

# pt news

NEWSLETTER No 1 - 2008

## SKILLS TRAINING UNDERWAY

The Skills Training courses commenced in November 2007 with thirty leading hands and team leaders completing modules 1-4, and fifteen new and existing PT employees completing modules 1 and 2. Courses recommence in February as shown on the back page of this newsletter. Look for the "Skills Ticket" holders on your building projects.



## A progressive New Year

### Happy New Year to all members and friends.

The PTIA Board, elected at our inaugural Annual General Meeting on 19 November, 2007 remains largely unchanged with myself as President, Ian Stuart (VSL Australia) as Vice President and Max Schweiger (Structural Systems) as Secretary/Treasurer. Continuing directors are Michael O'Neill (Australia Prestressing Services) and Ed Cross (Austress Freyssinet). I particularly welcome David Carolan (Taylor Thomson Whitting) as a new director and look forward to his contribution from a consulting engineer's perspective.

Your Board has a strong and ambitious programme for 2008, key items of which are:

- completion of Skills Training courses in New South Wales, then extending these to Queensland and Victoria
- conduct of six Prestressed Concrete Design workshops for consulting engineers
- a new seminar series to be held in Sydney, Brisbane and Melbourne jointly with the Concrete Institute
- development of new Technical documents which will be highlighted in these newsletters and posted to our web site
- expansion of our interaction with other groups including CCAA, ASA, ACRS, Engineers Australia, ACSE and Natspec.

I am also delighted to welcome our new members who are listed on the last page of this newsletter.

PTIA has planned a significant series of courses and seminars which are detailed on the last page. We are presenting these in accordance with our mission to promote high standards in design, construction and materials for post-tensioning.

The 2008 seminar series builds on the 2007 seminars and will present details on a range of post-tensioning applications, D&C requirements and technical topics. These should be of particular value to design engineers, builders and contractors.

We are also pleased to sponsor the Prestressed Concrete Design workshops presented by Cement and Concrete Services, and to be able to offer our consulting engineering Associate members substantial subsidies on the fees for these workshops.

Our Skills Training courses commence again in February following on from a successful start late in 2007. All employees completing these courses are issued with a "Skills Ticket" card and will be required to be reassessed at annual intervals.

I encourage people in the PT industry to feel free to visit the PTIA web site or to contact the PTIA for any queries which they may have about post-tensioned concrete construction.

**DAVID PASH**  
President

# PROJECT REPORT

**Location:** Chatswood, Sydney

**Client:** CRI & Laing O'Rourke

**Contractor:** Australian Prestressing Services

**Consultant:** Taylor Thomson Whitting

## Chatswood Transport Interchange

Construction is nearing completion on the Chatswood Transport Interchange (CTI), which is being developed in a Public Private Partnership between the Transport Infrastructure Development Corporation (TIDC) and CRI. The CTI, which in addition to the new Chatswood Railway Station and bus interchange includes a 10,000m<sup>2</sup> retail complex and a residential development of 500 units in three towers, has an estimated value on completion in excess of \$360 million. The project is scheduled to finish in line with the commencement of rail services on the Epping to Chatswood Rail Line in 2008.

Laing O'Rourke, the D+C Contractor engaged Taylor Thomson Whitting (TTW) as the structural design engineers and Australian Prestressing Services (APS) as the post-tensioning contractor.

The project is an unusual mix of rail, building and civil engineering works. Post-tensioned banded slabs and flat plates have been used for the basement carpark floors and the retail slabs. There are approximately 350m of suspended track structure which is typically a post-tensioned flat plate. New rail bridges have also been constructed at each end of the project over Help St and Albert Ave. These are single span structures using precast pretensioned girders.

Chatswood is currently the ninth busiest station on the City Rail network and is used by some 35,000 rail commuters daily. Except for the occasional track closures during possessions, two tracks were required to remain operational through 30 months of construction. Initially a temporary platform was constructed to provide an area sufficient to commence construction of the permanent works. The western

half of the project was constructed first. Following its completion, train services were relocated to the newly constructed western platform and concourse area. The temporary platform was then demolished and construction commenced on the eastern half.

The north track slab consists of a 1m thick post-tensioned slab, 120m in length. The western half was constructed top-down and the pair of tracks became operational prior to excavating beside and beneath this slab. Finite element models were prepared for all construction stages and these models were used to check stresses resulting from concrete shrinkage and the restraint from the supporting bored piers.

The central area of the project consists of three basement carparks, the rail concourse level, track level, retail podium and roof slab. Temporary columns were required to support the post-tensioned band beams at the podium and roof levels along the line of the construction joint between the two construction stages. These temporary columns were also located adjacent to an active rail line. Instead of designing these columns for rail collision loads, the podium and roof band beams were designed to be able to cantilever and support construction loads should a collision occur. The podium slab located above track level was also required to be designed for a collision impact load in its final configuration.

The project brief included limits on the transfer of structure borne noise from the rail level to nearby apartment floors. This was achieved by the use of a floating track slab (FST) which consists of precast planks and rubber bearing pads supporting the rail.



# ACHIEVING WATERTIGHT CONCRETE SLABS

“Watertight” concrete is a controversial issues and is often confused with the term “waterproof” concrete.

Concrete is a mixture of materials bound by a cement paste, which is porous. Passage of water is able to pass through the concrete via a capillary tract system, which links these pores. By adopting best practices, this small amount of water does not affect the end service condition and hence enables the designer to refer to this particular element as watertight. Due to its porous nature we do not refer to any concrete element as “waterproof”.

## Definition of a Watertight Slab

The Concrete Institute of Australia defines watertightness by the concrete element as: “being impermeable to water except when under hydrostatic pressure sufficient to produce structural discontinuity by rupture”.

In many international standards reference to watertight concrete is only made in specific instances relating to liquid retaining structures or structures exposed to severe conditions. AS 3600 is also silent with regard to the watertightness of concrete slabs, however the inference can be drawn from sections of the standard that define degrees of crack control. By limiting the possibility of cracking and crack widths, the designer is able to achieve a watertight slab.

## How do we achieve a watertight slab?

There are many factors which may influence the ability of a concrete element to be considered watertight. Factors which need consideration are;

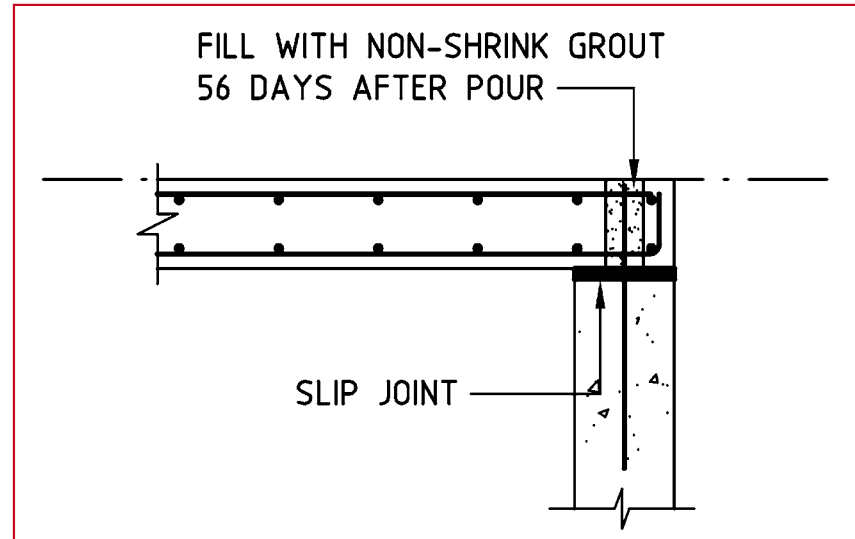
- Structural design
- Detailing for restraining members
- Concrete mix
- Concrete placement, compaction and finishing
- Environmental conditions (rain, wind, hot weather etc)
- Concrete curing

**Design:** Utilising post-tensioned techniques it is possible to achieve a design that in the primary direction provides almost no tensile stresses in flexure hence leading to uncracked conditions under service loads. In terms of the secondary direction, watertightness can be achieved by

combining appropriate levels of prestress and reinforcement for the control of cracking. AS3600 (clause 9.4.3) provides minimum requirements based on exposure classifications and restraint conditions for this to be satisfied. It is generally accepted that residual compression (P/A) levels between 1.8-2.0MPa plus the inclusion of mesh reinforcement satisfy these requirements.

**Detailing:** To successfully achieve a watertight element it is imperative that restraint conditions are closely examined. Large pours and vertical elements such as columns and walls can create significant restraining actions which may cause cracks to develop. In such instances attention to detail and appropriate isolation of the member is required to relieve the resultant stresses and alleviate the risk of cracking. A typical example of such a detail is shown below in the case of a concrete wall supporting a slab.

the final result of the concrete element is largely determined by the on site placement of the concrete on the formwork. It is essential that best practices in terms of adequate compaction of the concrete occur and finishing of the concrete is commenced and completed at the correct time. Early finishing of the concrete may be detrimental resulting in excessive bleeding of the mix and hence excessive evaporation of water. Hot weather and high wind can also cause rapid high evaporation of the mix leading to quick drying resulting in increased tensile stresses on the top surface which can develop into cracks. In these instances fast and efficient curing of the concrete should be undertaken which prevent and reduce the rate of evaporation of water from the concrete in the plastic state. The use of aliphatic alcohol can prevent the rapid evaporation of bleed water prior to the application of the final curing method.



Detail at the slab/wall junction to minimise restraint

**Concrete Mix:** The choice of mix design is equally important. Typically for watertight elements shrinkage strains within the concrete should be limited. Similarly the mix should be proportioned to prevent early thermal cracking in the plastic state and sufficient in strength gain to apply a nominal 25% stress level at 24 hours (9MPa).

**Concrete placement/Environmental Effects/Curing:** Factors affecting

## Conclusion

With adequate attention to design, detailing and concrete placement methods a watertight post-tensioned structure may be achieved for a large variety of projects such as roof slabs, walls, retention basins, reservoirs, containment vessels and the like. For further information on the achievement of watertight structures feel free to contact one of the PTIA members for assistance.



# PRESTRESSED CONCRETE DESIGN WORKSHOPS – 2008

PTIA is sponsoring a series of Prestressed Concrete Design workshops to be presented by Cement and Concrete Services (CCS). For consulting engineering firms who are Associate Members of the PTIA, there are significant subsidies on the fees for these courses – details are available from CCS at [www.cementandconcrete.com](http://www.cementandconcrete.com). Registrations for workshops are to be made through CCS.

These two day workshops are developed for engineers who are familiar with reinforced concrete but who have little experience with prestressed concrete and who wish to gain an understanding of the principles of analysing and designing statically determinate prestressed beams. An optional third day workshop on computer aided design for prestressed concrete is also available.

City	Venue	Dates 2008
Brisbane	Mercure Hotel	5 & 6 March
Melbourne	Hotel Grand Chancellor	16 & 17 April
Sydney	Stamford Grand Hotel, North Ryde	7 & 8 May
Melbourne	Hotel Grand Chancellor	17 & 18 Sept
Sydney	Stamford Grand Hotel, North Ryde	15 & 16 Oct
Brisbane	Mercure Hotel	12 & 13 Nov

## SEMINARS AND OTHER EVENTS SCHEDULE - 2008

Location	Event	Dates 2008
Newcastle	Latest developments in post-tensioned concrete structures. Jointly with CIA & Eng Aust	Feb/ March (tentative)
Sydney	Seminar with CIA	9 April
Sydney	Seminar with Eng Aust	27 May
Brisbane	Seminar with CIA	27 Aug
Melbourne	Seminar with CIA	Nov (tentative)

## PTIA SKILLS TRAINING COURSES SCHEDULE - 2008

All courses will be conducted at Manns Road, Gosford.

Course Modules	Attendees	Dates 2008
Module 3	Stressing and grouting operators	20 Feb
Modules 1 & 2	New and existing PT employees	5 March
Module 3	Stressing and grouting operators	19 March
Modules 1 & 2	New and existing PT employees	2 April
Module 3	Stressing and grouting operators	16 April
Modules 1 & 2	New and existing PT employees	30 April
Module 3	Stressing and grouting operators	14 May
Modules 1 & 2	New and existing PT employees	28 May
Module 3	Stressing and grouting operators	11 June
Modules 1 & 2	New and existing PT employees	25 June

## 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 – suppliers

Ajax Foundry Pty Ltd

CMC (Australia) Pty Ltd

Haggie Reid Pty Ltd

OneSteel Wire Pty Ltd



**SCAW METALS GROUP**  
Haggie Reid Pty Ltd

**onesteel**

### Associate Members – consulting engineers

Hyder Consulting Pty Ltd

Taylor Thomson Whitting



### PTIA welcomes its new members

- Paul Davis (Paul Davis Rajalingam Consulting Engineers, Sydney) as an Individual member
- Robert Alexander (Parsons Brinkerhoff, Brisbane) as an Individual member

### Post-Tensioning Institute of Australia Limited

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Please visit the PTIA web site [www.ptia.org.au](http://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.



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