The complex curves of the Australian Pavilion at Shanghai World Expo 2010 were simple to construct, thanks to a new panelised cassette system that makes building with weathering steel easy.

Words Alex Taylor  Photography Peter Bennett, Katarina Stuebe

ARCHITECT Wood Marsh Architecture
PROJECT Australian Pavilion
LOCATION World Expo 2010 Shanghai, China

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The Australian Pavilion resembles a monolith, thanks to the precision of BlueScope Facade Solutions Azure™ panels.

The Pavilion is a favourite with Expo visitors, including these Chinese Army soldiers at a pre-launch event.
As the architects responsible for the Geelong Ring Road and the Australian Centre for Contemporary Art (ACCA) on Melbourne’s Southbank, the team at Wood Marsh has amassed significant expertise in the design and delivery of weathering steel structures. Their latest offering – the Australian Pavilion at Shanghai World Expo 2010 – has benefited from recent innovations in technology in multiple ways.

For the Australian Pavilion commission, which Wood Marsh won in an open competition in partnership with creative design firm ThinkOTS, Wood Marsh aimed to represent Australia’s Red Centre in an abstracted and sculptural way – especially Uluru and Kata Tjuta – to evoke images of the landscape that most international visitors readily associate with Australia.

“When ACCA was completed, people remarked that although angular in form, it evoked the Red Centre, so it became the reference point for our design concept for the Australian Pavilion,” explains Wood Marsh project architect Antony Martin. “It was important for the pavilion to be both uniquely Australian and an excellent piece of design.”

By installing BlueScope Facade Solutions Azure™ weathering steel that were customised to the architect’s specifications, the design and construction team hastened the building process and achieved a level of precision that was not previously possible.

“Weathering steel was always central to that design idea,” Martin adds, “because the nature of the material relates to the patina and ochres associated with the Red Centre.”

According to Australian Pavilion organisers, Wood Marsh’s innovative design responds admirably to the Expo theme by embodying Australia’s approach to smart manufacturing, design and environmental sustainability.

“Australia’s is a striking national pavilion, where targeted trade and investment promotion activities, and associated cultural and communications programs, will further enhance our already strong bilateral links with China,” says Australia’s Commissioner-General Lyndall Sachs. “Consistent with the Expo theme, ‘Better City, Better Life’, our pavilion promotes Australia’s cities, which are consistently ranked amongst the most liveable in the world.”

Internally, the pavilion accommodates up to 40,000 visitors each day in three distinct public areas designed by creative design firm ThinkOTS. Journey takes visitors past six exhibition elements in the 186-metre long, glass-enclosed ramp that wraps around the facade and punctures its skin. At the pavilion’s heart, a 1000-person capacity theatre-in-the-round showcases an audio-visual spectacular in Discover, while Enjoy comprises food, beverage and retail offerings in a 15m high atrium, with an elevated gallery for cultural performances. The pavilion also features a 250m² VIP zone overlooking the atrium.

The launch of BlueScope Facade Solutions’ Azure™ panels simplified the installation of XLERPLATE® weathering steel cladding since Wood Marsh completed the ACCA project in 2002 and since construction of the Geelong Ring Road began in 2006. BlueScope Facade Solutions now provides a one-stop-shop for design, fabrication and construction solutions.

“We had initially considered commissioning a custom panel system that would have been designed specifically for this project,” Martin says, “but after being approached by BlueScope Facade Solutions in December 2008, we didn’t have to.

“As sponsors of the Australian Pavilion, BlueScope Steel was familiar with our winning scheme, and they became involved with the facade design, supply and installation at an early stage of the process,” he explains. “I travelled to Sydney with client representatives to see the Penrith Government Office Building [see Steel Profile #103] in construction. Based on what we saw there, I made certain requests in relation to panel size and joint specifications – and Facade Solutions was able to produce panels that fulfilled our requirements.”

According to Martin, the new cassette panels offer several key advantages over earlier weathering steel cladding systems. “The most significant difference in the construction methods employed was that at ACCA the weathering steel formed the weatherproof skin of the building, whereas at the Australian Pavilion it acts as a rain screen,” he says.
The final space of the visitors’ circuit – the Enjoy atrium – features eight 10-metre tall flower pods suspended from the ceiling.

“It was important for the pavilion to be both uniquely Australian and an excellent piece of design”
Inside the Pavilion, vivid displays, live performances and striking artworks help visitors Journey, Discover and Enjoy Australia’s unique offerings.
The Azure™ panels that fit around the circulation 'tubes' were cut to size onsite, using templates prepared in Australia.

The panelised system enabled the pavilion to be built in China by local workers employed by the head contractor, Bovis Lend Lease Projects Shanghai, using a combination of locally sourced structural steel and BlueScope Facades Azure™ panels.

"The crew that installed the facade was excellent," Martin says. "Once they mastered the sequence of the installation, they were able to move very quickly around the building, and it took just two months to complete the cladding."

The speed and ease of construction were important considerations in the specification of Azure™ panels, given the tight timeframe leading up to the official opening in May 2010. In addition, the simple task of removing the panels will ensure a smooth disassembly when Expo concludes.

"All the facade panels can be simply removed and reinstalled, regardless of the form or shape of a subsequent building," Martin says. "It's very easy to unpack the panels, and we kept the packaging, so that they can be shipped back to Australia for reuse afterwards."

However, there was another even more compelling argument for specifying the Azure™ panels, according to the architect. "The ability to ensure minimum tolerances and precise alignment in the panels was the most important factor," Martin explains. "It meant we were able to achieve minimal horizontal seams and therefore convey the monolithic appearance we desired."

The building owes its sinuous curved walls and undulating roofline to the flawless precision of the Azure™ cassette system. "All of the 'tube' penetrations were cut on-site from templates, but the parapet panels were cut to size in Australia," Martin explains. "You can see the precision that we were able to achieve through the smooth and curving parapet line. The fact that the panels were all prepared in Australia so that the workers could assemble them without delay was outstanding."

Martin says that construction on-site proceeded free of unexpected challenges because the design and construction team had undertaken rigorous preparation and testing beforehand. The complex structure was designed in Melbourne using a combination of CAD and Rhino, with comprehensive shop drawings produced in China using TEKLA 3D modelling software. "The primary structural frame was enormously complex given the plan, and the fact that you have a central theatre which is wrapped with circulation and exhibition spaces," Martin says.

"We were running to a very tight time frame – the building had to be built in just 12 months, and we had a non-negotiable completion date – so we had to be certain of everything in advance."

"We had a prototype produced of the facade system, which I inspected several times in Sydney before it was shipped to China, so that the local workers could see how it would all come together," he says.

"We did everything in our power to avoid running into difficulties on site," Martin adds. "In addition, Bovis Lend Lease established a quality control program to sign off on key stages of the construction, and I visited Shanghai as part of that process every four to six weeks during the installation, to inspect the progress."

Now that the building is open to visitors, it has taken on a life of its own, with streams of people moving through the pavilion each day. A constant flurry of visitors activates the spaces in and around the building, and the facade is anything but dull and boring, thanks to the unique qualities of XLERPLATE® steel.

"One of the most important things about weathering steel is that it develops a patina that will change over the course of the Expo," Martin says, "so the building is not necessarily a static object: its colours will change over time, depending on the prevailing weather, and by changing sunlight throughout the course of the day."

"We developed a very careful lighting plan based on our experience with ACCA," he adds. "The in-ground lights have an orange lens and are concentrated on the convex portions of the plan, so that the reading of the building changes dramatically at night."

While Antony Martin was in Shanghai putting the finishing touches on the building, several soft opening events took place prior to Expo’s official launch, and the architect was thrilled with the crowd’s reaction to the design. "When I was there on a VIP day, there was an enormous queue to enter. People are amazed by the pavilion, it’s a very popular building," he says.

Part of its appeal surely derives from its unmistakable 'Australian-ness', Martin concludes. "One of the aspects that we are most proud of is that, while some of the other pavilions boast amazing architecture, they are not necessarily representative of their countries, but the Australian Pavilion manages to do both," he says. "Weathering steel was at the centre of our design concept: it’s the form and material that best represents the unique landforms of the Red Centre."

The concept and sculptural form of this eye-catching building is extremely provocative, giving it an immediate presence in what is likely to be an exceptional field of buildings by well-known architects from around the world. We are interested in the potential of the unusual tubes that encircle and penetrate the facade, which recall the hulking mass of the desert vehicles in the Star Wars film.

**PANEL SAYS**

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Even in the context of the world’s biggest expo stage, the Australian Pavilion is a record-breaking project of mammoth proportions.

Words: Alex Taylor

Australia has a long history of participation at world exhibitions – Melbourne’s Exhibition Buildings date from the 1880 event that city hosted – but the Shanghai World Expo 2010 is our most ambitious and expensive undertaking yet. Where the Australian Pavilion at Aichi in Japan attracted 3.5 million visitors in 2005, Shanghai World Expo 2010 organisers hope to lure seven million visitors into the Australian Pavilion, from an anticipated 70 million attendees.

The Expo site comprises 528 hectares of prime land alongside the Huangpu River with the Chinese Pavilion at its centre, surrounded by 170 smaller pavilions grouped by continent and region. Some of the more striking designs include the UK Pavilion by Thomas Heatherwick, with a porcupine-like facade that incorporates the ‘Seed Cathedral’; the wicker basketwork skin of the Spanish Pavilion by Miralles/Tagliabue EMBT; Buchner Bründler Architects’ knitted aluminium and solar cell curtain for the Swiss Pavilion; and the golden sand-dunes of the United Arab Emirates Pavilion by Norman Foster.

The Australian Government spent $61 million constructing its Pavilion and exhibits, with a further $22 million sourced from business sponsorship and state governments. Over Expo’s six-month run, the Australian Pavilion will employ about 160 bilingual workers to inform, entertain and serve the mainly Chinese visitors.

Australian organisers are hoping that Expo will foster and strengthen business links between Australia and China, particularly in the areas of financial services; green building and renewable energy; resources; biotechnology, education; and information and communications technology.

“Over the 184 days of the Expo, our VIP facility will play host to over 200 targeted business program events including seminars, policy roundtables and promotions, all designed to broaden and enhance bilateral and commercial bonds between China and Australia,” said Australia’s Commissioner-General Lyndall Sachs.

Tourism is another sector likely to benefit, with the number of mainland Chinese visitors to Australia expected to grow by 11 per cent over the next five years, spurred on by the enticing cultural displays and interactive exhibits within the Pavilion.

Soft launch events augured well for the official opening and beyond, Sachs said, with busy queues translating into happy visitors. “I am delighted with the very positive reactions of our visitors to the Australian pavilion,” she said. “The look of anticipation on their faces as they waited patiently was matched by the very happy expressions as they completed their journey of discovery of Australia, its history, culture, products, food and beverages and our hopes for the future. I am pleased to hear so many of our visitors to the pavilion saying that it was worth the wait.”