



Street Performer: Case Study of an Australian University

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Introduction

RMIT University is Australia's largest tertiary institution, its city campus having occupied several blocks of Melbourne's inner north CBD for decades. A recent adaptive reuse project has linked several existing buildings – an epic undertaking that effectively transforms the campus.

Located at the corner of Swanston and Franklin streets, just before Melbourne's CBD meets Carlton, lies RMIT University's New Academic Street. Here is a \$220 million-dollar adaptive reuse project, which has effectively combined the lower levels of four existing RMIT buildings into one.

Design was handled by an architectural consortium led by Lyons Architects and fellow RMIT alumni in Minifie van Schaik (MvS) Architects, NMBW, Harrison White and Maddison Architects. The project's objective was to dramatically enhance the student experience while turning these buildings "out" to Swanston Street.

Wayfinding for students has been improved across the buildings involved, via visual and physical connections between the street and building interiors. Laneways have been created to bisect the campus from Swanston Street to Bowen Street, providing multiple paths of access, and expanding retail offerings for students.

The project has improved student spaces by more than doubling informal student learning seating. But that's only part of the story, with the existing central university library expanded, and a new, state-of-the-art media precinct for the RMIT School of Media and Communications created.

Incredibly, of the 32,000m² covered by the project, only 4,000m² has involved any new building footprint. Yet RMIT's city campus has been utterly changed.

Involved in the project as early as 2011, ESD and services engineering consultant AECOM was officially appointed in early 2012 following the appointment of the Lyons-led architectural consortium.

"The project had its fair share of challenges, all of which the project team, builder Lendlease and project manager Donald Cant Watts Cork (DCWC) worked diligently and persistently to address," says AECOM associate director for building services Nick Bamford.

Because of this, he says the project's design was one of constant evolution, from the earliest stages through to final construction.

Bamford says complicating factors in the project's design included the evolution of project briefing, limited As-Built information, hazardous materials, post-tender value management, complex phased handovers, and the need to maintain an operational environment in the surrounding RMIT building areas.

In addition to these immediate challenges, the project was completed in parallel with two other major projects in the area: the Melbourne Metro Rail project and RMIT's Sustainable Urban Precinct Program (SUPP).

SUPP involved a \$98 million investment in sustainable building infrastructure, including central plant upgrades, migration to an HV consumer, and a large 3.2MWe cogeneration plant, all completed within and around the NAS project footprint.

Renewal and Modernisation

The brief for RMIT's New Academic Street HVAC and mechanical services focused on renewal and modernisation within the existing building infrastructure.

The project encompassed the lower three to five levels of the existing RMIT Buildings 8, 10, 12 and 14 – all common with Swanston Street – as well as the “theatre stack” that extends to Level 13 within Building 10.

Project objectives included improving the student experience, and high aspirations for sustainability. AECOM undertook a detailed survey and assessment of the condition, capacity and compliance of the existing infrastructure both within and surrounding the NAS project footprint.

It didn't take long before AECOM discovered infrastructure from a range of eras, including primary HVAC plant and controls dating from the early 1970s.

The buildings had constraints that would affect the HVAC design, including low floor-to-ceiling heights, complicated smoke and fire compartmentation, and limited façade areas for air supply and extraction.



Building 14, Level 4 during construction

“The design needed to holistically consider the refurbished and surrounding-area HVAC systems,” Bamford says, “to ensure a high indoor air quality could be maintained, and that the refurbishment did not compromise surrounding buildings.”

With these constraints understood, AECOM worked to maintain thermal plant demands within the capacity of the existing precinct chilled-water and heating-hot-water plant. This was done while considering the significant increases in space utilisation and occupancy density within the existing buildings.

“This was successfully achieved through the introduction of thermal heat recovery, high-performing façades and demand-controlled ventilation,” says Bamford.

Lessons from the Consultant

AECOM associate director for building services Nick Bamford offers some of the key lessons learned from the RMIT New Academic Street project.

1. **As-built information and existing building compliance**

“The design team entered the project aware of the risks but still faced challenges with existing infrastructure, building structure and building compliance.

2. **Live building environment**

“The project was delivered in three main stages, each with between five and seven sub-stages that required extensive planning and client consultation. This was invaluable experience for the design team.

3. **Flexibility**

“Significant constraints placed on the design by the existing building, intended use and construction sequencing required innovative design and construction to ensure the success of the project.”

AECOM's HVAC design also focused on the use of central-tempered outdoor air handling with heat recovery, and local in-space fan-coil units (FCUs). This reduced duct reticulation for high-density occupancy teaching and student break-out spaces, as well as delivering greater energy efficiency through demand-controlled ventilation.

Select areas, including the library and RMIT Connect (the central RMIT student services hub) are served by central air handling with variable-air-volume (VAV) control.

“This was considered optimal for these areas on the basis of thermal zoning, occupancy density and the need to limit HVAC maintenance,” says Bamford.

Laneway Culture

A key architectural theme for the project was the recreation of Melbourne's famous laneway culture within RMIT. This was delivered by Lyons and the architectural consortium – each bringing their own architectural style and aesthetic.



Bowen Street landscaping

Such an approach required AECOM to work collaboratively with each individual architect to realise the design intent for each space, requiring multiple design iterations and a flexible approach to design workflows.

Overall, Bamford says the application of mixed-mode and natural ventilation was a success on the project.

"A key project objective was to reconnect RMIT to the Melbourne CBD through increased permeability to Swanston Street," he says. "This was achieved through folding the façade into the building, and creating enhanced unconditioned spaces to a large proportion of the primary student circulation on Level 4."

But how to control space temperature and air movement? An array of BMS sensors and actuators control doors, windows and louvres in and around the mixed-mode and naturally ventilated areas.

In winter and summer, these spaces have been enhanced with gas heaters and ceiling fans to improve occupant comfort.



Building 10, Level 7 roof terrace and theatre stack

Independent Commissioning

A.G. Coombs Advisory has provided independent commissioning agent (ICA) services on major projects to RMIT since the late 2000s. The firm was subsequently engaged as ICA on the New Academic Street project via DCWC on behalf of RMIT.



A student space in Building 10, Level 7

A.G. Coombs Advisory's involvement began in the last quarter of 2014, during the early design development phase of the project.

"Our role, as per the MAN-4 Green Star requirement, was to provide building services commissioning advice to the project

team through the design stages of the project, right through to the end of post-completion tuning," says A.G. Coombs Advisory project engineer (ICA), James Dalglish.

"As an ICA, we like to get involved as early as possible in the design and construction process."

Lessons from the Independent Commissioning Agent

A.G. Coombs Advisory project engineer (ICA) James Dalglish offers some of the key lessons learned from the RMIT New Academic Street project.

1. The use of a hybrid ventilation system in the RMIT NAS project – with its extra dimensions and complexities that needed to be identified, considered, discussed and resolved – confirmed the value of commissioning input as early as possible in the design and construction process.
2. The detailed planning and programming of services installation and commissioning activities was critical during the staged handovers to achieve the project milestones and, most importantly, minimise the disruption to staff and students of the continually operating university.
3. The original planning and subsequent commitment by all key members of the project team to the post-construction building tuning process is fundamental to the successful delivery of high-quality, high-performance building services at RMIT NAS.

Being involved from the early design development stage allowed A.G. Coombs Advisory to review the early project design documentation. The firm was able to offer valuable operability, maintainability, controllability and commissionability-related advice to the project team. This valuable intel could be included in subsequent design stages.

Despite the multi-building nature of the New Academic Street project, the basic role requirements were not unlike any other project utilising an ICA as part of Green Star.

"There is an understanding," says Dalglish, "that while specific equipment and systems will be commissioned and verified at the end of each individual stage, there will be increased ICA involvement and activity at the end of the project to ensure that the different systems in the individual areas/buildings are interfaced together and the 'whole' building project functions properly."

During the construction process, A.G. Coombs Advisory developed an overall building services commissioning plan. This led to coordinating and reviewing the individual sub-contractor commissioning plans and methodologies to ensure the right outcome was achieved in the commissioning period.

The firm also took a lead in the commissioning-verification process at the end of the construction process – witnessing, reviewing and approving the documented commissioning results. A.G. Coombs Advisory helped to carry out controls functionality

testing, including for the interfacing of systems of different service disciplines.

Dalglish says the major challenge was in managing the impact that the multiple staged handovers had on the “whole systems commissioning” aspect of the project.

This required that BMS interface testing of areas and buildings that may have been handed over for student occupancy six months ahead of the project’s practical completion to be revisited at the end of the project.



An external view on Level 4 of RMIT’s New Academic Street

Another challenge was encountered in incorporating the mixed-mode ventilation system.

“Delivering a high-performing hybrid ventilation system that used natural forces as much as possible and only uses mechanical power when weather conditions do not support the requirements for user comfort is always a challenge,” says Dalglish.

“Incorporating this type of system always brings another layer of complexity to all facets of the construction process – including the structure, equipment and system installation, the control strategies, and the commissioning and verification process.”

Media Precinct

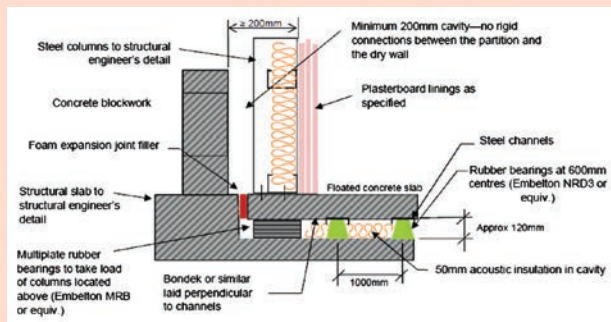


Figure 1: Indicative slab isolation detail for Studios A, B (not to scale)

Occupying Levels 2 and 3 of the project, the Media Precinct required dedicated air-handling units (AHUs) featuring significant acoustic performance.

“The studios and control rooms demanded acoustic performance to NR 20, which would be challenging in a new build let alone an existing, steel structure building that sits opposite a major tram line,” says AECOM’s Nick Bamford.

Both studios and plant areas also required floating slab and wall isolation to details of the AECOM acoustic engineers (as outlined in Figure 1).

To this end, over the course of the project, A.G. Coombs Advisory worked closely with the design team, including Lendlease and AECOM.

“This close relationship, with its regular meetings, open discussions and willingness to accept input from the ICA, significantly assisted in the completion of the landmark building,” says Dalglish, “which is very worthy of its Green Star rating.”



RMIT University’s New Academic Street was five years in planning and construction

Streets Ahead

After five years in planning and construction, the final stages of RMIT’s New Academic Street reached practical completion last September, with the Media Precinct officially launched in early November.

A 12-month building tuning period will now see building services performance information analysed on a quarterly basis, and discussed with key stakeholders.

Sustainability

RMIT’s focus on sustainability drove the design of the project and AECOM’s coordination with RMIT’s SUPP project.

In addition to a 5-star Green Star Interiors target, RMIT had its own key performance indicators (KPIs) for project innovation. This assisted the project team to push a range of sustainability initiatives.

These included the extensive application of natural and mixed-mode ventilation, demand-controlled ventilation, CO₂ compensation throughout, thermal heat recovery, and “green lease” environmental initiatives for the project’s large retail provisions.

Continuing its involvement as ICA during this period, A.G. Coombs Advisory will make recommendations based on this information. The aim is to help increase building performance, minimise energy consumption and improve user comfort levels.

Project at a Glance**The Personnel**

Architect	: Lyons, NMBW, Maddison, MvS, Harrison and White
Builder	: Lendlease
Client	: RMIT University
Controls	: Siemens
ESD engineer	: AECOM
Fire services	: Walker Fire
ICA	: A.G. Coombs Advisory
Landscape architects	: TCL
Mechanical services contractor	: O.P. Industries
Project manager	: Donald Cant Watts Cork (DCWC)
Services engineer	: AECOM
Structural engineer	: Arup

(Source: AECOM)

Conclusion

But for now, the achievements of this adaptive reuse project are easy to see, and are being celebrated by RMIT's student population.

"The project has been a huge success for RMIT and the student cohort," says Bamford, "with a big boost in space utilisation and student sentiment." ❖