

GreenSource

THE MAGAZINE OF SUSTAINABLE DESIGN

CHROMA ZONE

A FLASHY
NET-ZERO
OFFICE
BUILDING IN
MELBOURNE
MAKES
A GLOBAL
SPLASH

CASE STUDY 1

PIXEL

Melbourne, Australia

By RUSSELL FORTMEYER

The Pixel's
unapologetically
garish sunshades
strike a pose.

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Pixel Perfect¹

With an outrageously colorful facade, a Melbourne office building achieves the highest LEED score in the world.





You can't miss the Pixel building. The project is sustainable design's version of a drag queen, a muscular structure wrapped in a riot of accessories. Dylan Brady of Melbourne's Studio 505, who designed the project, is blunt about its dramatic presence. "We're very excited that it was voted among the top ten ugliest buildings in the world, because we're brash down here in Australia and we know how hard it is to get everyone's attention," Brady says. But even as it piles on campy flourishes, Pixel's costume of jagged, candy-colored shading panels conceals a super-high-performance building designed to achieve carbon and water neutrality.

>TEAM

ARCHITECT AND INTERIOR DESIGNER Studio 505
Owner and commissioning agent Grocon
Engineers VDM (structural); Umow Lai & Associates (building services and ESD)
Landscape design University of Melbourne
Carbon analysis RMIT University Centre for Design
Graywater and embodied carbon analysis CSIRO
Consultants Marshall Day Acoustics, Slatery Australia (cost planning); Vertigo (maintenance access); Meredith Withers and Associates (town planning)
General contractor Grocon

>KEY PARAMETERS

LOCATION Melbourne, Australia (Shore of Hobson's Bay)
Gross area 12,228 ft² (1,136 m²)
Completed July 2010
Cost \$6.5 million (AUD)
Annual purchased energy use (based on simulation) 2.9 kBtu/ft² (33 MJ/m²)
Annual carbon footprint (predicted) -1.5 lbs CO₂/ft² (-7.1 kg CO₂/m²)
Program Office space

>SOURCES

Concrete Nawkaw concrete stain pattern by Cambar Precast
Roofing Kliplok roof sheeting by Barden-Steeldeck
Paints and stains Dulux
Flooring Forbo Walton linoleum
Carpet Reused Interface bitumen-backed carpet tiles
Lighting Zumtobel
Plumbing Richstone Plumbing Hydraulics
Blinds Lidi perforated blinds on eastern windows for glare control
Heating and cooling Robur of Italy gas-fired absorption chillers; Krantzir air handling unit and diffusers



1

The four-floor, 12,300-square-foot office building is located just north of Melbourne's dense central business district. Its footprint fills a small corner site at the northwestern edge of the former Carlton United Brewery campus, which its developer, Grocon, intends to turn into a mixed-use neighborhood. Pixel, which opened in June 2010, will act as the project's sales office, as well as providing office space for other tenants.

It joins many wacky and otherwise unconventional buildings dotting the Melbourne cityscape, which has always been Australia's laboratory for architecture. In 2006, the Council House 2 project (*GreenSource*, May+June 2009, page 66), built by the city government, established high sustainable performance benchmarks for public buildings in terms of energy efficiency and water conservation by



2

JOHN COLLINGS (PREVIOUS SPREAD RIGHT AND 2); BEN HOSKING (PREVIOUS SPREAD LEFT, 1, AND 3)



3

employing innovations like automated sun shading facade systems and blackwater treatment equipment. With the Pixel, Grocon wanted to demonstrate that such an aggressive approach could also be taken with a commercial building.

Dirk Zimmerman, an architect who is Brady's partner at Studio 505, says that from the beginning the firm wanted the building to focus on water, a key concern for a drought-ridden country, especially since so much high-performance Australian architecture has otherwise focused on the country's infamously harsh sunlight. "The building is water balanced, so it doesn't need a connection to the main water supply, even when you have 80 people working in it and using showers," Zimmerman says.

The building has been designed to capture all rainwater that hits its roof, filter it

through native grasses covering 75 percent of the surface, and collect it in a tank beneath the ground floor. The rainwater supplies all faucets, toilets, and showers, although each floor offers one tap connected to the city supply for drinking water only. Graywater, collected from sinks and showers, is filtered through 460 linear feet of planted beds installed on external terraces on each floor, a system the architects call "living edges," and then is either lost to evaporation, directed into the rainwater tank, or dispersed into the city's sewer.

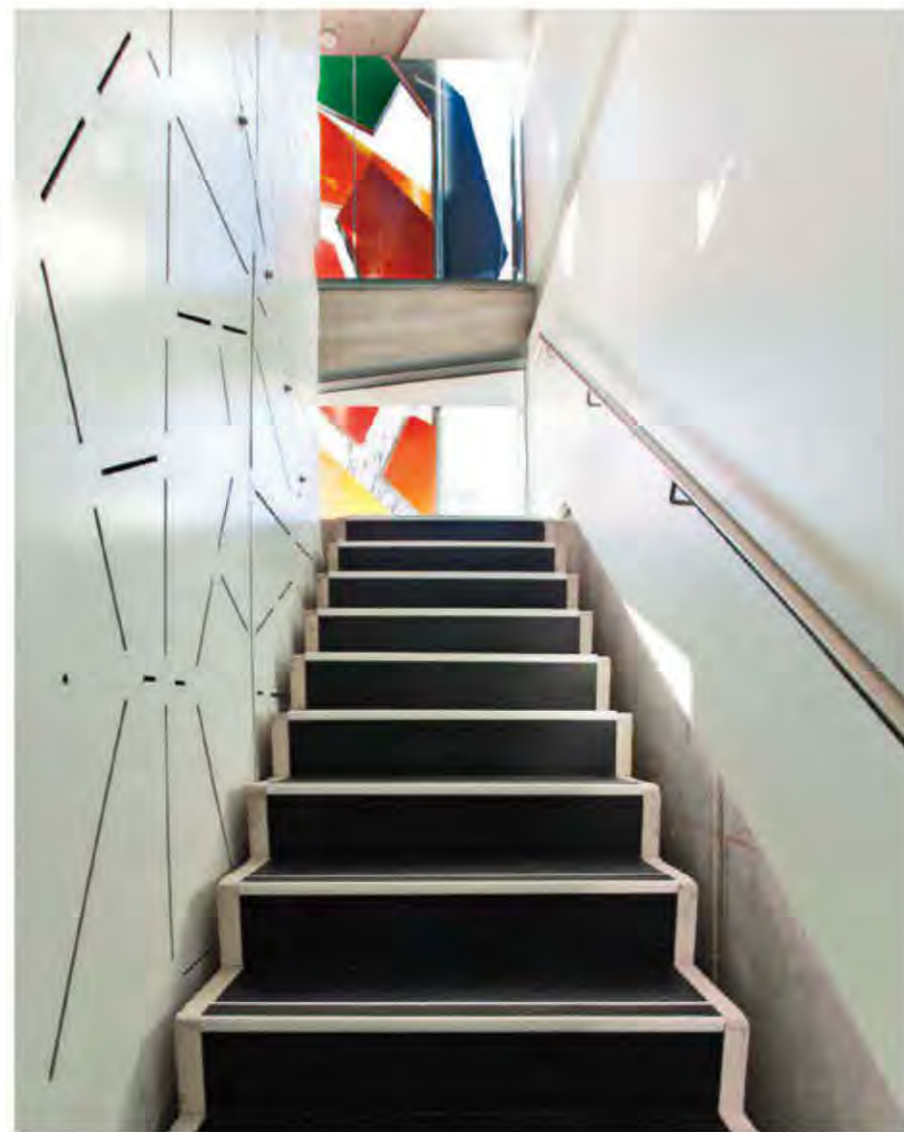
The building's water demand was kept low in large part due to an innovative vacuum-flush toilet system, similar to what you would find on an airplane. Such a system uses only 0.13 gallons per flush, compared with an efficient conventional toilet that would use 1.28 gallons per flush.

1 In addition to providing visual pop, Pixel's panels reduce glare in its office spaces.

2 Planters wrap each floor of the building, helping to capture rainwater and cooling Pixel's glass curtain wall.

3 Tracking photovoltaic arrays stand among native grasses on the building's green roof.

Importing the toilet system from its Norwegian manufacturer and convincing local agencies concerned about reducing water flow to the sewer system required extra work from the design team. Aside from the extremely low water demand, the toilets require only a 2.5-inch pipe that can be routed in any way through the building since, under a vacuum, it doesn't depend on gravity flow. A small water pump cycles on and off for every flush, so the energy impact is negligible. "This is not reinventing anything;



it's just a logical way to use technology that is already available," says Zimmerman.

In addition, the toilets feed into an anaerobic digester, which collects solid waste in a way that produces methane gas that can then be used as a fuel source for heating the building's domestic hot water. "This wouldn't work unless you had a vacuum toilet system, since it eliminates all of the water and macerates the waste," says Brady. "It increases the density of the medium—otherwise you would simply have a septic tank." It basically relocates the first step of a traditional wastewater treatment process to inside the building, as opposed to miles away in a city plant.

The Pixel's biggest demand on the city is for attention. But in addition to their visual impact, the colorful facade panels significantly reduce solar heat gain (and daylight glare), while the terrace gardens provide some cooling to the full-height glazed curtain wall. Shane Esmore led the building services and sustainability design for the project's engineers, Melbourne-based Umow Lai and Associates. He says the floor-to-ceiling glazing addressed local market expectations for office space, while the shading system ensured the building wouldn't pay an energy penalty for it. An underfloor air displacement ventilation system, fed by a 100 percent outside air

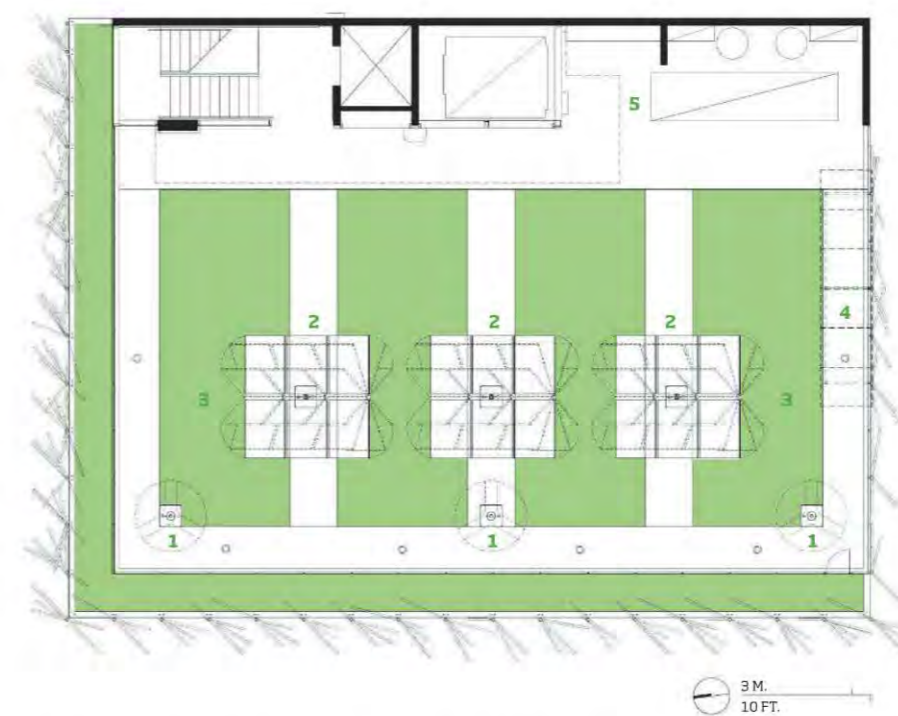
For its own office, Pixel's developer intends to earn the highest Green Star rating for interiors.

rooftop handling unit, provides 150 percent more fresh air than required by code. Heating and cooling is supplied through the ventilation system, and a thermally active radiant slab system in the exposed concrete ceilings. Combined exhaust ducts pass through a rooftop air-to-air heat exchanger in the air handling unit for improved efficiency.

Also on the roof, an air-cooled, natural gas-driven ammonia absorption heat pump chiller, imported from Italy, generates hot water for heating and chilled water for cooling, depending on the season. Australia's Green Star rating system measures energy by its carbon content, not by cost as in the LEED system, so cheaper, cleaner gas compares more favorably to grid electricity generated by coal. The rooftop includes a combination of 30 fixed and tracking 215-watt solar photovoltaic panels, as well as three 1.5-kilowatt vertical axis wind turbines developed specifically for the building. Needless to say, Pixel achieved all of the energy points in both rating systems.

Esmore says that Pixel has been a good laboratory for building systems, many of which his firm is now using for other projects. "We're using the vacuum toilet system in a much larger building in design right now, completely off the back of the experience of designing Pixel," says Esmore, who along with the architects credits Grocon's integrated design team approach with challenging them to deliver better performance by rethinking conventional systems. Other components, such as the graywater and anaerobic digester, have yet to reach full functionality because the building has not been completely occupied. The first tenant was the Australian government's chief climate change adviser, but Grocon waited until other components of the brewery development were moving forward before beginning to fit out its own sales offices.

Work is now nearing completion on the Grocon spaces, which have been designed to achieve the highest level of Green Star's interiors rating. The company's CEO, Daniel



Grollo, has also vowed to buy offsets for the carbon generated in manufacturing and installing the building's materials. Pixel has been certified with a perfect 6 Star Green Star Design rating, a 6 Star Green Star As Built rating, and a LEED 2009 for New Construction Platinum rating. A BREEAM rating is in the works. Once attained, it will be the first building in the world to achieve the highest ratings from the three leading rating tools. "If sustainability is spirituality, rating tools are religions," says Brady. "The reason for a building like Pixel to score so high with rating systems is to drag the 75-percent of the building market that doesn't care into a better world."

ROOF PLAN

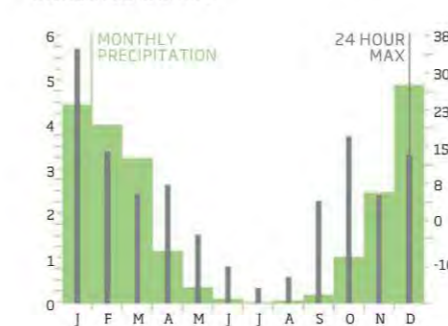
- 1 Wind turbine
- 2 Photovoltaic array
- 3 Green roof
- 4 Fixed photovoltaic panels
- 5 Rainwater treatment plant

PREVAILING WINDS:
WINTER S
SUMMER N

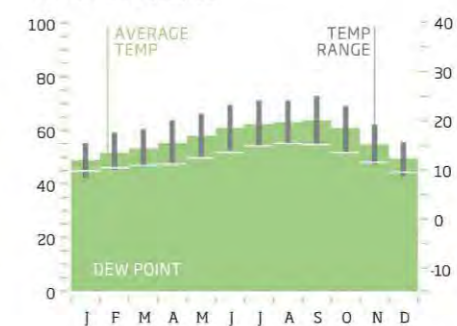
LEED SCORES
NC 2009 PLATINUM

| | |
|------------------------|-------|
| SS: SITES | 26/26 |
| WE: WATER | 10/10 |
| EA: ENERGY | 35/35 |
| MR: MATERIALS | 09/14 |
| EQ: INDOORS | 15/15 |
| ID: INNOVATION | 06/06 |
| RP: REGIONAL PRIORITY | 04/04 |
| POINTS/POINTS POSSIBLE | |

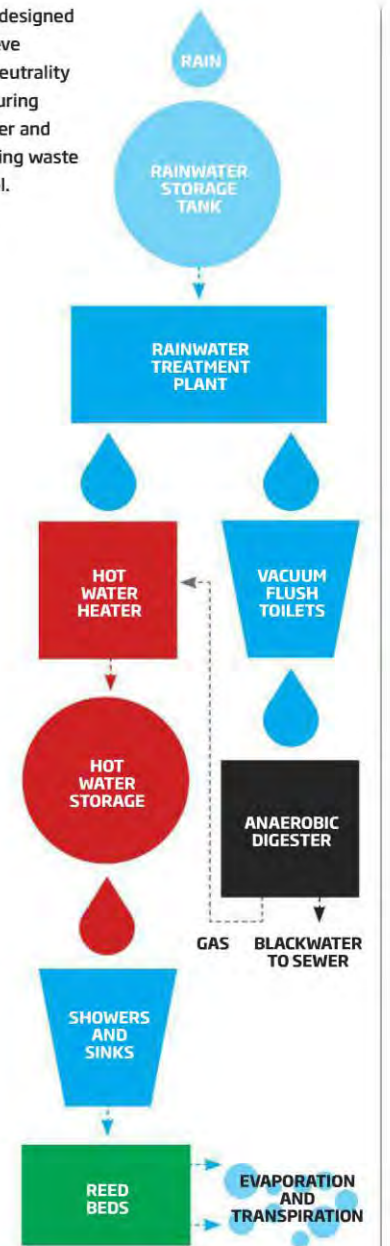
PRECIPITATION
INCHES/MILLIMETERS



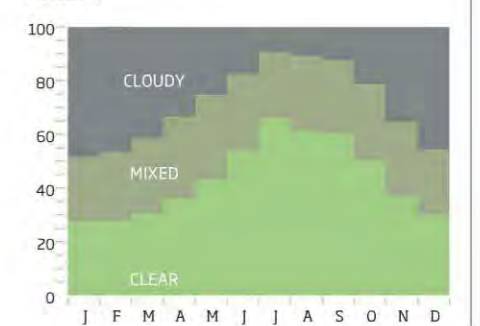
TEMPERATURES & DEW POINTS
FAHRENHEIT/CELSIUS



Pixel is designed to achieve water neutrality by capturing rainwater and converting waste into fuel.



SKY CONDITIONS
PERCENT



BEN HOSKING