

pt news

NEWSLETTER No 4 - 2007

POST-TENSIONING DESIGN COURSES

PTIA is delighted to have entered into an agreement with Cement & Concrete Services for the provision of a series of design courses commencing in 2008. These 2-3 day courses will be sponsored by PTIA and significant course fee subsidies are available to Consulting Engineering firms who are members of PTIA. The courses are also open to others whether they be members of PTIA or not.

Dates and locations of these courses will be advertised early in 2008 and can be seen on the Cement & Concrete Services web site www.cementandconcrete.com

A busy time as PTIA interacts with industry

Since our last newsletter, PTIA has embarked on a range of activities aimed at supporting its objectives to improve standards and knowledge within the post-tensioning industry in Australia.

We are delighted with the response from many materials supply and consulting engineering firms, and individuals who have applied for membership and we are keen to interact with these new members and to involve them in contributing to the development of knowledge and raising of standards in post-tensioning.

Following the success of the PTIA/CIA seminar Latest Developments in Post-Tensioned Concrete Structures in Sydney, we have conducted this seminar in Brisbane in September, and will present it in Melbourne on 21 November. We hope to conduct this seminar in Newcastle and Canberra early in 2008.

Another major achievement has been the development and conduct of the first skills training course. Now that this course is up and running, our ambition is to train all of the work force of PTIA members in NSW by early 2008, then to extend this training to other states around Australia. The course timetable is presented further in this newsletter.

In addition, the PTIA is particularly pleased to be able to offer PT design courses through its agreement with Cement & Concrete Services in 2008. We are planning to conduct 5-6 courses across several states and are pleased to offer significant subsidies on course fees to our Engineering company members.

PTIA will conduct its first Annual General Meeting on 19 November this year. The present Board has an ambitious programme for 2008, and we welcome the participation from our new members across the contracting, materials supply and design segments of the industry.

Concrete 07

We were delighted to have the opportunity to participate in Concrete 07 in Adelaide, and we congratulate the Concrete Institute and its Organising Committee for presenting such a successful conference. The PTIA was well represented by its Corporate members who had display stands in the exhibition area. PTIA also sponsored the Concrete Expo drinks segment on the Friday, providing delegates some time to relax as the conference approached its last day.

On the technical side, Dr Marcel Poser (BBR VT International Ltd) addressed Plenary Session 2 about European Approvals for Post-Tensioning Kits, supporting the ambitions of PTIA in its endeavours to raise standards through accreditation and certification here in Australia

Later that afternoon, a whole stream was devoted to Post-tensioning with papers being presented by Structural Systems, VSL Australia, Corcoran Consulting Engineer, and VicRoads.

As this will be the last newsletter for 2007, I take this opportunity to thank all of our working committees who have tirelessly contributed so much to the growth of PTIA, to those organisations who have supported our initiatives, particularly through membership, and the Concrete Institute of Australia for its cooperation and support over our first year.

I wish all our members, industry participants and friends a very happy Christmas season and to say that we look forward to our ongoing interaction in 2008.

DAVID PASH
President



John Woodside (left) and incoming CIA National President, Tony Kinlay, visit the PTIA area at Concrete 07 in Adelaide

PROJECT REPORT

Location: Riverview, Brisbane

Client: Ipswich Water

Contractor: Australian Prestressing Services (Qld) Pty Ltd

Consultant: Parsons Brinckerhoff Australia Pty Ltd

Riverview Reservoir

Australian Prestressing Services (Qld) Pty Ltd were awarded the contract for the design and construction of a new 13.2ML prestressed concrete reservoir at Riverview, Brisbane. The reservoir is 40.2m in diameter and 11m in height.

With Australia still in the grip of the worse drought this century and the demand for water being felt more and more, this state of the art reservoir incorporated large inlet and outlet pipe work arrangements complete with control valves housed on site, and a back to base telemetry system linked to a network of other reservoirs.

The floor slab was constructed using a 140mm monolithic post-tensioned slab, and external ring beam which was constructed in a single concrete pour. This eliminated the requirements for expensive construction and articulated joints. By using post-tensioning a watertight floor slab was achieved.

The wall was post-tensioned both vertically and horizontally and was made up of 38 precast panels with 4 stressing buttresses. The panels were curved to the reservoir's radius, 250mm thick x 2.6 m wide. Each wall panel was formed and made within the footprint of the floor slab which mitigated the need for access around the reservoir during construction. This technique was ideal for this project, which was positioned on the side of a hill.

Each panel contained 3 number, 5 x 12.7mm diameter vertical tendons and 26 number, 7 x 12.7mm diameter horizontal tendons.

With each panel weighing 17.5 tonnes and each buttress panel weighing 33.6 tonnes, the panels were strategically positioned and stack cast to allow access

for the crane to enable each lift to occur in one single operation. The prestressed panels were placed upright into a key joint, previously poured in the floor slab, and temporarily propped. The use of the key joint enabled the floor to wall connection to be watertight and durable.

By using this method of construction the need for expensive scaffolding access to the 11m high reservoir was eliminated. Also by leaving out 2 panels, which would be placed later on during the construction phase, continuous clear access into the inside of the reservoir for materials, labour and equipment such as concrete trucks, pumps and crane was achieved. Another of the major benefits of this form of construction is that OH&S requirements are able to be easily achieved.

By providing a 300mm gap between each of the precast units and having clear access internally, horizontal post-tensioning ducts were able to be joined together. Both an external and internal form was placed and through access windows at intervals no greater than 2.4m apart, the infill was poured using a concrete mix design developed particularly for this application with slumps in the order of 150 to 180mm, which allowed a good flowable mix to be vibrated around the post-tensioning ducts and reinforcement.

With the wall infill 70% complete the temporary props could be removed and the roof construction could be started. The reservoir roof is an aluminium roof structure consisting of stainless steel columns, aluminium beams and purlins with Lysaght Alspan roof sheeting. In conjunction with the post-tensioned concrete solution this offered the client a durable and watertight reservoir.



PTIA CIRCULAR TANKS

Post-tensioned concrete circular structures such as reservoirs, silos and containment vessels have been constructed in Australia for many years.

The circular shape of these structures means that when it is subjected to an internal pressure it will develop high axial tensile stresses. Post-tensioning, using the same prestressing system typically used in buildings and bridges, can be economically used to counteract the effect of this axial force and, in fact, leave the walls in a state of compression thus maintaining the watertightness of the structure.

BENEFITS OF POST-TENSIONING IN CIRCULAR TANKS

Circular tanks can be either conventionally reinforced or prestressed, prestressing being more efficient. The stresses in conventional reinforcing steel must be kept low and the percentage of reinforcement kept high in order to keep the crack widths within codified acceptable limits. If prestressing is used, however, the walls can be thinner and the reinforcing materials can be used to their full potential.

This efficient use of materials leads to significant economy in the following areas.

1 Reduced concrete

Thin walls thus reducing the amount of concrete used as well as reducing the size of the footing beam required to support the wall.

2 Less Reinforcement

Significant reductions in conventional reinforcement

3 Speed of Construction

The speed of construction is improved because the overall weight of steel is generally reduced. Further, the prestressing steel is generally placed after construction of the wall using strand pushing devices, meaning the wall can be constructed quickly with minimal time spent fixing reinforcement.

4 Efficient Structural Form

The use of prestressing gives enhanced structural performance as the axial forces induced by the internal pressure are counteracted by the prestressing force.

5 Lower Maintenance Costs

The high maintenance costs associated with repainting steel water tanks can be

avoided with the construction of a maintenance free post-tensioned concrete tank.

6 Watertight Structure

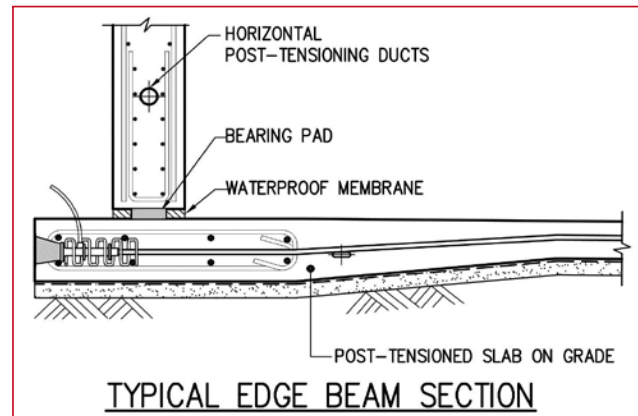
Post-tensioned liquid retaining structures offer a crack free concrete structure, subject to permanent residual compression and, as such, a high degree of watertightness. A post-tensioned slab-on-ground can eliminate joints in the floor reducing maintenance and the possibility of leaks.

DESIGN

The design of the post-tensioning used in circular structures is relatively simple. The hoop tensions induced by the internal pressure can be calculated using well established principles. These tensions are balanced by the compression induced by the prestressing forces (after all losses) leaving a residual compression in the wall. Losses are minimised since adjacent tendons are anchored at alternating buttresses.

Generally a sliding type base is used for reservoir construction because it is logical for post-tensioned reservoirs, and simplifies the detailing at the base of the wall. The detail suggested is a continuous rubber bearing pad backed up by a waterproof membrane. This detail is simple, well tested by many applications and subject to reliable calculations regarding the degree of restraint it offers. A fixed base is generally used for containment vessels.

Vertical moments in the wall are due to a number of factors. Generally the critical combination for sliding base reservoirs is the temperature gradient and the differential shrinkage strain across the wall. The temporary moments induced by circumferential stressing can be controlled by the



stressing sequence to minimise their influence on design. Fixed base reservoirs will experience additional vertical bending moments due to the restraint offered at the wall base.

For structures with a wall height in excess of 6.0m it is economical to consider vertical prestressing to control the vertical moments.

CONSTRUCTION

The construction of insitu post-tensioned circular structures follow well established methods as described below:

- 1 Preparation of the sub-base to the detail of the Geotechnical Engineer & installation of any in-ground services.
- 2 Construct floor slab and the footing beam for the wall.
- 3 Erect precast internal columns for the support of the roof.
- 4 Installation of bearing pad on top of the footing beam.
- 5 Construct walls in horizontal lifts between 1.5 and 2.5m each. At this stage the prestressing anchorages and ducts are placed and secured. Alternatively the walls may be constructed in vertical segments, as precast or insitu.
- 6 Installation of the prestressing strand.
- 7 Stressing of the walls.
- 8 Construction of the roof slab or steel roof.
- 9 Installation of waterproof membrane between the wall and footing beam.

TRAINING AND ACCREDITATION OF ALL PT SITE WORKERS

PTIA is very pleased with the progress made in establishing re-education and skills accreditation for all PT site workers of its member companies.

PTIA is on target to have instructed and accredited every PT worker of members in NSW by mid 2008. The courses will then be extended to Queensland and Victoria and subsequently to all other states before September 2008. This timetable is required to ensure that the accreditation of NSW site workers may be updated in the last quarter of 2008. Then the sequence will follow to ensure all workers are continually being assessed and accredited by issue of skills tickets.

Once the PTIA training and accreditation system has been operational for two to three years and improved with any special local area considerations, PTIA proposes to then seek national recognition and accreditation for the PTIA Training and Accreditation scheme.



TIMETABLE OF TRAINING COURSES

The first courses will be conducted at two venues near Sydney to re-train and accredit the skills of all existing PT workers in the NSW and possibly ACT. The following timetable has been established.

Course Modules	Attendees	Venue
Modules 1 to 4 21 Nov 07	Leading hands and team leaders	Chapman Street Vineyard
Modules 1 & 2 28 Nov 07	New & existing PT employees.	Manns Road Gosford
Modules 1 to 4 5 Dec 07	Leading hands and team leaders	Chapman Street Vineyard
Modules 1 & 2 12 Dec 07	New & existing PT employees.	Manns Road Gosford
Module 3 6 Feb 08	Stressing and grouting operators	Chapman Street Vineyard
Modules 1 & 2 20 Feb 08	New & existing PT employees.	Manns Road Gosford
Module 3 5 March 08	Stressing and grouting operators	Chapman Street Vineyard
Modules 1 & 2 19 March 08	New & existing PT employees.	Manns Road Gosford
Module 3 2 April 08	Stressing and grouting operators	Chapman Street Vineyard
Modules 1 & 2 16 April 08	New & existing PT employees.	Manns Road Gosford

Member Companies

Corporate Members

Australian Prestressing Services Pty Ltd
(founding member)

Austress Freyssinet Pty Ltd (founding member)

Structural Systems Group (founding member)

VSL Australia Pty Ltd (founding member)



Associate Members

CMC (Australia) Pty Ltd

OneSteel Wire

Taylor Thomson Whitting



PTIA welcomes its new members

- Ajax Foundry Pty Ltd as an Associate member
- Haggie Reid Pty Ltd as an Associate member
- Hyder Consulting Pty Ltd as an Associate member
- Simon Pikusa (MPN Consulting, Brisbane) as an Individual member
- Ross McDougall (TTW, Canberra) as an Individual member



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Please visit the PTIA web site www.ptia.org.au for details about membership, membership benefits and membership application forms. If you have questions about membership, please contact PTIA through this web site and our office will contact you to discuss your questions.



“ensuring excellence and accreditation for the post-tensioning industry”

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