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Ecolibrium

THE ECOLIBRIUM ANNUAL AIRAH AWARDS SPECIAL

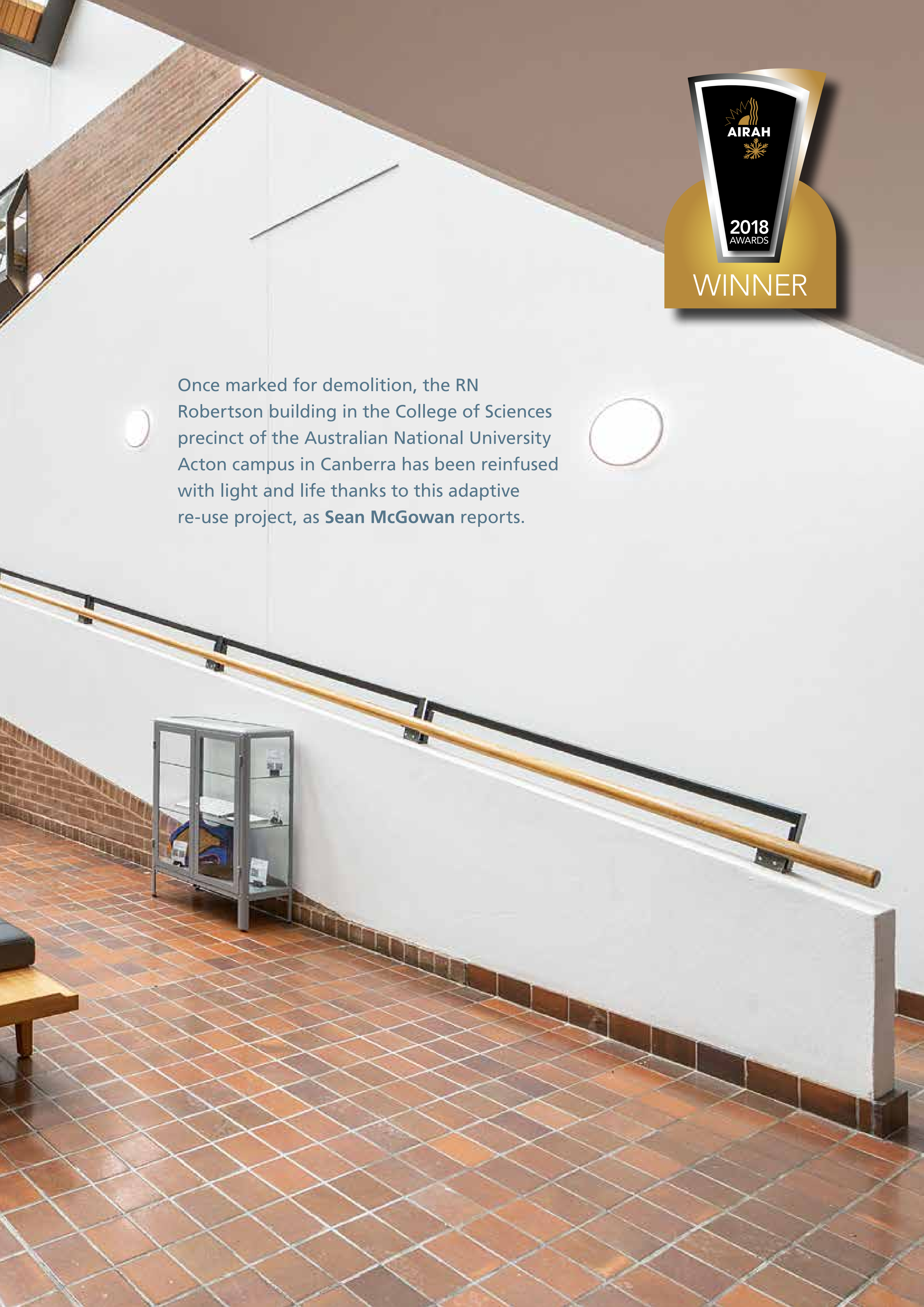
Law and order

Dramatically reimagining a heritage classic.

AIRAH

FEATURE

Two schools of thought



Once marked for demolition, the RN Robertson building in the College of Sciences precinct of the Australian National University Acton campus in Canberra has been reinfused with light and life thanks to this adaptive re-use project, as **Sean McGowan** reports.

The building provides a mix of different functions.

Built in 1972 to accommodate the ANU Research School of Biological Sciences, the RN Robertson building was named in honour of Sir Rutherford Ness (Bob) Robertson – the school's second director, and one of Australia's most influential and respected scientists.

The three-storey concrete and red-brick structure served its purpose as a research facility for almost five decades, undergoing many minor refurbishments and extensions. But in 2016, with the building showing its age, the ANU commissioned a comprehensive planning study to maximise the space and increase access to daylight for its occupants.

The study recommended a complete strip-out, reorganisation of space and refurbishment of the building's interior.

Designed by architectural firm CCJ Architects, the resulting refurbishment has created approximately 11,000m² of open flexible space, collaborative work areas and research laboratory space.

"The interior fit-out is a sensitive re-working of this early 1970s building, with an emphasis on reuse of existing features and materials," says CCJ Architects.

"Planning included re-organising of cramped existing layouts to give a more open floorplate with increased access to daylighting and views."

> The building provides a mix of different functions – office administration and teaching spaces, critical process/experimentation laboratories, research laboratories and observation spaces

In March 2016, Construction Control was engaged to provide construction management of the adaptive re-use of the building. A month later, Norman Disney & Young (NDY a Tetra Tech company) was commissioned by Construction Control to deliver mechanical and electrical design services for the building.

UNIVERSITY CHALLENGE

From the beginning of the project, the design intent was to provide a building that was both energy-efficient and functional. It had to operate in harmony with occupant requirements and the existing building structure's limitations, re-using existing features and materials where possible.

But it also had to cater for the individual needs of the two schools accommodated within the building: the Research School of Biology, and the Fenner School of Environment and Society. According to NDY senior associate Darren Kelly, each school had very different operational and user group requirements.

"Due to the different schools and user groups involved, collaboration was a key element of the success of the project," says Kelly.

"The building provides a mix of different functions – office administration and teaching spaces, critical process/experimentation laboratories, research laboratories and observation spaces – so operational efficiency was a challenge. It required a real effort from the whole design team to accurately capture the user group requirements and translate them into a usable space for the end user."

To develop the design solution, NDY – along with the wider design team – participated in extensive user group meetings and planning sessions.

INDUSTRY ACCOLADES

NDY's work on the RN Robertson building has been recognised by the 2018 AIRAH Awards, with the project named as a finalist in the Excellence in Sustainability category and winner of the Best HVAC Retrofit or Upgrade Award.

The project was also recognised by the Australian Institute of Architects, with CCJ Architects receiving a Commendation for Educational Architecture and an Award for Sustainable Architecture at the 2018 Awards.

Through these, it was determined that the fit-out design needed to provide as much access to natural light as possible in all spaces.

Additionally, the project included an upgrade to the façade (while maintaining the look and feel of the existing exterior); a reduction in the amount of waste created by the refurbishment via adaptive re-use of existing plant areas and reticulation risers; and re-use of existing building materials in the fitout to maintain the material look and feel of the original building.

As well as needing to satisfy distinct user groups, the existing building structure presented a number of design challenges. These included the space available for reticulation of services and process equipment, and the maximisation of natural light.

"The floor-plates are wide and deep, and the building features a low floor-to-ceiling height," says Kelly.

The slab-to-slab height measured between 2850mm and 2900mm across the floor plate. With a requirement for ceiling heights to be maximised to 2700mm where possible, this left 200mm or less for service reticulation.

The existing mechanical services plant and equipment (which had reached the end of its economic and serviceable life) used a hydronic system for heating and cooling, and did not provide sufficient infrastructure for ventilation or make-up air for fume cupboards.

This resulted in distributed reticulation risers across the floor-plate at an average dimension of 300 x 800mm.

The design team also had to ensure compliance with the ANU Campus Building Services Requirement Manual (CBRM), which sets out the performance required for all buildings within the campus.

"The challenge with the CBRM was balancing the requirements set out within it, against those of user groups and National Code compliance," says Kelly.

FEATURE

EXISTING SPACES

According to Kelly, early planning for the building indicated a potential need for larger reticulation space for services. This was mainly driven by user requirements such as a need to cater for high process heat loads or high make-up air needs.

To mitigate this issue, the NDY design team set about basing all air conditioning systems on a hydronic-type system, with an aim of using existing riser space. Kelly says that using a hydronic system allowed them to transport more energy, using significantly less space than an air-based system.

"And it was also in harmony with the original design intent of the building," he says.

In conjunction with the hydraulic, electrical and fire services, the existing risers were allocated to a service – thereby requiring minimal modification to accommodate each of the systems.

Areas were stacked into neighbourhood-type arrangements.

NEIGHBOURHOOD GROUPS

With the HVAC system design tied down, the NDY team worked closely with the architects to reconfigure the building's interior. This resulted in the "block and stacking" of spaces into neighbourhood-type arrangements, with the HVAC dictating the delineation.

By using the existing risers, NDY determined the maximum capacity that could be delivered to any given area of the building, allowing for the development of a stacking strategy.

Administration and support spaces, as well as research functions, were located at the perimeter of the building, with laboratory spaces in the centre.

CENTRAL ENERGY

To help achieve the energy efficiency targets of the refurbished building, the design team used the available connection to the College of Sciences Campus precinct central energy plant.

As well as realising energy savings, it also allowed for a reduction in plant and equipment within the reconfigured building – maximising floor and ceiling space.

Longer term, the connection to the central energy plant should reduce maintenance requirements for services within the building.

"The integration of this building to the central energy plant represented the final realisation of the intent of the original master plan for the science precinct at the Australian National University," says Kelly.

"This allowed the floor plates to be maximised and the project objectives and design principles to be generally met," says Kelly.

"By placing similar functional laboratory areas within the centre of the floor plate where the environment (temperature, lighting, etc.) needed to be controlled, it allowed the teaching, administrative and break-out areas access to the perimeter of the building and natural light."

The use of internal glazed partitions let natural light penetrate further into the floor plate, where the laboratory teaching spaces were located.

Working with the architect, a reticulation strategy was developed for the services, with all air conditioning equipment for the laboratory areas positioned in the corridors.

To overcome the ceiling void restrictions and maximise ceiling heights in the occupied areas, an exposed services approach was adopted.

All services were located and reticulated in the corridor/transient spaces.

This provided a very different look and feel to the sterile laboratory environments.

"The success of this strategy was only possible due to the close onsite coordination between the builder, the architect, consultant team and contractors," Kelly says.

A SYSTEM FOR EACH USE

The mechanical services design has been broken down into four independent systems: comfort air conditioning, critical air conditioning, ventilation and process air conditioning.

Kelly says that the different building uses naturally lent itself to this system-by-use approach.

"Utilising a single system to serve the different areas would not have achieved the same level of control and functionality, or the requirements of the user group."

The sterile laboratory environments had a different look and feel.

The building's main feature is its entrance atrium, with a full-height ceiling and skylight roof.

Comfort air conditioning is provided to offices, administration and teaching spaces via heating and chilled water reticulated from the central energy plant to cassette-type four-pipe fan coil units (FCUs) with central and localised controllers. During normal operating hours (7am–7pm) the system operates under a central controller. After hours the user group can control the air conditioning for their specific neighbourhood themselves.

A variable refrigerant volume (VRV) system provides critical air conditioning and dedicated temperature control to each laboratory. This system is supported by the building's emergency generator.

"Due to limitations associated with the central energy plant temperature control, the laboratory space is served by a variable refrigerant volume (VRV) system," says Kelly. "This is connected to the generator system for the building – allowing the critical areas to operate during a power outage."

The remaining systems combine laboratory fume-cupboard ventilation with dedicated outside air systems, and various process cooling applications throughout the building.

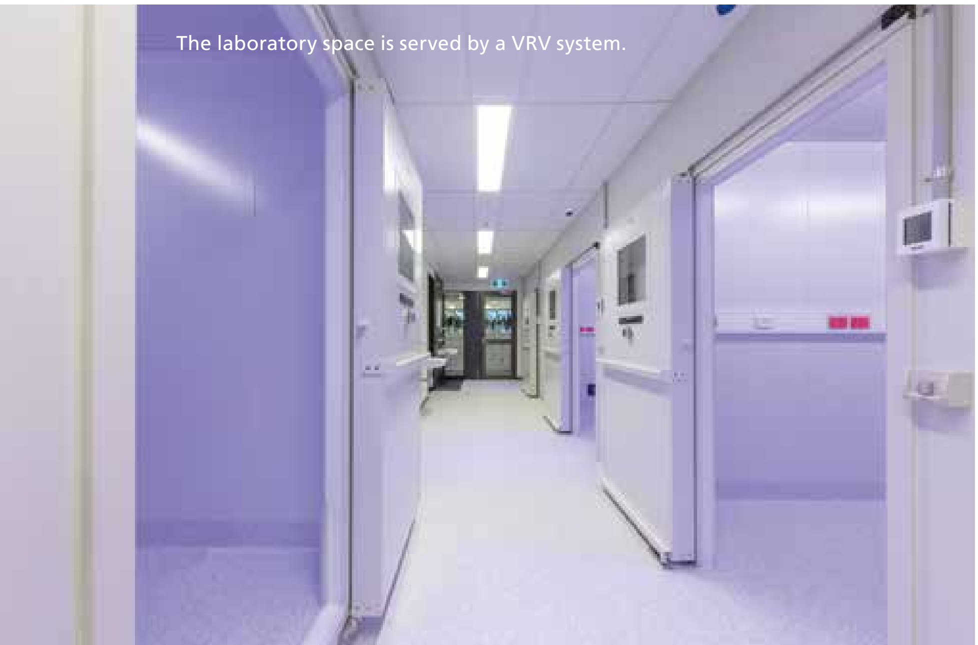
LET THERE BE LIGHT

The building's main feature is its entrance atrium, with a full-height ceiling and skylight roof. The light-filled space is used to showcase research and art displays, while meeting spaces with breakout areas are included on each floor.

Kelly says that to ensure the office and administration system does not affect the operation of the laboratories, dedicated outdoor air systems have been provided to serve the critical spaces. These are modulated to meet the demand requirements of the laboratory areas and are available around the clock.

"By splitting the outside air delivery to the building into dedicated, small systems, we ensure only the systems required to operate to maintain the 24-hour function of the building are operating," he says.

"Where possible, laboratory spaces have been grouped together on the same exhaust system, while fume cupboards have been provided with a dedicated exhaust system."



The laboratory space is served by a VRV system.

During normal hours the system operates under a central controller.

PROJECT AT A GLANCE

The personnel

- Architect: **CCJ Architects**
- Building services engineer: **NDY**
- Civil and hydraulic engineer: **Vital Design Studios**
- Client: **Australian National University (ANU)**
- Construction manager: **Construction Control**
- Independent commissioning agent: **SKV Consultants**
- Mechanical services contractor: **CCS Group**

The equipment

- AHUs: **GJ Walker/Air Change**
- BMS: **Schneider**
- Controls: **Schneider**
- Dampers: **Blendair**
- Diffusers: **Polyaire**
- Fans: **Fantech**
- FCUs: **York/Temperzone**
- Fume cupboards: **Labaire Industries**
- Grilles: **Polyaire**
- Heat exchangers: **Alfa Laval**
- Pumps: **QMAX**
- Sensors: **Schneider**
- VRV system: **Mitsubishi Electric**

(Source: NDY)

LESSONS FROM THE CONSULTANT

NDY senior associate Darren Kelly offers some of the key lessons from the adaptive re-use of the 46-year-old RN Robertson building at ANU.

Communication: As always, communication with all stakeholders about expectations and limitations is key.

Passion: This project represented a passion project for me. The one thing I will take with me is if you agree to be involved, then you are 100 per cent involved.

Change: Be prepared to change your position on an issue for the good of the project. Don't hold the line for the sake of it – circumstances change. So be informed, and be prepared to change with the circumstance.

Finally, process air conditioning systems have also been installed to specialist spaces, such as containment rooms. These are custom designed and built to meet individual user requirements.

MEETING FUTURE NEEDS

The refurbished RN Robertson building at the Australian National University reached practical completion in March 2018. In late July, both schools came together to celebrate the official opening of the building, and the adjacent Aboriginal Resource Garden.

To date, the building has reportedly performed well.

"The design team's dedication to making this space work should not go unnoticed," says Kelly.

"The ad hoc mixture of mechanical systems installed over the years has been consolidated and upgraded to meet the needs of the user groups, as well as the design principles set out by the design team at the start of the project."

> As an industry, before we demolish an existing building, let's think about how we can re-use and make the space work

The adaptive re-use of the RN Robertson building is a shining example of how – with careful planning, project team engagement and user group consultation – a building that was once marked for demolition can be revitalised and relied upon for another 40-plus years.

"As an industry, before we demolish an existing building, let's think about how we can re-use and make the space work," says Kelly. ∎