NUMBER 26 • MAY 2001

NATIONAL PRECASTER

NATIONAL PRECAST CONCRETE ASSOCIATION AUSTRALIA

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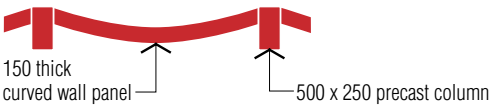
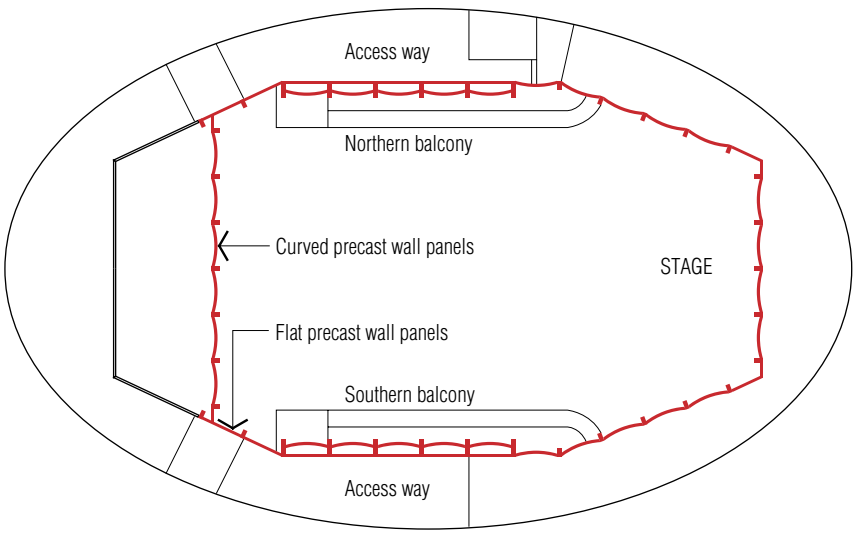
Panorama of the Hobart waterfront featuring the brass-coloured Federation Concert Hall on the right of the photograph and the Convention Centre



WALL/COLUMN DETAIL



PLAN OF CONCERT HALL AT BALCONY FLOOR LEVEL

FEDERATION Concert Hall – Hobart

Last year's opening of the Federation Concert Hall on the Hobart waterfront, with tiered auditorium space for 1100 people, not only provides a new home for the Tasmanian Symphony Orchestra but gives local citizens and visitors an exciting new venue for concerts and conferences.

The Concert Hall, designed as an integrated annexe to the existing Hotel Grand Chancellor, is now the dominant element in this waterfront city block with its arresting brass-coloured oval shape. Architects Forward Brianese and Partners, and acoustic designers, Arup Acoustics, collaborated on the project to conceive its unique external oval shape enclosing the trapezoidal-shaped inner skin. The oval form provides an historic link to the site's industrial architecture as up until the 1930's,

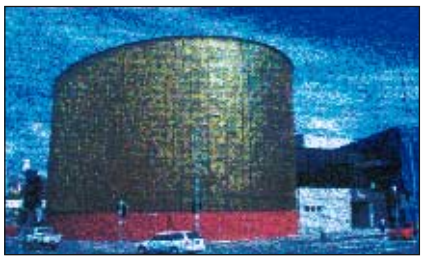
ACN 051 987 181

ISSN 1037-9908

Erection of upper level precast blade columns (top) and erection of 4.1 m high curved panels which form auditorium's main interior walls (above).

there was a round gasholder of the Hobart Gas Company on and close to the site.

Acoustic design considerations strongly influenced the shape of the inner skin; the room is tall and narrow, with predominantly parallel side walls to provide excellent acoustic strength, resonance, envelopment and intimacy. Painted concrete and timber flooring dominate the Hall's internal appearance, along with the purpose-built orchestra reflectors which allow sound to 'bounce' back down to the performers and the audience.The painted precast concrete walls and the concrete ceiling help to isolate the Hall from outside noise. These walls comprise curved panels stacked to 18 metre height which are laterally supported by spliced precast columns.



Close-up elevation of brass-clad oval shaped Concert Hall

Third-generation Huon Valley company and NPCAA Member, Duggans Pty Ltd provided in precast construction the entire 'inner skin' of the Hall structure which comprised over 600 elements totalling 1350 tonnes. The breakdown of these components are as follows:

- 168 curved panels (typically 2500 mm width x 4100 mm height)
- 78 flat panels
- 88 columns (typically 3000 mm high, 1125 mm wide)
- 85 seating plats and stringer beams
- 198 roof infill beams. ■

FULLY PRECAST BUILDINGS – A National Trend

Precast concrete components engineered to offer a fully precast building for residential and commercial applications have been common practice especially in Victoria for many years. Developers and builders are choosing precast solutions because of reduced construction times and design flexibility without sacrificing customer appeal. This article features case studies of recent projects in Western Australia and NSW.

CASE 1 – RESIDENTIAL DEVELOPMENT

Mounts Bay Village, Kings Park, Perth

This 5–8 storey project, involving eight buildings due for completion in June 2001, includes a total of 356 apartments, comprising of 2-bedroom and 3-bedroom units, 10 commercial offices, penthouses as well as tennis courts, swimming pools, gymnasiums, car parks and a restaurant. Its location is typical of an inner city construction site where space is limited, the construction programme extremely tight and the co-ordination of the various trades critical.

After considerable analysis by the project consultants and the main contractor, they concluded the best solution to these challenges was to design the buildings in a total precast system. The extent of the precast componentry amounted to 46 000 sq m, broken down as follows:

- External wall panels 2600 no.
- Internal walls 300 no.
- Spandrels 200 no.
- Columns 75 no.
- Hollowcore planks (up to 9.5 m span) 2875 no.

Lead-time is always critical and was overcome by leaving the basement and ground floor structure as conventional insitu construction.

Generally the basement and ground floor levels are the most complex and non-repetitive portion of the structure. This enabled the precaster, Delta Corporation, to prepare shop drawings, moulds and production to a stage which guaranteed continuous supply of precast elements. It also gave the consultants sufficient time to complete their design and working drawings for the rest of the building.

During erection of wall panels and hollowcore floor planks the workforce on site consists of one mobile crane, with an

Stage 1 of Mounts Bay Village, Perth designed as a fully precast building (above) and the front view of typical 2.9 m high x 5 m wide off-form painted external wall panel (right).

erection crew of five to six men. This is only one tenth the number required for an insitu structure and involves a number of trades.

Once the ground floor walls and hollowcore planks were installed (2–3 days), the reinforcement and concrete topping was placed. The entire cycle for each floor takes 7–8 days. The structure in this instance is about 50% complete before other finishing trades move onto site.

John Tognolini, State Manager of FAI Property Service, the company behind the Village development, said "Using a hollowcore floor system instead of traditional concreting methods reduced our cycle by more than one week per floor, and was an important factor in saving approximately a year in construction time. Also, while speed of construction is the main advantage in using precast concrete, there was also a lot less mess to deal with afterwards compared with in situ methods."

Mounts Bay Village was built by Multiplex Constructions; architects were Spowers Architects, and engineers Ove Arup and Partners. The developer was FAI Property Services Pty Ltd.

CASE 2 – COMMERCIAL OFFICE DEVELOPMENT Harvey World Travel Office, Rockdale, NSW

Harvey World Travel in looking to expand their existing headquarters to an adjacent site on the busy Princes Highway in Rockdale were confronted with a major challenge.

A four level building was needed to accommodate the anticipated business expansion of Harvey World Travel on a narrow, (12 m wide only) site, which was in the middle of a densely populated residential area where access was limited; moreover, as the location did not permit erection from the Princes Highway frontage all delivery and erection had to be effected via an extremely narrow 6 m laneway at the rear of the site.

To meet these challenges, the builder, Baseline Constructions, successfully convinced the client that re-engineering of the method of construction to a fully precast building thus minimising on site construction time and maximising the level of off-site precasting, was the solution. The key factor in the re-engineered structure was the use of 3-storey height precast wall panels and a prop-free prestressed hollowcore floor system.

Aerial view of wall panel erection at narrow Rockdale site.

The floor-by-floor breakup of the precast elements in the structure was as follows:

	Floor planks	Walls
Ground floor	12 off	19 off
1st Floor	none	46 off
2nd Floor	50 off	none
3rd Floor	51 off	none

The erection sequence is of particular interest.

The erection of the 7 tonne ground floor wall panels was carried out using an 80 tonne hydraulic crane from within the site.

A 200 tonne mobile crane was used to erect the 46 wall panels. These were temporarily propped on raking shores. A typical panel was 9.8 m long, 2.6 m wide and 200 mm thick and weighed 12.7 tonne. The heaviest lift was a panel weighing 14.9 tonne. The panels were transported on the side and were lifted and turned in the air to the vertical position.

Roof steelwork was fixed to the panels including all bracing. Central structural steel support beams and columns for levels 2 and 3 were erected to the rear 25 m of the building creating a 2-span floor solution; the engineer selected this option to easily provide structural stability. The front section of the building used 250 mm planks to provide a clear span solution.

After removal of raking shores for the external walling, the 51 150 mm and 250 mm floor planks to Level 3 were then erected using a 16 tonne Franna crane; the Level 2 were then erected using the Franna crane.

Peter Groenewegen, Project Manager for Baseline Constructions, had this to say about the project after its completion – "We were extremely happy with the result. The design support, construction expertise, working relationship and quality provided by the precaster was professional and of the highest standard. This method of construction gave us the opportunity to trade out a majority of our risk, use someone else's workplace and infrastructure and manage the foundation preparation simultaneously with the panel manufacture.

"It goes without saying that a substantial saving in both time and cost was made. The entire project was built in 6 months and was handed over 1½ months ahead of adjusted contract time.

"It is fair to say that the project as finally designed and constructed was built 3 months faster than would have been achieved using other building materials and practice."

Harvey World Travel Office at Rockdale was built by Baseline Constructions Pty Ltd, architects were McFadyen Anlezark Pty Ltd, and the precaster was Rescrete Industries.

Both Baseline Constructions and Rescrete Industries are Member Companies of the NPCAA. ■

(top) Lifting and turning 3-storey-9.8 m-long wall panel into vertical position and (above) the 9.8 m panel in its final position – seated on ground floor panel; both panels have factory fitted openings for windows and doorway

ACOUSTIC Properties of Precast Concrete

Precast walling and flooring systems, as with other forms of 'solid' construction, provide adequate acoustic properties for insulating residential and commercial buildings. The purpose of this article is to explain some basic issues on acoustic design and set out a simple procedure for assessing acoustic performance for precast wall and floor elements.

The science of architectural acoustics is used to control sound propagation within buildings. The objective is to provide environments where occupants hear what they want to hear and are not seriously bothered by unwanted sounds. Sound control in buildings may be divided into two categories.

- Sound distribution *within* an occupancy – wanted sounds are heard properly by the recipients, without being blurred by reverberation or masked by noise.
- Sound insulation *between* occupancies – noises originating in an occupancy do not intrude into adjacent occupancies. This mainly involves the provision of adequate barriers to sound transmission. Typical precast concrete elements are sufficiently massive to form effective components of a sound insulation design.

The flow of sound energy through walls and floors can be by either direct or indirect transmission. Direct transmission is when sound is transmitted directly from one side of a wall or floor to the other side. Indirect transmission occurs where the path of the sound energy is via a ceiling or some other pathway.

Precast methods of construction have traditionally provided both the mass and simple connection details to limit both direct and indirect transmission of noise.

When sound propagates between two rooms through a common partition, the principal factor controlling the sound pressure level in the receiving room is the sound transmission loss of the partition. The sound transmission loss, expressed in decibels (dB), is a measure of the ratio of the energy striking the partition relative to the energy that is transmitted through it. The greater the sound insulation provided by a partition, the higher its transmission loss.

The Sound Transmission Class (STC) rating is a measure of the amount of transmission loss that occurs through an element, expressed in decibels(dB). Sound transmission class is intended for rating partitions for sounds such as speech, which have most of their energy in the middle and high-frequency range. Nevertheless, it is widely used for rating the airborne sound insulation of partitions, doors, and windows against other types of noise such as transportation noise, music, and machinery noise.

An STC rating of 45 (STC 45) means that the element reduces the sound passing through it by a level of 45dB.

The Building Code of Australia (BCA) requires a minimum STC rating of 45 for the following walls:

- A wall separating sole-occupancy units
- A wall between a sole-occupancy unit and a plant room, lift shaft, stairway, public corridor, hallway or similar.

The *National Precaster* has a simple procedure to give designers guidance to comply with BCA requirements for a range of precast walling and flooring systems.

Figure 1 graph shows STC as a function of the weight of floor or wall. For example, a 230 kg/sq m precast wall would have an STC rating of 50, which should comply with the BCA requirement.

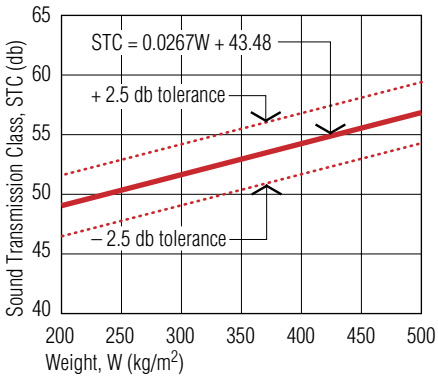


Figure 1

Table 1 *STC for some typical precast concrete flooring and walling systems*

	Mass kg/m^2	**STC**
Solid slabs or walls		
50 mm	115	43
70 mm	161	47
100 mm	230	50
150 mm	345	52
200 mm	460	58
Hollowcore slabs		
150 mm	220	48
200 mm	278	50
250 mm	312	50
Precast double tee		
350 mm deep with 50 mm topping	336	54

Table 1 provides a performance guide for a range of precast flooring and walling systems. It should be noted that all precast wall or floor panels over 75 mm thickness meet the BCA requirement.

Precast concrete walls and floors usually do not need additional treatments in order to provide specified sound insulation. If desired, greater sound insulation can be obtained by using a resiliently attached layer or layers of gypsum board or other building material. The increased transmission loss occurs because the energy path is now increased to include a dissipative air column and additional mass. ■

We wish to kindly acknowledge the Cement and Concrete Association of Australia for permission to reproduce sections of their booklet 'Acoustic Benefits of 'Solid' Construction'. For further information on the acoustic performance of precast concrete please refer to the NPCAA Precast Concrete Handbook to be published in September 2001.

NEW NPCAA President

At its recent AGM the National Precast Concrete Association Australia elected **CLAUDE PINCIN** (left) – Managing Director, SA Precast Pty Ltd, as its new National President, succeeding **Ian Coulter** (right) of Precast Concrete Pty Ltd.

Claude expressed the Association's appreciation of Ian's contribution to the industry over the last two years. He said 'Ian's efforts in raising the profile of the precast industry to new heights through boosting membership, and his committment to have the definitive manual on precast construction, *The Precast Concrete Handbook,* to be published this year needs to be recognised'. He went on to say, 'In today's environment time means money, so if the precast industry can convince designers, engineers and building owners through publications of this calibre that precast construction is simple and cost effective, we will have made a worthwhile contribution to improved productivity in the building industry.' ■

Precast textured and painted noise wall panels supplied by Icon Industries (WA) for Kenwick fly-over in Perth

MEMBER Profile

ICON Industries Pty Ltd (a member of the Milnes Holdings Group of Companies) who recently acquired the well-known NSW precaster CI&D Pty Ltd, have diversified geographically to specialise in the manufacture and marketing of a wide range of precast products including:

- Stormwater and sewer drainage
- Trade waste and environmental (including stormwater – oil and silt separation)
- Electrical and telecommunication cable pit and cover products
- Septic tanks and aerated domestic wastewater treatment systems
- Roadway drainage and barrier products
- Customised products for major civil works projects.

In the Victorian operation the company manufactures a wide range of plastic water storage tanks and telecommunication pits which complement the precast concrete range.

ICON are also a major marketer and distributor, throughout Australia, of cast iron and galvanised mild steel access covers and grates, and have recently been appointed exclusive distributors of the SIKA range of aluminium telecommunication access covers.

In the environmental market the company's OSA units (or oil and silt arrestors), designed to ensure maximum efficiency for the protection of Australia's natural water ways from infiltration of un-clean silts and oils, are now being specified and used by local government and road authorities throughout NSW.

Products such as Icon's Grease Arrestors (used in protecting heavy build-up and blockages of sewer lines, and preventing heavy untreated trade waste loads reaching sewerage treatment plants) have long been market leaders in this field.

In the civil market the company has been involved in major projects such as:

- M5 Motorway, Sydney – Arches for Bexley portals (Baulderstone Hornibrook)
- Roe Highway (Kenwick fly-over), Perth – Panelling and parapets (Consolidated Constructions)
- Warragamba Dam, Sydney – abutment panels (Abi Group)
- HMAS Cresswell, Jervis Bay – headstocks (Barclay Mowlem)

With manufacturing and distribution facilities in Sydney (Moorebank); Canberra; Ballarat (Victoria); Perth and soon to commence in Brisbane, ICON is now well placed as a national supplier, to effectively service the building and development infrastructure industries; telecommunication, Government, civil construction and environmental markets. ■

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OVERSEAS MEMBER

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NEW MEMBERS

The President, Directors and Members welcome the following new Associate Members to the Association:

Baseline Constructions – Sydney-based specialist in precast multi-level building construction and construction management services

Hilti (Aust) – Suppliers of concrete anchoring, positioning and fastening systems

NEG/Synthetic Resins – Suppliers of glass fibre reinforcement, gelcoats and epoxy resins.

Published by **National Precast Concrete Association Australia** 8–10 Palmer Street North Parramatta NSW 2151 Australia • **Tel [02] 9890 8853**