Water works

Striking architectural design and meticulous detailing and finishes are not qualities you'd normally associate with a waste water plant – but the recent refurbishment of Adelaide's Christie's Beach Waste Water Treatment Plant features all this – and more.

Perched high on a headland and in a residential area, the Christie's Beach plant is visible both from the ocean and to local residents. So when it was due for a major overhaul, aesthetics was a significant factor in the design brief.

Architects Brown Falconer had a strong vision from the outset: rather than generic utilitarian boxes, they wanted to create a visually pleasing structure that also made a clear statement about the plant's function.

To achieve the desired results - a combination of aesthetics, durability and speedy construction that would cause minimum disruption to the surrounding residents - the architects decided on the use of precast concrete façade panels. To provide the visual appeal, many of these have been etched with water-inspired words and motifs.

"The architects wanted our input from the planning stage to ensure that the design was achievable in practice and to run through any potential issues, test colours and finishes and so on," explains Michael Favretto, from Bianco Precast, which supplied the 117 panels for the three buildings that made up phase one of the project – a total area of some 2625 square metres.

"As far as the motifs and detailing were concerned, the original idea was to use acid etching, but we found that a sandblasted and off-form combination with a Brighton Lite mix gave the right effect. So the majority of panels are sandblasted, but the lettering is off-form," says Michael.

"We achieved the effect by using a mould to pour on and then placed another mould into the panel to protect it from the sandblasting process."

Michael goes on to explain that the major challenge with the job was not so much the panels themselves - which were relatively straightforward - but in ensuring the pinpoint accuracy of the rendering of the words and pictures that featured on them, because they all had to be pieced together on-site.

It was only once this was done that the final large scale images could finally come together and be complete.

"Apart from confirming sizes to ensure the curvature worked, it was very much a matter for our in-house shop drawing team. The job required very high quality detailing, very tight drafting, forming and manufacturing, with installation tolerances far exceeding normal industry practices even for architectural panels."

This was achieved using CAD for the design, laser cutting and manufacturing tools to achieve the tolerances required to ensure the design would fit together. An innovative method of joining computer cut patterns to form rebated lettering was used to achieve a seamless finish.

The reward of this applied precision was trouble-free installation, which occurred speedily in line with the project brief – and a genuinely striking result that local residents and passing water craft can view with pleasure.

Client: SA Water
Architect: Brown Falconer Architects
Engineer: KBR Engineers
Contractor: Badge Constructions
Precast manufacturer: Bianco Precast

Erection design engineering crucial to safety

Two recent incidents involving the installation of precast and tilt-up wall panels have put the spotlight on lifting systems and QA procedures. The incidents, one in Western Australia and the other in Victoria, occurred when lifting inserts broke away from the panels, causing the panels to fall.

Initial reports indicate that both incidents were attributed to the incorrect installation of the anchoring systems and poor rigging practices. In the two instances, both of the anchoring systems required tension bars to achieve their rated capacities. In one of the incidents a straight bar was used rather than the specified 'V-shaped' tension bar and in the other, the tension bar wasn't installed at all.

The incidents have raised questions about lifting systems generally and the quality control on their installation during manufacture. They have also emphasised the requirement for an Erection Design Engineer to be engaged for all building projects - as required by the current National Code of Practice for Precast, Tilt-Up and Concrete Elements in Building Construction. As defined in the Code, the Erection Design Engineer *"will usually be responsible to the builder, the precaster or the shop detailer or may also be the project design engineer"*. Contract conditions should clearly state to whom the Erection Design Engineer reports.

The importance of the Erection Design Engineer is often overlooked, or alternatively, the role is undertaken by a number of different people. This fragmented engineering approach can be confusing and often some important tasks are overlooked or forgotten during the construction process.

The Erection Design Engineer has a role to play in the manufacture, handling, transport and erection of prefabricated concrete elements, and must be engaged before any element is manufactured.

With an understanding of all the construction loads, it is the role of the Erection Design Engineer to ensure the structural integrity of each element during manufacture and erection and also to ensure the stability of the prefabricated elements within the building during construction.

With an understanding of all the construction loads, the Erection Design Engineer approves the selected engineered lifting system with the published technical data from the manufacturer, and approves shop drawings in which the system is installed. Alternatively, reputable engineered lifting system suppliers will provide certified lifting designs, on which the Erection Design Engineer can sign-off for a project. If the specified engineered lifting system is unable to be installed in accordance with the certified lifting point design, then the Erection Engineer must approve and record any proposed changes.

The next step is to communicate the various rigging designs (which will include the manufacture and erection drawings, showing any special rigging diagrams) to everyone who will handle the concrete elements. The erection documentation must be given to the erection crew on site before any erection work is undertaken. If, for whatever reason, the specified rigging details cannot be achieved, the Erection Design Engineer must be contacted so that the proposed changes can be verified and approved in light of the selected engineered lifting system.

Indeed, the role of the Erection Design Engineer is integral to the whole process, however it is also crucial to use a reputable precast manufacturer who has a documented QA system in place. This will minimise any likelihood of incorrect lifting systems being used or of systems not being installed correctly.

Critical to safe lifting and erection of panels is that:

- An Erection Design Engineer undertakes the 'erection design' (refer to the National Code for definition of 'erection design')
- All chosen lifting systems must be engineered (and approved by the Erection Design Engineer as part of the erection design)
- Lifting systems must be correctly installed by a reputable precaster who has a documented QA system (such as a National Precast Member)
- All rigging diagrams ('erection documentation') must be included in the erection design and communicated to the erection crew
- All rigging practice must be in accordance with the erection design and appropriate Australian Standards
- Any changes to any of the above must be approved by the Erection Design Engineer.

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Principal's glory

The Kerrie Murphy Building, a new five level primary school building commissioned by International Grammar School in Ultimo Sydney, is a classic example of the beauty, practicality and efficiency of a total precast structure. Named after former principal Kerrie Murphy, the building houses a primary school library, a ground floor covered outdoor learning area, languages faculty offices and a multipurpose space. The fully accessible roof can be converted to an outdoor play area shaded by an array of photovoltaic cells.

Michael Heenan, Principal of Allen Jack+Cottier Architects (AJ+C), had previously used Hanson Precast on the international award-winning Sport and Recreation Hall in Berry NSW, and wished to explore more possibilities in this building using the techniques previously developed for Berry. The brief this time was to deliver an energy efficient, modern building which harmonised with its vibrant surrounds.

AJ+C's design incorporates a number of environmentally sustainable principles. The building is a thermodynamic space with highly thermally-efficient walls and windows, together with intelligent cross ventilation to minimise the need for artificial heating and cooling and sensor-automated lighting. The concrete mixes and steel reinforcement for the precast elements contain a percentage of recycled material, and together with the use of insulated precast sandwich panels which feature high thermal mass on the inside of the insulation envelope, contributed 3 Green Star points to the project. Its strong design has already won the project the 2011 Viridian Vision Award for Commercial Energy Efficiency.

In This Issue

The AJ+C design team gave special consideration to the colour and texture for the exterior walling to ensure it would complement Ultimo's historical brick warehouses. The designers chose a burnt terracotta finish with a replicated scattered iron spot that added a metallic lustre to the panels.

Precast concrete was used for external walls, lift shaft walls and the curved walls of the stairwell. Precast was also used for the floors with 300 thick hollowcore floor planks spanning almost 13 metres onto the external load bearing precast walls. In all, 128 precast elements were manufactured for the project.

Careful planning and co-ordination using a 3D model during the shop drawing process allowed for the accurate engineering of the precast structure. Of greatest challenge, was the manufacture of the 12 large sandwich panels (each with fourteen amorphous holes) for the two street elevations. Working in association with AJ+C, Hanson achieved the random shapes by using rubber liners that had been cast from timber patterns. Detailing included a rebate to allow external glazing to be fitted. The insulating layer was profiled around the holes

Continued on page 2...

Photography: Michael Nicholson

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prior to casting the two layers of concrete. Each panel was produced with an off-form finish and then Nawkaw-stained in three stages inside the precast factory.

The curved off-form off-white stairwell panels were cast from purpose-built moulds, which were fabricated from full seamless sheets of rolled steel.

Erection in two stages

Erection of the precast elements required careful planning as all the usual site conditions of an inner city development applied. The building was erected over only 8 days in 2 stages, with each floor being constructed in only 3.5 hours. The rear section of the building that included the lift, curved stairwell, rear walls and a small section of the flooring, was erected first. A 130 tonne mobile crane located within the site was used for the 4 separate visits for this first stage. Temporary bracing of the precast was critical during this stage, as there was no insitu structure to brace the panels. This was kept in place until after the second stage elements were erected and the concrete topping to the planks was poured.

The second stage required a 300 tonne mobile crane to place the huge 16 tonne amorphous stained wall panels, the positioning of which was almost 20 metres from the crane. The rear wall panels and the floor planks in stage 2 were also erected with the same crane. The street was closed to traffic with police and traffic controllers controlling local traffic and pedestrians.

Whilst the Kerrie Murphy Building looks highly intricate and expensive, it was actually more cost effective per square metre than the average BER school hall. The new structure was built to budget and on schedule by Baseline Constructions, with $3 million in funding from the BER programme. In Kerrie Murphy's own words, *"As well as being beautiful, the spaces are light and joyful and will inspire play and learning"*.

Architect: Allen Jack+Cottier Architects
Engineer: Taylor Thomson Whitting
Builder: Baseline Constructions
Precast manufacturer: Hanson Precast

Photography: Michael Nicholson

On your marks

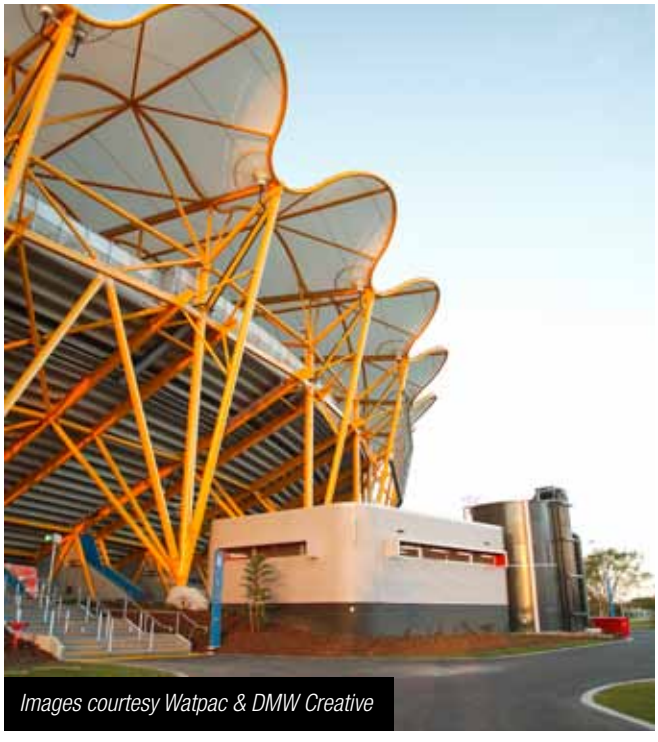
Gold Coast AFL fans have enjoyed a season of home game luxury with the 25,000-seat Metricon Stadium at Carrara open for business.

The much-loved local sporting ground, which has played host to a colourful array of codes, events and identities since it began life as the Laver Oval, has moved into premier status after an extensive $144 million redevelopment that has totally transformed the site.

Having a stadium of this calibre will help position the Gold Coast as a world class sporting destination, put its resident AFL team, the new Gold Coast SUNS, on the map and give local residents and visiting sports fans enjoyment of sporting events in A-grade conditions. The venue will also play host to cricket fixtures and is central to the Gold Coast's 2018 Commonwealth Games bid.

While the site has undergone various facelifts over the years, none compare to this one. The old stadium has been completely demolished, leaving only its six original light towers.

The new stadium is state-of-the art and a far cry from the original makeshift stands. Its 8.5-metre-high, 23-metre-wide high-definition LED scoreboard is one of the largest in Australia and its 450 square metres of solar panelling will generate around 20% of the stadium's total electricity needs.



Images courtesy Watpac & DMW Creative

Commissioned in 2009, with a completion date of May 2011, speed of construction was a high priority for the developer - and extensive use of precast throughout played a major role, not only in the successful delivery of the project but also in overcoming some of the design challenges associated with building a stadium to follow the curves of an oval for AFL – rather than a rectangular one.

In total, more than 8,000 square metres of hollowcore flooring and a staggering 15 kilometres of seating were supplied by Precast Concrete Products.

"While we had never made seating plats before, we had a strong 25-year track record with the client and worked very closely with the architect from the outset to be sure we got the geometry and the complex moulding right," says Ian Coulter, Managing Director of Precast Concrete Products.

He goes on to explain that the project called for special pre-stressed beds, and that the hard work in the planning stages more than paid off in savings in time, costs and the need for handling.

"Speed was of the essence with this job and budget was always a consideration. We had seven months from start to finish to get our components manufactured and in place. And there was no question of compromising on quality - a very high quality finish, in terms of both aesthetics and durability - was called for."

To meet these demands, Ian and his team developed a clever,'three-rows-in-one' precast seating plat in a mix of prestressed and conventional reinforced precast. In total, nearly 2000 of these plats were produced.

The end result is, to use Ian's words, *"beautiful"* and something he and his team were invited to view for themselves when a *"delighted"* client invited them all along to the stadium's grand opening - on-time, and on-budget.

Head contractor: Watpac
Architect: Populous
Project engineer: Arup
Precast engineer: Bruce Lemke Engineering
Precast manufacturer: Precast Concrete Products

Taking the floor

A new, low-rise residential development in Newington, Sydney, within a stone's throw of the Sydney Olympic Park facilities, is a showcase for sustainable post-20th century lifestyle development.

EKO by Crown is a multi-unit residential development comprising five blocks of either four or five storeys, with two levels of basement parking, a 35-metre infinity-edge swimming pool, gymnasium, residents' lounge complete with surround sound theatre and two music rooms.

Designed by architects Joshua International to offer residents a taste of 'resort style living', at first glance its luxurious fittings and upscale appearance do not necessarily shout 'environmental performance'.

However, in keeping with the ethos of the entire suburb of Newington, which was first developed for the Sydney Olympics, and in line with its strong green commitment, the complex has been designed and built with the principles of sustainability in mind.

This includes its fundamental infrastructure - and in particular the flooring, which is comprised almost entirely of a number of different precast applications supplied by Ultrafloor - totaling some 41,000 square metres of suspended concrete flooring or around 46 kilometres of precast floor beams and flat slabs.

As is so often the case, planning at the earliest stages helped deliver the optimum result.

"Over many years we have worked extensively with the client, Crown, and the architect and engineer are always mindful of designing the building to suit the use of floor and walling systems, as they see this as a significant benefit," explains Michael Dunne, Ultrafloor's Business Development Engineer.

"Our in-house design team comes in very early in the project so that, working together, we can help eliminate load transfers down the building and keep support layouts as typical as possible to aid in repetition."

In this case, a range of precast flooring applications was used to suit different parts of the development, including pre-stressed beams, infill sheets, flat slabs and precast edge beams. In addition, selected small areas were laid using conventional formwork.

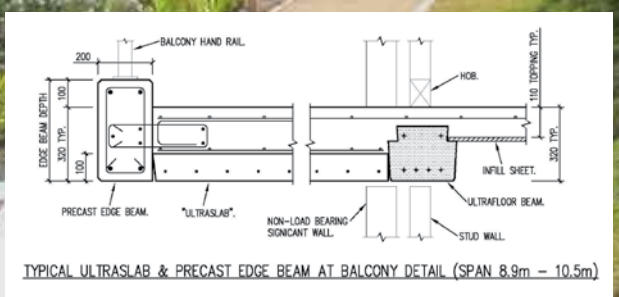
"The flat slabs and precast edge beams were new additions to what we usually supply Crown and were very well received as they greatly reduced construction times," says Michael. *"In fact, the floors and walls were on a 14-day cycle per level, with simultaneous construction of two blocks. The average area installed in this cycle was typically 2,000 to 3,000 square metres."*

Of particular note with this project were the large spans, typically between 8.9m and 10.5m. These required use of the larger 200mm and 250mm deep beams, which provide the performance without increasing the insitu concrete depth. The deeper ribbed slabs are both economical and more structurally efficient, only using concrete exactly where it's needed.

***"As well as the speed of construction, the significant savings in both concrete and reinforcement materials of up to 50% and the enhanced acoustic performance provided by the ribbed soffit, there are great outcomes available in terms of sustainability. The dematerialisation is significant, there is less site labour, less traffic movement, minimal timber formwork requirement and less waste generally,"* says Michael.**

It is all perfectly in keeping with Newington's other characteristics, having been built around sustainable energy generation using solar power, water capture techniques and water recycling and featuring extensive public transport networks, cycleways and paths to reduce emissions production.

Client: Crown International
Architect: Joshua International
Engineer: VDM Consulting
Precast manufacturer: Ultrafloor (aust)



TYPICAL ULTRASLAB & PRECAST EDGE BEAM AT BALCONY DETAIL (SPAN 8.9m – 10.5m)