Article courtesy of Ecolibrium magazine, an AIRAH publication.

Higher aspirations

In recognising the need to tackle climate change, universities have become bastions of intelligent and environmentally sensitive design, writes **Matthew Dillon**.

Think about university buildings and the image that probably comes to mind is the traditional one: large, classically imposing buildings characterised by ivy-strewn walls, concrete quadrangles and steadfast columns. They are structures that evoke qualities we associate with our established tertiary institutions: imposing and unalterable knowledge, and the culture of authority.

That's the old model. The new model of university building such as the Bond University Mirvac School of Sustainable Development (MSSD) on the Gold Coast reflects how universities see themselves today: intelligent, forward-thinking, responsive, socially and environmentally conscious, ethical, and committed to community.

That's one of the reasons why universities are frequently near the forefront of sustainable design: they want the buildings in which their students learn to reflect those same values.

Also, because universities like to see themselves as trendsetters and leaders, they are often enthusiastic about building exemplar projects and championing sustainability.

Bond University's Mirvac School of Sustainable Development is the first to achieve six-star status.

"It definitely makes it more exciting," says Brian Schmidt from Lincolne Scott, who was mechanical engineer on the Queensland University of Technology's Institute of Health and Biomedical Innovation. "From my experience, tertiary institutions have a good mix of exemplar projects and very ordinary buildings, depending on where they find themselves in the funding cycle. The design of an 'ordinary' university building is sometimes subject to very severe cost pressure and I think it reasonable to state that most engineers prefer working on exemplar projects."

The way Schmidt sees it, universities *should* be in the group of front runners when it comes to sustainable design.

"This is where they should be in terms of showing the way and even, if necessary, accepting a slightly higher risk on outcome," he says. "I rarely go onto a university campus without being excited about a building or two."

Professor Paul Thomas, vice-chancellor of the University of the Sunshine Coast, has noticed the trend toward more sustainable buildings – both at universities and in the commercial sector.

"It's remarkable, even in the last five years, how many people have started to talk about environmentally sensitive buildings," he says.

"Recognition of climate change and the imposition of carbon taxes are forcing people to behave more responsibly. And in many ways universities see their legitimacy defined in their response to climate-change issues."

THE SCHOOL OF ART, DESIGN AND MEDIA AT NANYANG TECHNOLOGICAL UNIVERSITY IN SINGAPORE

The School of Art, Design and Media at Nanyang Technological University in Singapore set out to create a building that symbolises what an art, design and media school stands for: uniqueness and creativity. And that is exactly what the University achieved: a building that is iconic and one that epitomises originality.

Perhaps the highlight of the building is its curving green roof, which sets it apart from the other structures on campus, but blurs the line between landscape and building, and blends with the ground contour.

The green roof at Nanyang Technological University insulates the building.

The green roof offers considerable benefits. Apart from its striking visual impact, the turfed roofscape is an easily accessible functional space that allows it to be an informal outdoor communal space. The roof insulates the building, cools the surrounding air and harvests rainwater for landscaping irrigation.

The glass facade provides a high-performance building envelope that reduces solar gain and heat load. At the same time, it permits natural views and daylight into creative spaces. In the evening, the building glows like a lantern. The interiors of the building are lit and the activities within are fully exposed to view.

"As this is an art school, we decided to give it a very raw feel," says the school's architecture and building consultants Singapore CPG Corporation. "The designers deliberately left a lot of surfaces, both indoors and outdoors, unfinished. These unfinished surfaces as empty canvasses suggest possibilities, where the art students can use them as giant billboards to express their youthful creativities."

Raw it may be, but the building proves that sustainable design can be as stunning as it is effective.

BOND UNIVERSITY MIRVAC SCHOOL OF SUSTAINABLE DEVELOPMENT

If there was ever a university building you'd expect to embrace energy efficiency, it would be in a school dedicated to the teaching of those principles. And that's certainly the case with the Bond University Mirvac School of Sustainable Development (MSSD) building on the Gold Coast, which is the first Australian university to attain six-star "World Leadership" status from the Green Building Council of Australia (GBCA). It is now regarded as one of the greenest education buildings in the world.

Arup sustainability consultant Henry Anning was part of the team that designed the building. He says the design, construction and operation of the new three-storey building reduces energy consumption and greenhouse gas emissions by 82 per cent compared to a conventional building.

"The building also generates around 40 per cent of its peak power through solar heating and other initiatives such as energy-saving controls on installed lighting and wind turbines," he says.

"This is a significant project that showcases leading sustainability design and technology. The award of six-star green rating means the building design has achieved world-class excellence."

When planning and design of the building began in April 2006 there was no rating tool available to guide the quest to achieve world's best practice. One advantage the design team did have was that the MSSD facility manager was an integral part of the process.

"With Bond University we had the person who was going to be overseeing the building helping to drive design from day one, which ensured that the high-performing building would be designed to perform exactly as the university wished," Anning says.

The end result is an impressive achievement.

There are several components to the sustainable HVAC&R features of the building. A weather station on the roof is connected to the building's building management system. When temperature or humidity reach certain points, the BMS turns off the air conditioning.

All systems within the building are integrated into the BMS, which itself is

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integrated into the campus-wide BMS.

"There is a multi-split VRF air-cooled air conditioning systems to take advantage of the wide-load diversity within the building, estimated by Bond University as 80 per cent of offices vacant 80 per cent of the time," Anning says. "The building makes use of mixed-mode with ceiling fans to encourage natural ventilation and extend the comfort range without air conditioning."

The corridors and common areas in the building are naturally ventilated all year around. "As movement spaces, it was decided that natural ventilation was the way to go. What that means is the students have to be made aware that a couple of days a year they may feel a little cool or a little warm, depending on conditions."

Other sustainable features in the building include: occupancy and daylight-controlled high-efficiency lighting (T5), with task lighting in offices; regenerative lift technology, which generates electricity as the lift descends; solar hot water with gas boost; and grey water collection, to name a few.

A comprehensive water recycling design means that the entire water requirement for landscape irrigation is sourced from rainwater and recycled water collected on site.

"It has been a wonderful opportunity to create a building that sets a new environmental standard for universities throughout the world," Anning says.

Form meets function in the outdoor room at Bond University's MSSD.

THE INSTITUTE OF HEALTH AND BIOMEDICAL INNOVATION (IHBI) AT THE QUEENSLAND UNIVERSITY OF TECHNOLOGY

"All forms of educational building present interesting challenges for engineering services designers," says Lincolne Scott's Brian Schmidt. "Open space requirements and future usage flexibility are but two of these. It can also be assumed that users are possibly more discerning than usual, keener to participate in appropriate environmental outcomes, and that property management will be highly tuned. It is also generally the case that occupants are more flexible in dress code and more willing and able to modify this if environmental outcomes are real."

The IHBI presented particular challenges for Schmidt.

QUT wanted a commercially viable research laboratory, but one that was flexible, innovative and sustainable. It therefore boasts a range of key sustainability features including natural light, 100 per cent fresh air, lowered building height (1.2m), recirculatory fume hoods, heat reclaim and rainwater collection/storage.

The building was designed to incorporate the first commercial application of passive chilled beams in Queensland to meet the ESD and functional requirements of a very aspirational brief.

"Chilled beam cooling has provided IHBI with significant benefits," Schmidt says.

"Overall building height is 1.2m less than would have been required from ducted air conditioning. This provided both capital cost savings and a reduction in recurrent expenditure and maintenance.

"Less space needed to be allocated to air handling and/or risers, because only fresh air is being pumped. Annual operating costs are predicted to be 30 per cent lower. Absenteeism is predicted to drop because only outside air is used."

Two separate chilled water systems were used. One provides 18°C water to beams and the other 6°C water for outside dehumidification.

"Ceiling style, indeed its very existence, was much debated," says Schmidt. "Beams work best exposed. They do not need a ceiling. If this is found aesthetically unacceptable, the ceiling needs to be at least 50 per cent perforate."

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Environmentally sustainable design principles are central to the Chancellery building at the University of the Sunshine Coast.

So as an engineer, is it frustrating when architects push for form over function?

"Yes, sometimes," he admits. "However, I also see little of lasting merit in a building that is totally functional. I believe best outcomes derive from team members who like working together, understand the needs of each other and have well-established design procedures."

THE UNIVERSITY OF THE SUNSHINE COAST

When the University of the Sunshine Coast, one of Australia's newest tertiary institutions, was being established in 1994, it did so with a theme of sustainable design.

"We wanted to ensure that we developed a building program that was as sensitive to our sub-tropical climate as possible and relied as little as possible on artificial means of heating and cooling internal spaces," says Professor Paul Thomas AM, the university's vice-chancellor.

"This has been a strategy that has not been without some problems, but we established that we wanted to be a university that was committed to being an architectural laboratory for sustainable sub-tropical design, and have received many accolades, awards and international recognition in journals, books and magazines for our work."

Today the university is committed to sustainable design more than ever, but accepts that climatic vagaries demand occasional intervention from heating and cooling systems.

The centrepiece of the campus is the new Chancellery building designed by Kerry and Lindsay Clare of Architectus.

The building houses academic offices, tutorial rooms, student services, a theatre and a café.

"The ESD principles of the university are central to the design," Architectus says. "Offices and tutorial rooms are mixed-mode. That is, they operate without air conditioning for the majority of the year. However, each room has an individual air conditioning unit to maintain comfort during temperature extremes. Separate switching for each space eliminates the unnecessary use of energy. All corridor spaces are external and non air conditioned, and the theatre is cooled by a displacement air system."

The Chancellery's north-south orientation allows the building to maximise light and breezes, and helps minimise energy consumption.

Steel-bladed eyelids above windows help reduce solar gain throughout the year.