

■ New bridge faithfully replicates art deco era

Innisfail in North Queensland is famed for its architectural buildings and structures. Its CBD has Australia's largest concentration of art deco buildings, featuring examples of Spanish, Sicilian, Moroccan, Italian and Anglo Saxon art deco design facades.

Innisfail's landmark Jubilee Bridge was built in 1923, and provided an important link between East Innisfail and the CBD, carrying up to 10,000 motorists a day. Crossing the South Johnstone River, the bridge carried all services – electricity, sewerage and water. By May 2010, the bridge had aged to such an extent that the Cassowary Coast Regional Council was forced to close it off to all vehicular traffic. Engineering tests found the bridge had deteriorated rapidly, with major cracking and scouring of the piles. With the bridge closed, residents had to undertake a six kilometre detour.

When the Council decided to replace the Jubilee Bridge, the re-creation of its art deco style was a critical factor in the design of the new bridge. Other important considerations for the new bridge were cost effectiveness and speed of construction. The rapid replacement of the bridge was critical.

In supplying precast for the bridge, Humes played a key role in helping to maintain Innisfail's reputation as the art deco Capital of Australia.

Humes delivered a tailor-made decorative precast solution to ensure the new bridge faithfully represented the art deco style. Specially made moulds were used to create the 108 decorative precast plinths and 112 decorative precast infill panels. As well, 12 precast arch facades were supplied, the spans of which were built to imitate the

original arches. All elements in the new Jubilee Bridge met stringent load standards set down by the Queensland Department of Transport and Main Roads.

The precast solution that was delivered, ensured that BMD was able to meet an extremely tight construction program and minimise on-site labour works, which helped to keep costs down and make the bridge's completion less susceptible to weather conditions.

The end result authentically recreates the art deco style of the original Jubilee Bridge, while delivering a solution that will serve the town of Innisfail for many years to come.

Client: Cassowary Coast Regional Council

Building contractor: Joint venture between BMD and Albem

Engineer: GHD

Precast manufacturer: Humes



■ Precast winners in National Architecture Awards

Topping the list of award winners in the prestigious 2011 National Architecture Awards was the Australian War Memorial Eastern Precinct in the ACT. Recipient of The Sir Zelman Cowen Award for Public Architecture, the building features diamond-rubbed black polished precast concrete panels, columns and beams, plinth walls, off-form grey bollards, precast seats and off-form grey raised planters, all manufactured by Adelaide's S.A. Precast.



Photo courtesy Australian War Memorial

Also a winner in the 2011 Awards was AAMI Park in Melbourne which took out the National Award for Public Architecture. The robust stand is a combination of different forms of concrete, including precast seating plinths, precast stepped seating units, and precast panels supplied by Westkon Precast and hollowcore precast flooring made by Hollow Core Concrete.



ERECTION DESIGN ENGINEERING CRUCIAL TO SAFETY: BRACING

Issue 62 of National Precaster outlined the role of the Erection Design Engineer in relation to lifting. Another high-value, high-risk and necessary task under the responsibility of the Erection Design Engineer (EDE) is the temporary bracing of precast elements after site erection, while awaiting incorporation into the finished structure.

Lifting design is largely controlled by predictable and likely loads, a short design life (typically just a few minutes) and a greater likelihood for any failures to occur at the start of a lift. Bracing design, however, deals with more unpredictable and longer term events. Events such as unlikely wind loads as per AS1170.2, an unpredictable design life that might be typically 2 weeks (but could extend for years - it has happened!), and the probability of high damage and possible injuries, necessitates a certified engineering approach for all bracing designs.

Other considerations for the EDE are the design of the connections at both ends of the brace, the selection of the correct bracing and the specification of the anchor conditions (existing concrete structure or dedicated footings).

A further level of complexity which the EDE must consider is if the designed bracing system includes secondary bracing. There is a common misconception that this simply refers to just a single knee brace on each main brace to increase allowable load. However, to avoid buckling in all directions, a complete bracing arrangement needs to include a single knee brace plus a lateral brace connecting groups of main braces, plus some diagonal bracing (typically at the end). Needless to say this requires competent engineering and, being a system, if any one element is inadequate, absent or removed for some reason the entire bracing solution is compromised.

It is common practice that as part of the lifting and bracing design process the EDE may produce the required bracing design information or, alternatively, assess and sign-off that which has been provided by a certified engineered bracing system supplier. In this case it must be engineered by a competent person, approved by the EDE, and co-ordinated with the precast manufacturer where cast-in bracing inserts are specified.

Critical to safe BRACING of elements is that:

- All specified bracing systems must be engineered and approved by the EDE as part of the erection design.
- Rated and marked bracing systems must be correctly installed and verifiable - by the precast manufacturer for any cast-in items, and by the erector for completed bracing when erected.
- A complete bracing design is specific to each panel and nominates the type and location of braces, their support conditions and required connections. This is more extensive if secondary bracing has also been specified, which typically includes single knee braces, plus a lateral brace, plus diagonal end braces.
- Any changes to any of the above (including moving or removal of braces) must be approved by the EDE.

Adopting these practices will minimise any potential for accidents.

Note – for more information about the role of the Erection Design Engineer, refer to the National Code of Practice for Precast, Tilt-up and Concrete Elements in Building Construction.

Site comments that could have disastrous results!

The comments below are sometimes heard on site. All of them are addressed in AS3850.

- **“Whatever length fits”** – this ignores design wind pressure variations between sites.
- **“It’s just for a few weeks so a real design is not needed”** - the Wind Load code AS1170.0 & .2 specifically allows for construction-phase bracing. More accidents have occurred from bracing failures than from lifting failures!
- **“Not needed for overheads bolted to adjoining panels”** - but have the adjoining panels been braced for the larger panel area?
- **“If the components are installed correctly there’s no requirement to have to verify anything later”** - braces must have visible rating plates which can be checked for compliance with the bracing design and anchor bolts must be checkable.



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President's report

That small group of precast manufacturers responsible for establishing National Precast twenty years ago must be proud of what the Association has become today. Recent times have seen us go from strength to strength.

Whilst the whole industry has been through some challenging times, never before have we as an association been so active. We have an energetic, dedicated and capable Board, and if membership growth during last year and member attendance at our end-of-year meeting in Perth are anything to go by, our membership is just the same.

2011 was a year of development, and 2012 will be one of fruition. During 2011 we were busy working on a number of exciting new projects that will actualise this year.

Late last year we ran a trial of our new *Precast for Engineering Graduates+Students Seminar*. Held at a precast factory in Sydney, the seminar was so successful that we have scheduled seminars for March in Melbourne, Hobart, Perth, Adelaide and Brisbane. Watch out too for more advanced precast engineering design seminars later in the year, which are currently being developed by precast engineering guru Barry Crisp.

2012 will also see the release of our new *Sandwich Panel Recommended Practice* and our *Walling Detailing Manual*. Also planned for release are our R-value Calculators. Not only will these calculators provide designers and energy assessors with a user-friendly tool to assess the R-value of precast walling and flooring, but they also allow a BCA-compliant solution to recognise the true value of thermal mass.

With membership growth and participation at an all-time high we are encouraged that the Association is doing its founders proud and is adding value to an ever-changing industry. It makes me proud to be involved with such a talented group of people.



LEO VALENTE
PRESIDENT



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Flagship hospital for WA

At \$2 billion, Perth's state-of-the-art Fiona Stanley Hospital is Western Australia's largest ever building infrastructure development.

The vast healthcare facility is undergoing construction in Murdoch, south Perth. When completed in 2014, it will be the major tertiary hospital in the south metropolitan area, offering health care services to both local communities south of Perth and across the

state. The 783-bed, 6,300-room development will combine the latest in cutting edge technology with design that blends seamlessly into the natural environment.

With 150,000 square metres of floor space, the hospital will occupy five main buildings, taking up the equivalent of four city blocks. The whole development is set in more than five hectares of natural bushland, landscaped parks, internal gardens, courtyards and plazas.

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■ Precast architectural panels

The first phase of construction includes the main hospital building, pathology/education centre, central plant building, two multi-storey car parks and the service tunnel to the main hospital. All were scheduled for completion in December 2011, to be followed by the final fit-out.

Each of these structures feature extensive use of precast, selected because it offers architectural finishes of various colours and textures that cannot be achieved with conventional construction.

Delta Corporation was selected by developer Brookfield Multiplex as the preferred precast specialist to supply architectural walling panels for the project as well as hollowcore flooring for sections of the main hospital building and central plant building.

Specifications for the precast architectural wall panels on the project were highly complex, with strict quality controls and meticulous finish requirements. At the same time, the rigorous project program called for a high rate of production, which was met. Panels were wet-cast horizontally using high quality steel moulds.

A total of 994 custom architectural wall panels covering 7,151 square metres were required for the main hospital building's podium exterior, internal courtyards and corridor. Panels feature horizontal and vertical grooves, creating a semi-regular rectangular chocolate bar pattern with an extremely high quality off-form cream finish. Randomly selected rectangles have then been grit (sand) blasted to reveal a warm granite aggregate with red pebble highlights – a pleasing contrast with the rest of the panel. Panel surfaces have been treated with a clear sealer for water- and stain-proofing and reduced maintenance.

For the pathology/education building, a different but complementary finish was selected. In this instance a total of 103 architectural cladding panels totalling 940 square metres were manufactured with a blend of cream and grey cement, featuring a grit blasted finish to expose the granite, diorite and red pebble aggregate. These were also sealed prior to delivery to site.

Two multi-storey car parks also called for the use of precast, in this case striking white architectural wall balustrade panels were created using cream cement and white oxide with a high quality finish. More than 3,000 square metres of panels were supplied for this part of the project.

With both the precast elements and the vital water infrastructure of the project installed smoothly and well ahead of the construction schedule, the people of Western Australia can soon look forward to the opening of one of the finest medical facilities in the country.

- Client:** State Government of Western Australia
- Building contractor:** Brookfield Multiplex
- Architects:** Hames Sharley Architects; Hassell Architects
- Engineer:** BG & E Consulting Engineers
- Precast manufacturers:** Delta Corporation, Humes

■ Storm water innovation

An innovative approach to storm water detention, filtration and harvesting is also a feature of the project. Humes initially won a contract to supply five detention systems, but project engineers extended the contract to six.

The stormwater system chosen was supplied as a purpose-built detention and infiltration system, produced by connecting individual precast modules into a configuration that met the project's requirements. This unique approach provides an extremely simple and flexible design solution without compromising above ground land use.

The largest of the project's detention systems replaced a large retaining wall and detention basin with a stormwater system. The stormwater system was as cost effective as building the retaining wall. With a storage capacity of 3,708 cubic metres, the system's design included a grated side opening to allow extension and interaction of the basin with nearby bushland during high flows, a further example of the client's focus on delivering a water sensitive urban design solution.

Given its tight building schedule and a requirement for early completion of civil drainage works, the stormwater system was an ideal fit for the project. Approximately 30 units of the stormwater system were delivered to site each day. Each piece took approximately 10 minutes to install, with each of the systems completed and ready to be backfilled in less than 10 days. This quick installation allowed the civil and structural works on buildings, roads and car parks to progress without delay.

Design loads were in accordance with AS 5100.2-2004 – Bridge Design Code. The stormwater system also provided a fully trafficable solution for the project. With most units installed beneath hospital access roads and car parks, the managing contractor was able to fully maximise the site for vehicular traffic and storage during construction, even before the finished surface was completed.



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■ Shop 'til you drop

With shoppers abuzz about the impending arrival of international discount retailing giant Costco, the race to construct its massive Sydney outlet and corporate headquarters was on.

While Melbourne beat Sydney to the punch when it came to the long-awaited opening of Costco, when the time came for the construction of the Sydney outlet there were no holds barred.

Located in Auburn, in the city's south west, the \$35 million Sydney operation was to combine 14,000 square metres of warehouse and distribution space, set above two levels of car parking, along with 2,000 square metres of mezzanine office area to serve as Costco's Australian corporate headquarters.

There was an extraordinarily tight deadline on this project, with demolition of the old buildings on the site commencing in August 2010 and shelves due to be racked, stacked and open to the public by June 2011.

This requirement for speedy construction made precast the logical choice. It was used in a combination of load-bearing and cladding applications, including moulded and textural finishes in line with the aesthetic requirements of the architect.

Demolition and site remediation meant the build itself could not commence until October 2010, when the ground slabs were poured and the basement – or car park – panels were installed.

Austral Precast won the tender for both supply and erection of the precast and worked intensively from the outset on the buildability aspects of the project with the builder, architect and engineer. A close pre-existing relationship between all three parties enhanced this process.

"Precast was the critical path on the project and we worked co-operatively at every stage, from the shop drawing process through to the manufacture and then installation – something that's essential working on a project of this scale and timeframe," says Aaron Hadfield, Austral Precast NSW General Manager.

"We also had input to help make the building more suitable for precast, including maximising panel sizes, working with Costco and the engineer to ensure walls were capable of taking design loads for the structure and making subtle adjustments along the way in the planning to ensure optimum outcomes for all concerned. The really big

issue we faced with the timeframe was project management – working with the project manager and co-ordinating multiple trades including formworkers, steel fixers, structural steel installers and in-situ footing concreters. So thinking ahead was critical."

The project entailed manufacture and installation of 314 panels averaging 16.3 square metres each and with thicknesses varying from 200mm to 300mm. Reckli architectural form-liners gave an etched pattern to the panels and false joints were incorporated in the design for added effect.

The high level of co-operation and attention to detail on the job meant that, in June 2011, the shelves were racked, stacked and ready for the grand opening – on time, and on budget.

Builder: Hansen Yuncken
Architect: Mulvanny Design
Engineer: Hughes Trueman Engineers
Precast manufacture and erection: Austral Precast
Formliners: Reckli Form-Liners & Moulds



■ Roll out the barrels

Strict thermal performance requirements and the need to seamlessly complement the new building with the old made precast the natural choice for the extension of this Tassie winery and function centre.

Tasmania has become a centre for boutique wine production, with a reputation for making fine wines using time-honoured methods. Home Hill Winery is an example of that boutique tradition, a privately owned winery and function centre south of Hobart in Ranelagh, whose rammed-earth construction and old-style architectural detail has become a favourite with locals and tourists alike.

When the time came to expand the winery side with the construction of new barrel and testing rooms however, concerns relating to the durability of the rammed-earth finish arose. Maintaining strict temperature control is of paramount importance for both the successful storage and testing of the wines as they are being made. The owners and architect wanted to use the best available material – which is where precast came in.

Sandwich panels for thermal performance

“In Tasmania’s cool climate, precast concrete insulated sandwich panels are well recognised for their thermal qualities, and that includes in the winery sector where they have become particularly popular,” says Brent Hardy, Precast Division Manager for Duggans, which supplied the precast for the job.



“The other plus for precast on this job – for which the appearance and architectural features were so important – was the design flexibility allowed in terms of finish and detailing. In addition to the thermal requirements, the brief was to not so much match, but complement, the existing building,” he explains.

To that end, a series of sample finishes were created, with the architect and precast supplier working closely with the client to achieve the right result. The ultimate finish was limestone aggregate external walls featuring a 5% ‘river blend beige’ oxide in grey cement, with the aggregate exposed on certain sections to create an earthy contrast with the rest of the building.

One of the challenges of using this mix is the risk of an alkaline aggregate reaction leading to expansion and resultant cracking of the limestone finish. This was combated with precautionary use of silica fume in the mix.

In terms of the thermal performance, while standard 150mm wall panels were used elsewhere in the project, the external walls of the barrel room and testing room used sandwich panels with a 50mm extruded styrofoam layer between the two concrete layers, that gave a Mass Enhanced R-Value of 2.51 (m²K/W) for the BCA climate zone in Tasmania.

In addition to the finishes and the thermal properties, various architectural details called for special attention. In particular, the design called for replication of the existing roofline and some of the church-style window shapes, which feature angled recessed borders. To achieve the roofline, for example, sections of the exterior sandwich panels were rebated to allow installation of an outrigger frame, allowing the roof to tie seamlessly back in to the precast.

The final result? A seamless enhancement to the existing structure that meets the thermal performance requirements ensuring that fine wine making can continue – and a design result that is more than pleasing to the eye.

Client: Home Hill Winery

Architect: Brian Wyatt

Engineer: Aldanmark

Building contractor: Brian Larrett Builders

Precast manufacturer: Duggans

Sandwich panel system: Thermomass

■ Small House wins World Best House at World Architecture Festival Awards 2011

‘Project demonstrated commitment and excellence on many levels’

Small House in Sydney’s Surry Hills, designed by Domenic Alvaro, has won the ‘World’s Best House’ award at the prestigious World Architecture Festival (WAF) Awards 2011. Critical to the success of the project was the collaboration between the architect and builder, Baseline Constructions, and the extensive use of precast concrete, which was supplied by Hanson Precast. The jury commended the project, saying: “Built on a difficult laneway site in Sydney, more than any other contender this project demonstrated commitment and excellence on many levels. From the concept right through to execution, employing construction techniques more typically used on large scale commercial projects in response to physical and budget constraints.”

For more information about Small House refer to issue 59 of National Precaster.

