ptNEWS

Newsletter 3 - 2014

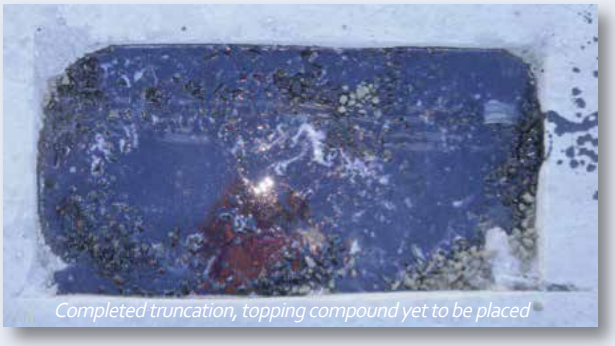
POST-TENSIONING INSTITUTE OF AUSTRALIA LIMITED

TRUNCATION OF POST TENSIONED TENDONS

Tendon Truncations are a newly formed, epoxy based, anchorage zone in an existing post-tensioning tendon.

The anchorage zone is strengthened to achieve comparable performance to that of a proprietary cast in place anchorage system. *AS3600-2009 Cl. 13.3.3*

"Anchorages for tendons shall be capable of developing the tendon the minimum tensile strength (f_{pb})"



Completed truncation, topping compound yet to be placed

Truncations should enable compliance with the intent of the code.

PTIA promote the use of tendon truncations whenever the tendon is to be preserved.

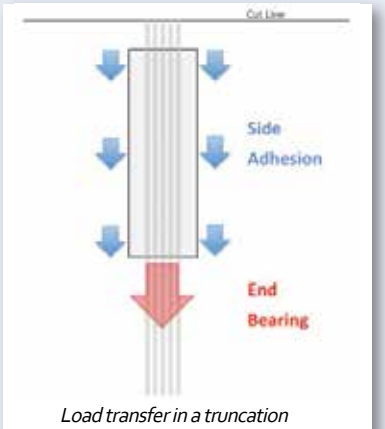
It is important to consider the only tendons that do not require truncations are those that become redundant following structural modifications, often due to insufficient lengths or substantially different load paths.

The role of Grout

Due to the fact that grouting occurs when tendons are only subject to short term losses, the grout is only ever required to transfer the "incremental" load in the tendon. Tendon grout was never intended / required to transfer the full load in the tendon – as would need to be the case if a truncation was not employed.

What about bursting reinforcement?

Truncations can be thought of as transferring load by both side adhesion and end bearing. The epoxies bond to the side faces should have sufficient adhesion to allow the end bearing load to be within the range as defined by AS3600-2009 Cl. 12.6 to alleviate the need for special confining reinforcement.



Load transfer in a truncation

AUSTRALIAN AND NEW ZEALAND STANDARDS RELATING TO POST-TENSIONING

Design and Installation

Technical and performance requirements for building and construction work in Australia and New Zealand is set out in each country's Building Code. The building codes are supported by referenced Standards that provide rules, guidelines and specifications for works undertaken in our industry.

Post-tensioning Contractors and Post-tensioning Designers need to be aware of relevant standards that relate to their works. The following standards directly relate to post-tensioning design and installation works:

AS/NZS 1170 (Parts 0 to 3): Structural Design Actions (loading codes) for permanent, wind and snow loads

AS 1170.4-2007: Earthquake Loadings for Australia

NZS 1170.5:2004: Earthquake Loadings for New Zealand

AS/NZS 1314-2003: Prestressing Anchorages

NZS 3101-2006: Design code for concrete structures in New Zealand

AS 3600-2009: Design code for concrete structures in Australia with a design life up to 50 years

AS/NZS 4672-2007: Steel Prestressing Materials

AS 5100 (Multiple Parts): Design requirements for bridges and structures with a design life of up to 100 years

Australian Standards also cover other aspects of building works that directly or indirectly relate to post tensioning works. These include:

AS 1012 (Multiple Parts): Methods of Testing Concrete

AS 1379-2007: Specification and Supply of Concrete

AS 1478 (parts 1 and 2): Chemical admixtures for concrete, mortar and grout

AS/NZS 1554.3-2008: Welding of reinforcing steel

AS 2670 (parts 1 and 2): General requirements for vibration and Continuous and Shock Induced Vibration in Buildings

NZS 3112 (Multiple Parts): Methods of Testing Concrete

NZS 3106-2009: Design of concrete structures for storage of liquids

AS 3610-1995: Formwork for concrete

AS 3735-2001: Concrete structures for retaining liquids

AS/NZS 4671-2001: Steel Reinforcing Materials

NZS 3109-1997: Requirements for construction of concrete elements in NZ

HB 64-2002: Guide to concrete construction (Australia)

NOTE: The above is a guide only. All Standards should be read to include all the latest amendments to the published version.

CONTENTS

Truncations of Post Tensioned Tendons & PT Standards	1
Project Report: APS Blackman Park	2
Truncations *continued*	3
Events & members	4

Blackman Park Lane Cove

Location: *Lane Cove, NSW*

Client: *Lane Cove Municipal Council*

Contractor: *Australian Prestressing Services Pty Ltd*

To provide a more serviceable sporting field in the area, Lane Cove Council is undertaking the installation of a synthetic sports surface on an old landfill dump site. Until recently this area had a sports field operating on top of a soil layer placed above a decomposing rubbish dump.

Generally, landfill sites are continually sinking and produce a very uneven playing area that requires continuous maintenance to be fully utilised. To overcome this problem, Lane Cove Council is placing a synthetic field on a concrete slab. This provides a surface with a long term solution, almost maintenance free, and with correct establishment and lighting it can provide many extra hours of use in all weather, year round. The concrete slab on piles down through the landfill allows the fill material to settle further over time and not disrupt the playing fields.

Many suburban Councils are finding it increasingly difficult and expensive to provide good quality playing surfaces. Where landfill sites or other areas are available but unsuitable for a high standard of playing finish, the concrete slab and synthetic surface provides a very efficient solution. A concrete slab with a built in gas collection system also provides a great seal against unwanted toxic leakage and allow gas collection if necessary.

In January of this year, Lane Cove Council awarded Australian Prestressing Services (APS) a design and construct contract to complete an 18,750 m^2 (150 m x 125 m) sealed slab over an old landfill site at Blackman Park adjacent to the Lane Cove River.

The site, when completed with its synthetic surface will provide for a cricket pitch, and two soccer or rugby fields or AFL field. The site will be secured and served with an excellent lighting system. Because of the very high level of concrete finish the surface will drain in a way that it provides all weather playing.

This particular site had landfill placed in depths from 2 metres to 29 metres deep. Originally, the site was a valley that had a stream running through it to the river. Bedrock is generally sandstone with a steep profile down to the original creek bed, up to 30m below.

APS chose a design using a post-tensioned slab on piles to support the synthetic surface.

Work on site commenced in January with the placing of approx. 23,000 m^3 of fill obtained from nearby excavation sites.

Piling commenced with bored piers at 9m centres down to approx. 10m then CFA piles for all others down to 30m total depth. All piles were 400 mm diameter reinforced concrete with pre-welded reinforcing cages. Piles were completed with a 2m x 2m x 400mm pile cap, poured integrally with the pile. The post-tensioned slab was designed to float on these pile caps initially, to be later fixed with dowels after all stressing and initial shrinkage.

Because of its large size the slab was poured in eight large pours with smaller perimeter and infill pours. Smaller infill pours completed the cricket pitch areas and perimeter paths. A drainage system was cast around the perimeter to control surface run off and taken into the existing drainage system.

The synthetic turf is made up of a series of layers. First is a conventional solid drainage cell mat. On top of this is placed a rubber base, with the turf then laid in wide mats over the rubber. When placed, the turf is filled partially with a synthetic backfill and then a loose sand fill to give a more realistic feel to the playing surface.

The field when finished should have a surface that has the characteristics of a lawn with significantly more durability.

Some of the statistics for the project are listed below:

PROJECT STATISTICS

Slab Area:	18,750 m^2 (150 m x 125 m)
Synthetic Pitch Area:	16900 m^2 (146 m x 116 m)
Supporting Fill:	22,000 m^3 compacted backfill
Piles:	256 bored and CFA to 30 m depth each 400 mm diameter
Total Length of Piles:	4,970 LM
Slab Concrete:	5,000 m^3 approximately
Reinforcement & Mesh:	160 T and 20,000 m^2 approximately
Post-tensioning:	120 T
Gas release pipes:	650 LM
Drainage:	270 m of 375 mm diameter with suitable pits
Electrical:	6 x high mast lights
Playing Field:	1 x cricket pitch that can be lowered when not in use, allowing play over the top 1 x AFL playing field or 2 rugby fields or 2 soccer fields

CONT/..P1

PTIA truncation procedure overview

No specific code coverage or guidance, practices in industry vary.
The advice below is generic, and may not be suitable for your specific application (refer to a PTIA member company for further details).

Concrete, duct and grout removed prior to placement of epoxy

Truncations installed prior to saw-cutting new stair penetration

1. **Safety First**
   Is all in-slab power completely disconnected?

2. **Is any necessary propping / supporting structure in position?**
   Ensure adequate propping is in position prior to commencement. Consider the requirements of the completed structure, the temporary cases that may occur during concrete removal AND as a result of concrete removal. Also consider the potential of damage to existing tendons during concrete removal.
   Do not design propping to occur in areas that may need to be formed during the truncation process.

3. **Locate post-tensioning tendon positions**
   Depending on the structure, as-built drawings may or may not be available. We recommend GPR scanning by a suitably experienced operator, to ensure accurate identification of all tendons. Evidence of tendons on site can also be gathered from the structure itself by suitably experienced personnel.

4. **Concrete removal**
   Sawcut the perimeter of the hole to around 10mm depth to prevent over break on the surface, this also avoids feathered edges. Using large capacity jack hammers remove the concrete until the duct is visible or if the tendon depth is known, restrict large hammer to within say 10-20mm of the duct.
   Never cut reinforcement without approval.
   Highly reinforced areas are also symptomatic of highly stressed, more sensitive areas of the structure. Lighter capacity hammers can be used to remove concrete around the tendon without damaging the strand itself. Ensure minimum clearances around the strand are achieved. Take care when removing duct from the tendon, cut material can be very sharp!

5. **Infill Material**
   Why epoxy? Can I use a very high strength micro-concrete?
   Generally.... **No**.

   Epoxies typically have compressive strengths of the order of 100MPa. However, there are some high performance micro-concretes now available that achieve similar compressive strengths – the issue here is two-fold;
   a) Strength gain: Normally truncations are required to be cut within a day or two of the installation, and,

   b) Tensile / Bond Strength: Epoxies generally exhibit FAR higher tensile / bond strength than cementitious products

   c) Infill Material Epoxies should be chosen for their hardened performance criteria and their ability to be placed to the required placement depth. Epoxies react and cure exothermically, producing high levels of heat – never exceed the manufacturers recommendations on placement depths.

   PTIA preferred epoxy performance criteria,
   Compressive strength: 60MPa in 24 hours (at the time of cutting) 100MPa in 7 days.

6. **Placement of Epoxy**
   Whilst all manufacturers recommendations must be followed, the most common error at site level is part kit mixing and incorrect proportioning.

   Incorrect mix proportions can result in epoxies that turn to jelly and take days / weeks to cure if at all, or, react so fast that they tend to fracture.

   Once the epoxy has been place to the required depth, say 80mm – 100mm, central about the strand, broadcast course sand or fine aggregate to promote bond to the topping compound.

7. **Making good**
   Topping compounds, generally cementitious, should be selected to achieve performance criteria appropriate for the location.
   e.g. Vehicular, forklift access, external, architectural etc.
   Allow min. 24hours curing time prior to saw-cutting tendon. Strand ends should be epoxy coated at the cut face for durability.
   - Tendon truncations performed correctly allow surety in design.
   - Tendon performance may be guaranteed for the structure's life.
   - Relatively simple and economical to install.

PTIA member companies can assist with the design and execution of tendon truncations.

PTIA WELCOMES CROSBIE NATIONAL CEMENT AS OUR NEWEST MEMBER

Crosbie National Cement wishes to take this opportunity to thank the PTIA for inviting our Company to join your Association.

As most of the members of the PTIA will certainly know, the key people at Crosbie have been supplying Cement and related products to the PT industry throughout Australia for the best part of 20 years. We certainly understand your needs.

Grouting of Post- tensioning Tendons is an important phase of the Post-Tensioning process. Recently, some cheap "home branded" Cements have started appearing in the market. Please beware! In most cases the origin of these "home branded" cements is not disclosed. They may originate locally or from various parts of Asia, depending on where the product is purchased.

The PTIA always recommends the Grout be batched using GP Cement no older than 90 days from date of manufacture. It's almost impossible to manufacture the cement in Asia, load it into containers, ship it to Australia, warehouse it and then distribute it to sites within the PTIA's recommended time frame. Batching Grout with imported cements has many other risks as well. If in doubt, ask your supplier for a current NATA Test Certificate for the cement you are using now.

The Cement supplied and delivered to you by Crosbie National Cement is 100% Australian made, it is that fresh, and often it will arrive at your site still quite warm from the manufacturing process! Current NATA Test Certificates are always available and when requested, we can easily send subsequent Certificates to our customers on a monthly basis.

Technical Seminars

PTIA will present a PT seminar with Concrete Institute in Brisbane, on 25 November. For details and registration, visit the Concrete Institute website - www.concreteinstitute.com.au/

Training Course

The PTIA Monostrand Post-Tensioning Training course (CPCCSF3002A), including assessment for Recognised Prior Learning (RPL) can be accessed through the "News and Events" page of the PTIA website – www.ptia.org.au

Networking Events

PTIA held another PT Industry Forum in Sydney on 10 June. At this event, guests were able to network and meet with PTIA Directors. There were also short presentations about – Monostrand Guidance Note, Grouting, and PTIA activities. The event was well attended with some 50 people including guests and PTIA Members.

Please visit:
www.ptia.com.au
or email:
info@ptia.org.au
for more information

MEMBER COMPANIES

Corporate Members

Australian Post-Tensioning Pty Ltd
Australian Prestressing Services Pty Ltd (founding member)
Interspan (NSW) Pty Ltd
Structural Systems Pty Ltd (founding member)
Tensioned Concrete Pty Ltd

Associate Members – suppliers

Ancon Building Products
Crosbie National Cement Pty Ltd
OneSteel Wire Pty Ltd
Refobar Australia
Severs Technical Systems Pty Ltd

Associate Members – consulting engineers

ABC Consultants
ADG Engineers (Aust) Pty Ltd
Bornhorst + Ward Pty Ltd
Costin Roe Consulting Pty Ltd
Hyder Consulting Pty Ltd
SCP Consulting Pty Ltd

POST-TENSIONING INSTITUTE OF AUSTRALIA LIMITED ABN 86 121 218 228 PO Box 861, Five Dock NSW 2046
Telephone: 02 8765 6199 Facsimile: 02 9743 4013 Email: info@ptia.org.au Web: www.ptia.org.au