

GOING UNDERGROUND

Urbanisation is stimulating investments in energy, transportation and water, potentially creating a healthy tunnelling construction project pipeline. Many of these urban tunnels will be constructed using the New Austrian Tunnelling Method (NATM). Claims arising from NATM tunnel failures are already among the most technical and challenging to manage, but could a hardening insurance market add extra complexity?

Urban expansion is growing at unprecedented rates, as cities spread out and new global cities emerge. The United Nations predict the shift from rural to urban living will continue for some time to come, with potentially an additional 2.5 billion people living in urban areas by 2050.

Tunnel construction may provide some answers for those involved in urban planning, helping to maximise space utilisation and reduce the environmental impacts of development. Railway tunnels for metro, light rail or main railway lines. Road tunnels that relieve congestion in city centres and reduce pollution using ventilation and clean air systems. Tunnels that convey water and wastewater, and pressurised water mains that support sustainable energy from hydropower plants.

Suitability of NATM

NATM is one of the most common methods for constructing tunnels in urban environments. Widely used to build shallow tunnels in soft ground below city centres, it is a particularly popular solution for underground stations, where very large diameter tunnels with complex junctions and interfaces would be difficult to construct by traditional methods. According to Andy Evans, Chartered Loss Adjuster with Integra Technical Services “NATM is commonly

used for creating shorter tunnel sections (normally less than 2km) and where there are variable ground conditions. It does not have the long and costly mobilisation process associated with the Tunnel Boring Machine method, so is generally more cost effective and flexible. When compared with Cut and Cover it minimises the impact on the environment by avoiding surface disruption.”



NATM has been used to construct tunnels in many parts of the world including the Frankfurt Metro (above), Crossrail, Prague Ring Road Tunnel and M11 Extension to the Istanbul Metro.

Technically complex claims

Whilst accurate and up to date loss data is difficult to establish, there is no reason to suggest that NATM presents frequent losses or has a worse claims profile than other tunnelling methods. Reports point toward 70 significant NATM tunnel failures between 1973 and 2007, including high profile incidents such as Heathrow Express Rail Link, Sao Paulo Metro, Barcelona Metro and the Lane Cove Tunnel in Sydney.

Jonathan Sargent, Head of Wholesale Property & Casualty Claims EMEA and Director Claims Corporate Solutions at Swiss Re concurs “it’s not frequency, it’s that losses tend to be catastrophic, quickly getting north of USD10 million and often running into tens of millions of dollars.”

According to Scot Peachey, Managing Director International Construction, Marsh JLT Specialty, “managing tunnelling claims is certainly not business as usual. Anyone that has managed a tunnel collapse will testify that these are complex and highly technical loss adjusting assignments. There are so many different considerations, that determining cover and setting appropriate indemnity cannot be compared with a traditional fire or flood loss.”

Root cause

Many of the technical cover considerations come back to root cause of the loss. The NATM construction method involves spraying thin layers of concrete as the open face of the tunnel advances, taking advantage of the inherent strength of the surrounding ground. Movement and settlement are closely monitored

throughout the construction, with strengthening measures adopted depending on the results which is why it is often referred to as ‘design as you go tunnelling’.

According to Andy “Integra Technical Services have handled (and are currently handling) many NATM tunnelling losses and it’s common for parties to blame ground conditions, or workmanship or both. However, the NATM design, construction methods and systems of work must all be carefully analysed. Causation is often not the ground conditions, but defective workmanship or design leading to the use of the wrong construction method in the ground conditions which existed.”

The Loss Adjuster and independent Engineer will gather complete information and evidence: answers to key questions (see next page); copies of site geotechnical reports and monitoring that was undertaken both before and after the collapse; NATM design information including drawings, method statements, settlement and deformation data; site meteorological records; inclinometer records; borehole logs; and any associated laboratory testing of samples of soil, rock and groundwater records.

Managing the repair

If a significant section of a tunnel has collapsed removing the debris and putting in place a suitable repair scheme generates its own set of challenges. Jonathan suggests that this will “initially relate to safe access and then considering different options, for example subject to permits building another tunnel to go around the damaged segment.”

Andy recently adjusted “a loss that involved a NATM tunnel collapse which left a large sinkhole. The successful solution was the implementation of a Cut and Cover repair using auger piles and a concrete cap.”

These repairs almost always far outweigh the original construction cost. A Zurich Insurance presentation in 2011 cites a Hull Wastewater Tunnel loss where the repair was 4,667% of the original contract value. That’s why Scot suggests that “when designing the cover Marsh JLT Specialty will sit down with the client to discuss the project in detail, including scenario testing to evaluate the maximum potential loss and determine the limit of indemnity required.”

Cover considerations

There may be questions about the number of deductibles to be applied, for example if there's subtle differences in defective workmanship causing damage to different sections of the tunnel. Cover could possibly depend on the definition of 'physical damage', for example if shotcrete sprayed onto the crown of a tunnel does not adhere. Or, perhaps, require a broad definition of 'property insured' if the actual defect is in the surrounding ground, rather than the contract works.

But many of the technical differences in opinion about policy coverage are likely to come back to two significant factors that Scot suggests "are key to the design of the policy wording. The specific tunnelling clause in the policy which confirms the basis of indemnity for tunnel losses, in other words what Insurers will cover and the maximum they will pay if insured loss or damage occurs, which during loss adjustment will work hand in hand with the scope of design cover afforded in the policy wording."

Hardening market could add complexity

The NATM construction method naturally raises questions about the extent of design cover under the policy, as many losses arise from defective workmanship or design. CAR policies written with design clauses

DE3 or LEG2 will naturally invite more disagreement and difference in opinion about the interpretation of the insurance cover and, potentially, lead to a dissatisfied insured and a delay in settling the claim.

It can be inherently difficult with NATM tunnelling projects to define 'defective property' and be able to ascertain and exclude the cost of repairing with the original defect. As a consequence, Scot suggests that "when it is available we always recommend DE5/LEG3 over DE3/LEG2 even with a higher deductible as we prefer our clients to have certainty of cover which supports a smooth adjustment process."

During the soft market this has generally not been an issue, but as the market has started to harden Scot suggests "we're seeing the number of lead Insurer options reducing and pressure being placed on policy wordings, notably the design cover. Whilst it's still possible to secure cover with DE5/LEG3 there is no doubt that it is becoming more challenging."

The management of tunnelling claims are among the most complex in the insurance market and can be challenging for Insurers, the Insured, Loss Adjusters and other professional advisers. Andy suggests that "the majority of claims are settled without dispute, but the hardening market and potential restriction of design cover is a matter for concern as this has the potential to polarise opinion."

Six initial causation enquiry questions

- 1 Were the pre-work ground investigations thorough enough to identify all of the possible ground conditions?
- 2 Are the fundamentals of the concept part of the design and construction process?
- 3 Is the shape of the tunnel and are the cycles of the excavation sequences (topheading, bench, invert, sidewall drifts) appropriate for the prevailing ground conditions?
- 4 Was sufficient support applied at the appropriate time?
- 5 What is the real NATM experience of the designer and of the contractor?
- 6 What is the experience of the engineers and tunnelling crews carrying out the works?

