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Courthouse balances form and function

Situated on the western fringe of the Brisbane CBD and strategically located on the edge of Brisbane's legal precinct is the recently completed 14-storey Brisbane Magistrates Court. As a landmark building in the Brisbane region, the building meets the design brief of a state-of-the-art modern courthouse building whilst maintaining an iconic form – an elegant balance between form and function. The polished and sandblasted precast façade contains the same granite aggregates as the nearby Commonwealth Law court building, providing sympathy with the existing cityscape and enhancing the stately civic precinct.

Pedestrian access George St

A team-based approach between the builder, consultants and the precaster throughout the project was instrumental in solving the sometimes complex challenges encountered in the geometrical shapes of the panels, finishes, fixing and waterproofing detailing. The precast façade required extensive waterproofing and fixing detailing to deliver the complex panel shapes and relationships between adjoining elements. Precast Concrete Products were involved early in the design phase of the project which assisted the economies of scale and practicality of the precast package, and resulted in minimal changes to the design documentation throughout the shop drawing process. The precast design team worked closely with Arup façade consultants to ensure the waterproofing and air sealant detailing was comprehensively covered at all junctions and was practical from an installation perspective.

Extensive climate control is adopted throughout the building in the façade, examples of which are found in the wide precast sunhoods and articulated façade detailing on the Western façade, angled precast sunshade blades on the Eastern façade and an environmentally sensitive "climate wall' constructed in curtain walling on the Northern face of the building. The honed and sandblasted sun blades located on the Northern and Eastern façades were fixed in place with high grade stainless steel metalwork, custom made by the precaster, and were erected underneath a wide cantilevered sunhood, adding to the complexity of the erection. The precast façade over the George Street entry is enhanced by the addition of precast "art blocks" which are secured to the precast façade panels.

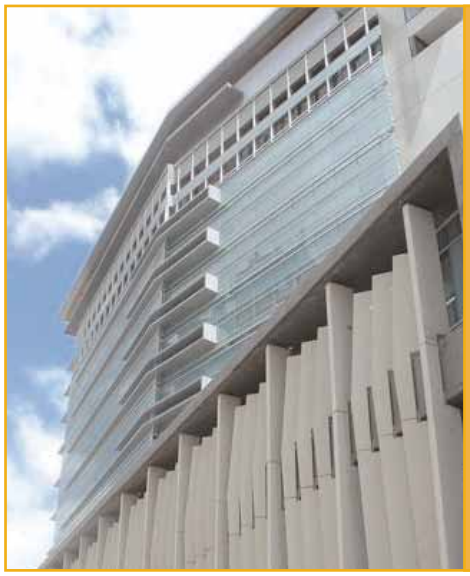
Wide pedestrian corridors around the base of the building facilitate pedestrian access from the nearby Roma Street transit centre and parklands through to the city. Precast is used extensively throughout the pedestrian spaces in the form of sandblasted black step treads, polished planter cladding and polished precast seat sculptures which were funded from the project's extensive artworks budget.

Holding cells are located in the basement of the building, with courtrooms, hearing rooms, magistrate chambers and other administrative spaces throughout the 10 stories above ground.

North Western Pod

Separate access corridors are required to enable prisoners, general public and magistrates to move throughout the building independently. Extensive security management is used throughout the building and a full security screening checkpoint is located at the main entrance.

A solid precast internal magistrate stair was skated in and erected on the 9th floor after the building structure was completed overhead. The stair incorporates top, middle and lower landings with 2 flights all in an architectural sandblasted finish.



Sunblades to Eastern Elevation

The stair features cantilevered glass balustrade and is supported by a narrow zone of concealed columns under the mid landing giving the appearance of floating between the floors.

Some of the geometrical precast panel shapes on the North Western "Pod" structure are a credit to the flexibility of form available in precast concrete. The fixings and erection procedures for these complex shapes challenged the ingenuity of the precast detailers and erection contractor. The combination of polished, honed, and sandblasted precast finishes, integrated with various other façade cladding elements such as these, combine well to deliver a unique looking building full of life and variety on each wall, whilst maintaining the dignity of the surrounding precinct.

Project Details

Client:	Queensland Department of Justice and Attorney-General
Project Manager:	Queensland Department of Public Works
Head Contractor:	Walter Construction Group
Architects:	Ainsley Bell and Murchison / Cox Rayner partnership
Structure:	Robert Bird and Partners
Precast Supplier:	Precast Concrete Products Pty Ltd

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FORMS, PATTERNS, TEXTURES, FINISHES AND SHADING IN PRECAST

By Dr Edward L Harkness FRAIA FIEAust CPEng

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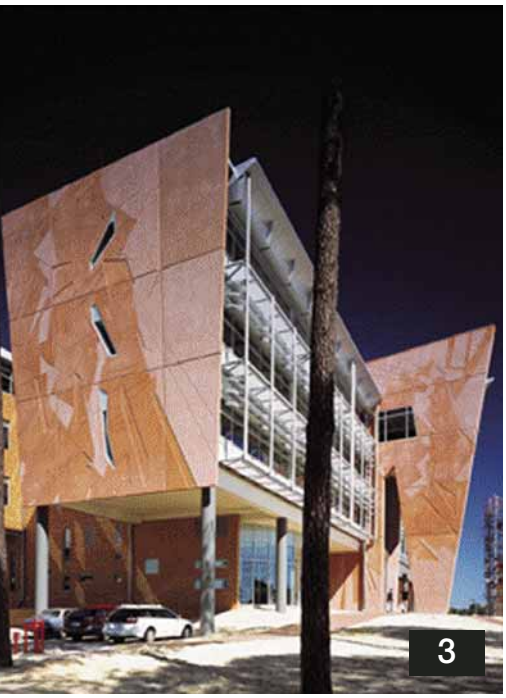

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Introduction

Architects have applied their creative flair to the creation of curvilinear and textured buildings.

Virtual imaging opens up new creative opportunities. Computer driven routers make possible the making of complex moulds for forms conceived in virtual imaging. The virtual images can be imported into flat bed router control drives.

Other programs can unfold complex surfaces into true developed surfaces.

The possibility of quantifying the energy benefits of self-shading patterns cast into concrete is being investigated at the University of Sydney.

Building form

Cox's Sydney Casino (Fig 1) uses precast to form a smooth sinuous building facade with minimal relief. The integrity of the facade surface is maintained.

Figure 2 expresses the structure and the precast facade elements; producing a quite different feeling. The facade is seen to be composed of a structural frame with superimposed precast panels.

The John Curtin School of Medical Research (Fig 4) currently under construction at the ANU in Canberra is using precast to create a unique and striking façade.

Surface patterns and textures

Jones Coulter Young in their Curtin Business School, Bentley, Western Australia (Fig 3) designed precast panels with surfaces conceived as graphics to present shapes on the facade. The metaphor for these shapes is understood to have been "A Nude Descending a Staircase". The architects created bas-relief to achieve recessed forms; and used a variety of surface textures and oxides to produce a unique art form. *Photograph in Fig 3 is by Patrick Bingham-Hall.

The computer pattern created for the National Museum, Canberra (Fig 5) was cast by Rescrete Industries. Sensuous is a descriptor that comes to mind. The forms are progressively variable. It is unlikely that such a surface could have been formed other than by the use of computer imaging.

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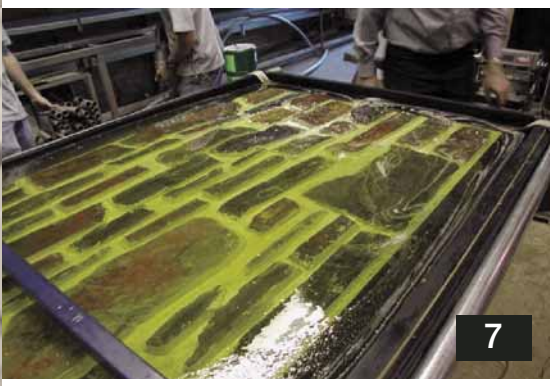
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Photos 1, 2 & 5 by Eric Siemens.

Moulds

Moulds in which concrete may be cast can be taken from forms in nature, from models made by the hand of man or created from virtual imaging.

Urethane moulds

Urethane is currently used for taking moulds from natural forms because a degree of undercutting is possible by using this flexible material.

Figure 6 shows a urethane mould used by Rescrete to cast a basalt texture.

Figure 7 shows the pouring of urethane over specially laid stonework to from a mould from which multiple units were cast.

Figure 8 shows the cast panel awaiting transfer to the site.

Figure 9 shows the cast panels positioned on the Multiplex building in Oxford Street, Sydney.

Virtual models

Computer images can be created using a variety of programs. Two illustrated here are 3D MAX and Rhino.

3D MAX virtual models

Figures 10 and 11 show initial and final stages in the design of a sunshading system for the northern facade of a building in Dubai which has a latitude north approximating that of Sydney and Perth in the southern hemisphere.

These shapes could be made in GRC. They were conceived by the author and visualised in 3D MAX Studio by Georges El Boustani.

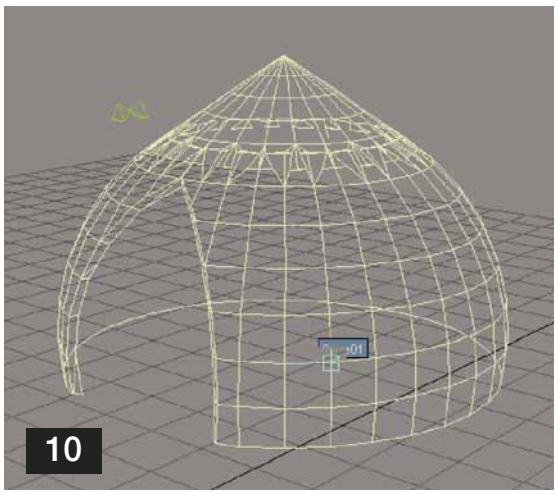
RHINO virtual models

Figures 12 and 13 show images modelled in Rhino by Big City Production Services P/L.

Images can be emailed to the architect and responses emailed back for updating the image.

When the image has been finalised it can be imported into a CAM program to drive a 3D router for cutting the mould. Either a positive or a negative mould can be made using the flat bed router.

Figure 12 shows a negative and Figure 13 shows a positive for a project by McGregor Westlake Architecture.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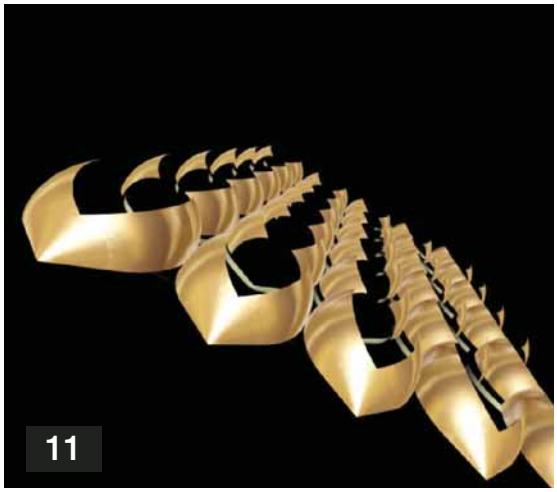
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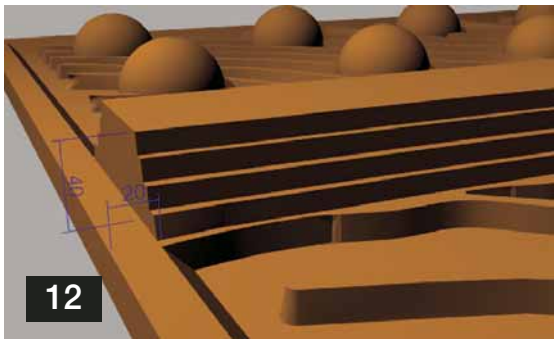
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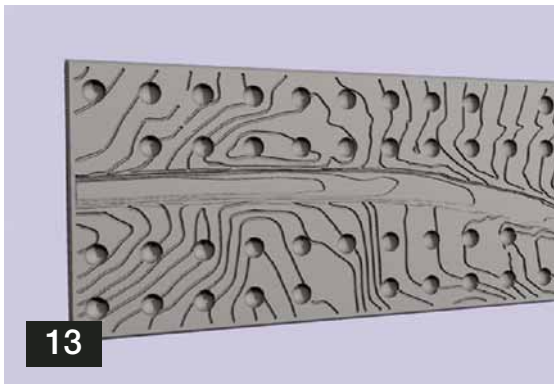
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Measuring energy benefits of cast-in self-shading precast

An experiment set up on the roof of the Architecture Building at the University of Sydney in late 2004 is presently monitoring the heat transfer effects of self-shading elements cast into the face of a precast concrete panel.

Shading of a wall by louvres

Given a north facing wall (Section A in Fig 14) shaded by horizontal louvres a distance from the face of the wall: the louvres can be designed to exclude all of the direct component of solar radiation for any nominated period of the year required. The wall will also be shaded from some of the diffuse component of solar radiation. No heat can be conducted to the wall from the louvres because the louvres do not contact the wall.

Given a north facing wall (Section B in Fig 15) shaded by horizontal louvres that are infinitely thin and of negligible mass and in contact with the wall, a negligible amount of heat would be conducted from the louvres into the wall.

Self shading of a precast wall

In this case heat will be conducted into the wall. Figures 16 and 17 show the vertical sections of two test panels to compare the thermal performance of a flat-faced panel with a profile-patterned panel.

November and December 2004 data show that the temperature on the southern face of the profile-patterned panel was consistently lower than on the southern face of the flat-faced panel in the afternoons. The range being in the order of 0.0 to 1.3 degrees C, depending upon sun position and cloud cover.

Differences between outdoor Sol-air temperatures on a vertical wall, and air temperatures in an air-conditioned interior in Sydney, Perth, Brisbane, Adelaide or Melbourne, in summer, could be in the order of 10 degrees C. Under these conditions, a reduction of 1 degree C by self-shading would represent a reduction in conducted heat gain of 10%. (The overall BASIX sustainability index energy reduction target in NSW is 25%.)

Summary

Architects have a predilection for designing precast concrete with various surface forms, patterns textures and finishes. It may be possible to quantify the energy benefits of various cast-in self-shading patterns for different orientations.

Acknowledgements

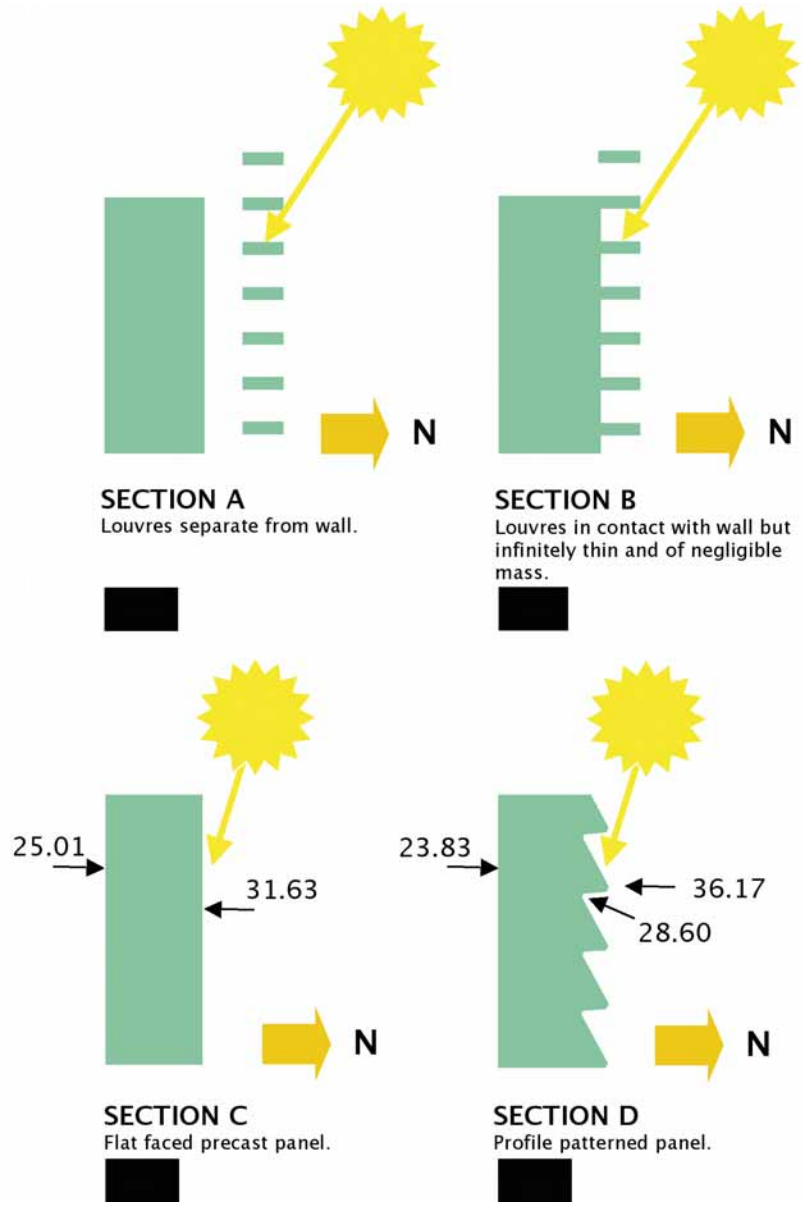
Appreciation is expressed to Brian Findlay, Alistair Peters and Gary Luke of Big City Production Services P/L for making and installing the self-shading panels; to the Faculty of Architecture at the University of Sydney for allowing the experiment to be set up on its roof and for providing data logging equipment; and to Bruce Forwood, Phil Granger, John Bassett and Mathew Storey of the University of Sydney.

Notes about the experiment

The northern and southern faces of both panels were exposed to outside air. The average thickness of the panels was 55 mm. The surfaces were off the form mid to light grey. The southern faces of both panels were shaded. Both panels had the same mass. One sensor was placed on the northern face of the flat-faced panel and four on its southern face. Two sensors were placed on the northern face of the profile-patterned panel and seven on its southern face.

Temperatures were recorded to five decimal places. The temperature of the leading edge of the shading element was higher than the temperature of the vertical face as is to be expected because the angle of incidence to the sun is less. The temperature under the shading element was less as was to be expected. Using the average temperatures of the several sensors located on the southern faces of the panels, the southern face of the profile-patterned panel was, for example, 1.18 degrees C cooler than the southern face of the flat-faced panel at 15.49 pm on 7 November 2004.

** Sol-air temperatures (effect of radiation and air temperature).*



Precast Flooring – Easy

Precast flooring has made huge market gains over the past decade because engineers and builders are finding that, besides its other advantages, it's easy to use. Quantity surveyors and estimators are also realising that the low price volatility of precast flooring makes it easier to price.

Precast flooring is easy to design because the manufacturers have design aides, such as load-span tables and software, and a wealth of experience to draw upon. Experienced technical staff who have been involved in hundreds of projects can easily resolve detailing issues. In addition, there is the NPCAA Precast Handbook which gives valuable guidance.

Most consultants now have some experience with flooring and their willingness to use the product owes a lot to the ease with which designs can be developed. Consultants find that having shop drawings introduces a welcome additional level of discipline and control when compared to insitu construction methods.

Builders, mostly conservative by nature and resistant to change, are now preferring precast flooring because it makes their life much easier. The reduction in site trades and people on site, the immediate safe working platforms and the speed of installation are all factors in this process. Additional productivity results on sites that suit erection on multiple work faces.

Quantity surveyors, who frequently have to advise on budgets well in advance of construction, welcome the relative price stability of precast flooring. Price increases tend to match inflation rather than being subject to the volatility associated with formwork, reinforcing placing and premix concrete. This makes the job of giving reliable predictive pricing much easier.

Precast flooring is widely available throughout Australia with further capacity being installed as demand increases. The nature of the suspended flooring market has permanently changed – precast flooring is gaining market share as users realise just how efficient and easy it is to use.

For more information about precast flooring go to www.npcaa.com.au/html/PRODUCTS-Flooring.html

NPCAA and Cement & Concrete Services are pleased to announce...

Precast Concrete Workshops for Engineers

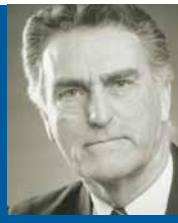
Sydney	Tue 2 - Wed 3 Aug 2005
Brisbane	Tue 9 - Wed 10 Aug 2005
Melbourne	Tue 23 - Wed 24 Aug 2005
Adelaide	Tue 6 - Wed 7 Sept 2005
Perth	Thu 15 - Fri 16 Sept 2005

Course content to include Materials, Tolerances, Analysis & Design of Buildings, Design of Structural Elements, Connections & Fixings, Joints, Handling /Erection, Finishes, Transportation, Contract Issues, and Acoustic & Thermal Properties of Precast.

Course attendance to count towards Professional Development.

For more information go to www.npcaa.com.au/html/EDUCATION.html

In memory of Ivor Jones



Ivor Jones, long time Secretary of the NSW Precast Concrete Manufacturers' Association and the first NPCAA Executive Officer, has died at the age of 75.

Throughout the difficult years following the mid 1970's recession, Ivor's commitment to the potential of the industry remained strong. Many will remember him for his work in transforming the NSW PCMA into the NPCAA in the early 1990s. As Ivor would say – "Of course we can!".

Ivor was determined, hard working, pro-active, constructive, loyal and cheerful, and was tireless in his work on behalf of the industry. We confer our greatest sympathy to his family and friends.

President's Message

I would like to thank all Members for their warm wishes and support welcoming me in as the newly elected President of the Association. My personal thanks go to our out-going President, Matt Perrella, who has set a high standard for me to follow. I would also like to thank Matt on behalf of the Board of Directors and all Members for the time, commitment and effort he has put in and for the great work he has achieved and initiated. We assure Matt that these projects will continue and in time come to fruition.

The Association's first meeting for 2005 was held in Fremantle, WA at the Esplanade Hotel, welcomed by some of the best February weather WA could provide. With delegates from around Australia, the attendance showed once again, that we are a national organisation.

Our meeting in Fremantle and start to my term in the chair, came at a particularly difficult time for me, as I was coping with the tragic loss of a friend and colleague Brendan Brown, only days previous to the meeting. I had already been in WA a few days visiting fellow Members of the Association and friends within the precast industry at the time I received news of the fatal incident. I would like to take this opportunity to thank all my friends in WA, for their support and friendship, which helped me to attend and carry out my duties at the meeting.

At the AGM in Sydney last year, when elected to the office of President, I announced some objectives I had set for myself during my term as President. One of these initial objectives was to get the Association more involved in OHS issues and to represent the industry to the various state-based workers' compensation bodies around the country. The Association has set up a sub-committee to address OHS issues in a proactive manner. The sub-committee hopes to work closely with the Office of the Australian Safety & Compensation Council on the development of a national code of practice for the precast and tilt-up industries. As well, a delegation from the OHS sub-committee has already met with WorkCover NSW on issues relating to the storage of wall panels with some encouraging outcomes.

With all the good work done so far on marketing of precast concrete, by supplying technical information to architects, engineers and builders, the NPCAA must further improve its profile as an organisation representing the precast concrete industry in all areas including OH&S and production issues. We must take the initiative regarding how our products are handled during transport and construction.

I look forward to working with the new Board of Directors and welcome our two new members of the Board, Russell Bianco and Leo Valente, both from South Australia.

Gavin Stollery

Civil works Match Desires with Designs

The most successful civil engineering projects are those that combine excellent performance with attractive appearance. Owners, architects, contractors, engineers and landscape architects are interested in demonstrating their professional capabilities by designing civil engineering structures which aesthetically integrate into their sites and enhance their surroundings: structures which reflect the designer's attention to architecture, excellence in detail and construction.

The Merri Creek Bridges on the 17km Craigieburn Bypass Project in Melbourne, Victoria are no exception and provide an excellent example on the use of precast concrete to minimise the aesthetic and environmental impact of an infrastructure project on its surroundings.

Abigroup contractors approached The Reinforced Earth Company (RECO) to design and supply over 5200m^2 of reinforced soil wall abutments for four major bridges on this project. The Merri Creek Bridges are one of these, with the wall abutments having a facing area of 3492m^2 and a maximum height of 15.38m.

Minimising aesthetic and environmental impact

Merri Creek begins near Wallan, a town on Melbourne's northern outskirts, and joins the Yarra River at Dight's fall, Collingwood approximately 70km downstream. The Creek is highly treasured from an environmental perspective; hence any development along its course is extremely sensitive and should have minimum aesthetic and environmental impact on its surroundings.

The use of a bluestone rock fixed to the wall, was identified as an aesthetically pleasing solution, which would allow the structure to blend in well with the natural surroundings. However due to safety issues caused by fixing rock to a cast insitu wall in excess of 15m height, along with the construction time required to do this, it was decided that this was not a practically feasible solution for this project.

Precast gives bluestone appearance

Instead, the precast manufacturer worked closely with the head contractor in developing a new random bluestone appearance, which could be used on the precast concrete facing panels of the reinforced earth wall. The specially created panel achieves a look, mimicking that created traditionally by fixing natural bluestone rock to cast insitu walls, without any of the negative drawbacks.

Specify precast early to achieve maximum benefits

A project of this nature is testament to the fact that when precast is specified or selected in the earliest phases of a project, the precast manufacturer can help owners, their engineers and architects to maximize the design possibilities, allowing architectural expression to be easily accomplished.

Traditional bluestone rock finish

Bluestone finish facing panel

Reinforced Earth wall with random bluestone rock finish at Merri Creek Bridge

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