

## ACARP ROADWAY DEVELOPMENT OPERATORS' WORKSHOP – OCTOBER 2011

### Workshop Report

The theme "Installation of Long Tendons in Roadway Development" was adopted in response to both a recognition that long tendons were becoming more widely employed as a primary support in gateroad development, and feedback from earlier Workshops where participants identified that installation of long tendons was a major barrier to improving gateroad development performance.

The Workshop program was structured to address three key aspects relating to installation of long tendons as noted below, with consulting geotechnical engineers, OEMs and suppliers, and mine based geotechnical engineers and development coordinators making presentations around these aspects:

- Geotechnical considerations for installation of long tendons in gateroad development;
- Developments in long tendon technologies and hardware, and;
- Long tendon installation practices at mines.

While the two consulting geotechnical engineers agreed that maintaining development rates was a critical factor in reducing the likelihood of deteriorating ground conditions, they presented a number of divergent views on how long tendons might effectively be employed as primary supports in gateroad development, including both placement of the tendons above the roadway and whether they should in fact be grouted. Readers would be well advised to seek an understanding of the arguments proposed by both engineers, and the implications of those arguments on roadway support design and practice.

Suppliers outlined the introduction and refinement of long tendons in roadway development over the past two decades, and provided a number of valuable insights into the learnings made by operators and suppliers alike in regards to their successful introduction. Suppliers also detailed some of the recent developments with torque tensioned tendons, pumpable resins, and cable pushers, and identified areas for future development including high load transfer tendons, and a cable pusher capable of rotating the tendon and mixing the resin anchor.

The mine-based presentations outlined a number of "best practice" examples of the use of long tendons in roadway development, covering nearly all of the currently available long tendon technologies. Clearly, the industry has benefited greatly from innovations in long tendon technology and installation practices pursued by some of these mines, Angus Place in particular. The presentations should provide a valuable resource for mines contemplating the introduction of long tendons, and for budding development coordinators and geotechnical engineers.

Two forums were conducted during each of the Workshops to allow participants to interact with presenters and fellow delegates by sharing experiences and making suggestions for improving long tendon technologies and installation practices.

In overall terms, the Workshops were attended by over 160 delegates (plus presenters) across the three mining regions, with participants identifying a number of opportunities to improve the effectiveness of long tendons, including:

- The ability to install long tendon supports in close proximity to the face (as routinely adopted at Angus Place).
- The development of industry standards for the manufacture, supply and testing of strata support products, including bolts, mesh and tendons.
- The design of equipment to improve access into the bolter work platform and for materials handling – designing the continuous miner for long tendon installation.
- Improving ergonomics around the bolting rigs.
- Making hydraulic tensioners safer - removing or redesigning hydraulic tendon tensioners?
- Understanding the relative risks associated with torque tensioned and hydraulic tensioned tendons.

- Developing two-speed bolter motors that enable tendons to be tensioned using a high torque/low speed setting without the need for a torque multiplier.
- Telescopic drill steels or continuous drilling systems (eg; water jet drilling).
- Sectional or coupled bolts as an alternative to long tendons.
- Self drilling tendons.
- Improved storage and handling of long tendons.
- Better systems to ensure quality control of grout mixing and consistency.
- Adoption of pumpable resins in lieu of grouts once approved resins are available.
- Transfer of learnings, technologies and equipment from the metalliferous sector (eg; carousel bolters, long tendons on reels).
- Roadways designed to optimise strata support capabilities of bolts and tendons.
- Design of roof support systems to provide a safe level of support - optimising roof support design.
- Improving data management, particularly in regards to the logging and monitoring of extensometers.
- Real time monitoring of extensometers, and data logging of drilling conditions/strata off the bolting rigs.
- Using geotechnical engineers as engineers, and not for drafting strata support plans.

In addition to the above opportunities, some of the yet unresolved challenges relating to the installation of long tendons in gateroad development include:

- Licence to operate using pumpable polymeric resins.
- How much torque/pre-tension is enough?
- Tendon stiffness – grouted or non-grouted tendons?
- Bottom-up or top-down grouting?
- How might automated roof and rib bolters be employed for installation of long tendons?

In looking to the future participants considered that long tendon installation practices might include some or all of the following:

- Torque tensioned, post-groutable tendons;
- High load transfer tendons;
- Higher levels of pre-tensioning of tendons.
- Pumpable resins, and;
- Tendon feeding devices (eg; Cable Lobster).

Participants at the Hunter Valley Workshop also proposed that a theme “Installation of Primary Supports in Roadway Development” should be adopted at a future Workshop to similarly explore geotechnical factors, technologies and hardware, and primary support installation practices currently adopted in gateroad development.

All presentations are now available on the [www.undergroundcoal.com.au/roadwayworkshops](http://www.undergroundcoal.com.au/roadwayworkshops) web-site (together with presentations from the previous nine Workshops). Due to the size of some of the presentations it is recommended that individual presentations be “saved” before opening the respective folder/s.

In closing, I would like to again thank the presenters for their contributions, and also thank delegates for their participation and involvement.

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