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NATIONAL PRECAST CONCRETE ASSOCIATION AUSTRALIA

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## PRECAST Cuts Major Road Link Construction Time

Sydney's \$700 million Eastern Distributor is one of the largest civil construction projects underway in Australia. Designed to provide a direct link between the city's northern and southern suburbs, the massive project has run several months ahead of schedule.

Joining up with the Cahill Expressway and the Sydney Harbour Tunnel, the Eastern Distributor begins at Woolloomooloo. From there the 6 km long, six-lane road makes its way, mostly underground, through the inner-city suburbs of East Sydney, Darlinghurst and Surry Hills, before joining

up with Southern Cross Drive, the main route to Sydney Airport and the city's southern suburbs.

Construction of the Eastern Distributor is expected to save road users a substantial amount of time and aggravation by taking through traffic off the local streets. The route will be of particular benefit to those travelling to or from the airport or the industrial areas around Port Botany.

The Eastern Distributor is being built by Leighton Contractors Pty Ltd, one of the joint venture partners in project developer, Airport Motorway Limited. One of the factors that is contributing to the timely construction sequence is the extensive use of precast concrete throughout the project in both civil and structural applications.

For the Eastern Distributor, CSR Humes is supplying the bulk of the precast concrete components including civil concrete products such as stormwater drainage pipes, box culverts and road

*Aerial view of Eastern Distributor Landbridge with supporting structure of prestressed super T girders and planks. Photography supplied by Technical Resources, a member of The Leighton Group*

barriers, as well as columns, beams, girders, bridge decking and architectural concrete in a variety of colours and finishes.

The volume and nature of the work necessitated the construction of a new factory at Erskine Park in Sydney's outer western suburbs. The builder required the precaster to have stockpiling capacity of 40 000 tonnes because there is little space to store the products on site.

The new plant has produced around 10 000 tonnes of architectural concrete elements for the project including wall panels, cladding, parapets, retaining walls and tunnel portal panels. These elements have been manufactured in a range of



*Precast plant for Eastern Distributor at Erskine Park, Western Sydney*

colours, including reds and greens, and different finishes to suit the project. Some of the detailing on the architectural panels which line the roadway is quite intricate, with laser-cut plywood being used in the casting moulds to create distinctive graphics, shapes and lettering.

The bulk of the remaining 50 000 tonnes of precast concrete is contained within the three major sections of the project – Landbridge, Double Deck Tunnel and Parkway

**1 Landbridge** The 8000 sq m landbridge is a 140 m long and 55 m wide structure which provides nearly a hectare of new parkland and connects the Art Gallery of NSW, the Botanical Gardens, the Domain and Woolloomooloo.

The landbridge is supported by a series of five in-situ reinforced concrete walls constructed across the width of the highway. Super T bridge girders and planks span up to 26 m between the walls, with the decks acting as permanent formwork for the in-situ reinforced concrete topping screed. Because the landbridge was designed to follow the contours of the existing parklands, there was little standardisation of componentry through this section of the project, which meant that many of the 320 bridge girders and planks supplied for the landbridge were cast as one-offs.

**2 Double-Deck Tunnel** A 1.7 km long double-deck tunnel which passes under Darlinghurst, East Sydney and Surry Hills comprises three north-bound lanes and three south-bound lanes, with the traffic travelling over or under the other in a piggyback arrangement depending on the direction of travel. This design solution minimised the amount of space required for the tunnel and also helped to reduce

the cost of the project. At its deepest point, the tunnel is some 24 m below road level at Taylors Square, and it has a maximum cross section of 22 m wide by 12 m high. With most of the tunnelling taking place through sandstone, the tunnel has been designed with a flat roof. The walls are being shotcreted and lined with precast barriers. The upper deck road surface is being built using around 2000 precast concrete planks which span from 9 m up to 22 m between concrete sill beams or precast concrete columns and beams. The planks are placed on rubber bearing pads on the beams, with the planks varying in width from 600 mm to 2.4 m and in depth from 250 mm to 900 mm. The precast planks work as permanent formwork for

the 150 mm thick continuously reinforced concrete base, which is then topped by an asphalt wearing course to improve ride comfort and reduce noise.

**3 Parkway** The 2.8 km long Parkway and southern tunnel structure linking the Eastern Distributor to Southern Cross Drive runs about 5 m below road level for most of its length, reducing noise pollution and the visual impact on the road which runs adjacent to the residential Moore Park area. The road will pass under major intersections along the way, with twin 600 m long tunnels being built to alleviate congestion where it crosses Dacey and Todman Avenues at Kensington.

A major problem for the builder over the length of the route has been relocating services. Examples include relocating a 147 m long section of the Tasman-1 cable, the 2000 km long telecommunications link between Australia and New Zealand, about 5 km of gas filled electrical cable, and numerous kilometres of electrical, gas, water and sewer mains.

#### **CONSTRUCTION PROGRESS SUMMARY**

The Eastern Distributor is on target to being opened several months before its scheduled completion date of August 2000, in time for the Sydney 2000 Olympics. For a large portion of the project, the builder's use of precast concrete manufactured in a purpose-built plant off-site, was a significant factor in achieving this result. ■

*Installation of Super T bridge girders and planks for Landbridge*





*Award winning Goldman Apartments in South Perth built exclusively in factory precast concrete featuring a wide range of precast components including architecturally finished wall spandrels, internal lift shaft wall panels, beams, columns, balcony panels as well as floors*

## President's Column

### The PRECAST / TILT-UP Distinction

Architects, builders and designers seem to be still in a state of confusion about factory precast concrete and site-cast tilt-up products.

There is a clear distinction between the two products, namely:

**Factory Cast Precast Concrete** – these elements are cast in a specialised manufacturing plant, remote from their final location. The elements may be further finished eg sandblasted, etched or polished before transport to site for erection onto the main building structure.

Many advantages exist for factory cast products:

- Factory made to high quality standards usually in steel moulds.
- High strength densely vibrated concrete which may be steam cured for rapid mould turnaround.
- Production independent of weather constraints.
- Reduces site labour and associated site congestion problems.
- Availability of range of architectural finishes not normally available with site cast concrete.
- Can greatly reduce total project construction time since elements are manufactured and stockpiled while other phases of the site building work are performed.

**Tilt-up Panel** – a concrete element cast in a horizontal position at or near its final location, lifted by rotation about one edge in contact with the casting bed until in a vertical or near vertical position, which may be then lifted into position where it

may be temporarily braced or permanently incorporated into the main structure.

In recent times there have been many instances when high quality factory made precast has been 'passed off' as being site cast by parts of the tilt-up industry seeking to perpetuate the myth that the two systems are identical. This type of publicity leads to misinformation which in turn confuses designers and specifiers to such an extent that 'tilt up panels' may, in a ridiculous situation, be considered as an application for high rise construction.

Standards Australia have played a part in this process of confusion by releasing a code of practice, AS 3850 in 1990, entitled 'Tilt-up Concrete and Precast Concrete Elements for Use in Buildings', which has failed to stem the tide in making a clear distinction between the two systems. Fortunately, their current review of AS 3850 proposes to delete the references to factory cast precast concrete.

In summary, the key issues for building owners when choosing between factory cast products and site cast products revolve around quality, time and cost.

In all these areas, factory manufactured precast concrete offers a superior solution. Factory precast concrete is produced under rigid quality control conditions in a precasting plant to an agreed production programme. The concrete strengths used range from 35–60 Mpa with higher strengths preferred to ensure durability and higher cycle production rates in the plant. Both conventionally reinforced and prestressed hollowcore wall panels provide a higher quality, higher precision product than can be provided with on-site construction.

The forms used are of better quality than those normally used for cast in place concrete hence truer shapes and better finishes are obtained.

With precast concrete the architect is offered greater freedom in design with a lower total form and production cost, given sufficient project size and repetition of units.

By using precast concrete, continuous uninterrupted erection of elements is possible, quickly creating the structural frame and enclosing the building.

This total saving in time equates to lower interest paid on construction finance, earlier occupancy and a quicker return on the owners investment. ■

IAN COULTER

## ANIMAL, Vegetable or Mineral?

### THE PRECAST CANTILEVER

The University of Newcastle will soon be the proud owner of yet another building on its campus. To be known as the *Life Sciences Building*, its primary function will be to house research and teaching laboratories together with lecture theatres and other specialist operations.

Designed by Suturs Architects in conjunction with Stutchbury Pape, the five story building, 83 m long and cantilevering almost 15 m at one end, is situated on a narrow strip of land between the rear of the University library and the Medical Sciences Building. The site has obstructions such as a service road, large sub station and many covered walkways. These difficulties, as well as environmental aspects, made precast concrete the ideal choice for construction. Architect, Dino Di Paolo says precasting took the time risk out of construction due to its inherent speed of construction.

The building is constructed entirely of precast concrete structural elements. The precast columns, beams and spandrels form the structural frame. Transfloor and

hollowcore elements are integrated with insitu concrete screeds to form floor diaphragms. Metallic fusion connectors join the spandrels together longitudinally and conventional grouting of joints and doweled bars complete the remaining connections. In its completed form, the structure is elevated above the ground for its first two levels to provide open-air space for access to adjoining buildings and to create a sense of space on the congested site. As such it will appear to 'float in the air'. This effect is further emphasised by the six-metre side cantilever.

The function of the building dictated that it be a stiff structure without excess structure-borne vibrations and movement. The main east and west walls act as a stiff beam to support the large cantilever on the north end. Northrop, engineers for the project has designed prestressed 1000 mm deep twin cross beams at 7.2 m centres, which support the precast hollowcore floor system. The 1500 mm deep spandrel beams are major structural tension members required to restrain the large horizontal forces created by the two inclined struts supporting the cantilevered section of the building. These forces are transferred back to the insitu core structure at the south end of the building. Project engineer, Neil Petherbridge of Northrop Engineers describes the building 'as structurally the most challenging building we have done'.

The precast concrete structural frame presented an intricate and complex issue

with regard to interaction of the precast elements intersecting in three directions. This complexity was further amplified by the need for all of the structural frame elements to be 300 mm in width. To provide a satisfactory fit combined with buildability became the major issue in the detailed design of the elements. The specialist precaster became instrumental in resolving buildability issues through working in close consultation with the architect, structural designer, specialist erector and the builder. The complexity could only be addressed by employing the close tolerances achievable through adopting precast concrete techniques.

The building is due for completion in 2000. ■



Computer-rendered image of the completed University of Newcastle Life Sciences Building

## The indispensable guide to GRC for architects, designers and engineers



### The National Precast Concrete Association Australia has just released a ninety-page manual entitled *A Recommended Practice – Design, Manufacture and Installation of Glass Reinforced Concrete [GRC].*

The manual covers design, manufacturing and installation aspects relevant to the GRC industry and is based upon overseas and local technical information together with manufacturing procedures current in Australia.

The main aim of the Recommended Practice is to set down all requirements fundamental to the design and manufacture of GRC necessary to obtain acceptable levels of safety, serviceability and durability for this building product.

## ORDER

Please send me \_\_\_\_\_ copy(s) of  
*A Recommended Practice – Design,  
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## MEMBER Profile

**GIROTTA PRECAST PTY LTD** is a family business, founded in 1987, as an off site precast concrete manufacturing company, in Elliott Road Dandenong, Victoria. Through its attention to quality and service, the company established itself as a leader in the industrial and commercial markets for precast panels.

In 1997, a second precast manufacturing facility was built in Whyalla Place Prestons, New South Wales, which expanded the companies capacity by over 100%. The Prestons facility represents the culmination of innovation, experimentation and experience gathered from the original manufacturing facility and current local and overseas technologies. Wherever possible the latest technology has been used to improve safety and working conditions, reduce waste and increase energy and resource efficiency.

*Precast walling in Fox Studios Australia. The Music and Books Centre (below) and Family Entertainment Precinct and Studio (right)*



*Girotto's new Prestons plant in Western Sydney*

Accurate panel layouts, elevations and detail panel drawings are produced in-house by highly skilled staff using the latest autocad software and state of the art computer equipment. The detailing department work in conjunction with the architect, the engineer, the builder and the steel detailer to ensure panels are custom designed in accordance with design for each project.

The Managing Director, Mr Josh Girotto, attributes the high quality product produced by both plants, to the skill of the production teams and quality assurance procedures. Both manufacturing facilities are fully enclosed to provide a secure, controlled environment, that is maintained in an immaculate condition by the staff, who are proud of their work place. Equipment and machinery are cleaned and maintained on a daily basis and all suppliers are carefully selected and monitored to ensure a high quality of materials.

The company has its own fleet of trucks, semi trailers, cranes, cherry pickers and booms to ensure panels reach their final destination on time and in pristine condition. Erection of precast elements is carried out by a dedicated team of highly competent erection specialists, who arrive on site fully equipped to place each panel

in its designated position. A complete understanding of the supply, delivery, erection and post erection works of the precast package of a project, together with the flexibility of in-house services, enables Girotto Precast to work in with customers schedules and therefor eliminate costly delays.

Girotto Precast's aim is to maintain their reputation as a company that can be relied upon to provide the most advanced construction technology, highest level of service and ensure that their customers, employees and the wider community enjoy and benefit from their efforts.

Recent major projects completed include:

- Fox Studios Australia, Family Entertainment Precinct and Studio, the Grand Cineplex and Music and Books Centre.
- Norton Plaza, Shopping Complex, Norton St, Leichhardt.
- Village Megaplex, Cinema complex, Hampshire St, Sunshine.
- Sails, Commercial development at 391-395 Newbridge Rd, Moorbank.
- Roxburgh Park Shopping Centre, Somerton Rd, Roxburgh Park.
- The Marbury, Residential development at 174-182 Goulburn St, Surry Hills.
- Olympic Village Retail Centre, Olympic Village, Homebush. ■

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## SKATEBOARDING on Precast

Skateboarding has evolved over the last 35 to 40 years via the surfing fraternity. When the surf was flat and offered no rideable waves, the next best thing was to ride a 'board' down a hill. Hills became pipes, walls and empty swimming pools, until eventually the first skateboard park was created about 30 years ago.

These parks were privately owned and evolved during the 70's to cater for bowl riding, freestyle and slalom skateboarding. For various reasons over the next ten years these parks disappeared and the sport literally took to the streets. Skateboarders began using everyday objects on the streets to create moves – gutters, fences, steps, hand rails, rubbish bins, ramps, walls and so on. This became known as street skating and had wide appeal to people of all ages, but led to considerable conflict with property owners and pedestrians. The need for a different style of skateboard park soon became obvious.

*Precast skateboard facilities at the Entrance, Central Coast, NSW*

Beresford Concrete Products in conjunction with Wyong Council and an avid experienced skater, has designed and developed a range of precast concrete modules which, when placed together in various combinations, create skateboard parks designed to meet this new style of skateboarding.

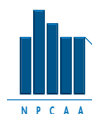
The precast modules include curved flatbanks, quarter pipes, hips and bowls, all designed to fit together to provide long stretches of skateable ramps. Products range in height from 500 mm to 1800 mm and are supplied in plain or coloured concrete, to accommodate the different skill levels of skateboarders from novice to expert.

The major benefits of precast concrete units include superior finish, ability to be installed quickly on prepared slab and be relocated to another site later if the park loses popularity. Councils who have enthusiastically endorsed this concept include Wyong, Wollondilly, Hornsby, Newcastle, Maitland, Cessnock and Taree.

Skateboarding is a growing, dynamic sport enjoying increased participation in Australia and the precast concrete industry is proud to be able to provide an innovative solution to support this activity. ■

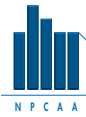
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*The information provided in this publication is of a general nature and should not be regarded as specific advice. Readers are cautioned to seek appropriate professional advice pertinent to the specific nature of their interest.*

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### NEW MEMBER

The President, Directors and Members of NPCAA welcome the forthcoming support of this new member in further consolidating the status of the precast concrete industry.

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**The Precast Company Pty Ltd** Manufacturer of precast concrete panels for industrial, commercial and apartment developments

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