No 1 Bligh Street - Complex geometry raises solar control delivery

External Venetian Blinds integrated with fully automated control

horiso®

Owners - Co-owned by DEXUS Property Group, DEXUS Wholesale Property Fund (DWPF) and Cbus Property.

Architects - Australian Architectus and Germany's Ingenhoven who came together in 2006 for a design competition.

Builders - Grocon : Australia's largest privately owned development and construction company.

Awards - 1 Bligh has received a number of awards and has been highly commended for its sustainable design, development and architecture.

- Awarded Best Retail/Commercial Development - Urban Development Institute of Australia
- NSW Highly commended Office Development - Australia category, Asia Pacific Property Awards (May 2011)
- Highly commended Office Architecture - Australia category, Asia Pacific Property Awards.

Australia's first Six Star Green Star high rise office tower surpasses world's environmental best practise.

In a world first, the Horiso automated sunshade system is integrated within the elliptical glass cavity of the curved Double Skin Ventilated Façade which runs the full height of the building's 29 floor atrium. In addition, automated External Venetian Blinds with a 7.5 metre drop were installed on an exposed glass area on the building's roof.

1 Bligh has 64 separate controllable windows facing 64 different directions, each programmed to receive unique information combining the sun's Angle of Incidence, absolute position within the building and relative position to adjacent buildings.

The fully automated shading system comprises of 897 individually programmed controllers and 1780 external venetian blinds.

"The tower speaks of enduring presence attuned to emerging cultural, social and environmental concerns." Christoph Ingenhoven, Principal Architect - Ingenhoven

The overarching benefit of the shading system is reduced heat and optimised light which underpins high performance sustainability and unprecedented environmental innovation with the proven flow on effect of healthier and happier tenants and employees, who are more productive.

1 Bligh was designed from first principals to meet environmental world-best practices.

The property has achieved a five star rating, which is the highest award under the Government's Australian-built environment rating system which scores buildings for their impact on the environment. Furthermore, the building was awarded a five star NABERS energy rating together with the Australian Green Building Council's six star rating in line with world's best practice.

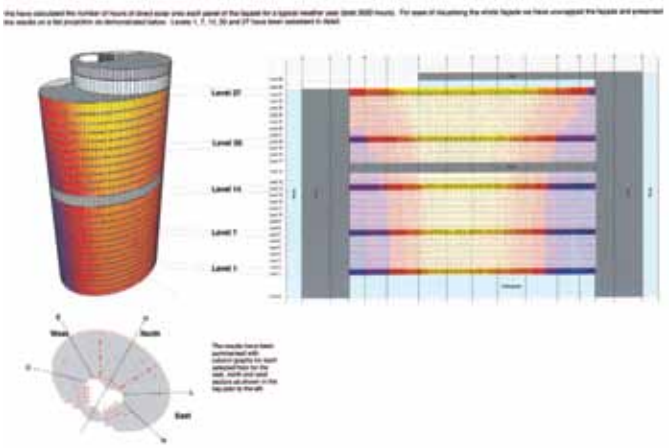
To maximise the expansive views of Sydney harbour, the focus was on the clear untinted glass with a Visual Light Transmission of 62 per cent. While a

high VLT in commercial properties is an ambitious way to maximise views this invites the potential for excessive heat load into the mechanical systems which in turn drives the need for a dynamic intelligent integrated shading system to eliminate glare and reduce energy consumption.

The environmental bar was raised even higher with the vast square meterage of glass dominating the eastern and western facades. Developing shading for the elliptical shape and the programming of the blind control system was an engineering triumph of astronomy and mathematics. This drove the performance over the challenges of the geometrical nature of the building.

To design a shading system which operates in an elliptical shaped ventilated facade with only 600mm void was an engineering master stroke. The programming of a fully automated shading control system had to take into account, not only the entire building surrounds but also the overshadowing and indirect glare from neighbouring offices and the harbour.

About 200,000 data points have been programmed into 890 decentralised controller units which are networked over the 28 floors.



Over 145,000lm aluminium alloy coil material, 125,000lm stainless steel cable (PVC free coated), about 6800lm structural aluminium (about 6 ton) have been used for local manufacturing of the 1790 external venetian blinds.

At the prestigious apex of Sydney's business district with surrounding views of Sydney harbour, the ellipse stands with its feet in Farrar Place, then, deftly turns a little and faces the harbour. One of the most beautiful tricks in design represents an engineering tour de force. Instead of trying to meet the irregular street frontage the architects turned the building foot print into an ellipse touching all the abutting streets but opening broadly to the north and Farrer Place to the east.

The sustainability features of 1 Bligh Street result in the lowest operating costs of a premium grade building in Sydney, equating to estimated savings of approximately $2 million per annum.

Top graph shows proposed category scores of points to achieve for Green Star rating requirements.

Diagram above illustrates the number of hours the sun will directly hit each solar panel for a typical weather year.

Image left. A top floor The expansive view of Sydney's city landscape from one of Bligh Street's top floors.

"It was a very competitive tender process. The input from Horiso was extraordinary. They have a very high technical capacity and commercial approach. We wanted to work with Horiso again. The project has very complex geometry in which Horiso excels. Because of this we had to continually refine and modify which they compensated for with a continual loop of feedback after ever iteration and adjustment, whether we wanted to hear it or not. The high density, built up environment of the business district is difficult from the angle of sun position. The design philosophy is about space and light and the delicate balance between space light and glare."

Bruce Jones - Grocon Project Manager / Horiso's direct report.

1 Bligh is born

The process took ten years (and that was before the owners started acquiring, amalgamating and demolishing the surrounding sites – which took several more years). Ninety four percent of the demolished buildings' materials were recycled including steel and concrete.

Half way through the first phase, the Global Financial Crises hit.

With foresight, the project was designed in two phases. Fortunately allowing for the unforeseen, which occurred, with the sudden economic downturn, half way through the first phase, heightening the risk for all concerned. Strong management combined with strong nerve saw the team forge ahead.

The Horiso control engineering and shading

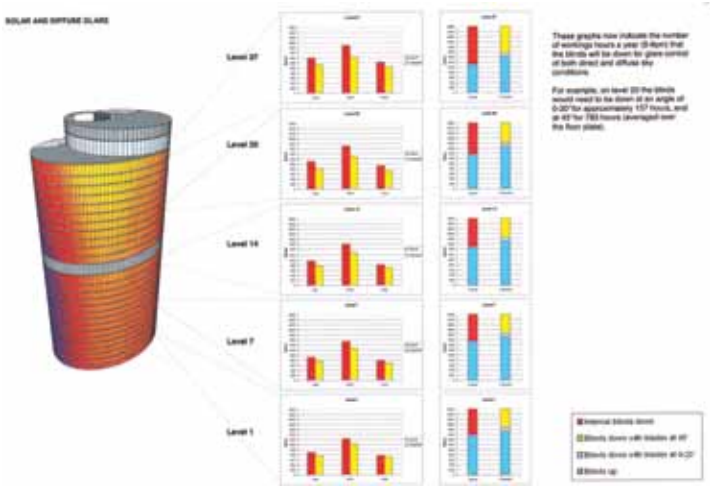
At the outset this ambitious project was forecast to be the international front runner of innovation. From a competitive international tender process, Horiso was the first choice with the added benefit of a superior team of experts with international expertise already in place ready to hit the ground running. Furthermore there was Horiso's credibility gained working on Australia's most significant commercial projects.

The German architects, Ingenhoven are leading proponents of the Double Skin Façade – in Europe.

Sydney with its high density office towers, dramatic climatic conditions, and the sensational harbour views created a novel set of complexities. No 1 Bligh has 64 facades with individual geographical orientation. Standard shading control system can account for one, two or three facades and control these in one section. Every office is an individual façade on its own and requires an individual program to account for the specific surrounding parameters for this particular orientation.

The double skin has a ventilated cavity and incorporates Horiso's fully automated shading system which reduces the heat load enormously.

At the same time, intelligent micro controllers allow highly complex mathematical and astrophysical calculations to take place within each controller device. This technology allows the energy consumption of the building to be kept to a minimum, and facilitates the maintenance of the energy performance at 5 Star NABERS Energy levels with a 42 per cent CO^2 reduction when compared to a similar sized conventional office tower.



By integrating intelligent-control of the façade's venetian blinds into the building management system, micro processors ensure each set of venetian blinds adjusts individually according to the angle of the sun ensuring the exact position required to achieve maximum heat and light control.

Horiso's Dynamic façade technology factors for glare, shade and light reflection from sun, water, cloud cover, unseasonable weather and neighbouring buildings.

Diagram illustrates the working hours of the day that the blinds will be down and angled to control the internal sun glare.

Detail of Horiso's External Venetian Blinds at Bligh Street.

Horiso technology uses the native BACnet protocol. This ensures easy integration with the majority of other building management systems and can be remotely controlled from any location worldwide. The entire shading control network consists of only three major hardware components. The intelligent distributive network enabled two motor controllers, a Control Point to connect sensors and provide contact to the BMS and a network router per floor for communication with the server. All mathematical processing of specific astrological parameters are compiled and executed within the shading controller. All smarts are decentralised which means a server is unnecessary. Due to the very low complexity in the hardware the system runs on a safe operation level. Thus less interfaces equal less points of failure.

> "The design of the building is attractive to the firm because it provides health benefits which are important for staff wellbeing and productivity. The building design helps increase collaboration. After one month I could already see the difference in terms of people talking to each other; and because they can see what's happening on their floors there's a heightened sense of being part of a whole."
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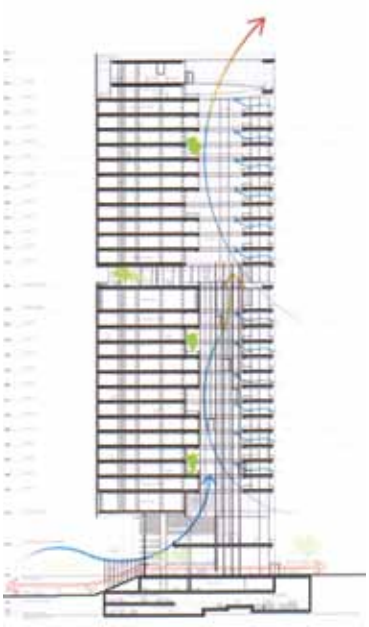
> **Julie Levis** - Clayton Utz, Sydney Managing Partner.

The anchor tenant is a leading law firm. Their focus was firmly on staff wellbeing to foster an environment of productivity and professionalism in line with the firm's brand. The tenants, although provided with an option of a pelmet system that they could control themselves, favoured the Horiso automated system allowing the staff to concentrate on their work in a constantly controlled environment.

Project Collaboration

A building project of this scale and the challenges that were overcome during the many stages of the design and construction was a feat in itself. In particular, was the External Venetian Blind design, delivery and installation component. This intrinscally important project was managed by the internationally acclaimed Australian based company Turner Bros. Furnishings Pty Ltd. The crucial building schedule required delivery and installation to be carried out in the exact time allocated to avoid any potentially expensive delays on the building's completion. On the onset, the unusual oval shaped curve of the glass facade meant that the original design specifications and installation details of the External Venetian Blinds were amended to accommodate the building's curvature. Highly skilled communication, multiple detailed drawings and painstaking installallation has enabled this project element to achieve it's highly successful outcome.

Clear glass Double Skin Façade



1 Bligh will be the first high-rise office tower in Australia to feature a double-skin, glass façade to reduce the significant heat load. In an engineering feat the entire façade is cantilevered out from the ring beam. An outer glass skin protects the sun shades, allowing natural light into the building. This is the most energy efficient feature available in high-rise buildings today.

1 Bligh is designed so that the building stays cool. The air enters the cavity on the bottom of the building, allowing cool air to circulate within the cavity and exiting at the top of the building. This also protects the mechanised metal blinds from being buffeted by wind. By integrating the Double Skin Ventilated Facade in the floor space it actually provided an extra 10 per cent letable area.

Central atrium

Australia's tallest naturally ventilated atrium provides dynamic views across floors through the building to the south. A naturally ventilated glass atrium soars the full height of the building, providing a flow of fresh air and a sense of openness on every floor. Providing dynamic views through the building, the atrium is an arrival point for all floors, enhancing communication, connection and community.

Mechanical System

1 Bligh's mechanical system consists of a hybrid arrangement of low temperature VAV air-conditioning systems to the central zones of each office space floor, and passive chilled beam to the perimeter spaces. The system has been engineered to consume minimal amounts of energy in light of addressing minimal amounts of solar heat gain from the east, north and west facing facades.

The philosophy of the mechanical air-condition system to the Class 5 net letable office space is very much dependant on combating solar heat gains at the façade. Without a strong defence against solar heat gain, the mechanical system would be unable to address the absorbed heat loads resulting in discomfort for the occupants and unpredictable operational energy consumption.

Diagram above demonstrates the building's airflow to create natural ventilation.

Air conditioning

The ground floor heating/cooling which in combination
with the open atrium and the vented roof top encourages an additional natural cooling/heating effect. A hybrid structure combining a variable air volume (VAV) with a chilled beam air conditioning system installed to maximise comfort levels and reduce energy consumption.

Tri-generation energy and recycled water

1 Bligh uses an innovative tri-generation absorption chiller system powered by the hot water heated using the solar panels on the roof. A series of curved solar thermal collectors provide the energy to drive the cooling systems; an advanced hybrid of VAV and chilled beam air conditioning technology. This is the Sydney's first CBD commercial office tower to incorporate black water recycling which is also used to irrigate a feature 9.7m high green wall.

The building atrium is shaded at roof level by a series of curved solar thermal collects which inject high temporary energy into a solar cooling system. This strategy provides enough energy to allow 100 per cent more fresh air to be pumped through the building without any additional running costs whilst providing all the heating for the building.

Image shows the system of solar themal colletors on the roof of No 1 Bligh Street.

Note:
No 1 Bligh Street's External Venetian Blind project collaboration between Horiso, Turner Bros and Grocon has resulted in the three companies collaborating again on Sydney's latest significant building project at 161 Castlereagh Street.

For further information email info@horiso.com or phone (61 2) 8755 4500

No 1 Bligh Street's Environmentally Sustainable Design achievements

- Water recycling measures reduce mains water usage by up to 90 per cent
- Black water recycling of up to 100,000 litres per day (equivalent to one Olympic swimming pool of water will be saved every two weeks)
- Building design and features such as the double skin façade and sun-shading reduce air conditioning energy consumption by up to 50 per cent
- The use of gas and solar panels reduces electricity grid strain by up to 25 per cent.
- 42 per cent CO^2 reduction when compared with similar sized conventional office building towers.

Key building facts

- Double skin floor to ceiling glass facade
- 90 per cent of the steel used comprises more than 50 per cent recycled content
- 94 per cent of construction waste has been recycled
- Prime Sydney CBD location with commanding views of Sydney Harbour
- Premium grade office design
- 1 Bligh is the third premium quality office building
- Unique column-free floor plates designed to maximise workspace
- Large 1637sq m floor plates and suites from 320sq m
- Horizontal and vertical connectivity between floors
- Expansive feature roof top terrace
- Glazed and naturally ventilated wintergarden space
- Australia's largest green wall (vertical garden)
- A naturally ventilated internal atrium (approx. 135 metres in height)
- Stylish foyer café and outdoor green wall café
- Dedicated child care facility (opening 2012)
- 24 hour on-site security monitoring and patrol services
- Bicycle storage, locker and shower facilities
- On-site car park and loading dock.

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