

# PRECASTER

ACN 051 987 181 • ISSN 1037-9908

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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.

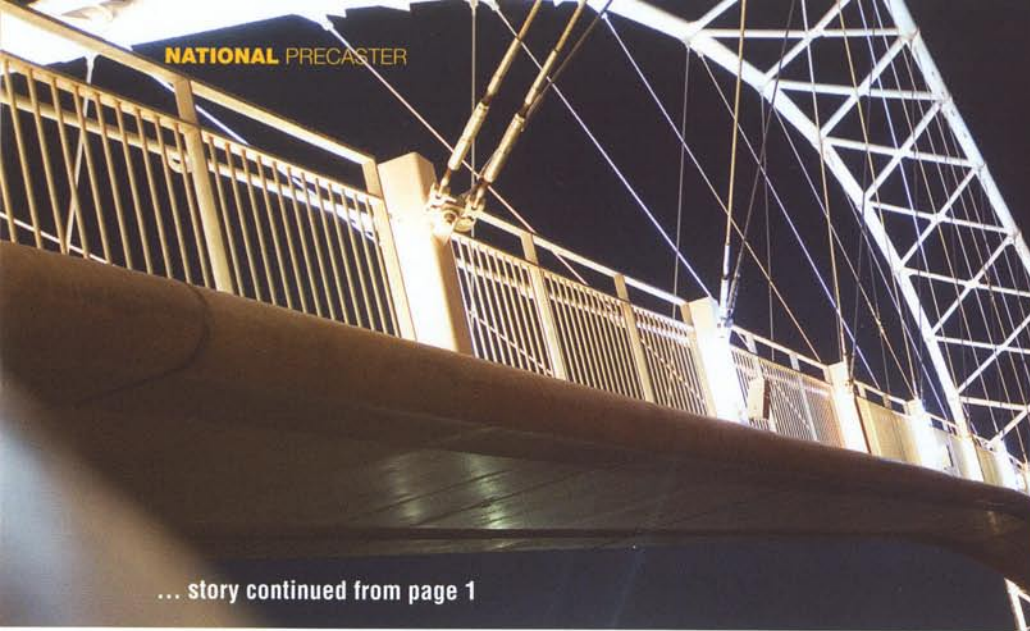
Recognising this fact, authorities are endeavouring to amend building codes to raise the standard of construction in bushfire prone areas. To combat the impact factor, ordinary lightweight construction will need to answer some searching questions, particularly when impact resistance will be needed for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

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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

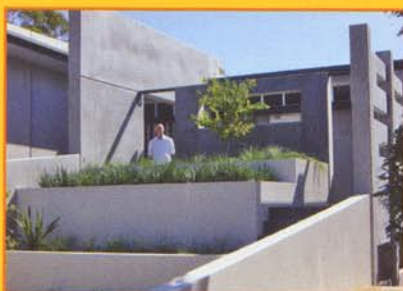
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protection in bushfire prone areas. Precast concrete walls on a concrete slab, combined with fire protected (or fire resistant) windows, sprinkler systems and ember proofing of structures offers a truly assured method of protecting property and lives. 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."



## Commendation Exmouth Marina Footbridge Exmouth, WA

Client – Benchmark Projects on behalf of Landcorp  
Architect – JCY Architects and Urban Designers  
Principal Engineer (and entry submission) – BG & E Pty Limited  
Principal Contractor – Bocol Constructions Pty Ltd  
Specialist Concrete Contractor – Delta Corporation (Precast)  
Main Concrete Supplier – Hanson (on-site concrete)

### Overview

The Exmouth Marina Footbridge comprises a shallow concrete deck suspended from a high-arch steel superstructure, spanning 90 metres over the main canal of the marina.

Concrete was chosen for the abutments and deck for its economy,



strength and constructability.

The specification of a concrete deck, in particular, ensured there was sufficient weight to resist uplift wind loads without the need for tie down cable. Precasting of the deck modules provided an economical means of rounding the edges for wind streamlining and screening of the undulations in the deck.

Precasting also allowed for the economical inclusion of ramps, landing and parallel kerbs to provide disabled access.

The abutments provide direct support for the main arch to caissons keyed into rock below and integral walls above, retaining massive fill for the required stability under cyclonic wind loading. The faceting of these walls lent itself to insitu reinforced concrete.

### Judges Comments

The elegant combination of concrete and tensile structure in this footbridge provides a welcome example of how concrete can be used with a light touch in public infrastructure which is often characterised by weight, especially in weather-challenged environments.



## Commendation Roxburgh Park Railway Station Roxburgh Park, Vic

Client – Department of Transport  
Architect (and entry submission) – Cox Architects and Planners  
Principal Engineer – Aurecon Australia Pty Ltd (formerly Connell Wagner)  
Principal Contractor – Theiss  
Specialist Concrete Contractor – Conrock Industries

### Overview

The urban context of the new Roxburgh Park railway station provided impetus for bold and tectonic architectural forms and language.

Inspiration was drawn from artist Jeffery Smart, in particular the dislocation depicted in his paintings. Visual cues through the use of bold colours, symmetry and repetition were employed to heighten commuters' awareness of their environment and context. This awareness was extended through the selection of materials and consideration of their properties.

The translation of design concepts to built form is evident in the strong expression of the tectonic forms of the building elements, substation, lift tower and bridge elements. A bold graphic element embedded on the building façade - the 'chevron graphic' - provides directional cues, identifying the station and directing commuters.

Experientially, consideration of the material formation of the chevrons expresses the materiality of the concrete, with the applied texture in the concrete recesses juxtaposing against the raw concrete.

### Judges Comments

The jury welcomes this energetic addition to an important area of public infrastructure. The design demonstrates how concrete, as an obviously robust material, can achieve experiential interest as well as longevity.

