Bruno Seguin.

LOOKING THROUGH THE FACADE

The impetus driving façade innovation is solar control technology, writes BRUNO SEGUIN, general manager of the specialist Australian solar control company Horiso.

The key objective in façade design and management is to maximise the use of natural daylight without the problems of glare or excessive solar heat gain, with a view to optimising occupants' wellbeing and comfort. This is underpinned by energy saving efficiencies that make environmental as well as economical sense.

The future path of façade innovation leads to three groundbreaking areas that are set to become world-class practices in commercial projects: the double skin ventilated façade with external operable and retractable venetian blinds; the double skin ventilated façade with split control external venetian blinds; and the high visual light transmittance (VLT) glazing façade with a combination of specialty internal shading systems.

These benchmarks are demonstrated in three prestigious landmark developments, all of which are set to achieve Six Star Green Star ratings: Sydney's No 1 Bligh Street, Christchurch Civic Centre in New Zealand, and Darling Quarter in Sydney's Darling Park. They all have in common state-of-the-art integrated technology control systems, making them climate ready.

Traditionally, we have had buildings with thick walls, small windows, huge eaves and cross ventilation, which was part of the evolution of construction from when we came out of caves with thick walls and no light. In the 1970s and 1980s the trend was for construction with a predilection for a grand façade with highly reflective performance glazing, using internal shading to deal with the light and glare, coupled with large HVAC (heating, ventilation, air-conditioning) systems to manage the heat gain entering through the façade. The sole aim was for as much light as possible regardless of the cost. This was certainly achieved but with the resulting discomforting glare, space and energy wastage of air-conditioning and power sources working at full capacity around the clock. Today these buildings appear as antiquated and as out of step with current design and lifestyles as the early cave dwellings, which at least offered a cool den in which to hibernate.

below: 1 Bligh Street, Sydney.

EXAMPLE 1: 1 BLIGH STREET

No. 1 Bligh Street, Sydney, demonstrates the double skin ventilated façade in a 31-storey building by Grocon and designed by Architectus in association with Ingenhoven architects, Germany.

With the aspect of a transparent glass tower, this project is Australia's first double skin ventilated facade.

The 1774 motorised 80mm venetian blind systems will be integrated within a custom design ventilated double skin façade and controlled with an advanced system consistent with the unique circular design of the building.

The design of the blind pelmets will allow airflow from the back of the blind to travel over the custom-curved head section. Airflow between the double layers of glass will assist in maintaining a constant average temperature within the building, thus avoiding excessive use of HVAC systems.

The blinds will operate automatically within the outer and inner cavities of the ventilated facade. These blinds are designed to reduce solar heat gain while maintaining optimal light and views.

To achieve maximum energy efficiency, a complete blind and control package was necessary. This control system enables the motorised venetian blinds to operate using an intelligent motor controller pre-programmed with all the building's control requirements - including both the geographical location and physical orientation of the building's circular shape. It will operate in conjunction with sun-tracking software that enables individual blinds to react to the variations of the sun's angle of incidence throughout the year.

In addition, the blinds will also react to external light levels. This ensures that the blinds are always at their optimum tilt position to meet the client's light penetration and glare control requirements for transparency.

The focus is on maximum natural light all year round, with performance glazing for controlled admission of natural light through windows to reduce or eliminate electric lighting. To provide a direct link to the dynamic and perpetually evolving patterns of outdoor illumination, 'daylighting' helps create a visually stimulating and productive environment for building occupants while reducing as much as one-third of total building energy costs. It is not merely a mood but the physical effect of wellbeing and calm restored by the effects of being in harmony with the elements.

EXAMPLE 2: CHRISTCHURCH CIVIC CENTRE

New Zealand's Christchurch Civic Centre demonstrated our split control external venetian blind within a double skin ventilated façade. It was developed by project architect Athfield Architects and was built by Hawkins Construction.

The double skin façade becomes a thermal and solar buffering zone. This façade will also be used to vent air and heat from the building, enhancing its thermal properties. Within the office floors a monitoring system detects when carbon dioxide (CO_2) has reached a certain level and automatically introduces fresh air through floor vents. Double skin façade buildings were first built in the US and Europe in the 1970s during the first energy crisis as an attempt to improve building performance.

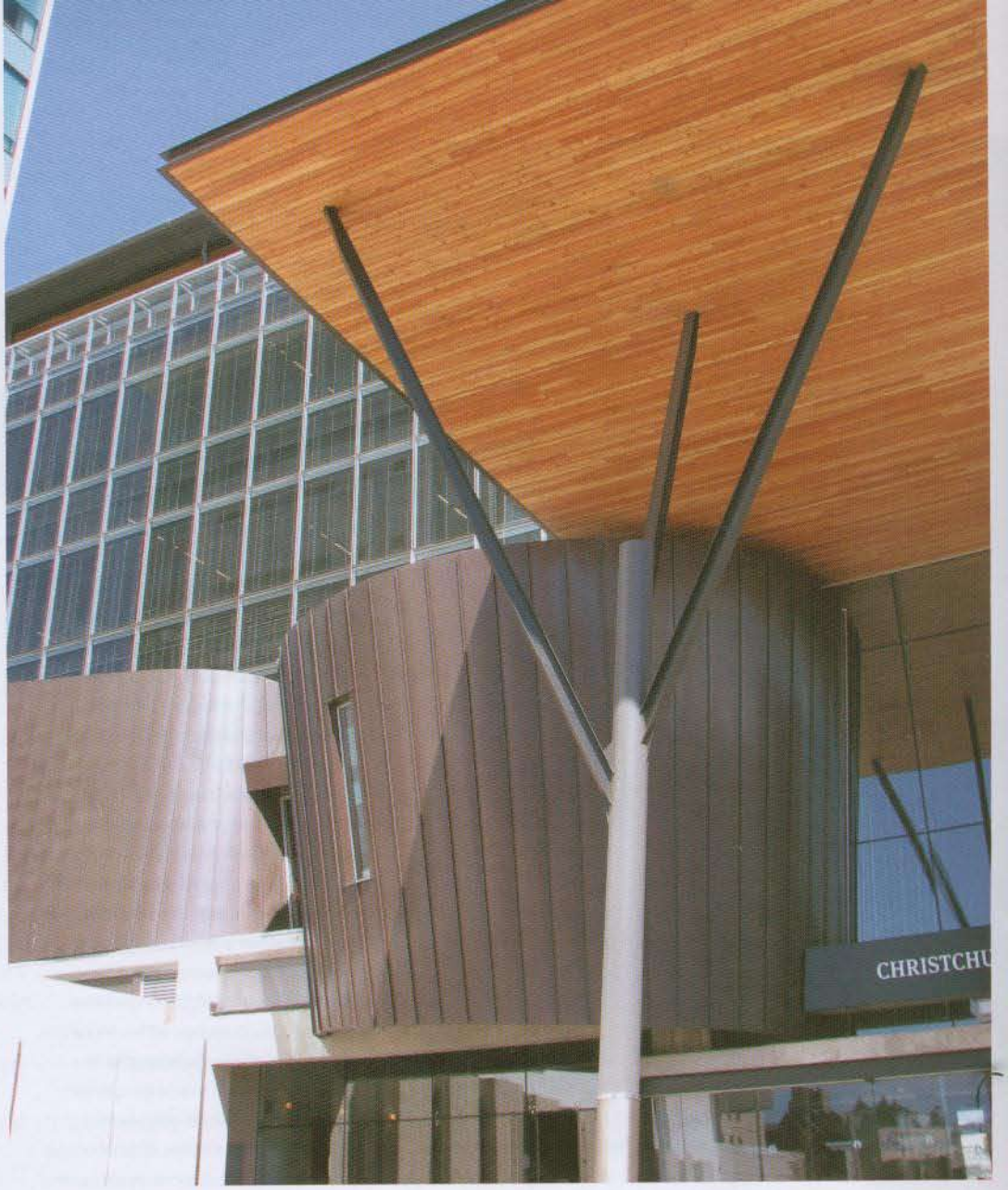
The recent resurgence of efficient building design has renewed interest in this concept. Since the Green Building Council of Australia rewards points for reduction in energy consumption, this strategy has been used to optimise energy performance.

The client's initial design concept was always going to be a full curtain wall of glazing on the north face of the building to maximise views and daylight to the interior office space. For most of the design period the specifications were for a double glazed curtain wall with external shading devices such as operable louvres and fixed fins. This concept was dropped to allow for better management of daylight using motorised venetian blinds in a double skin ventilated façade, split so the top third operates independently from the bottom two thirds.

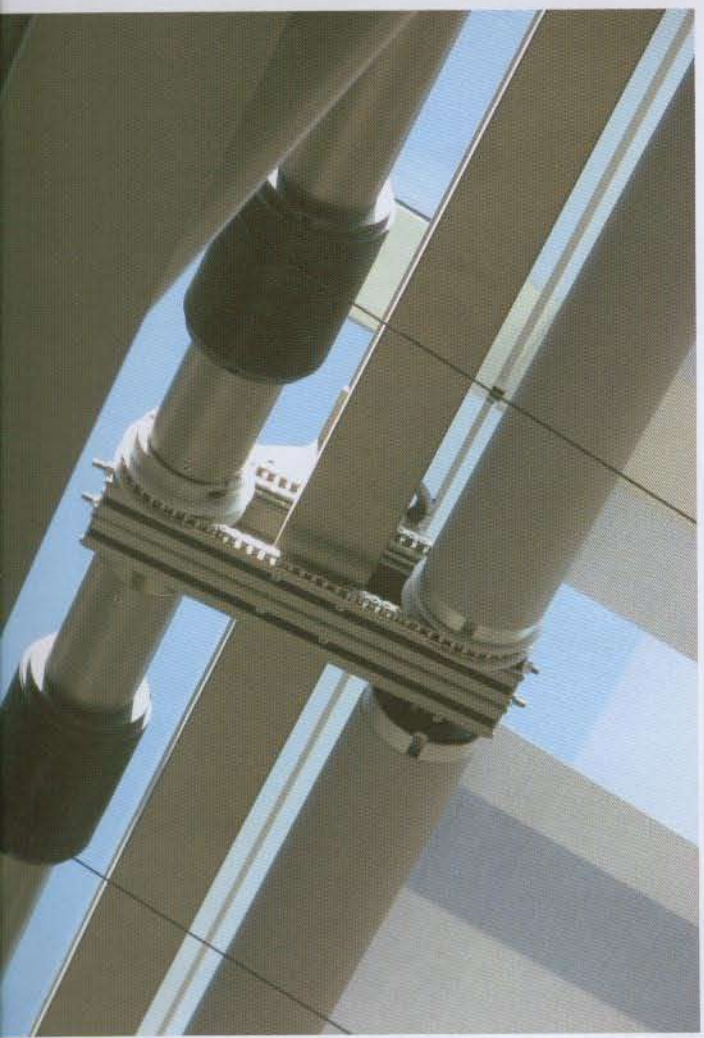
This created an internal occupied buffer zone for the first three metres from the glass and the 5.8-metre floor-to-floor height walls, which, if not shaded, would have culminated in a cool air 'waterfall' effect dropping down the glass in winter. The double skin facade (DSF) provides a thermal buffering zone and results in much warmer internal glass temperatures, allowing the occupants to locate workstations nearer the glazing, gaining maximum use of the very deep floor space.

As well as providing a larger occupiable floor space, the DSF offers environmental benefits in terms of cooling, heating and shading. The building has attained a 6 Star Green Star rating for office design with the highest score ever achieved by a New Zealand office building, saving $1.3 million in energy. Furthermore, the DSF provides a smooth outer skin for easy maintenance, with minimal wear and tear over the long term – a key point to be taken into account with the client's 70-year tenancy agreement.

The technical control philosophy is automated relative to the time of day and the seasons associated with the sun's angle of incidence, as well as the real-time brightness outside via a roof-mounted sensor. When it's sunny the blinds lower automatically and tilt to the required position to provide solar and glare control. The programming in the controllers takes into account the surrounding buildings to raise blinds in localised sections of the façade in relation to the phases of the neighbouring light and shade. In bright overcast conditions the blinds just tilt horizontally, while in fully overcast conditions they retract completely.



above: Christchurch Civic Centre, New Zealand.



above: The Darling Quarter motorised tension system lends great polish to the whole complex

The DSF encourages 'free cooling', utilising the cool air from the outside for cooling with 100 percent fresh air for significant periods of the year. When a floor is in the 'free cooling' zone the upper blinds relax their tilt angle to allow for more 'daylighting' into the open plan spaces, with the signals from the building management system (BMS) on each floor 'speaking' to the external venetian blind technology.

EXAMPLE 3: DARLING QUARTER

Darling Quarter in Sydney is a Lend Lease development with Francis-Jones Morehen Thorp architects using internal plantation wood blinds and specialty retractable shading.

This is innovation of the highest order. The building, due for completion midway through the year, has already achieved a 6 Star Green Star rating for design. This project introduces high-transparency glazing on its western façade. Historically, this would have raised objections from tenants because of problems with glare in the working environment. But for the first time in Australia we have combined clever engineering and technology with environmentally friendly, white poplar plantation-wood motorised venetian blinds. Due to the high heat absorption properties of the timber, these work together to reduce the heat load through the glass, manage any glare and add a soft and ambient interior, achieved with the use of white timber as opposed to the typically stark aluminium designs traditionally used in commercial properties.

It is important to note that the original concept was created around timber shades on the outside of the building, but we couldn't make this work so we put the shades on the inside. This solved any maintenance issues and gave us better glare control on the western facade and enhanced the relationship with the green surrounds and the parks playful ambience.

The white poplar plantation timber motorised blinds are a first using this type of glass on a western façade. Typically, on a western façade there would be 30 percent VLT, and the majority of glare issues arise from the western side of the building. In the morning it is not an issue because people are not in their offices but the afternoon can be a killer. It presented a major issue for tenant occupancy and we have addressed it as critical criteria. The client's overarching goal has been to achieve tenant harmony and plenty of light with great design, and thereby overcome the challenges that would normally arise.

For example, in a normal residential house VLT would probably be about 75-80 percent and the highest Lend Lease would typically accept on their projects is 45 percent.

Furthermore, the building has an atrium on one level, which runs between two towers from level 6 on the west to the roof soffit on the east, with a solid glass wall where the sun penetrates into the floor below. For the first time in Australia and internationally, this glare and heat issue has been addressed with automated blinds to the soffit, which traverse down the 37.5 degree pitched roof, thereby shielding tenants from radiant heat and daylight glare.

Developing such technology for the maintenance and operation of 24 fabric tension systems - running in parallel following the shape of the glass - would not have been possible without the team support of the architect, builder and client.

This is cutting-edge technology at its finest.

IN CONCLUSION

Each of these projects has shades that are automatically adjusted by the sun's angle of incidence (SAI) software for a perfectly controlled environment. With the right shading device, this equates to a 93 percent reduction in solar transmission and a cooling cost reduction of up to 69 percent, depending on the configuration of the building. The software allows individual control user overrides; however, we believe that by developing systems that negate the need for any human interaction, energy and economic efficiency are assured.

Now we have turned a full revolution where we can ensure easy integration with all other building management systems. Such systems can be combined and remotely controlled and monitored from any location with a unique graphic user interface (GUI).

We have the technology, the design and engineering expertise, but to ensure successful projects it is vital that we collaborate closely with the architect on the scope of work and work with the team of façade consultants, engineers, designers, builders and installation contractors from the concept stage. **FM**

Bruno Seguin is general manager of Horiso, the Australian-owned manufacturer of solar control systems and specialty blinds.

His role in business development encompasses strategies for innovative solar control and the implementation of programs.

Horiso creates internal and external solar control solutions for the commercial, hospitality, institutional, and residential sectors.

The company's focus is on research, development and manufacture, working collaboratively on major projects in Europe, American and Asia. These diverse operational arenas have allowed the company to adapt its product range to all architectural, design and engineering requirements worldwide.

More information

Horiso

www.horiso.com