

PRESIDENT'S REPORT

In this Newsletter, we feature some interesting applications of post-tensioning technology as distinct from post-tensioned concrete floor slabs. Heavy Lifting systems have been used on many significant projects and are finding more and more applications across a wide range of industries. The Stressed Roof Structures enable very large span, column free structures to be constructed.

These applications were featured in a recent PTIA seminar presented for the NSW Branch of the Concrete Institute, along with presentations on Heavy Duty Industrial post-tensioned slabs on ground, and on the recently completed Gateway Bridge Upgrade project. PTIA is hoping to present these topics with Concrete Institute in Victoria and Brisbane later in the year.

We are particularly pleased with the continued progress with the PTIA industry training objectives. As reported on page 4 of this Newsletter, we are pursuing an objective to have a stand alone Certificate III level qualification in post-tensioning. The Construction and Property Services Industry Skills Council is embarking on a scoping exercise to determine the support for this qualification and to verify the proposed content of the course. PTIA has also been promoting safety and training, conducting courses for NSW WorkCover, MBA Victoria and a number of major building organisations. We are getting significant interest in what these courses contain from many of the training and safety organisations in NSW.

We encourage all builders and contractors to require all PT workers to be properly trained in the interests of work safety and quality.

One of the outcomes from our training initiatives is the provision of a short course, including White Card, for people working in the building and construction industry with work activities related to PT, such as Project Managers, Safety Officers, site engineers, students on work assignments, and others (see page 4 for more detail).

Generally we are noticing an increase in activity for post-tensioned building work in NSW and the ACT. This increased activity should translate into more interest and support for PTIA initiatives in all areas.

PTIA will hold its fifth Annual General Meeting in Melbourne on 28 September. Members and other interested groups are most welcome to attend. This meeting will provide Melbourne based people and organisations the opportunity to engage with PTIA Directors. If you are interested in attending, please advise us by email to info@ptia.org.au.

Michael O'Neill
President



WINNERS: AWARDS FOR EXCELLENCE

Concrete Institute State Awards for Excellence include many post-tensioned structures.

Congratulations to winners in the recently completed State Awards for Excellence events held by the Concrete Institute of Australia.

Winners where post-tensioning was involved include –

Queensland : Gateway Bridge Upgrade

New South Wales : New Iron Cove Bridge

Victoria : Djerriwarrh Creek and Pyrities

Creek Bridge Structures, and Cherry Lane

Container Park Pavement Rehabilitation

Winners of these State Awards are now

being judged for National Awards to be

presented at the Concrete Institute Biennial Conference in Perth in October.

Perth Arena

Location: *Perth, Western Australia*
Owner: *Government of Western Australia*
Architect: *Ashton Raggatt McDougall Pty Ltd & Cameron Chisholm & Nicol (WA) Pty Ltd*
Consulting Design Engineer: *Aurecon Australia Pty Ltd*
Main Contractor: *BGC (Australia) Pty Ltd*
Steel Work Erector: *Perth Rigging Co. Pty Ltd*
Specialist Lifting: *Contractor: VSL Australia Pty Ltd*



Perth's skyline and sporting infrastructure is about to change with the opening of its newest iconic structure, the Perth Arena. The distinctive multipurpose indoor sporting and entertainment facility will seat approximately 15,000 people with car park amenities in Perth's city centre.

A fundamental component of the project was the construction of the complex steel structural roof with its 115 metre span retractable roof over the main arena. The 2,200 tonne main portion of the roof was lifted vertically approximately 25 metres into place using strand jacking Heavy Lift techniques. The technique enabled the major components of the roof to be assembled at ground level with prefabricated elements, with M&E, commissioning and cladding fitted and then lifted as one unit. Apart from the obvious benefits in safety, quality, economics and efficiency, the technique minimized the hazards and delays inherent with conventional crane operations from Perth's renowned strong winds.

Benefits of strand jacking include the capability to mechanically lock off the lift at any elevation, at any time, and for an indefinite period where the lifting bundle becomes a static tie element. Being able to monitor and control a lift within millimetres, coupled with the advantages of a "flexible" and adjustable tie, allows the suspended load to be adjusted in space for easier fit up. A demonstrated history of proven reliability and outstanding safety performances provides an outstanding testimony to the success of strand jacking in the handling of complex tasks.

The three hour lift was engineered and executed by VSL Australia Pty Ltd using four synchronised lifting points

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arranged in the four corners of the 130 metre long by 38 metre wide primary steel framing "Megatrusses". Each lifting point comprised a pair of VSL 580 tonne jacks mounted on VSL's temporary, free cantilevering portal frame structures which in turn were anchored to the arena's basement slab. Each lifting point was linked to a fully integrated remote control centre which, with load sensors and laser level system, continuously monitored and controlled the operation within the strict pre-set parameters and tolerances.



HEAVY LIFTING TECHNIQUES

Heavy Lifting Techniques have been around since ancient days. Images of massive stone blocks moved and lifted into place come to mind. Instead of thousands of manual workers as in the past, however, pneumatics, hydraulics, high tensile steels and programme logic control units are now the tools of today.

Utilisation of hydraulics and in particular the extension of post-tensioning plant and techniques enables the controlled application of force for the handling of awkward and or heavy loads. In effect, the applied force is only limited by the support structure, and jacking forces in the thousands of tonnes are typical.

Use of these techniques has increased as the move towards prefabrication and modularisation has increased, along with a greater emphasis on safety and environmental challenges in the work place. The ability to handle bigger and bigger pieces enables more items to be fabricated and preassembled in workshops offsite. Quality and safety is improved and construction times can be significantly reduced. General cranaage replaces special oversized cranes for one off critical lifts. Numerous small lifts are thus replaced by engineered movements of fewer, heavier pieces. The often high risk works aloft are mitigated and so are the environmental constraints of wind and rain that typically affect crane works.

Strand jacking provides continuous load monitoring as well as multiple redundancies in the lifting elements. Unlike winch ropes in cranes and other continuous rope based devices, the load in the strand bundles can be locked off mechanically at any position for an indefinite period of time. The lifting element becomes a static structural steel element in the same way as any incorporated tie or strut member within a structure. Factors of safety are typically 2.5 on the lifting strand which at 40% UTS, is approximately half of the usual design loads for the same components in post-tensioned structures e.g. elevated road viaducts etc.

Heavy Lift Techniques are used in all industries and in applications ranging from underground to skyscrapers, in the resource and energy sectors as well as civil and monitoring works.

Recent applications of strand jacking are readily seen on Manmade Marvels and Mega Structures. Some closer to home recently in Australia include: Perth Arena (2,500t steel roof) 2010, Box Jacking at Toombul (26,000t) 2011, TBM Lowering (1,400t) 2011 as well as on some other selected structures around the world.

Above, left: Toombul Box Jacking. Part of the equipment for 26,000t Combination Strand and solid ram jacks.

Centre: Werribee Aqueduct ILM Launched using 4x7x15.2mm dia strand bundles.

Right: Toombul QLD TBM lowering 1,400t



STRESSED ROOF STRUCTURES

s² Corporation and its precursor companies have evolved as a world leader in the provision of large span post-tensioned steel solutions over a period of 30 years.

Across Australia, Asia and the Middle East, s² has built a legacy of highly efficient, pure space for aircraft hangars, industrial facilities, office buildings, sporting complexes, and equine centres.

All of these spaces are characterised by large, clear span open volumes. s² has delivered post-tensioned steel solutions up to 120m clear span on projects for such clients as Boeing, Qantas Defence, EADS Australian Aerospace, Sydney Olympic Stadium, Department of Defence, numerous Councils and tier-one builders.

Building upon fundamental physical principles of equilibrium, the s² genre of structures has evolved that can store energy against applied loads, to control strain and deflection, which is at the heart of successful solutions to these problems.

By post-tensioning cables and cable net structures inside a structural form, and bonding them to the parent structure, a pre-load condition can be established that controls deflections. By controlling deflections in this way, structural material can be minimised enabling stronger, stiffer structures of increasing span.

In our current world where the embodied energy inherent in the creation of structures is attracting a higher level of importance, the ability to store energy in a structure enables a reduced carbon foot-print to be generated. This is a key feature of s² and design technology, as the philosophies contained in it enable many more structures to be built from a given amount of material.

Recently OneSteel has supported the adoption of this technology by funding the development of a range of modular products incorporating the patented LiteSteel beam section. The combination of LiteSteel beam and post-tensioning has created a range of efficient wide-span, column free structures which can be rapidly deployed into a range of end uses. OneSteel and s² are finalising an exclusive license agreement for the commercialisation of post-tensioning technology in Australia and the United States of America.

PTIA TRAINING NEWS

PTIA's ambition is that all workers in PT are properly trained, and this ambition is gaining support from WorkCover organisations and Unions.

CERTIFICATE III qualification in post-tensioning

We are most pleased to report that we are progressing towards a stand alone qualification in Post-tensioning. PTIA has been holding fruitful discussions with the Construction and Property Services Industry Skills Council (CPSISC) regarding the introduction of a stand alone Certificate III qualification in Post-Tensioning. CPSISC is commencing a scoping exercise, gauging opinion from stakeholders on the relevance and need for such a qualification before submitting their recommendations to DEEWR. We hope that all members and others directly or indirectly involved with post-tensioning will support this ambition.

SHORT COURSE in post-tensioning, incorporating White Card

Emerging from the *Skills Training* courses, is a new short course in PT designed for people working in the building and construction industry with work activities related to PT. This course has been developed with the following classes of people in mind –

- project managers
- project engineers
- consulting engineers new to PT
- safety officers
- union workers
- engineering and other students on industry work experience

This eight hour course involves six hours of classroom style learning and two hours of site demonstrations and learning. It will also include the required instruction and assessment for the Construction Industry General Induction (CPCCOHS1001A) certificate (White Card). Course participants should acquire knowledge, skill and understanding of –

- OH&S requirements for Post-tensioning on site
- The Fundamental concept of Prestressed Concrete
- Post-tensioning terms and definitions
- The processes for the Installation, stressing and grouting of Post-tensioning systems
- Post-tensioning construction hazards and control measures
- OH&S legislative requirements
- OH&S communication and reporting processes
- OH&S incident response procedures

Courses will be run on demand when a minimum of 12 people have registered. Details are shown on the PTIA web site.

Enquiries and applications for all courses should be directed to PTIA at ptia.org.au

Course	Non- Member fee	PTIA Member fee
Skills Training & Assessment course		
• Mono Strand (CPCCSF3002A)	\$1,100.00	\$550.00
• Multi Strand (CPCCSF3003A)	\$1,100.00	\$550.00
• Stress Bar (CPCCSF3004A)	\$1,100.00	\$550.00
RPL assessment	\$935.00	\$467.50
Short course in PT including White Card	\$484.00	\$242.00

MEMBER COMPANIES

Corporate Members

Australian Prestressing Services Pty Ltd (founding member)
Structural Systems Pty Ltd (founding member)
VSL Australia Pty Ltd (founding member)

Associate Members – suppliers

Ajax Foundry Pty Ltd
Ancon Building Products
Haggie Reid Pty Ltd
Holcim (Australia) Pty Ltd
OneSteel Wire Pty Ltd
RefoBar Australia
Sanwa Pty Ltd
Severs Technical Systems Pty Ltd
Usha Martin Australia Pty Ltd

Associate Members – consulting engineers

ABC Consultants
Arup
Bornhorst + Ward Pty Ltd
Costin Roe Consulting Pty Ltd
Hyder Consulting Pty Ltd
McVeigh Consultants Pty Ltd
Parsons Brinkerhoff
SCP Consulting Pty Ltd
Taylor Thomson Whitting



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