

# PRECASTER

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Let Precast  
Concrete  
become your  
Bushfire Barrier



Challenged  
by cyclones?  
Answer: Precast!

Few places on Earth are more exposed to cyclones than Exmouth in WA's remote north-west corner, one thousand kilometres from Perth. The area holds the Australian wind speed record of 267 km/h, about the same as the top speed of a V8 Supercar – a frightening thought!

This was a larger part of the challenge for the design of a new \$4.8m cyclone resistant footbridge spanning 90 metres recently constructed over the main channel at Exmouth.

The bridge provides easy access to the newly developed marina district, now becoming a tourist destination. Due to its spectacular setting and daring construction, the slender new bridge is already a local attraction in this fast-growing area.

The project has some very interesting features with its cyclone resistant and highly detailed precast and structural steel components embodying elegance and strength. The basic structure is a steel arch of 90-metres span,

fabricated in two sections then lowered from each abutment into position until they meet in the centre.

The arch was trial assembled in its fabrication yard then transported 1,000 kilometres to the site from Perth. Meanwhile, precast manufacturer Delta Corporation was completing the precast decking units that would provide essential structural stability against cyclonic wind uplift as well as forming the 1.8 metre wide footway. Precast deck units, apart from aesthetic considerations, were selected for the steel arch structure to provide sufficient mass to stabilise the structure against wind uplift prior to the grouting-in of stressing cables that perform this task in the completed structure.

The lifting of the steel arch involved a large mobile crane at each end, with a third crane providing a platform for workers to join the two

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Flame comes in a 120 km/hr firestorm in a big bushfire like the recent fires in Victoria. Survivors talk of it sounding like a jet aircraft directly outside their house. Fire fronts create their own terrifying wind, easily capable of propelling burning parts of tree limbs. Wind driven impact of flying objects weighing in excess of 5kg is not unusual. Usually after about 15 minutes the fire front has passed.

But even if a building survives the fire front, the period immediately after its passing is critical and many buildings have been lost during this time. Not only are the combustible parts of a building at risk, but ember attack can cause significant damage. Use of lightweight building materials can become a real problem as they can provide an entry for flames/embers and searingly hot smoke. Smoke alone can result in loss of life.

Recognising this fact, authorities are endeavouring to amend building codes to raise the standard of construction in bushfire prone areas. To combat the impact factor, ordinary lightweight construction will need to answer some searching questions, particularly when impact resistance will be needed for full protection assurance.

The solution is to provide fire and impact resistant buildings which provide shelter from the fire front in assured safety while protecting vital possessions.

National Precast President Peter Healy sees a bigger role for precast concrete in construction in fire prone areas, following the aftermath of the Victorian bushfires.

"Nobody should have to re-build their lives or suffer the tragic loss of loved ones and precast is the perfect choice of construction material to offer

... story continues on page 2



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bridge sections together. The bridge segments were held by temporary cables during this operation. As soon as the arch was joined, the 300mm thick precast decking units were sequentially placed – each being bolted to the steelwork and the previous unit using a steel bracket with a box-out to conceal the fixing. Next, prestressing strand was threaded through each edge of the deck and grouted to enhance resistance to the cyclonic wind uplift forces.

The precast decking units are cleverly designed with rounded edges to shed wind loads assessed at a maximum design wind speed of 99m/sec at the apex of the arch. Exposure classification of the precast concrete was designed to AS3600 Classification 1. Each of the 15 total decking units is 6m long x 3m wide x 300mm thick cast off steel moulds using

50 MPa concrete. Each deck unit was lifted complete with bollards attached for the final balustrades to obviate the need for temporary railings and assist the speed of construction. Careful detailing of the precast units permitted the inclusion of embedded steel UB spreaders that support 250 x 250 x 9mm SHS steel suspender stanchions that hang the deck from the overhead arch hanger cables. The precast units also contain embedded lighting conduits threaded through the steel stanchion assembly, all being fully concealed in a very constricted space. This aesthetically pleasing outcome was a testament to the design skill of the consultants and the co-operative approach of the precaster and provides a good example of the benefits of early engagement with the precaster in the design process.

A special feature of the highly detailed precast deck units was the clever design of the ramps and landings required for wheelchair access. These were contained within the precast thickness so as to hide the ramp profile in the side view. No in-situ topping was required to the deck units.

**Marina Footbridge at Exmouth WA**

- Constructing Authority:** Landcorp
- Project Manager:** Benchmark Projects
- Engineer:** BG&E Consulting
- Head Contractor:** Bocol Constructions
- Precaster:** Delta Corporation
- Steel Fabricator:** Structural Marine

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protection in bushfire prone areas. Precast concrete walls on a concrete slab, combined with fire protected (or fire resistant) windows, sprinkler systems and ember proofing of structures offers a truly assured method of protecting property and lives. Sensible vegetation management solutions are also important, and many councils will need to review their policies in this regard when allowing building in fire prone areas," said Mr Healy.

"It is critically important that codes right around the country are reviewed and that the design and construction industry specifies to address this devastating problem," he said.

It is reassuring to know that precast concrete wall panels are impact resistant and offer a 4-hour fire resistance in 170mm thickness (AS 3600-2001 Section 5 Design for Fire Resistance).

**Deriving the benefits of precast – a house that protects its occupants**



Stephen and Emma Richardson are the proud owners of an interesting new precast concrete house in Sydney's Harbourside suburb of Castlecrag. The testing nature of the site and multiple family requirements have resulted in

a relatively complex building. The challenge presented by this complexity was well answered by the choice of precast concrete. Hanson Precast was the supplier/installer of the precast panels.

Mackenzie Architects won a limited design competition to design the home. The brief was reasonably specific, and in essence consisted of making the home private, securing against bushfire and storm, enabling a view from all habitable rooms and the language of the house had to be timeless. With this in mind, the design was formalised and pitched to the clients, who immediately loved the ideas and ran with the concept.

Dugald MacKenzie said: "Looking at Castlecrag and the natural features of the

area was one source of inspiration, but also my love of concrete, and particularly precast concrete, was another."

"The client also liked the idea of precast concrete, but also wanted an internal softness so that the home wasn't a museum, but something with warmth and heart. The precast panels are located primarily to the street and as internal features around the main stair spine and the family rooms. There is a mixture of panel sizes, including a series of 80mm blades facing the street which provide screening and visual access," he said.

Dugald MacKenzie concludes: "The great thing about using concrete in this way is that over the years it will age gracefully and form more of the natural environment."





## Profile: A Builder shares his thoughts on using precast

Nicholas Bettar, Managing Director of Baseline Constructions in Sydney, shares his thoughts on the benefits of using precast concrete walls, floors and other elements, in a highly competitive construction market.

**Q: How did you get started using precast?**

**A:** In the early nineties, we realised that clients deserved a better construction solution – one that would provide assured quality, certainty and savings using off-site fabrication with precast. We call this “The Real Alternative.” We recognised that the traditional way of building using scaffolding for floors and walls, messy formwork/brickwork, and a large site crew with many trades, was no longer the way to go. Conventional building has lots of items needed to complete the building, all needing handling and placing that adds to the complexity and time. With precast it is simple.

**Q: What is “The Real Alternative”?**

**A:** Obviously our realisation and implementation

worked, as we have gone from being a relatively small general contractor in a big pond to where we are today. Baseline Constructions is recognised as an innovator and is renowned for offering our clients the benefits that modular precast construction provides, as follows:

**Safety** Safety is our main priority and is enhanced by using ‘designed-in’ safety construction methods that minimise site manpower, and that incorporate project-specific safety management plans.

**Efficiency** Meticulous planning (importantly – pre-planning) and design translates to major efficiencies during construction.

**Accuracy** Factory production, i.e. precast wherever possible, reduces mistakes and inconsistencies that occur with on-site production.

**Quality** Quality means doing it right the first time and never having to go back to rectify anything. Precast concrete and our quality assurance system make this possible.

**Speed** Fast project delivery thanks to precast equals major cost savings and a greater return on investment.

**Environment** Environmental impact is minimised by use of earth-friendly concrete, especially in precast off-site production where wastage of materials and man-hours is unheard of.

**Q: How have you demonstrated “The Real Alternative”?**

**A:** We started winning awards and a growing list of clients after our first few precast projects, so

we’ve stuck to a winning formula. The economics and construction speed of precast mean that we are offering clients a genuine point of difference over our competitors. The point is – it’s not just the use of precast but how we use it. I’ll explain this by saying that because we are skilled in both conventional and non-conventional construction, we are able to offer more choice and more options. Clients love that!

**Q: You said it’s not just the use of precast but how you use it – can you explain?**

**A:** After many small to medium projects, we implemented many of our results on our first major precast project called ‘The Metro Village’ at Rosebery in inner Sydney. By the use of early-placed precast stairs we were able to provide workable, clean and safe, vertical access that saved weeks of time. All walls, floors and balconies were precast on this project. Wall cladding consisted of load bearing precast panels ranging in thickness from 150mm to 250mm, incorporated with hollowcore flooring. The construction was in three stages of approximately 100 residential units and 1200m<sup>2</sup> retail per stage. By the time we did the last stage our crews were very proficient. On the last stage alone we saved 30% of time as against traditional construction.

**Q: Can you describe other aspects of your use of precast?**

**A:** On the large \$100m Rhodes Bay development we used our experience gained over the last 10 years to really move things along. This was a development comprising 11 buildings up to

## Putting ideas into practice

**National Precast Executive Officer Sarah Bachmann believes in putting her ideas into practice as she builds a house which fronts onto the bush of the Adelaide Hills. The house is being constructed with precast concrete walls and fire resistant windows.**

“Yes, fire resistance was a determining factor in the choice of precast concrete for the house, but we will also derive the benefits of an extremely thermally efficient, acoustically efficient and durable home. We have taken advantage of the thermal storage properties of precast concrete sandwich panels to even out temperature extremes on hot summer days and cold winter nights,” she said.

For more information go to [www.hillsideproject.net](http://www.hillsideproject.net).



## The Precast Bushfire Advantage

**Passive fire protection**, such as precast wall panels offer the inherent advantage of being a permanent barrier to fire, heat, impact, and smoke – needing no additional protection. These natural advantages include absence of toxins under any fire conditions, heat absorption, structural integrity, fast construction and single-source supply.

**Active fire protection** systems such as fire pumps and rooftop sprinkler systems can be very effective in combating the ravages of bushfires. Like any mechanical or electrical system, no one can claim 100% reliability. If the system goes down there may be no time to effect alternative protection when a fire is bearing down.

**Minimisation of Joints** is a great advantage of precast in inhibiting the likelihood of ember penetration. Lightweight buildings usually have many more joints/gaps than solid precast concrete walls. Fires have started from miniscule gaps due to entry by multiple embers which can be not much larger than a pinhead.

**Increasing Emphasis on Risk Avoidance** means that building approvals are going to become more difficult to achieve without a considerable increase in fire protection. Insurance companies are taking note of precast’s fire advantages, offering lower rates for precast structures in some instances.

**A winning combination** sees precast delivering compelling long-term savings – in addition to its ability to save lives.

eight storeys in height on the one site, being the largest precast project ever constructed in Sydney. While site prep went on we were able to spend 6 months pre-planning before delivery of precast. Precasters, Giroto and Hanson, were very helpful in this process.

We again provided early vertical access using precast stairs and stair towers that also impart shear-wall capacity. A major saving was the use of 'single-box' lift shaft precast units – these saved 225 panels over using flats. That's a lot of handling that we didn't need to do. Formwork was eliminated by the use of hollowcore floors throughout. Balconies used Transfloor panels that were lifted complete with balustrades, providing instant edge safety.

Walls were precast panels 180mm thick (exterior panels) using 40 MPa light-weight concrete to maximise panel sizes in terms of crane capacity. Horizontal joints were shiplap with a 50mm step and exterior caulking. Vertical joints were caulked over backing rods. The tricky bit was to sequence the site operations on the tight waterfront site as there were quite a range of building configurations including 25 townhouses, a café, pool and gym. All this was completed as design-and-construct in only 85 weeks.

**Q: Where do you see the future of precast heading?**

**A:** Costs and construction/buildability issues dictate that precast has considerable advantages over conventional systems and

that this will continue to accelerate the use of precast for an ever-expanding range of projects. We'll see precast used where it has never been used before. Who would have thought that precast was ideal for roads? Well, in Italy it is!

A real driver in the use of precast is the principal aspect of safety and its enhancement that is delivered by a modular system that has pre-planning at its core – that is, and will always be, our number one priority. The expanded capabilities of 3D computer simulations point to a time when construction will be transformed, and precast pre-planning will be instrumental in this.

## Concrete Finishes – Should you specify Class 1?

**The improper use of AS3610 leads to more arguments than probably any other issue in the precast industry.**

Although a recent spot check of specifications from actual projects correctly showed the Precast Concrete Handbook as the source reference document, there is still misunderstanding and confusion on the correct use of AS3610. Class 1 is very often incorrectly specified, finishes are confused and AS3610 is sometimes incorrectly used for coloured off-form concrete.

Commercially, using AS3610 incorrectly can be dangerous. In the event that the finished project does not meet the designer's expectations, then the only instrument available to mediate is removed.

AS3610 Formwork for Concrete sets out the requirements for the design, fabrication, erection and stripping of formwork. Some sections of the Standard, in particular sections 3 and 5, are applicable to precast concrete. These sections talk about the quality of a formed concrete surface for grey concrete. The important words here are a formed surface and grey concrete.

In simple terms AS3610 defines five classes of finish. Classes 1, 2 and 3 are used where the visual quality is important. Classes 4 and 5 are specified where the visual quality is not significant. Therefore, it is important that a class of finish is specified on all drawings and documentation for a project.

Class 1 is the highest standard of finish and represents the highest quality of workmanship. It is only recommended for use in very special features of buildings of a monumental nature. The standard

states quite clearly that Class 1 is not to be specified for whole elevations or extended surface areas of a building as it cannot be consistently achieved.

A Class 2 finish is intended for external and internal façades that can be viewed in detail. A Class 2 finish is a high quality finish requiring very substantial input by the designer and the precaster and is the finish which is most appropriate for prestige architectural projects.

The only difference between Classes 2 and 3 are the type, number and dimensions of permitted surface defects. A Class 3 finish will give a good visual quality when the project is viewed as a whole.

Colour control of formed concrete is covered in Section 3 of AS3610 and again it only refers to formed grey concrete. Table 3.6.1 in the Standard lists the maximum tonal range for the visual important classes of 1, 2 and 3. The suffix C should be added to the finish class number if this feature is important. For concrete of other colours (ie concrete which contains added colouring oxides), the project documentation should contain a means of determining and recording the acceptable tonal range.

The Standard also describes a process of modifying the requirements of an individual finish class on a particular project by adding the suffix X. It is worth noting that the Standard does not allow this convention to be applied to Class 1 as there is no higher class of finish.

**As the precast industry has the capability of producing many finishes other than those covered by the**

**AS3610 it is always advisable to contact your local National Precast Member to discuss these special finishes.**

For more information refer Chapter 10.5.3 of the Precast Concrete Handbook. Also refer the updated Part 1 of AS3610 due for release in mid 2009.

### Remember...

- Appreciate that AS3610 is written for off-form grey finishes. Many architectural precast concrete surfaces are not off-form and many surfaces may be unformed.
- If using AS3610 in documentation, it should be read in conjunction with the Commentary which sets out the intent of the Code committee.
- Like most documents, it requires pragmatic interpretation.
- Don't use the document in an attempt to obtain unrealistic quality. Good design and detailing are still the prime requirements for a quality appearance.
- Avoid the temptation to specify the impossible; be realistic in terms of the status of the project and importantly, the budget.
- Appreciate that the most realistic measure of what is achievable is that which has been achieved on previous projects of a similar nature.
- Talk to your local precaster during the design stage for input into practicality of design.

## Pullman Hotel integrates precast walls and floors for fast construction

Construction work on the new \$45M five-star Pullman Hotel (originally called the Sofitel) located on Olympic Boulevard in the Sydney Olympic Park was completed late last year. The hotel includes 212 hotel rooms on levels 3 to 16, located above a four-level podium.

Builder, St Hilliers, undertook a significant design review process to ensure that the selection of the building's façade and structure was the best choice from a range of alternatives to ensure the demanding level of quality and buildability required. An equally important requirement of the selection was to provide a stunning visual appearance, in keeping with the vibrant surrounds of the Hotel.

A load-bearing precast solution with fully precast floors for the tower was selected to meet these requirements and to reduce the need for in-situ concrete construction and its attendant formwork requirements. Particularly important in this decision was the choice of an Ultrafloor precast flooring system which minimised the construction time and site crew requirements. Fast construction was delivered by the combination of the flooring system, integrated with load-bearing solid precast wall panels from Sasso Precast that achieved a remarkable six-day floor to floor cycle.

The Hotel achieves a striking visual impact with its imposing tower of painted precast concrete, with sunshades on the north and west faces and a southern four-storey wing constructed from a glass and panelled façade. The precast façade is moulded with changes in planes and over-sailing corner treatments that enhance the regular joint pattern and window modulation.

The façade comprises a total of 564 precast walling elements, the majority being 200mm thick for load-bearing capacity, with a total area of 8,600 square metres. From Level 7 up, there are 29 similar panels per floor. Concrete strengths of these panels varied from 80 MPa for Levels 2 and 3 internal walls to 60 MPa for the levels 4 and 6 internal walls, with 40MPa for the remainder of the superstructure. The panels, cast in steel moulds, were butt jointed at vertical joints, being caulked from both sides. The precast wall panels were tower craned by St Hilliers Installation with post-installation crews provided by Sasso.

The Ultrafloor precast flooring system spanned 8.6 metres between the load-bearing precast walls over the 650 square metre tower footprint and provided a safe and ready working platform. The flooring was temporarily propped off-centre to allow immediate access for following trades while providing the thinnest overall structural solution and satisfying the fire rating requirements. The available space between the beams was used to advantage

for hydraulic and sprinkler services to minimise ceiling space. Prefabricated stair elements removed the need for any conventional formwork. The need for perimeter scaffolding at the edge of the floor was avoided as fall protection was provided by a temporary handrail system fixed to the wall panels prior to lifting into place. This was bolted on to the inside face of a 300mm wall upstand projecting above floor level.

As a company that delivers environmentally sustainable work, St Hilliers incorporated ESD principles for the Pullman including energy consumption reductions in relation to a comparable luxury hotel, water efficiency and the use of specific material selections. Being of 5-star standard, the hotel required a very high level of acoustic performance. The precast flooring system provided a significant air gap between the suspended ceiling and the structural slab soffit which obviated any requirement for additional acoustic insulation. The precast walls had an insulated wall lining to deliver an excellent acoustic and thermal performance. Internal transverse walls were of precast construction to optimise the construction program and to minimise costs.

### **Pullman Hotel, Olympic Park, Sydney**

**Architect:** RCG/PTW

**Structural Engineer:** Hyder Consulting

**Builder:** St Hilliers Contracting

**Precast Flooring:** Ultrafloor (aust)

**Precast Walling:** Sasso Precast Concrete





# ICCX Oceania 2009

## An occasion to catch up on a wealth of international knowledge



For the first time ever Australia has played host to ICCX – the International Concrete Conference and Exhibition. With previous ICCX events having taken place in Germany, Russia and South Africa, this prestigious international event brought more international precast expertise to our region than any other concrete conference ever has.

From 30th March to 2nd April four hundred delegates from Australia and around the world gathered at the Sydney Convention Centre for ICCX Oceania 2009. National Precast was well represented by its members at the event, showing that the Australian precast industry is keeping a focus on new developments in design and production technology. They were joined by a contingent of engineers, industry suppliers, academia, builders and precast manufacturers, from both here and abroad.

Sarah Bachmann, Executive Officer of National Precast Association Australia said: "ICCX was very well received here and certainly has set high expectations for next time."

"We had the chance to meet with a high calibre of expertise from around the world. Suppliers, precast manufacturers, researchers, academia, industry associations... they were all there. It really was like a 'who's who' of the international precast scene. What a fantastic opportunity to develop relationships, share information and learn about new technologies."

"Whilst some of the manufacturing techniques we saw were mind blowing, we know that we are already highly advanced here in Australia, especially given our population. And those newer technologies that we did see won't take long to filter through to our local manufacturers."

"It was also reassuring to know that our precast products are equal to any that are being produced right around the world. Australia is right up there, and is in fact one of the world leaders, particularly in the manufacture of architectural precast."

In the exhibition, over seventy national and international exhibitors showcased their machinery, services and goods. This was a great opportunity to speak to the experts from the exhibitors and to collect the latest publications and brochures.

The conference was primarily directed at the efficiencies and expertise of the precast industry – focusing on modern concrete production technology. Importantly though, it also included sessions on self-compacting concrete, design, concrete products, advanced precast concrete finishes, concrete pipes, sustainability, modern concrete materials, concrete durability and architectural concrete.

**ICCX Oceania is organised by CPI Worldwide and will next be held in 2011. Watch for details.**

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*The information provided in this publication is of a general nature and should not be regarded as specific advice. Readers are cautioned to seek appropriate professional advice pertinent to the specific nature of their interest.*



## Managing your firm through the Global Financial Crisis

### Emerge a stronger business from the economic downturn

Half day seminar for manufacturers and small-medium businesses

Presented by Robert Powell of BDO Kendalls (NSW VIC) Pty. Ltd. BDO is the 5th largest accounting organisation in the world.

Robert Powell is a Chartered Accountant and Director in BDO Kendalls' Private & Entrepreneurial Clients division. He has over 25 years experience in providing business taxation structuring, performance betterment and wealth creation advice to Small & Medium-sized Enterprises (SME's).

#### Ensuring your business survives/thrives during the GFC

- What are the warning signs to look out for
- Avoiding/defending an insolvent trading claim
- What opportunities might arise
- Opportunities for government assistance
- Case studies

#### Keeping your bankers happy during uncertain times

- What are the numbers that your bank is interested in
- How does the bank assess your financial position
- How does the bank calculate its key ratios
- Putting together a winning finance application
- Using finance brokers

#### What are the likely impacts of the GFC on your business

- Lessons learned from previous slowdowns
- Influence of international events locally
- Informed crystal-balling

#### Using planning & monitoring to recession-proof your business

- Importance of strategic planning
- Setting meaningful & uncomplicated KPI's
- Cash flow forecasting that actually works
- Developing an "upside down budget" to desired profits
- How to achieve sustainable growth
- Case studies

**8.30am – 1.00pm : \$70 (GST incl) per person – includes lunch and handouts**

**Perth** Mon 15th June    **Adelaide** Tues 16th June    **Melbourne** Wed 17th June  
**Hobart** Thurs 18th June    **Sydney** Fri 19th June    **Brisbane** Tues 23rd June

Numbers are limited to 50 to enable maximum participation, so book now so you don't miss out! Email Rachel at National Precast at [admin@npcaa.com.au](mailto:admin@npcaa.com.au) for more information.



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