The building provides comfortable conditions for occupants up to 27 degrees Celsius before mechanical cooling is required.[10] The western and southern facades have operable windows that contribute to the natural ventilation strategy by allowing cross-ventilation. Additionally, louvres assist the ventilation strategy with a combination of automated and manual control. High-level louvres are controlled automatically while lower ones can be controlled manually to suit conditions. Ceiling fans complement the natural ventilation strategy by assisting air circulation.

The control of the louvres and natural ventilation system is flexible in that it allows manual override so that users can govern their environment, while the automatically-controlled

[7] FMSA (2012) *182 Capel St: A Case Study in Sustainable Workplace Design*, AIRAH Forum, Melbourne, June 2012, online: www.airah.org.au/iMIS15_Prod/Content_Files/MelbForum/MF_190612_GA.pdf, accessed 27/08/2012.
[8] City of Melbourne (2011) *1200 Buildings Case Study – 182 Capel Street*, 1200 Buildings Program, online: www.melbourne.vic.gov.au/1200buildings/CaseStudies/Documents/182_Capel_Street_29_7_11_pdf.pdf, accessed 27/08/2012.
[9] FMSA (2012) *182 Capel St: A Case Study in Sustainable Workplace Design*, AIRAH Forum, Melbourne, June 2012, online: www.airah.org.au/iMIS15_Prod/Content_Files/MelbForum/MF_190612_GA.pdf, accessed 27/08/2012.
[10] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.

operable windows have the ability to 'night purge'. This allows the day's heat build-up to be vented at night, which greatly reduces the initial start-up loads of the air conditioning system.

The building already had adequate insulation, so no changes were made to the existing building fabric. A new floor was added to create level 2, which incorporates well-insulated walls and double glazed windows. The walls use thick Austral panels that have excellent insulating qualities. The western wall was especially well insulated to reduce heat load during summer afternoons.

External shading elements help control heat gain, particularly along the western facade. Additional shading is provided by external motorised blinds and vegetation, as shown in Figure 12.[11]

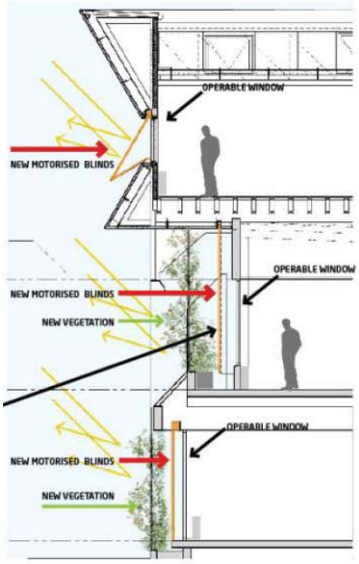


Figure 2: External shading element design Source[1]

Tenancy Design and Fit-out

A light colour scheme for walls, ceilings and furnishings throughout the tenancy maximises the benefits of natural daylight. Internal venetian blinds compliment the external shading elements to control daylighting when necessary. As well, there are indoor plants throughout the office.

Building Management

Commissioning and Tuning

Building systems are currently undergoing commissioning and tuning.[12]

Reporting and Evaluation

The building has been occupied for around eight months and building systems are still being commissioned. Energy consumption is monitored monthly to track progress. Energy consumption figures are provided below, courtesy of FMSA. While these are preliminary and subject to change, they suggest that total energy consumption (electricity and gas) has been reduced by approximately 30 per cent compared to pre-refurbishment levels (from around 28,000 MJ prior to refurbishment down to an average of around 19,000 MJ after refurbishment).

[11] FMSA (2012) *182 Capel St: A Case Study in Sustainable Workplace Design*, AIRAH Forum, Melbourne, June 2012, online: www.airah.org.au/iMIS15_Prod/Content_Files/MelbForum/MF_190612_GA.pdf, accessed 27/08/2012.

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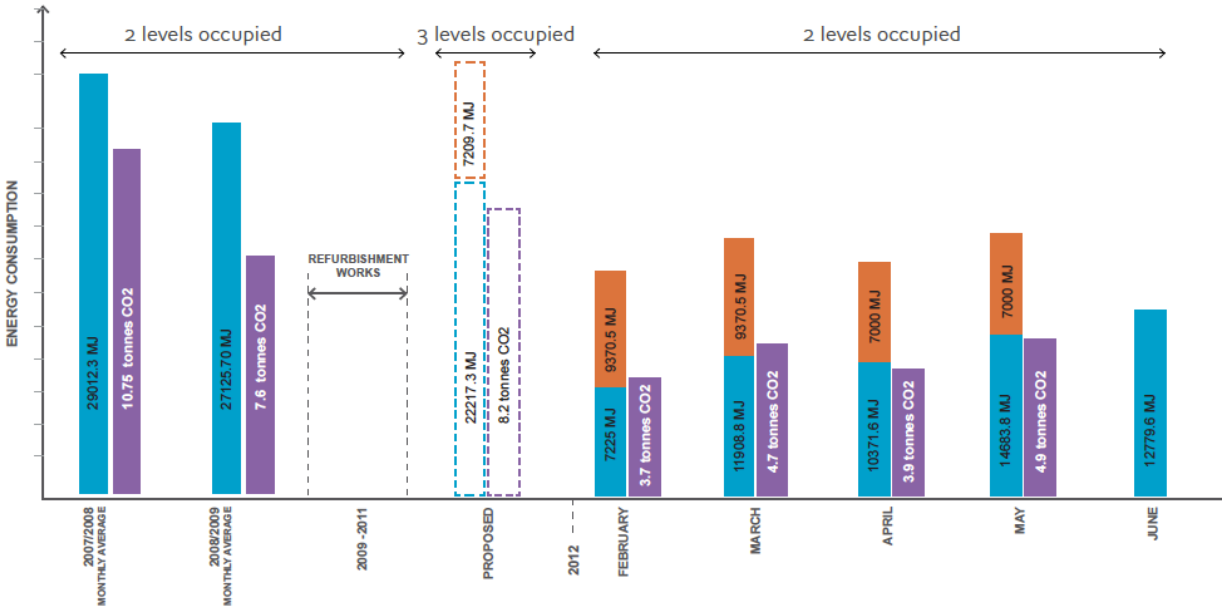

Figure 3: Preliminary energy consumption data – 182 Capel St[13]

Maintenance and Cleaning

The refurbishment has resulted in reduced maintenance requirements. It is estimated that lighting and mechanical system maintenance costs will be reduced by about 40 per cent and 70 per cent, respectively.[14]

Agreements and Culture

Commitments and Targets

FMSA are signatories to CitySwitch and are setting energy targets as part of the program. These targets are communicated to staff in the FMSA office, and other tenants will be inducted to the energy reductions program in 2013.*[15]*

Communication and Education

FMSA staff are educated in the energy efficient operation of the building, and they have been proactively involved with how the building works and in assisting with its fine tuning. It is intended that other tenants will be provided with energy efficiency training in 2013 after the building has been fully commissioned.*[16]*

[13] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.
[14] City of Melbourne (2011) *1200 Buildings Case Study – 182 Capel Street*, 1200 Buildings Program, online: www.melbourne.vic.gov.au/1200buildings/CaseStudies/Documents/182_Capel_Street_29_7_11_pdf.pdf, accessed 27/08/2012.
[15] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.
[16] Anson, G. (2012) *Personal Communication*, Greg Anson, Director, FMSA, 10/09/2012.

Ratings, Mandates and Incentives

Data is currently being collected for a NABERS Rating, which requires 12 months of energy data. As mentioned, the building has been occupied for eight months at the time of writing.

IEQ

No indoor environment quality analysis has been identified.

Occupant Experience

No formal survey has been identified.

Performance Nexus Summary

Key lessons to inform the Performance Nexus concept:

- Good design, focused on maximising the use of daylight, providing an efficient envelope, and facilitating natural ventilation, helps contribute to a more efficient building and provide comfortable conditions for occupants.
- Good building management practices, including an ongoing commissioning process, are contributing to improved building performance.
- Ongoing monitoring and evaluation is helping track performance and contributing to the commissioning process.
- Setting targets and engaging staff early in energy efficiency initiatives through programs such as CitySwitch is contributing to energy efficient operation through the early stages of occupancy.

Acknowledgements:

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