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FLAGGED FOR THE FUTURE

Contemporary office design can go far beyond ergonomic layouts – pointing the way forward for the planet





PULLING THE PLUG ON TRADITION

A working prototype office building outstrips the coveted carbon-zero rating, creating carbon-neutral architecture that gives back everything it takes

Energy resources shrink, population numbers and greenhouse gas production leap under our ever-growing demands – how can we contemplate even one more planet-sapping construction? Fortunately, there is a responsible way forward – a new breed of architecture that not only treads lightly on the planet, but actually leaves no carbon footprint at all.

Once a symbol of Melbourne's rich historic past, the iconic Carlton Brewery site on Swanston Street is now the setting of an eco flagship for the future. Pixel – designed by architectural firm studio505, sustainability experts Umow Lai and structural engineering firm VDM Consultants – is the new Grocon development office for the substantial Carlton Brewery redevelopment at the same address.

Grocon's general manager of the Carlton Brewery project, David Waldren, says Pixel provides a local solution to the global problem of a carbon-constrained world.

"With a prospect of a carbon-linked economy in Australia – in the form of carbon tax – Pixel serves as a prototype for commercial design of the future."

Waldren is not overstating his case. Pixel goes beyond the growing number of carbon-zero builds which offset the carbon produced in running them with renewable energy, usually generated elsewhere. The carbon-neutral Pixel also offsets the carbon embodied in its building materials, as well as the carbon produced in its construction – and uniquely, does so on its own site.

In Australasia, the vibrant Pixel has achieved a 6-Star Green Star rating and a staggering 100% Green Star score. Grocon and studio505 are also aiming to ace all green building code conventions in England and the United States. Pixel rated highest achiever to date on the US LEED rating tool and on the UK green building yardstick, BREEAM.

Studio505's project architect on Pixel, Dylan Brady, says the approach has been to address carbon issues up front, but also to undertake a thorough review of water harvesting, and building environment control.

"Offsetting carbon levels is achieved in several ways. Pixel achieves an extremely low level of base building carbon emissions – it uses a special type of concrete, Pixelcrete, which halves the traditional levels of embodied carbon in the mix," says Brady. "The low levels of carbon emissions make it easier to get a carbon neutral outcome, as less renewable energy is required.

"However, it is Pixel's mechanical and electrical services, which are designed to emit very low levels of carbon, that make carbon neutrality achievable."

A central aspect of achieving the Green Star rating is the 100% fresh air systems and strategies employed in the building. These rely on the thermal integrity of a concrete-mass base structure and a thermally responsive building facade – both of which Pixel enjoys.

Pixel's operational energy is significantly reduced through the use of active mass cooling (AMC),

a system design that uses separate cooling and heating approaches. Cooling is via hydraulic pipe work embedded into the exposed structural slab, providing silent, radiant cooling, with ventilation and additional cooling coming from fresh air delivered through access floors. The thermal mass of the concrete slab allows it to soak up energy during the day without large fluctuations in internal temperature. In winter, the mass then absorbs the warmer air being expelled from the building, removing much of the building's requirement for heating.

In addition, free night cooling, or night purging, is achieved through smart window technology, operated by sophisticated building management software, that automatically opens the windows of the facade on cooler nights to enable the night air to flow into the building and cool the structure.

Besides using natural processes, Grocon imported a gas-fired absorption chiller to add to Pixel's green arsenal – an idea originally from Umow Lai. Widely used elsewhere, but a first for Australia, the high-tech chiller uses ammonia as its refrigerant source and natural gas as its energy source. As a result of this technology, the carbon emissions from the air conditioning plant are dramatically lower when compared with electrically powered chiller systems. The use of ammonia as the refrigerant gas in the system means there is no ozone-depleting potential.

All this minimising of carbon emissions is balanced by the usual sustainable energy suspects – three improved, and patented, wind turbines are complemented by photovoltaic panels mounted on a tracking device to follow the sun. There are

Preceding pages Pixel is a first for Australia – a completely carbon-neutral commercial office building. The structure's vibrant exterior is a riot of static flags that optimise shade and natural light for the interior spaces.

This page The roof is a hive of green activity. Photovoltaic cells and wind turbines capture wind and solar power, while a green roof plays a vital role in the building's self-sufficiency in water capture and treatment.

Facing page below Pixel's water harvesting system in action.

also some fixed PV panels. One far more unusual resource takes the form of biogas, generated in an anaerobic digester from the blackwater off Pixel's vacuum toilet system – this energy is used for domestic hot water heating.

Efficient use of water systems generally is another stand-out sustainable advantage for Pixel. The building is designed to be highly water efficient – reducing water consumption to zero, with the only exception being drinkable water for staff.

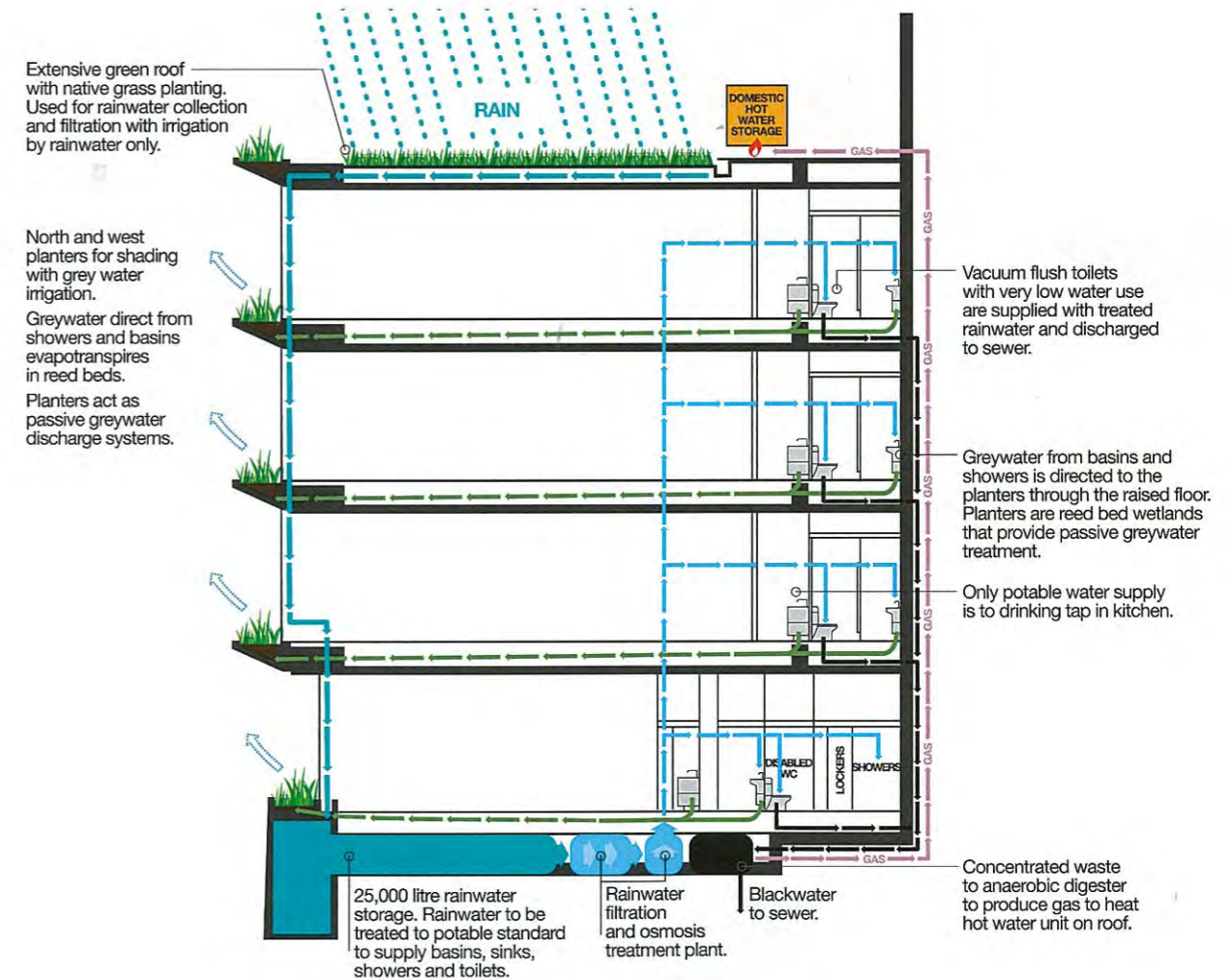
"Strategies include low-use water fittings, such as the vacuum toilets, collection of rain water from the green roof for showers and hand basins, and a highly innovative approach to grey water usage.

"Grey water from showers and basins is moved through screens and filters before being channelled into the gravel substrate for planter boxes on the

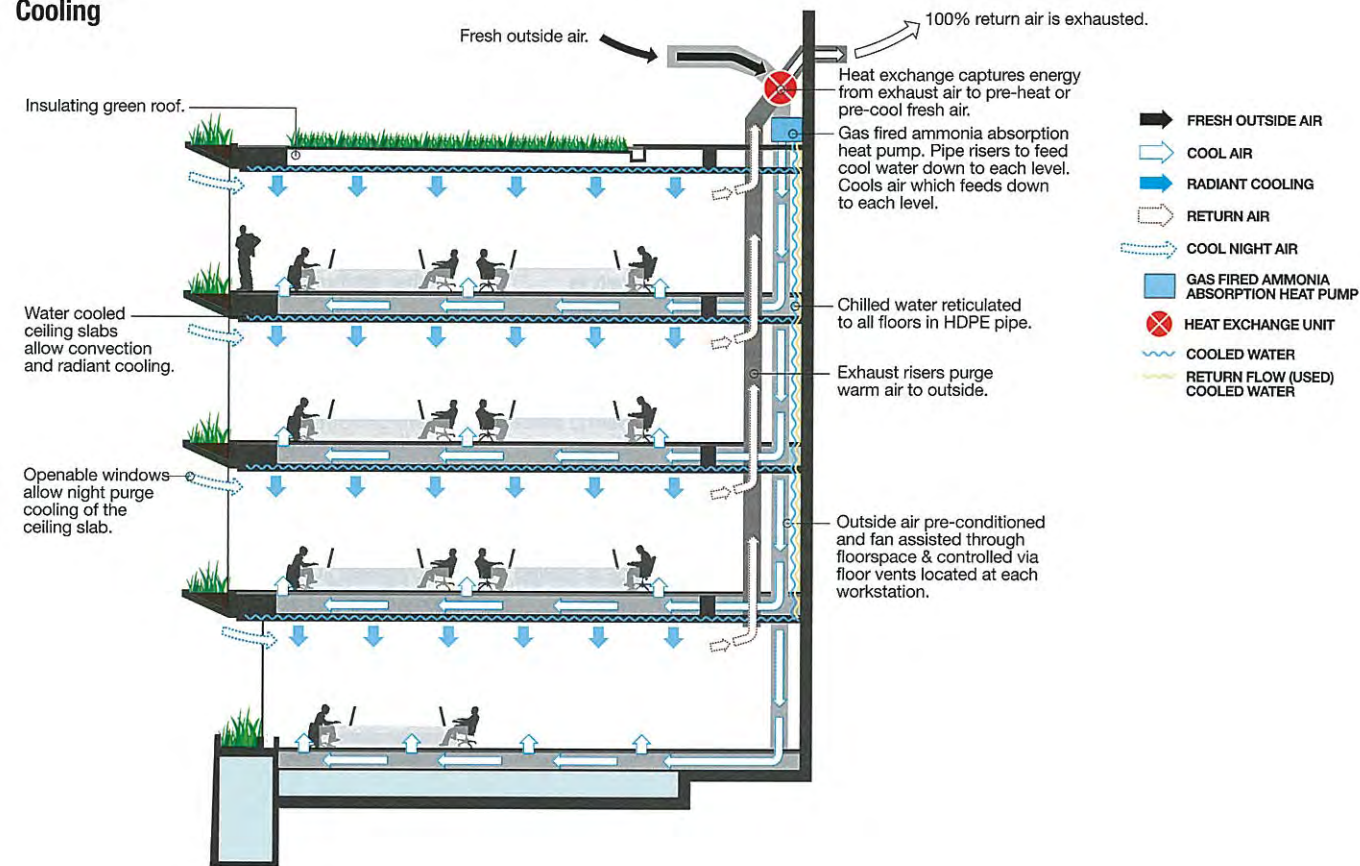
building's facade, where the plants' roots remove further impurities via microbiological actions. The water then moves through further cleaning treatments with little actually reaching the sewage system at the end," says Waldren.

Other attributes of Pixel include deep natural light penetration and eco glass, raised floors and localised climate control – even the facade's multi-coloured flags that provide strategic shading are cut in such a way as to leave no material wastage. Then there was Grocon's and studio505's vigorous on-site recycling and education policy.

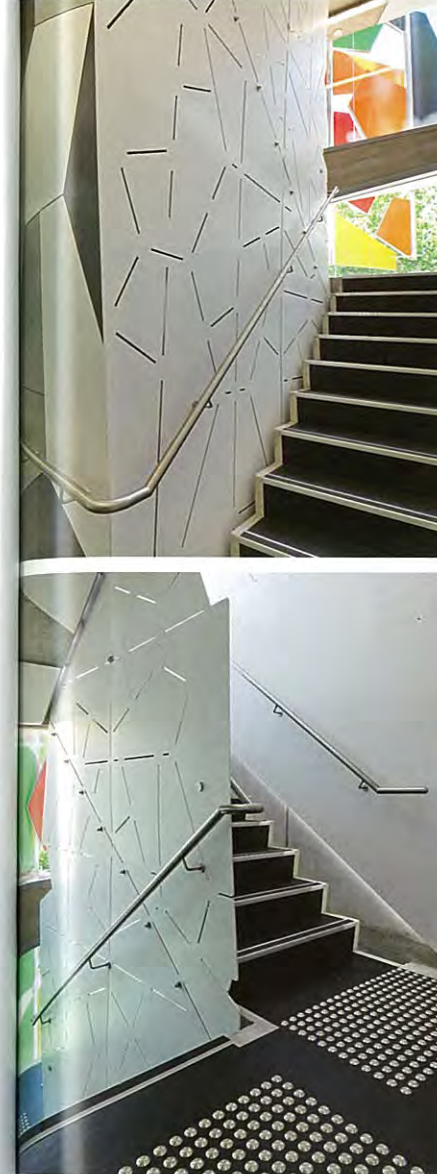
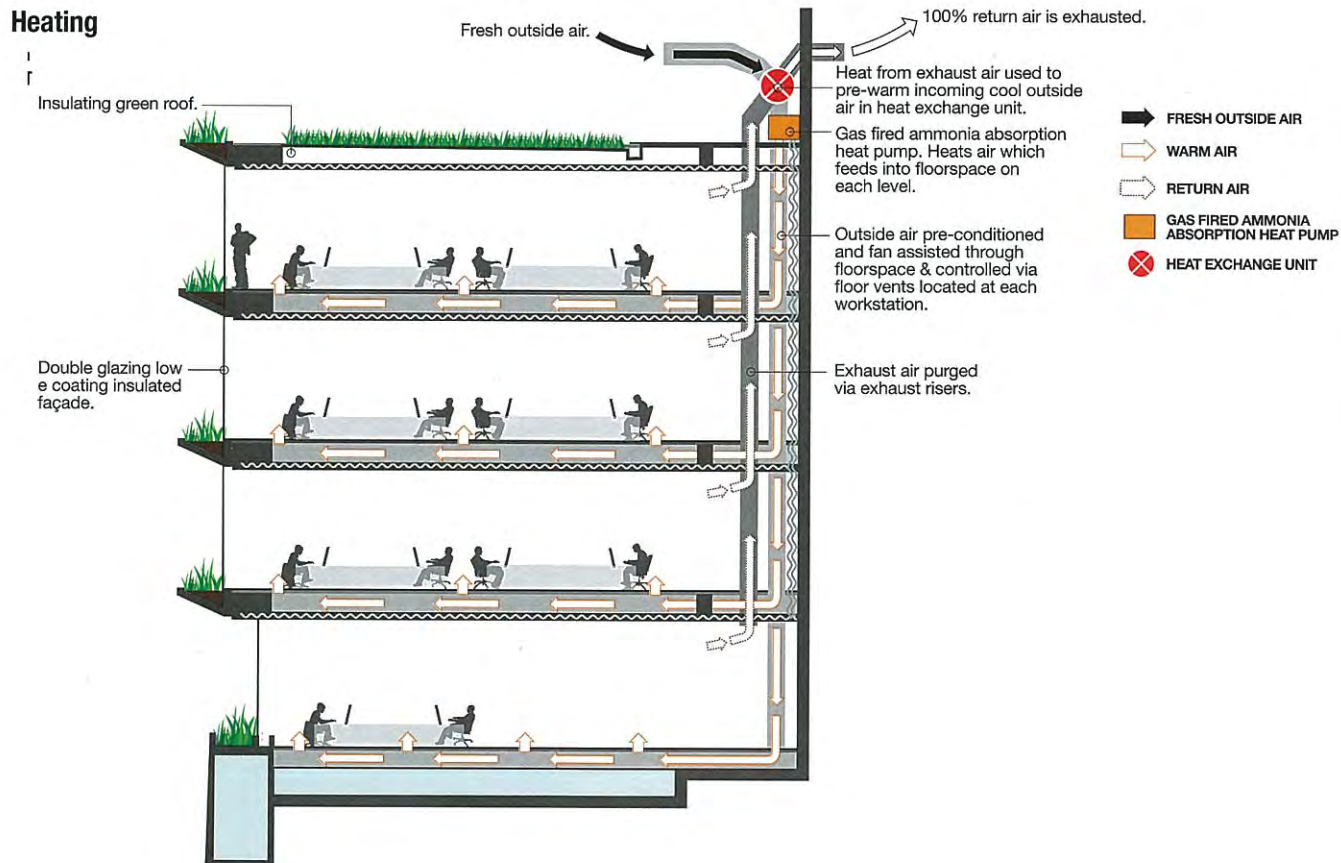
But Pixel's real pulling power for Grocon's future clients in Australia and around the world is that it showcases such a broad array of sustainable approaches – all seen together in one place, on one extremely planet-friendly commercial building.



Cooling



Heating



Facing page Illustrations of Pixel's sophisticated air cooling and heating systems that play an integral role in the building's 6-Star Green Star rating.

Top and above The building's distinctive coloured flags are echoed in the patterning on the circulation stairway.

Above right Extensive testing and modelling was carried out to ensure every flag was optimally placed to improve the comfort of the interiors through the seasons.

Location The Pixel Building, Carlton, Victoria
Developer Grocon, Melbourne

Architect studio505

Interior design studio505

Construction Grocon Constructors

Civil engineer VDM Consultants

Mechanical and electrical engineer Umow Lai

Fire consultant Aurecon

Quantity surveyor Slattery Australia

Landscaping Dr Nicholas Williams, lecturer in Urban Horticulture and Plant Ecology, University of Melbourne

Landscape supply Julian McCarthy Landscapes

Cladding Cambar Precast concrete with Nawkaw concrete stain pattern; external facade glazing and alpolo-clad sunshades by Materials Fabrication

Roofing Kliplok roof sheeting by Barden Steeldeck; solar panels on north face from The Solar Shop

Facade design/construction Glazed curtain wall

Window/door joinery External glazing, internal glazing and auto doors by Materials Fabrication; internal partition glazing and doors by Arc Plastering, joinery by Vos Joinery

Flooring Reused Interface bitumen-backed carpet tiles; Forbo Walton linoleum; both supplied and installed by Coveney Interlay

Wall coverings Painted off-form concrete and painted plasterboard. All coatings selected for low volatile organic

compounds and so low or zero off-gassing. Paint is low VOC Dulux waterbased White, supplied by Attention to Detail and colour matched to Resene Half Black White

Ceiling Low VOC Dulux waterbased White, colour-matched to Resene Half Black White, supplied and installed by Attention to Detail

Blinds Lidi automatic perforated blinds to eastern windows for glare control; all other windows are without blinds

Lighting Zumtobel

Heating and cooling subcontractor JL Williams

Heating and cooling Grocon-imported gas-fired absorption chillers from Robur of Italy; Air Change air-handling unit; swirl diffusers by Krantz

Chiller slab piping Inner City Hydronic

BMS Alerton

Office furniture Reused workstations from Grocon stock

Signage Custom-fabricated by Materials Fabrication; statutory signage by Premier Graphics

Hydraulics Richstone Plumbing

Story by Charles Moxham

Photography by Andrew Ashton

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COMPANY : RICHSTONE GROUP
SPECIALTY : HYDRAULIC SYSTEMS



PRECIOUS WATER

Pixel achieved its outstanding green rating by maximising energy efficiency on every level – some of the most important aspects of which were the building’s sophisticated hydraulic systems.

Richstone was engaged to undertake the hydraulic package for the contemporary building. This involved several ground-breaking initiatives, says director Hayden Richardson.

“The vacuum toilet technology implemented for Pixel is a first for Australia,” says Richardson. “Supplied by Grocon, the system reduces water consumption to an absolute minimum.”

While water output is minimised, water collection is also important. All rainwater is collected and stored in tanks before being processed to potable water standard. Grey waste water is filtered and directed to the living-edge reed beds. This means no grey water waste exits Pixel, greatly reducing emissions to the sewer.

Another important feature installed by Richstone was an anaerobic digester system that holds black waste from toilets and kitchen. Methane extracted from the waste is the energy source for heating water for showers, which afterwards feeds the living-edge roof.

“This was an intricate job – you only have to look at the technology. Pixel is on the world stage and we were fortunate to be part of its development, construction and delivery,” says Richardson.

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COMPANY : COMMSOLAR
SPECIALTY : SOLAR POWER



TAMING THE SUN

Many technologies were used for the first time in Australia on Pixel, including the latest wave of solar-capturing energy systems.

Commsolar was commissioned to design, supply and install the photovoltaic solar system on the roof. A 6.3kW system was required – spread across the roof garden. Director Frank Teofilo says to increase the output given the limited space, three arrays of panels were mounted on dual axis solar trackers with two fixed arrays mounted on a lightweight tilt frame and the stairwell roof space.

“One of the challenges was positioning the trackers to minimise shading impacts from each other, as well as from the wind turbines. Several simulations were conducted to optimise layouts and in the end, the trackers were staggered in height north to south and spaced across the roof between the turbines on the west side.

Products used included Suntech PLUTO215W PV Panels, SMA SB4000TL Inverters, and Kalang Harvester-DA Solar Trackers.

Commsolar is the commercial arm of Solar Shop Australia, which supplies grid-connect solar power systems nationwide. Completed projects range from this 6.3kW system for the Pixel building up to the 1000kW rooftop system at the Adelaide Showgrounds.

Commsolar worked with Suntech to reclaim excess panels from other projects – assisting Pixel with its Green Star rating.

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