

Reflections of a career paralleling the 50 years of the ATS

By Dr Charles MacDonald

Coincidentally, my 50 years of work experience corresponds almost exactly with the 50 years of the existence of the ATS and this causes me to reflect on what has changed in the industry, either positively or negatively, over that period and what remains constant.

During these 50 years I have worked in a number of countries including the UK, Far East (Hong Kong, Singapore and Philippines), Saudi Arabia and Australia. I have also been employed in all sectors of the industry including client, contractor, consultant and academia which I believe gives me a broad career base on which to make such a reflection.

Whilst not all of my career has been in underground works, it has been the predominant field of my professional life for the last 30 years, primarily in tunnelling associated with road and rail transport, but also other applications such as hydroelectric and utility tunnels (drainage/sewerage and power transmission).

The range of tunnelling projects I have had a significant involvement in the planning, design and delivery of include the Melbourne City Link, the whole WestConnex Scheme in Sydney and the Brisbane Airport Link. In more recent times I have provided peer review services on such projects as the Melbourne Metro and Melbourne Rail Loop projects

The first and most obvious change from the status of tunnelling 50 years ago is that an increasing amount of infrastructure including road, rail and utilities power, water and telecommunications, is now being located in tunnels, even though placing such facilities underground is significantly more expensive than equivalent infrastructure located above ground. This is a trend that has occurred in many countries around the world but it is very strongly illustrated by the adoption of an almost totally underground solution for the \$16 billion WestConnex urban motorway scheme in Sydney, supporting the proposition that tunnelling is enjoying a golden age.

Modern equipment and techniques make tunnelling more cost effective than it has ever been. This combined with increasing concern from the



community about the adverse consequences of above ground solutions means that the underground alternative is now often seen as the only acceptable way forward. That said, underground solutions are not without potential impact particularly in relation to ventilation, air quality, fire and life safety, dewatering and ground settlement issues.

The technical developments over that period have been very substantial.

'Uncertainty is a feature that is unavoidable in tunnelling, but it can be understood and controlled so that it does not cause damaging risk.'

This includes TBM and roadheader technology, blasting techniques, numerical analysis software available to refine both temporary and permanent design, shotcreting and grouting techniques plus many other advances in plant and equipment generally. Such technological developments continue to evolve at a rapid pace and the ongoing evolution of automated and robotic technologies will greatly assist in the development of underground space in a way that was very difficult and prohibitively expensive in the past.

I now turn to what has not radically advanced over this period and arguably even receded. As a now 'mature' member of the tunnelling industry I have been around long enough to



have had the pleasure and privilege to meet and briefly work with Sir Alan Muir Wood who, in 1974, was the founding president of the International Tunnelling Association, an organisation which now has some 75 member countries globally, with Australia represented by the ATS.

Sir Alan had a very clear view of how the management of risks in tunnelling should be addressed and this is captured in the following quote:

Despite this statement by one of the most respected forebearers of our industry, the management and allocation of risk and uncertainty on major tunnelling projects, particularly in Australia, remains a matter which is often poorly addressed.

Reference to any text on risk allocation will inevitably uncover the principle that 'the risks in a project should be apportioned to those stakeholders who can best manage them.' Whilst it seems that this maxim appears to be universally recognised it is sadly rarely practised, primarily because it is often considered 'easier' to pass all risks on to others rather than adequately analyse how particular risks can be better managed. Several developments have taken place in the last fifty years in the evolution of alternative delivery

models for major infrastructure projects including tunnels. However, the manner in which risk allocation, as opposed to risk management, has been addressed has not, with a few notable exceptions, genuinely advanced particularly in relation to tunnelling projects. In fact, the view can be formed that in many major projects the allocation of risk is less fair and equitable than it was fifty years ago. This is a topic taken up in more detail in another paper (Dix, MacDonald) in this copy of the Journal.

The nature of tunnel projects i.e., complex engineering challenges in uncertain ground conditions in tight time frames, lend themselves to the greater adoption of more collaborative procurement models which provide fairer and more equitable allocation of risks, including unforeseen ground conditions, between the contract parties. Much could be gained in this area by considering and hopefully adopting internationally developed contract forms that specifically address the particular circumstances of underground works rather than the continued adoption of unique bespoke contracts for each individual project.

Concluding on a more positive note: In my view, the challenge, complexity

and at times heroic scale of major underground works has attracted many of the brightest engineering minds and innovative constructors over the years. That tradition appears to endure with the industry continuing to attract many highly talented younger members of the profession.

There is every indication that there will be an increasing number of upcoming major infrastructure projects, particularly road and rail, which will require tunnelling solutions.

It is also evident that significant progress has been made in recent years in improving communications between clients and those parties tendering for and delivering such major projects. This is apparent in the much more open dialogue between the parties during the tendering process and a general acceptance that more substantial site investigations should be undertaken by the client before going to the market to procure delivery of a project.

There are also indications that more enlightened clients are becoming open to the adoption of fairer and more equitable procurement models/ contracts which will deliver better value for money to the whole community.



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