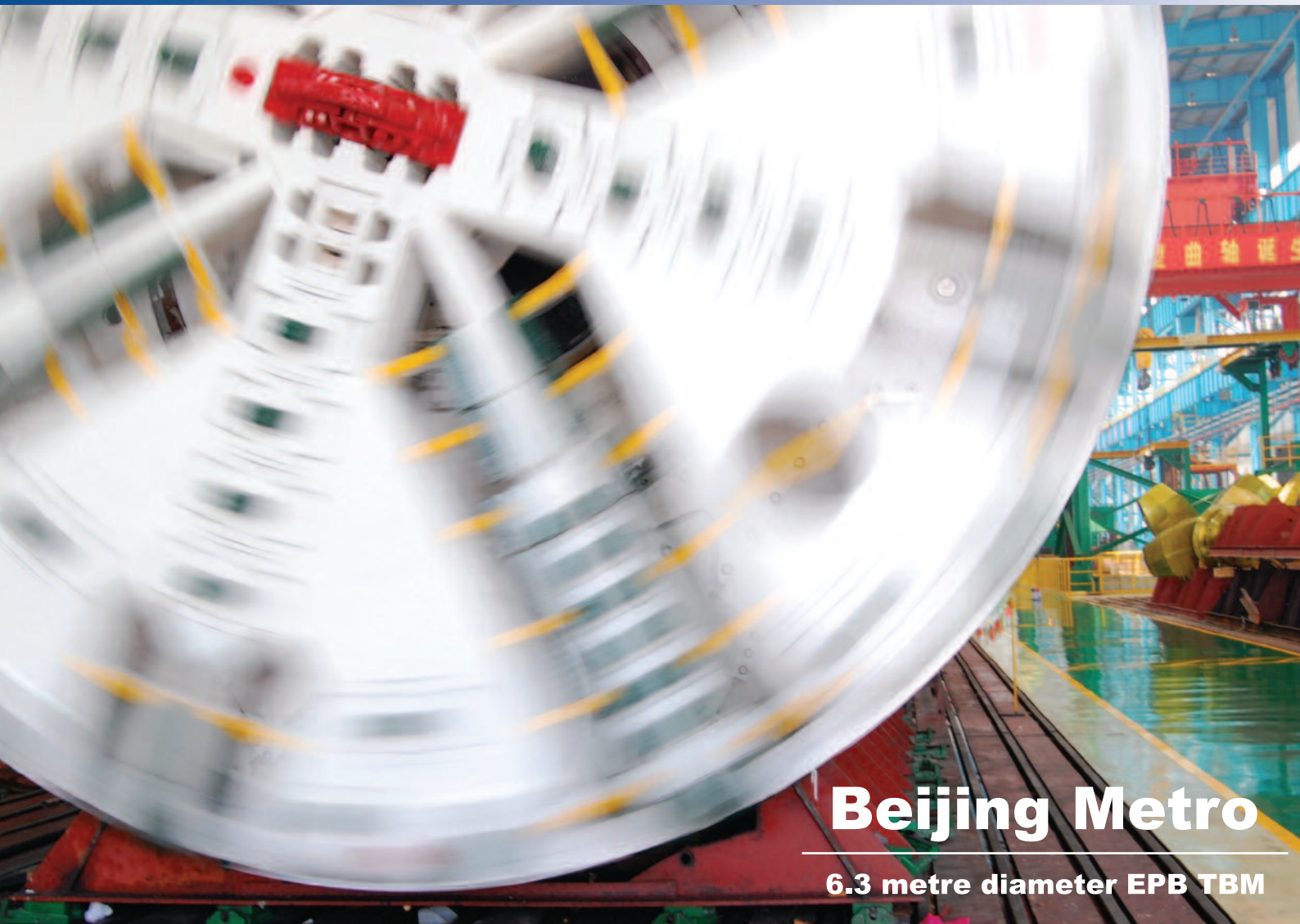


JANUARY 2010

tunnels & tunnelling INTERNATIONAL



BREAKTHROUGH SERVICES



Beijing Metro

6.3 metre diameter EPB TBM



Tunnel Boring Machines

LOVAT

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Contents

FRONT COVER:
Montage of photographs showing the past year's tunnelling activity around the world. Artwork by T&T's in-house designer, Natalie Kyne.

WEB ADDRESS
www.tunnelsonline.info

CONVERSIONS
US\$1.00
€0.69
£0.62

COMMENT

It is an election year for Britain and it is clear that tackling the country's massive budget deficit is going to occupy the debate over the coming months. Both the Labour Party and the Conservative Party are promising massive spending cuts to tackle the problem.

According to Treasury figures, Britain's budget deficit for the current financial year will total £178bn (US\$285bn), some 13 per cent of GDP, making it the biggest of any major economy. The country's public finances have been ravaged by the crisis in the financial sector and the end of the housing boom.

Drastic measures will be taken by the incoming government to cut spending but the frontline big spenders have already been ring fenced in the debate. The Tories have promised not to touch the hospitals under David Cameron's slogan "I'll cut the deficit, not the [National Health Service]" and PM Gordon Brown has added Schools and Police to the safe list.

The savings will have to be found somewhere and no doubt the government will chose the path of least resistance.

It is vital that over the coming months we all join the debate. The incoming government must be made aware of the importance of maintaining the national infrastructure to the economic recovery.

Transport projects have been proven time and again to stimulate an economy and drive development. Crossrail and High Speed 2 are two projects that could be a catalyst for recovery in the capital and the UK.

Water and power developments such as Thames Tideway and the National Grid cable tunnels are also great methods for stimulating an economy through the employment they create.

The UK tunnelling industry must find its voice and be heard by those in power, so that infrastructure doesn't bear the brunt of the cuts.

Happy New Year
Jon Young



Jon Young



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A piling rig works its way down the River Thames to a more accurate understanding of ground conditions for Tideway



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THREE MACHINES, TWO TUNNELS, ONE BENEFIT: FLOOD PROTECTION IN HONG KONG.

A comprehensive flood protection program is being realized in Hong Kong to better control the consequences of the heavy rainfalls and typhoons that occur annually. Large tunnels are designed to collect the huge amounts of rainwater and channel them safely into the sea. The "Dragages Nishimatsu Joint Venture" is employing Herrenknecht's Double Shield technology for the construction of the "Hong Kong West Drainage Tunnel". The S-486 and S-487 sister machines have a diameter of 8.28 each, and have been driving ahead the eleven kilometer long tunnel since April and June 2009, respectively. The tunnel is scheduled to offer protection against floods for the city's business and finance center from 2012 onwards.

It is also planned to complete the "Lai Chi Kok Drainage Tunnel" by then. The "Leighton John Holland Joint Venture" will excavate the 3.5 kilometer long tunnel using the Herrenknecht S-536 Mixshield. The machine, with a diameter of 5.65 meters, is being assembled on the construction site with an expected start of tunnelling early 2010.

The tunnel has sufficient capacities to collect the water of even the most extreme rainfalls and storm surges which have been seen up to now and will protect the inhabitants against floods in the long term.

HONG KONG | CHINA

PROJECT DATA

CONTRACTOR



S-486, S-487
 2x Double Shield TBM
 Diameter:
 8,280mm, 7,210mm
 Cutterhead power:
 3,150kW, 2,800kW
 Tunnel lengths:
 6,640m, 4,360m
 Geology:
 granite, volcanic rock

Dragages Nishimatsu JV:
 Dragages
 Hong Kong Ltd.,
 Nishimatsu
 Construction Co. Ltd.



S-536
 Mixshield
 Diameter:
 5,2650mm
 Cutterhead power:
 1,575kW
 Tunnel length:
 3,484m
 Geology:
 fresh granite, granite
 with varying degrees
 of weathering

Leighton John Holland JV:
 Leighton Contractors
 Pty. Ltd., John Holland
 Engineering PTY. Ltd.



First major Tideway award

Concerns amongst the British tunnelling community about rumoured delays in progress in Thames Water's Tideway project will be alleviated to some extent by the announcement of the first major tunnelling contract. As *T&T* went to Press, Thames Water named the MVB joint venture (comprising Morgan Est, Vinci Construction Grands Projets and Bachy Soletanche) as preferred partner for the £400M (US\$647M) design-and-build contract for the Lee Tunnel. The tunnel will run from the River Lee at Abbey Mills Pumping Station to the Beckton Sewage Treatment Works on the north bank of the River Thames, east London.

It was feared that no award would be made before Christmas, although construction work will still not commence until April 2010 (originally scheduled for January) with scheduled completion by the end of 2014. The project aims at complying with the EU Urban Waste Water Treatment Directive by intercepting untreated storm-water/sewage flows that enter the River Lee at a single point at Abbey Mills at times of high rainfall and transferring them for treatment at Beckton Sewage Treatment Works (STW).

Work covered by the contract includes the 6.9km-long, 7m i.d. Lee Tunnel, two 25m-i.d. shafts and a 20m-diameter shaft (one at Abbey Mills Pumping Station and two at Beckton STW for pumping and overflow), plus a 38m-diameter

pumping station shaft to allow the main Tideway Tunnel to link to the Beckton STW. Associated work will include the installation of pumping and associated equipment in the shafts for effluent management to lift it up to 80m.

The Lee Tunnel route is to be between 65m and 75m in depth and has to pass under the Jubilee and District Lines of Transport for London, the Essex suburban main railway, and main cable tunnels near the Abbey Mills end. It is understood that both of the final bidders for the contract were being expected to draw up designs for the project in exchange for separate fees, thus avoiding further delays after the final contract award whilst the design was drawn up by the winning contractor.

The losing shortlisted contractor is a JV of Murphy and Hochtief, whilst a Laing O'Rourke/Impregilo joint venture, plus FCC of Spain, also shortlisted, had been counted out of the running in June. Morgan-Est had a major advantage with the availability of its nearby precast concrete works at Ridham, which recently completed supplies for the Belfast Sewers Project.

The Tideway tunnels are planned to have a 350mm thick precast segmental primary lining and a 400mm thick cast in situ secondary lining, using fibre-reinforced concrete for the segments in the reference design to cope with high external groundwater pressures and high



Above: A piling rig works its way up the Thames River to a more accurate understanding of ground conditions for the Tideway Tunnel

internal pressures at times. The design life is 120 years.

Spokespersons for Thames Water had been denying that tying in the proposed Tideway Tunnel into the Lee Tunnel was a cost-saving measure brought about by budget scheduling problems due to over-runs in other capital projects. The rumours increased concerns among tunnelling engineers that the Tideway project would be delayed, causing a hiatus of some 12 months in tunnelling activity after completion of Crossrail. The Thames Tunnel was originally due to start in 2012 and Crossrail to finish tunnelling around 2015. Thames Water had also cited planning applications delays with Newham Borough

Council before going to the London Thames Gateway Development Corporation and the Olympic Authority for approval.

Site investigation work continues on the route of the main Tideway tunnel with a jack-up barge slowly moving down the River Thames to bore at various sites. The whole Tideway project is valued at some £2 billion (US\$3.2bn) - the biggest single sewerage project since UK water utility privatisation - with the Thames Tunnel of the project designed to intercept at least 34 combined sewer overflows (CSOs). Programme manager for the project is US engineering practice CH2M Hill with Aecom as reference designer.

Rosedale breakthrough

Auckland's Rosedale Wastewater Treatment Plant Outfall Project has taken a step closer to final completion with the breakthrough of its tunnel section. The NZ\$116M (US\$81M) project is the largest ever undertaken by North Shore City Council, and will see the existing 50 year old tunnel and outfall system replaced with new system that will release effluent 2.7km off-shore into waters of about 12m in depth.

McConnell Dowell was responsible for the design and construction of a 3km long (2.4km onshore and 0.6km offshore) TBM driven, segmental lined tunnel with an internal diameter of 2.8m. This connects to a 1.6m diameter, 2km long HDPE submarine pipeline laid

in a dredged trench. The marine pipeline also includes a 300m long diffuser section. MacDow's scope also includes inlet works and a shaft at the treatment plant.

The MacDow owned TBM bored through sandstone and mudstone, typical of the area's East Coast Bays Formation with no problems, leaving a trail of One Pass Precast concrete segmental lining behind it. The water table was measured at 20m above the tunnel. Local news sources claim the tunnel runs between 25 and 60m below ground and holds 18,000 tunnel segments. After working 24 hours a day since January, the TBM, named Amelia Rose, finished the dig 600m from shore.

Rafah steel curtain

There was a mixed response from Palestinians in the Gaza strip last month as plans for an underground wall along the border were announced in Israeli media. The wall is to form a barrier to stop tunnelling under the border. Work is reported to have been underway at the site for some six months and is expected to take some 18 months to complete. The Egyptian government has not confirmed the construction of the wall.

Residents of the border town Rafah reported seeing heavy machinery sinking steel pipes at intervals along the boarder. According to Israel's Haaretz newspaper the barrier will reach 30m deep and will be 10km long.

The tunnels are often between 6 and 20m underground where the sand is hard enough to tunnel through. But defiant Palestinians have said they can dig to more than 30m down to avoid the blast

proof steel wall. The 500-600m tunnels take some 5-6 weeks to excavate with tunnelling rates at about 15m a day. The tunnels rarely have any form of support, which has often led to collapses.

Palestinians have relied upon the tunnel network since 2007 when Israel and Egypt blockaded Gaza's borders after Hamas was elected to power.

In 2008 Israel destroyed hundreds of tunnels with aerial bombardment but their commercial value meant they were quickly re-dug.

The number of Palestinians killed while working in the tunnels, which are largely hand dug, is believed to easily exceed 100.

In another attempt to end tunnelling under the border U.S. Army Corps of Engineers earlier this year deployed a sonar system for detecting tunnels (T&T October 2009, p7).

Bulgaria Metro receives TBM

A Herrenknecht TBM arrived in Sofia last month ready to start work on the city's second Metro line. From April 2010, it will carve 3.8km of tunnel

that will run beneath the historical Bulgarian city as part of a project overseen by contractor Doğuş İnşaat ve Ticaret A.Ş for Metropolitan EAD.

In parts, the minimum overburden is only 3m, meaning that as the 1,250t EPBM worms its way under railway tracks, a historical church and a built-up area, special care must be taken to ensure that the bore is undertaken sensitively and without subsidence and heave. To meet these delicate requirements, Herrenknecht has adapted an EPB Shield to meet the geological conditions (silt, gravel, sand and clay) and extreme inner city constraints.

The 84m long EPBM has a maximum torque of 24,997kNm and a total thrust of 90,883kN. Its 9.36m shield holds eight double discs, 16 bucket lips, 13 rippers,

170 scrapers, one centre tip, one over cutter disc and one over cutter ripper. Its ring length is 1.5m.

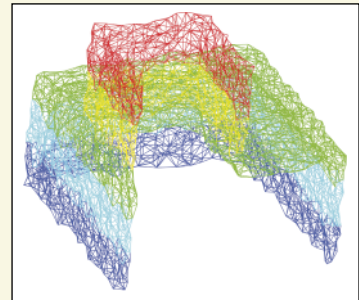
Some of the larger parts of the machine will be transported via the Rhine, the Rhine-Main-Danube-Channel and the Danube, whilst the transport of the other segments will be managed by land.

Upon completion, the 17km long route will run from the terminus Obelya via Nadejda station, the Central Railway Station and the National Palace of Culture up to the Hladilnitsa district. The 8.43m diameter tunnel will run through a partial section of the line from Nadejda Junction to Sveta Nedelja Square.



Calculating volumes

A US land surveying firm last month claimed to have developed a new way of calculating the volume of complex structures to deliver more accurate results. The method developed by Delaware firm Geo-Plus uses a 3D triangulation method as apposed to the more traditional 2D method.



According to a Geo-Plus spokeswoman, "2D triangulation models have been used in civil projects to calculate the volume of overhang, tunnel or other complex construction shapes. However, the result produced was always flawed. In fact, civil engineering software that calculates volume uses an algorithm which, for a X, Y surface, can take different Z coordinates. In such a planimetry case, the algorithm connects the adjacent X, Y points while the values of Z points are not in the same plane."

"TIN modeling associates X, Y, Z coordinates that are not adjacent. To achieve their goal, civil engineering professionals have no choice but to use more

than three software."

The Geo-plus solution, called tetrahedralization, uses a four-faced pyramid, also known as tetrahedron, to model the envelope of a structure accurately. The spokeswoman added "With a proper set of survey points and using the data from connectivity strings, Geo-Plus VisionCivil 2010 can build the various surfaces of a solid. Then, the software assembles these surfaces, ultimately creating a solid composed of several tetrahedra. With the help of this 3D calculation using tetrahedralization, Geo-Plus VisionCivil 2010 can calculate the volume and draw the shape of just about any structure."

completed. Despite adverse weather conditions including several heavy rainstorms during the five week dredging period, the operation finished on schedule. The impact of the dredge was carefully monitored throughout the operation using the live information transmitted from five dedicated water quality monitoring buoys.

The cutter suction dredger

'Vesalius' has now been demolished following completion of the works and has been transported away from its site at Howdon Basin.

Four 90m long tunnel sections have been built at Walker Dry Dock. The dry dock was flooded at the beginning of December to enable the units to be floated out of the dock early in the New Year ready to be placed in the trench.

Two milestones for Tyne Tunnel project

Two milestones were reached on the Tyne Tunnel river crossing in Newcastle, UK. On December 22nd, design and build contractor, Bouygues Travaux Publics, broke through the concrete wall at the end of the first section of sprayed concrete lined (SCL) tunnel in Jarrow, whilst earlier in the month the cutter suction dredger 'Vesalius' concluded its dredging operation on schedule.

The new vehicle tunnel comprises two short sections of SCL of 32m and 40m which equates to approximately 4% of the land tunnel excavations. It was decided to apply SCL techniques to these two locations in Jarrow in order to avoid major utility diversions. Cut and cover methods are being applied to the rest of the land side tunnelling.

Nicolas Caille, project managing director for Bouygues

Travaux Publics, said: "This is a very challenging and technically specialised part of the project. I'm delighted with the progress we're making here. By using this approach we have been able to avoid the disruption of serious utility diversions, including a major gas main that runs across the site."

All necessary cut and cover excavations were completed in October 2009, and floor and roof slabs are currently being built at the bottom of the trench. The tunnel breakthrough marks the uniting of the first section of completed SCL tunnel with the rest of the excavation. Previously, it had been separated by a temporary underground concrete wall.

The trench to accommodate the installation of the four pre-cast concrete tunnel sections that will make up the new vehicle tunnel has now been fully

Construction of Brighton sewerage scheme begins

Following several years' delay mainly through planning objections, construction work has begun on the UK Southern Water's Brighton & Hove Wastewater Treatment Scheme. Final planning permission was granted in October.

The contractor is the utility company's usual environmental improvement partner 4Delivery, a joint venture of United Utilities, Costain and MWH.

Tunnelling work for an 11km long, 2.4m i.d. segmentally lined sewage transfer pipeline using two TBMs is scheduled to commence this April, although construction of major shafts has already started. The tunnel will run from Brighton's Marine Gate along the coast to

feed a new sewage treatment works (STW) and sludge recycling centre at Lower Hoddern Farm near Peacehaven. This will handle 95 million litres of residential wastewater, meaning that the area's sewage would be treated for the first time to EU quality standards. This is an urgent matter according to Southern Water since the area is the last in the country not to meet environmental quality standards and one of the last in Europe.

The project also includes two sub-surface pumping stations at Marine Drive and Portobello (a conversion of the existing treatment works), plus a trenched sea outfall, 2.5km long, from the new STW through Friars Bay. The

tunnel section of the project requires eleven shafts for sewer connections. The shafts vary in diameter from 3m to 17m and in depth from 8m to 46m in view of the varying height of the chalk surface adjacent to the coastline. There will also be some pipejacking mainly for sewer connections.

Site preparation began in July in several locations with tunnelling from Peacehaven and Ovingdean.

The Brighton & Hove wastewater treatment scheme was first announced in 1997 but was not passed by public enquiries in 1999 and 2006. It was shelved due to another planning application

failure in 2007. Then a joint venture of Black & Veatch, Morgan Est and Amec was an alternative contract bidder to 4Delivery. The final hurdle in objectors' action seems to have been overcome last March when an application by a Peacehaven residents' organisation for a judicial review into part of the scheme was rejected by the Queen's Bench Division in the High Court. Objectors still had the possibilities of appeal.

Since inception, the cost estimate for the project has practically doubled from the original £160M (US\$277M at historical rates).

Prequal list for Seattle deep bore

All four JVs have been pre-qualified from those seeking to bid for the deep, single bore tunnel to be built at the waterfront in Seattle on the SR99 highway route.

The design-build JVs that have been pre-qualified to build the tunnel, the route of which has been modified, are:

- WV JV – Kiewit Pacific, Bilfinger Berger and AECOM;
- Seattle Tunnel Partners – Dragados and HNTB Corp;
- Seattle Tunnelling Group – S.A. Healy, FCC Construcción, Parsons Transportation Group and Halcrow;
- VTS JV – Vinci Construction Grand Projets, Traylor Bros, Skanska and Arup.

The approx. 3.2km long tunnel is being designed to be excavated by a single, approx. 54ft (16.45m) TBM, which would be the largest built.

The pre-qualification list was announced last month by Washington State Department of Transportation (WSDOT). The project is being funded by the

state, county, city and the port authority.

A Request for Proposals is to be issued by the second quarter and bids for the contract are to be submitted by about the beginning of Q4. Contract award is anticipated by the end of 2010.

A second, supplemental draft environmental impact statement (EIS) into the bored tunnel project, announced at the beginning of 2009, is to be published this year.

The tunnel is being built to replace a seismically-damaged highway viaduct running along the waterfront area. A number of scenarios were studied, including replacement surface and various tunnel options, before the single large bore was elected extremely late in the process.

Recent consultations with local communities and businesses have also led to a change in location in the south portal and a possible shift in the position of the north portal. The alignment of the tunnel has been altered as a result of the modifications, and new site investigations are underway along the revised route.



Sao Paulo tunnel heist

Thieves made off with millions of dollars after tunneling from a rented house in to an armoured car company's safe. According to local media reports, the Brazilian Police claimed that the gang took advantage of the end of season football matches keeping the nation glued to the TV screens to make their secret haul.

The break in was not discovered until hours after the final whistle. A spokesperson from the armoured car company - Transnacional Transporte de Valores e Seguranca Patrimonial - told officers that 10M Reals (\$US5.9M) were missing.

In a statement the Police said officers followed the 1m diameter tunnel from the company's safe

approximately 100m underground, passing sacks of coins as they went, until emerging in an abandoned house. Here they found a map of the tunnel and bags of muck from the excavation. Neighbours claimed the property had been occupied for about four months. The missing tenants are considered suspects but as yet no arrests have been made.

Local media reported that a security guard at the building heard a loud noise about 5pm that day, around the same time as the football game was under way, but took no notice, thinking it was from fireworks that fans had been setting off throughout the afternoon.

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Hard-rock TBM



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Tsuen Wan TBM set for build underway

The JV of Maeda, China Railway Engineering Co (CREC) and Seli is due next month to start the TBM drive on the Tsuen Wan sewer in Hong Kong.

Assembly of the 7.72m diameter double shield, made by Seli, was being completed as

T&T went to press. The JV was completing the launch tunnel.

The Drainage Services Dept is building the stormwater sewer to help reduce flood risk in parts of Hong Kong by upstream interception and discharge to the sea.

The TBM will drive a 5.1km

long, 6.5m i.d. tunnel through geology expected to comprise volcanic tuffs and grandiorites. The shield is fitted with 19" cutter discs and will drive with a minimum cover of 100m. The vertical alignment will run to depth of 200m below the ground surface.

Tunnel lining consists of 1.6m long rings of 250mm thick segments. The tunnelling works are due for completion late next year.

Construction works on the project also include access shafts, adits, a 40m deep vortex shaft and chambers for deaeration.

Rome B1 b'thru, extension for Seli

Seli has holed through with the first TBM at Gondar station on the B1 metro line in Rome, and the subcontractor has secured an additional job to help extend the route still further, north to Jonio.

Two TBMs have been outside the box structure's bulkhead for a few months as the delayed station was readied, and last month the first EPBM broke through and it is to be followed this month by the second.

The 6.77m diameter Herrenknecht shields (S-387, S-388) were launched at Conca D'Oro station in the middle of 2008 and reached the edge of Gondar station in the third quarter of last year.

Geology along the alignments was poor, comprising compressible clays and silty sands. EPB pressures were up to 3-4bar, and ground water head approx. 2.5 bar on the drives which also pass below the river Aniene. The tunnels are lined with (6+1) rings of 350mm thick Universal segments.

Seli is driving approx. 3km twin

tubes to terminate at Bologna station by October. There is another intermediate station – Annibaliano – on the way. At Bologna, Line B1 will interchange with Line B.

The main contractor on the project is a JV of Salini Costruttori and Maire Engineering.

Separately on line B1, Seli has been awarded a subcontract by the JV of Salini and Tecnimont, to build the twin tubes in the opposite direction, north from Conca D'Oro to Jonio station.

Work involves excavation of a 950m long tube and a 150m long crossing of Jonio station. Similar geology is anticipated along the route to the other current stretch of B1 under construction, and the groundwater level is approx 17m above the tunnel crown.

The section is to be bored by a 9.79m diameter Herrenknecht EPBM, which is due to be launched in the second quarter. The 8.65m i.d. lining will consist of (7+1) rings with 400mm thick segments.



The 6.77 diameter TBM breakthrough on Rome's B1 metro

Airport Link gets TBM



Brisbane Airport link TBM arrived on site last month

A Herrenknecht EPBM last month arrived in Australia ready to work on Brisbane's Airport Link project. The machine has a nominal torque of 20461 kNm and is powered by 14 350kw motors, giving it a thrust of 88976kN.

This John Holland JV is operating the TBM as a joint venture. TJH has been contracted to design and construct the project, which incorporates the Airport Link, Northern Busway (Windsor to Kedron) and Airport Roundabout Upgrade.

Upon completion, the tunnel will have a steel fibre precast reinforced segmental lining in a 9+1 configuration. The tunnel wall lining will have a vitreous enamel coating on the surface.

The machine arrived at Brisbane's Kalinga Park worksite from Germany on 10 December. LS International Cargo was the forwarder for Herrenknecht, and shipping was handled by Beluga Projects. McAleese Transport undertook local transport in Australia.

March 18–19, 2010
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- Construction with Hard Rock TBM
- Issues & Solution in City Subway Tunneling
- Comparison via Three Tunneling Method of Subsea Tunnel
- Shorten the Construction Period by New Tunneling Method
- Advanced Risk Management & Safety Design from EU
- Case Study from Informationized Tunneling Method Applied in EU Mountain Tunnel

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London tube job for TW, Nuttall JV

A JV of Taylor Woodrow Construction and BAM Nuttall has been named as winner of a contract to redevelop Tottenham Court Road tube station in central London, which will later be further expanded to have a separate Crossrail link.

The contract award to the JV was announced by Transport for London (TfL), which owns the tube system through London Underground (LU).

The JV beat four rival bidders for the job – Balfour Beatty, Morgan Est, a JV of Skanska and Mace, and a JV of Costain, Laing O'Rourke and Bachy Soletanche. Taylor Woodrow had originally moved to seek the contract and subsequently entered into the JV with BAM Nuttall.

TfL said the total cost of redeveloping the Tottenham Court Road tube station is approx. £500M (US\$808M), and includes a bigger

ticket hall, new entrances and access points, extra escalators and new lifts. The station already serves the Northern and Central lines, and the redevelopment is to be completed by 2016.

Separately, the Crossrail project is developing plans for its own adjoining station, which will mean that Tottenham Court Road will be transformed into an even larger transport hub in the heart of the West End of the capital. Crossrail is to begin train services from 2017-18.

TfL said the total budget for the tube station redevelopment and new station works for Crossrail was approx £1bn (US\$1.61bn).

Last month a JV including BAM Nuttall was among the groups approved on the tender list to bid for two running tunnel contracts on the Crossrail project (T&T, December 2009, p12).

Impregilo JV wins Sogamoso job

An Italian-Colombian JV led by Impregilo has won a further contract for the main works of the Sogamoso hydropower plant, in Colombia, and the works include construction of an underground powerhouse.

Last month the JV was awarded the second contract by the developer Isagen, which is a public-private company. Impregilo, which has a 60% stake in the JV, said the contract is valued at some €345M (US\$495M). The other members of the JV are local firms Conalvias and Tecnica Vial.

Tunnelling works on the entire project include excavation of the powerhouse cavern to hold three generating units, access tunnels and two large (11m wide) by short (870m long) diversion tunnels for the dam construction.

Impregilo said it is already on site performing preliminary construction work for the dam under the first contract, which includes the access tunnels and diversion tunnel construction. The first contract is valued at €55M (US\$79M).

The project site is on the river

Sogamoso in the Santander region of northwest Colombia, near the towns of Giron and Bucaramanga. The construction period for the entire project is five years, and the plant is to be operational in 2014.

Also last month the project received approval for a funding contribution of US\$140M from the Andean Development Corp (CAF). The entire cost of the project is approx. US\$1.74bn.

Barnard, Judlau JV grabs ARC contract

The Barnard-Judlau JV has been named as the winning bidder for a 1.6km long tunnel in Manhattan as the first of three sections of the Mass Transit Tunnel, which is the key link in the 'Access the Region's Core (ARC)' scheme.

The JV was awarded the US\$583M design-build contract by New Jersey Transit last month following approval by the board of directors. Construction is to start shortly.

Alpine JV signs Slovenia contract

The contract to build the Markovec road tunnel in Slovenia has been signed by a JV of Alpine Bau and local firm Cestno Podjetje Maribor (CPM).

Slovenian motorway company DARS awarded the €54M, excl VAT, (US\$78) job some months ago but the contract was only recently signed. Including VAT, the value is €64.5M (US\$93M).

Construction work on the 2.2km long tunnel project is due to begin this month for completion in 32 months. The tunnel is being built on the coastal motorway between Koper and Izola.

The Markovec tunnel is a twin tube structure and will be bored through sandstone by roadheader, Alpine told T&T.

In a statement, Alpine said: "Although the contract was awarded months ago, the period for the negotiations and contract signing was protracted."

The job was awarded in June last year but signing was delayed by a request for a tender review submitted by a local JV, said Alpine's parent group, FCC.

DSI takes full Spanish control

Dwywidag Systems International (DSI) has made its Spain subsidiary a wholly-owned business following the purchase recently of the outstanding shares in the business.

The Spanish business, Dywidag Sistemas Constructivos (DSC), provides post-tensioning, geotechnical and tunnelling/mining systems to the local markets.

DSC, based in Fuenlabrada near Madrid, is the group's technical and logistical base for operation in both Spain and Portugal. It has been co-operating

with other parts of the DSI group for some years, said DSI.

The remaining stock in DSC was bought by DSI in November, having been the majority owner in the business for some years. DSI said the strategic move was an important step to expand its position on the Iberian Peninsula.

Within the past 18 months DSI – owned by CVC Capital Partners – bought other two underground support systems companies, Agrhimerc in Peru and Fosminas Ancoragens, respectively (T&T, March 2009, p11).

Construction work on the first, Manhattan contract involves sinking an almost 49m wide access shaft at Twelfth Ave and 28th Street, and two TBMs will be used to drive a total of approx. 5km of tunnels.

On average, the bores will be driven at a depth of approx. 36m. The tunnels will split into four tubes at their eastern end to help ensure train capacity is maximised to the expanded Penn station.

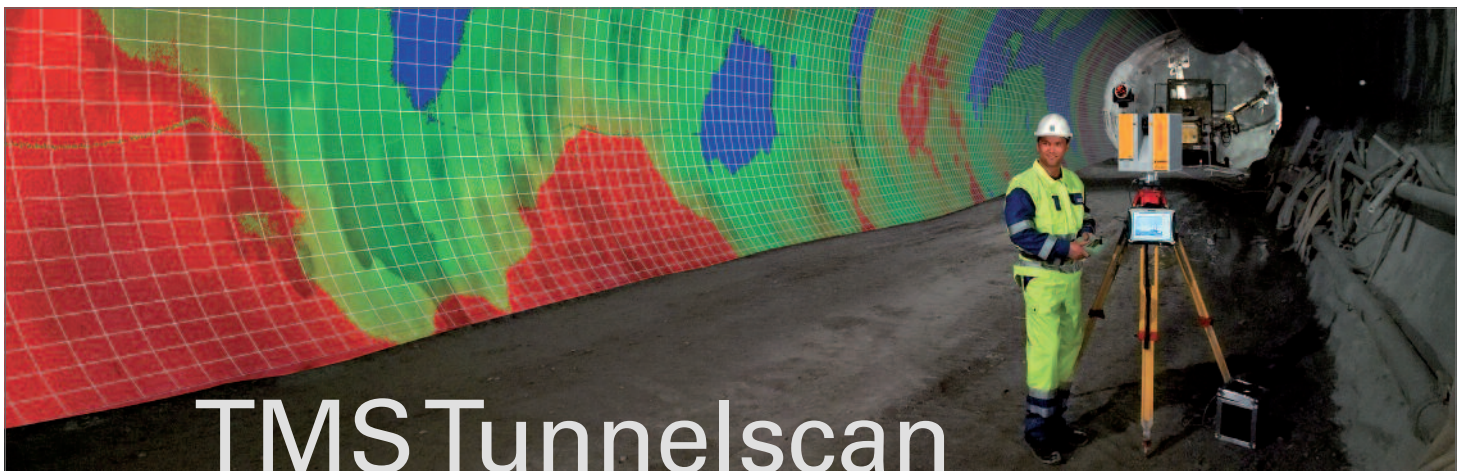
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Tube Lines unhappy at cost review verdict

With Transport for London (TfL) being happy but Tube Lines left unhappy with the initial ruling by the PPP Arbitrator on anticipated costs under the periodic review, the metro infrastructure company said last month it will 'robustly' argue for more than the approx. £4.4bn (US\$7.1bn) proposed for the next 7.5 years period.

The PPP Arbitrator, Chris Bolt, said in his draft guidance that the package of work beginning July 2010 could be done for a substantially lower cost than

Tube Lines' revised bid of £5.75bn (US\$9.3bn). The package is for future maintenance and upgrade of the Jubilee, Northern and Piccadilly lines (*T&T*, December 2009, p12).

The client, London Underground (LU) – owned by TfL – had estimated the cost to be approx £4.0bn (US\$). The PPP Arbitrator said the work could not be done as cheaply as LU suggested but his estimate was much closer to the company's figure than that bid by Tube Lines.

The PPP Arbitrator said that Tube Lines could have completed the Jubilee Line upgrade to time and budget, and let other work advance further, allowing for an effective partnership but noted instead that contractual claims were underway against the client.

However, the PPP Arbitrator noted that should Tube Lines' claims succeed then more claims would be expected in relation to upgrade project, which it said would add to its income. Tube Lines said LU is a 'difficult client' but claimed the

PPP Arbitrator seemed to expect the company to cover its costs through claims rather than making some allowance for that argument.

The overall budget needs to be settled before the PPP Arbitrator advises on acceptable charges to be paid by the client. But he said LU must show it can pay for the works or they will have to revise the entire package, which would set off the negotiating cycle again. But TfL said the Government needs to cover any shortfall in funding.

Alpine JV bags Bosruck 2nd tube

Alpine JV of Metrostav and Hochtief has been awarded a contract to build the tunnels and underground stations for the extension to Metro A line in Prague.

Prague's transit authority awarded the contract last month and the 14-day appeal period was underway as *T&T* was closing for press. Upon contract signing, the JV anticipates that general construction work would commence on site this month.

The 6km long, mostly twin tube extension will run from the existing Dejvicka station to the new station at Motol, and the works are planned to take about four years. The line will add three intermediate new stations at Cerveny Vrch, Veleslavin and Petřiny.

Geology along the alignment comprises mainly weak rock – weathered to sound clay with some sandstones and harder,

quartzitic sandstones. The vertical alignment is below the ground water table and up to 25m of head is anticipated. Overburden is 12m-45m.

Two-thirds of the extension calls for 6m diameter EPBM drives to build 5.3m i.d. single-track tubes. The JV plans to use a pair of TBMs, and boring is expected to start around March 2011. The remaining 2km stretch is to be sequentially excavated as a single tunnel with double-tracks.

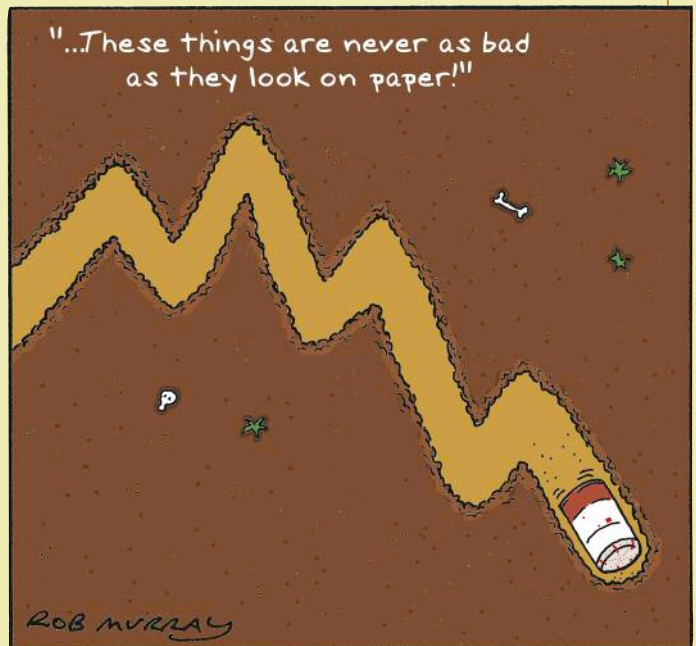
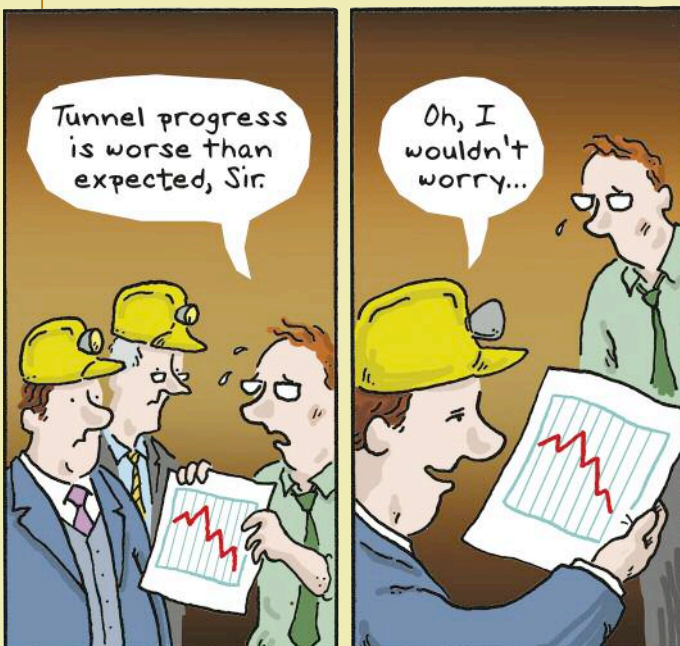
Three of the stations – Cerveny Vrch, Veleslavin and Petřiny – are to be sequentially mined and are to be opened for

the TBMs to be pulled through. The terminus station at Motol is to be built as a cut and cover box structure.

The project will receive the bulk of the funding –10.7bn Czech Koruna (US\$584M) – from the city's municipal authority. The European Union (EU) is to provide approx 8bn Czech Koruna (US\$436M). It has been estimated, however, that inflation could increase the total cost of the project.

Metro A is to be extended in two further phases, adding a total of 6.9km of route to take the line to the international airport at Ruzyně.

TROUBLE at the FACE



TUNNELLING CONSULTANTS

A

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|--|---|--|
| AECOM Technology Corp Enterprize House 160 Croydon Rd, Beckenham Kent, BR3 4DE United Kingdom Tel: +44 20 8639 3500 Fax: +44 20 8663 6723 Web: www.fabermaunsell.com www.maunsell.com www.maunsell.aecom.com www.dmjmharris.com www.uma.aecom.com | a) US\$3.3bn b) US\$67M | Project planning, preliminary & detailed design, project management, site supervision, multi-disciplinary & multi-professional specialist services for highway, rail, water, power & utility tunnels | USA: Fork Creek, Atlanta; GA Homestead Ave, Hartford; 2nd Ave Subway, NY; North Shore Connector, Pittsburgh; Trans Hudson Expressway, NJ/NY; Silverline III, Boston; ESA, NY; UK: Lower Lea Valley Cable Tunnel; West Ham Flood Alleviation; Shetland Fixed Link; Shepherds Bush Station; Europe: Dublin Metro North; Dublin Eastern Bypass; Attiko Metro, Athens; Hallandsås, Sweden; Australia & NZ: North South Bypass, Brisbane; City West Tunnel, Sydney; Inner Northern Busway, Brisbane; City Link Project, Melbourne; M5 East Tunnel Air Filtration, Sydney; Victoria Park Tunnel, NZ; North Shore Outfall, NZ; Hong Kong: Harbour Transfer; Ocean Park Funicular; Po Shan Drainage; KDB200 & 300 | USA: PR53 - Mariani Road Tunnels, Puerto Rico; Silverline II, Russia Wharf Segment, Boston; CA/T Section 9, Boston; JFK Airport, NYC; UK: CTRL 2, C342; Europe: Schaarbeek Redevelopment, Brussels; Australia & NZ: City West Tunnel, Sydney; India: Delhi Metro; HK: Eagles Nest Tunnel; Southern Rail Link; Shatin Height Road Tunnel; Tsim-Sha-Tsui Rail Station; Singapore: North-East Line C708, Changi Airport Line C503; PLE Pelton Canal; Cable Tunnels C201, C202 & C203 |
| AJS ingénieurs civils Rue de la Place d'Armes 5 CH 2001 Neuchâtel, Switzerland Tel: +41 32 720 0100 Fax: +41 32 720 0101 Email: ajs@ajs.ch Web: www.ajs.ch | a) US\$3.5M b) US\$0.4M | Claims management, tunnel muck management, waterproofing and drainage, directional drilling, CM and advice | A5 Längholz tunnel, Bern, Switzerland - 2.5km long twin-tube highway tunnel with typical cross section of 100m ² , construction started in 2007 and will cost approx. US\$240M; A16 Court tunnel, Bern, Switzerland - 686m long single tube road tunnel, connecting canton Bern with canton Jura, with a typical cross section of 100m ² , construction is due to commence in 2009 | BLS AlpTransit, Lötschberg Base Tunnel (Mitholz), Switzerland - 10km of twin-tube and 7km of single-tube tunnel for high speed rail line connecting Bern with canton Wallis, typical cross section 67m ² , completed in 2006 |
| Alpina Via Ripamonti 2 I-20136 Milan Italy Tel: +39 02 5830 5010 Fax: +39 02 5830 7388 Email: info@alpina-spa.it Web: www.alpina-spa.it | a) €5.7M b) €2.2M | Design/engineering Ground stabilisation Hydroelectric project tunnelling Microtunnelling Monitoring/warning/ alarm systems Project/construction management Raise boring & shaft drilling Relining/renovation Site investigation. | Milan metro line 5, Italy - Section Lagosta-Garibaldi: two stations and 2,5 km tunnels. Preliminary, final and detailed design of all underground works. Assistance to the Contractor during the works. Total amount of works 40 M€ Client: Metro5 SpA Milan metro line 5, Italy - Section Tre Torri: station and 0,3 km tunnel. Preliminary, final and detailed design of all the civil works. Total amount of works 10 M€ Client: Citylife SpA Oudayas tunnel and relevant access roads in Rabat, Morocco. City highway tunnel under historical building 1 km long. Final and detailed design of all underground and civil works. Assistance to the Contractor during the works. Total amount of works 40 M€ Client: Pizzarotti SpA Neshar 220 MW Hydroelectric plant in Haifa, Israel. One large cavern and 4 km hydraulic and road tunnels. Conceptual design of all underground and civil works. Total amount of civil works 150 M\$. Client: Clal Energy LP Saint Martin La Porte inspection tunnel - Turin-Lyon high speed railway tunnel, Italy-France - Supervision of works (joint venture with Egis Tunnels and Antea). Total amount of works 72 M€. Client: Lyon Turin Ferroviaire | Milan metro line 5, Italy - Section S. Siro-Settimo: 6 stations, train park and 4,5 km tunnel. Feasibility study. Client: Metro5 SpA Garibaldi-Repubblica tunnel in Milan. City highway tunnel 0,3 km long. Preliminary, final and detailed design. Client: IN.G.RE SpA Cassia Monte Mario tunnel- Rome, Italy. Ground freezing system for the detailed design of the Cassia Monte Mario tunnel. Client: Italferr Genova Voltri-Genova Brignole railway line, Italy - Detailed design for the structural upgrading of the line tunnels. Client: Italferr Acerra improvement route on the Cassino-Napoli railway line, Italy - Preliminary design. Client: Italferr Castellano railway tunnel - Bologna Lecce railway line, Italy - Detailed design for the restoration of some polycentric tunnel sections. Client: Italferr |
| Amberg Engineering Trockenloosstrasse 21 PO Box 21 CH-8105 Regensdorf-Watt Switzerland Tel: +41 44 870 9111 Fax: +41 44 870 9175 Email: info@amberg.ch Web: www.amberg.ch | a) US\$26.2M b) US\$23.1M | Engineering services for the construction and refurbishment of underground structures in all ground conditions. Planning, project design, site management, expert consulting, state assessment services, project management | Gotthard Base Tunnel, Switzerland - 57km long HSR line: design & construction supervision (JV) for southern sections; Semmering Base Tunnel, Austria - 30km long HSR line: alignment selection & design (JV); Axenberg Tunnels, Switzerland - Refurb of 3 tunnels (8km) under operation: design & construction supervision; Dobrovského Highway Tunnel, Czech Republic - 1.25km TBM heading: design & construction supervision; Gubrist Highway Tunnel, Switzerland - 3.3km long tunnel: design & construction supervision; Alborz Highway Tunnel, Iran - 6.3km long service tunnel: Design & construction supervision; XFEL, DESY, Germany - 3.4km accelerator tunnel: Design & CM | Zimmeregg Railway Tunnel, Switzerland - Project design for renewal of 1.1km rail tunnel; Milchbuck Highway Tunnel, Switzerland - Refurb of a 1.8km road tunnel: design & site supervision; AYA Tunnel, Singapore - MRT tunnel in soft ground: Design; Films Bypass, Switzerland - Project management of two tunnels; San Bernardino Highway Tunnel, Switzerland - Project management of 6.6km tunnel refurb; Uetliberg Motorway Tunnel, Switzerland - Design and CM for a 2 x 4.5km long twin tube, 3-lane, motorway tunnel; |
| Arcadis 9 avenue Réaumur F-92354 Le Plessis-Robinson France Tel: +33 146 01 2428 Fax: +33 146 013598 Email: direction@arcadis-fr.com Web: www.arcadis-global.com | a) €1.74bn | Full range of consulting services in the field of design and works supervision for all kind of tunnels, in any ground and watertable conditions | Coentunnel PPP, Netherlands - Finance, Design & construction of a 5-lanes Immersed Tube Tunnel - length 1270m - width 35m; A2 Leidsche Rijn, Netherlands - Design & built contract of a 8-lanes tunnel construction with a length of 2km; A2 Maastricht, Netherlands - Design & built contract of a 2.3km tunnel (cut and cover) - 2 storey road tunnel; New York City Transit, East Side Access, USA - 2200m twin railway tunnel connecting Grand Central Station Manhattan to eastern NY suburbs, including new station level below Grand Central - Construction management services; Tunnel rehabilitation under the Old Port, Marseille, France - 600m long immersed twin road tunnel - Project and construction management; New Railway transalpine Lyon-Turin, France/Italy - Preliminary design of the 57km long twin base tunnel; Los Bronces-Confluencia Conveyor Belt Tunnel, Chile - Basic Design & construction supervision of a 4.5km long tunnel, 7m wide & 5m tall for ore transport - Drill & blast; Cuervo Hydroelectric Power Plant, Chile - Basic Design of a 16km long tunnel, 9m wide & 7m tall - Drill & blast; Blanco Hydroelectric Power Plant, Chile - Basic Design of a 4.5km long tunnel, 7m wide & 7m tall - Drill & blast. | A50/A57 link, 2nd tube, Toulon, France - 1,820m twin tube highway tunnel - Detailed design; Metro, Line 1, Marseille, France - 973m long tunnel - EPB, diam. 9.80m - 4 new stations; LGV Perpignan/Figueras Perthus tunnel, France/Spain - 8.4km double-tube rail tunnel - Geotechnics, project and construction management; A86 Western loop highway near Paris, France - 2 storey road tunnel, 10km long; Upper Rouge Tunnel, Detroit, USA - 7-mile long deep tunnel, diameters 20 to 34 ft - 100 MGD dewatering pump station - Design & construction management; Santiago Metro Line 4, Chile - Detailed engineering for 4.5km tunnel & 4 stations; Belo Horizonte Metro Line 1 & 2, Brazil - 16.5km of tunnel and 18 mined stations; Busan-Geoje Fixed Link, South Korea - 3.3km long immersed tube tunnel 50 m below sea level - Independent design checking; Los Lumes Conveyor Belt Tunnel, Chile - Conceptual Engineering of a 18,800m long tunnel for ore transport; El Teniente New Level, Chile - 2 parallel tunnels 8km long, diameter 8m - conceptual Engineering |

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|--|--|---|
| Arup 13 Fitzroy Street London W1T 4BQ United Kingdom Tel: +44 20 7636 1531 Fax: +44 20 7755 2121 Email: tunnelling@arup.com Web: www.arup.com/tunnels | a) US\$1.2bn b) US\$34.8M | All tunnelling and underground projects: Design and project management for all types of tunnels, shafts, caverns and large excavations. Concept to detailed design, major project delivery, sustainability, JCOP benchmarking, advice, insurance assessments, etc. | UK: Crossrail, MDC, UK; Copenhagen Metro, Denmark; Olympics Primary Foul Sewer, UK; Tideway Lee Tunnel, UK; Dublin Interconnector, Ireland; D1 R1 Slovakia; Dublin Metro North, Ireland; M6 Hungary; USA: 2nd Ave Subway, NY; Lake Mead Intake No3, CA; 7 Line Extension, NY; Grand Central Terminal Caverns, NY; East Side Access Project, NY; California HSR, LA; New Crystal Springs Bypass (Polhemus) Tunnel, San Francisco; East Asia: Downtown Line Stages 2 & 3, Singapore; DSD Hong Kong West Drainage Tunnel; Ocean Park Redevelopment Project; DSD Harbour Area Treatment Scheme (HATS), HK; MTR Express Rail Link Tunnels, HK; Australia: Brisbane Airport Link; Northern Busway Project | UK: Olymics Powerlines Underground Project, UK; King's Cross St Pancras Station Redevelopment, UK; CTRL, UK; Tindaya Cavern, Fuerteventura; Cooling the Tube - Post Office Tunnel, UK; Waverley Station Enhancement, UK; LGV Cote D'Azur, France/Italy; East Asia: Downtown Line Stage 1, Singapore; Bugis Station A-E, Singapore; Nicholl Highway Collapse Investigation, Singapore; MTR Express Rail Link, HK; Nam Wan Tunnel, HK; Australia: T2E, NSW; Hobson Bay Sewer, NZ; North West Rail Link, Sydney; CBD Metro, Sydney |
| Atkins Woodcote Grove Ashley Road Epsom Surrey KT18 5BW Tel: +44 1372 726140 Fax: +44 1372 740055 Email: info@atkinsglobal.com Web: www.atkinsglobal.com | a) US\$1.78bn b) US\$20.6M | Tunnelling design, cavern engineering, settlement assessment, advanced numerical analysis, geotechnical investigation and expert ground characterisation, thermodynamic modelling, ventilation and risk studies | Crossrail MDC2, UK – Design; HK Regional Express Line – Preliminary design; Bond Street Station Upgrade, UK – Design; HK West Island Line – Detailed design; Dubai Metro Red Lines – Detailed design; HK Lai Chi Kok Drainage Tunnel – Detailed design; Victoria Station, UK – Category III design check; Cooling the Tube, UK – Ventilation analysis; Dubai Metro Green Lines – Detailed design; HK Shatin to Central Link – Preliminary design; Metronet BCV and SSL, UK – Assessments & inspection; HK Lai Chi Kok Drainage Tunnel – Detailed design; Belfast Sewers Project, Northern Ireland – Construction supervision; Hindhead Tunnel, UK – Agent; Queensway Tunnel, UK – Refurbishment studies | DLRL Dagenham Dock Extension, UK – Preliminary design of tunnels & stations, preparation of TWA docs; Gautrain Rapid Rail Link Project, SA – Detailed design of 11km of tunnels & 3 stations; Eurotunnel, UK – Specialist support on ventilation studies; Cooling the Tube, Bank, UK; Liverpool Street Step Free Access, UK; King's Cross Station Upgrade, UK – Technical advisor; Nanjing Metro Line 2 Ext, China – Technical study; Castle Peak Cable Tunnel, Hong Kong – Construction supervision |
| Babendererde Ingenieure Markt 2 D-23611 Bad Schwartau Germany Tel: +49 451 300 939 0 Fax: +49 451 300 939 29 Email: office@babeng.com Web: www.babeng.com | Undisclosed | Design works, technical consultancy, construction management, troubleshooting for mechanised tunnelling. Soft ground and hard rock tunnelling, compressed air works, data management, claim & arbitration support, PPP services | Hallandsås Tunnel, Sweden – 5,6 km long twin railway tunnels (Ø10,5 m Slurry-TBM), member of Technical Committee; Thessaloniki Metro, Greece – Twin 7.5 km long tunnels, TBM and NATM, plus 15 stations, support during design and construction phase; River Elbe Crossing, Hamburg, Germany – Twin 5.5 km long road tunnels (2 x Ø14 m Softground-TBMs) and 21 cross passages, design work; Brightwater Conveyance System, King County, US – Water transfer line, 4 TBMs, 26 km long, member of design team and data management; Pedestrian Tunnel Volkswagen, Germany, under life railway line, full design services; Tunnel Gastau, Brazil – 5 km long service tunnel in rock (Ø7 m Double Shield), construction management services and data management; POMPT Miami, USA – Highway tunnels 2 x 1,2 km long tunnels (Ø12,2 m EPB-TBM) passing under shipping canal in karstic ground, construction management services; Rosedale Outfall Project, NZ – Water outfall tunnel 3,8 km long and 3,4 m in diameter, consulting services | Metro Contract C855, Singapore – 3 km long twin tunnels, 2 x Ø6,6 m Slurry-TBMs, technical support during construction; Gautrain Rapid Rail Link Project, South Africa – 2,8 km long single track tunnel (Ø6,7 m EPB-TBM); Hobson Bay Orakei Tunnel Project, New Zealand – 2,9 km long water tunnel (Ø4,3 m EPB-TBM), design work and data management; Brixlegg Tunnels H3-4 & 8, Austria – 8,9 km long double track tunnels (2 x Ø13 m Slurry-TBMs). |
| Bennett Associates, MG Bennett House Pleasley Road Whiston Rotherham, S60 4HQ Tel: +44 1709 373782 Fax: +44 1709 363730 Email: jcb@bennettmg.co.uk Web: www.bennettmg.co.uk | a) US\$3.8M b) US\$0.2M | Expert witness in relation to design and use of TBMs, investigation into TBM failures for insurance companies, design of tunnelling machines and back-up systems, design of bespoke tunnelling equipment | Glendoe Hydro Electric Project, Scotland – Advisor to Scottish and Southern Energy on TBM matters; Singapore – Advisor on TBM matters for a cable tunnel; Assistance to loss adjuster for various tunnelling projects; Delhi Metro, India – Design and preparation of detail manufacturing drawings for a back-up system for a 6.52m diameter TBM | Alimnetti Madhava Reddy Project, India – Design and preparation of detail manufacturing drawings for a back-up system for 10m TBM; Pajares Tunnel, Spain – Design of segment hoist and segment feeder for 8m tunnelling machine |
| Black & Veatch 8400 Ward Parkway Kansas City Missouri 64114 USA Tel: +1 913 458 2000 Fax: +1 913 458 3626 Email: corporateinfo@bv.com Web: www.bv.com | a) US\$3.2bn b) US\$50M | planning, investigation, design, risk management, estimating, CM and alternative project delivery for water, wastewater, CSO, and stormwater conveyance tunnels, shafts, microtunneling, pipelines, and other buried infrastructure systems rehabilitation | System Conveyance & Operations Program, Las Vegas, USA – Lead design for 15.4km treated effluent tunnel; Lantau Tunnel, HK – Design of 7.1km rock tunnel; Bi-County Water Tunnel, Washington DC, USA – Design and CM for 11.2km rock tunnel; Cooper River & Daniel Island Tunnels, Charleston, USA – Design and CM for 11.2km soft rock tunnel; Ashley River Tunnel, Charleston, USA – Design, CM and resident engineering for 3.6km tunnel; Jollyville Water Transmission Tunnel, Austin Texas USA – Design; Indianapolis CSO, USA – Preliminary engineering and geotechnical design; Sydney Desalination Works, Australia – Design; Milwaukee Northwest Side Tunnel, Wisconsin, USA – Design, resident engineering for a 16km rock tunnel | Kai Tak Transfer Scheme, Hong Kong – Design and CM of a 1.5km mixed face slurry TBM tunnel for stormwater; Cady Marsh Tunnel, Chicago Metro, USA – Design and resident engineering for 2km flood control tunnel; Lewes CSO, UK – Design-build for 1.2km long conveyance tunnel; Thorn Creek Tunnel, Chicago, USA – Design of 7m dia hard rock connecting tunnel, shaft and gate system; Kansas River Crossing, USA – Design and CM for 2.5m diameter river crossing tunnel and carrier pipe |

B

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|--|--|---|
| C Capita Symonds Capita Symonds House Wood Street East Grinstead West Sussex, RH19 1UU United Kingdom Tel: +44 1342 327 161 Fax: +47 1342 315 927 E-mail: richard.lunniss@capita.co.uk Web: www.capitasymonds.co.uk | a) £270M b) £8M | Immersed Tunnels, sprayed concrete lining design, bored tunnels, cut & cover tunnels, tunnel refurbishment, M&E including tunnel ventilation and communication and control systems, tunnel operations, Inspection Entity role under the UK Road Tunnel Safety Regulations 2007 | M25 Bell Common Tunnel Refurbishment, UK – Detailed design for two additional lanes and refurbishment of mechanical and electrical systems for 500m long cut and cover tunnel Limerick Southern Bypass, Ireland – Detailed design of 600m long dual two lane immersed tunnel under the River Shannon Crossrail, London UK - Detailed design of Royal Oak Portal. Crossrail, London UK: Detailed design of North Woolwich & Plumstead Portals. London Underground, UK. Green Park Station Step Free Access. Detailed design of tunnels and shafts Second Tyne Tunnel, Newcastle, UK – Lenders' Technical Adviser on PFI project for new 2.2km tunnel (immersed/bored/cut & cover) under the river Tyne and refurbishment of the existing tunnel Mount Sion Tunnel, A41 Autoroute, France – Lenders' Technical Adviser on PPP project for twin bore 3km long hard rock road tunnel SCUT 2, A24, Portugal – Lenders' Technical Adviser for PPP motorway including 900m and 500m long rock tunnels D1 Motorway, Slovakia – Lenders' Technical Adviser for new motorway including four tunnels (3km, 0.5km, and 2x2km long); Bognanco, Italy - Detailed design and supervision of construction of rock tunnel and caverns for new underground Hydroelectric Power Plant. | M25 Holmesdale Tunnel Refurbishment, UK – Detailed design for two additional lanes and refurbishment of operational systems for 650m long cut & cover tunnel London Underground Tunnel Cooling, London UK – 5 stations on the Central Line and 9 stations on the Northern Line E18 Bjørsvika Tunnel, Oslo, Norway – Detailed design of dual two lane 700m long immersed tunnel under Oslo Harbour |
| Coffey Geotechnics PO Box 125, North Ryde, NSW 1670, Australia Tel: +61 2 9911 1000 Fax: +61 2 9911 1001 E-mail: geotechnics@coffey.com Web: www.coffey.com | a) US\$326M b) US\$2M | Site characterisation, numerical modelling, soil structure interaction, shaft design, support design | Power Grid Cable Tunnel, Singapore – Design & construct project for a 2.6km cable tunnel. Undertook detailed design of the shafts and tunnel components and construction services; Inner Northern Busway, Brisbane, Australia – Alliance partner in the design and construction of this project; Airport Link, Brisbane, Australia – Geotechnical and groundwater input to the tender design | SMART Tunnel, Kuala Lumpur, Malaysia – Geotechnical review of tunnelling works; Perth Urban Railway Development (PURD F), Australia – Geotechnical engineering advice; Lane Cove Tunnel, Sydney, Australia – Scope of works included investigation, prediction of rock mass response, design of retaining walls, ground improvement measures and settlement assessments |
| Cowi Parallelvej 2 2800 Kongens Lyngby Denmark Tel: +45 4597 2211 Fax: +45 4597 2212 Email: cowi@cowi.dk Web: www.cowi.dk | a) €90M b) €1M | Soft ground tunnelling technology with earth pressure balance TBMs; Durability assessments of concrete structures; Risk assessment; Specifications for TBM; Segmental Lining Design; Shaft design; Sprayed concrete linings; Design and installation of ground water control schemes; Mechanical and electrical systems; Ventilation systems for tunnels and underground stations | Metro Cytaringen, Copenhagen, Denmark - A new metro circle line consisting of 16 km twin tube tunnels with 17 underground stations; Citybanan – Söderström, Stockholm Tender - basic and detailed design of the 400 m long immersed Söderströmstunnel in Central Stockholm; Marieholm Tunnel, Gothenburg, Sweden - Clients consultant for the development, tender and implementation. The Marieholmstunneln is an immersed tunnel and will be 500 m long under the Gotha River. It has 2x3 lanes. Hong Kong – Zhuhai Macao - Clients consultant for the development of a 5.8 km road tunnel between Hong Kong and Macao / Zhuhai; Busan-Geoje Immersed Tube Tunnel, Korea - Detailed design of a 3.4 km triple tube road tunnel between Busan and the Island of Geoje. The total length of the tunnel will be 4 km. The tunnel will have a maximum depth of 50m (world record); STEP tunnel, Abu Dhabi - The Strategic Tunnel Enhancement Programme (STEP) includes a deep sewer tunnel with a diameter up to 6.3 m and several link sewers to transport wastewater to treatment plants in the area. Services by COWI: Contracts T-02 (16.2 km) and T-03 (10 km) tunnel | Bjørsvika immersed Tunnel, Norway - Design review a dual tube highway connection under Bjørsvika and Bispevika in Oslo Harbour. The design includes approximately 600 m immersed tunnel and 250 m cut & cover tunnels; District Heating Tunnel, Denmark - Design of a 4.5 km bored tunnel and shafts for a district heating system transporting 300° temp. for central heating. The tunnel has an internal diameter of 4.2 m; Nanjing Yangtze River Tunnel, China - Supervision of TBM manufacturing and assistance to Client on implementation of tunnelling project with two 15 m diameter slurry TBMs for a twin-tube road tunnel to be constructed in soft clayed river deposits; Copenhagen – Ringsted, High Speed Railway - Clients consultant. Preliminary design of the high speed railway line which includes 2 km of urban railway tunnel through Valby, Copenhagen; Malmö City Tunnel, Sweden - 8km railway tunnel with 2 underground stations in Malmö Sweden. Engineering services for the Client for all tunnel and underground structures and Mechanical end electrical installations. |
| D D2 Consult Hirschgasse 32 A-4020 Linz Austria Tel: +43 732 713812 Fax: +43 732 713812 4 Email: office@d2-consult.eu Web: www.d2-consult.eu | a) €4M b) - | provide comprehensive knowledge both in conventional (NATM) and in mechanized (TBM) Tunnelling. The D2 Consult partners' know-how cover all areas of infrastructure. The D2 Consult team provides technical services, being based on experiences and know-how as gained during realization, as well as during rehabilitation of major infrastructure projects. D2 Consult services ranges from Design, Project Management, Construction Supervision and Consultancy covering all Engineering services for public as well as private clients. | Highspeed Railway Brenner Lot H2-2 / Austria Construction supervision and contract management for main construction of double track tunnels of Lot H2-2. Lot H2-2 has a length of approx. 2.4 km and is situated in the East of the section. A9 Motorway Pyhrn - „Bosrucktunnel“ 2nd Tube / Austria Attendant control during design and construction in JV for the tunnel with approx. 5.500 m length. Interceptor Belgrade / Serbia. Project Management, Construction Supervision & Technical Assistance for the new collector system with a TBM Tunnel with a total tunnel length of approx. 6,770 m. Mellat Road Tunnel Tehran / Iran. Detailed Tunnel Design and Technical Supervision for the 3.2 km long project section which includes three uni-directional 2lane tunnel tubes with emergency lanes. The length of the north tunnel is 2,628 m and the south tunnel is 2,370 m. They have a cross section of 185 m² and will be excavated by NATM (New Austrian Tunneling Method). S1 Vienna Expressway - Tunnel Danube - Lobau / Austria. In the course of construction of section S1 the River Danube is under crossed with the new twin-tube road tunnel "Danube- Lobau". Preliminary and Tender Design for the tunnel with a length of 7,729.3 m (5,979.8 m TBM, 1,749.5 m open cut section) and a diameter of 15 m. | Wuhan Yangtze River Tunnel Project / PR China Technical consultancy services during design and construction for the 2 TBM Tunnels with 2 lanes which are connecting Hankou Dazhi Road in the north with Wuhan Yonyi Road in the south. Tunnel length is of 3.7 km. Metro Bangkok, Blue Line Extension / Thailand Detailed structural design of the TBM tunnels, the cut&cover sections and the mined sections of the 4 stations. Length of underground structures 5.2 km including crossing of the Chaophraya River. Highway Tunnels El Tablon - Pipiral Bogotá - Villaviciencio / Colombia Detailed conventional tunnel and portal design including electromechanical design for ventilation, illumination, signalling, traffic control, etc. for the 8,500 m long tunnel. Metro Budapest 4th Line / Hungary Design & Consulting Services for the new line 4 has with a total length of 2 x 7.3 km single tube and TBM driven tunnels including 10 metro stations and running tunnels. Highspeed Railway Brenner, Section North / Austria Review of final design and Consultancy Services for the design of the 5 main tunnels and the investigation Tunnel Brixlegg. Length of the 5 main tunnels are of 4.2 km, 5.5 km, 3.5 km, 8.8 km and 2.9 km (approx. 2,500 m with cut & cover) and they have a cross section of 100 to 150 m². |

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ROME METRO LINE B1
LIBIA / GONDAR STATION

BREAKTHROUGH 16/12/2009



www.selitunnel.com

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|--|--|
| Dawn Underground Engineering 10 Village Court Hazlet NJ 07730 USA Tel: +1 732 739 8840 Fax: +1 732 739 8870 Email: dawnunderground@comcast.net Web: www.dawnunderground.com | Undisclosed | TBM in rock and soft ground, microtunnelling, drop shaft design, Geotechnical Baseline Reports, design of shaft supports, design of ground improvements | Croton Water Tunnel, NYC, USA – Design of TBM option for twin 9ft i.d. water mains in rock tunnel to connect the New Croton aqueduct with a new water treatment plant; Kensico Water Tunnel, NYC, USA – Member of design team for shafts and tunnel for new water supply line; Dobson Run Flood Relief Sewer, Philadelphia, USA – Design and geotechnical engineering for 3,500ft of 12'6" i.d. storm relief sewer in rock by TBM or roadheader; Dugway East Interceptor Relief Sewer, Cleveland, USA – Design and geotechnical engineering for two RR crossings in tunnel (hand mined and micro) for 78" and 48" relief sewers; CSO Facilities Plan, NY, USA – Evaluation of tunnel storage options | Contract T230 Relief Sewer, Cleveland, USA – Design and geotechnical engineering for 11,000ft of 6' i.d. sanitary relief sewer and six shafts; Linden Flood Control, Linden NJ, USA – Design of twin 330ft 66" RCP storm sewers in microtunnel beneath 14 active rail lines with shallow cover; Toledo East Side Water Main, USA – Design and geotechnical engineering for 1,600ft 48" concrete pressure pipe in tunnel beneath the Maumee River; Mill Creek Tunnel Phase 2, Cleveland, USA – Design of 3 vortex drop structures |
| Donaldson Associates Eastfield, Church Street, Uttoxeter, Staffordshire, ST14 8AA, United Kingdom Tel: +44 1889 563680 Fax: +44 1889 562586 Email: uttoxeter@donaldsonassociates.com Web: www.donaldsonassociates.com | Undisclosed | Design, site supervision, technical advice for all tunnel related projects including civil, structural and geotechnical aspects from pre-feasibility to construction, asset management and remedial works, expert witness services. | Gibraltar Airport - Design checking and development of wave deflection wall for major cut and cover tunnel Bradway and Standedge Railway Tunnels - Design development of re-lining projects, including partial and total replacement of Victorian brick and masonry linings North London Cable Tunnels - Ongoing reference design development for 20km of new tunnels and associated shafts Hong Kong High Speed Rail Link - Tender design and geotechnical review for 7.5km of 15m span hard rock tunnels including associated shafts and access adits. | Green Park Station – London Underground Design of elliptical, sprayed concrete shaft and tunnel openings onto cross passages and station platform tunnels Dublin Metro North Independent review panel member – Review of tunnelling options prior to public enquiry London 2012 - Design of 1500m primary drainage tunnel and 15 shafts Tunnelling Advice Middle East - Design, expert reports and site supervision for tunnel projects in Bahrain, Abu Dhabi and Mecca |
| EBA Engineering Consultants 9th Floor, Oceanic Plaza 1066 West Hastings Vancouver, BC V6E 3X2 Canada Tel: +1 604 685 0275 Fax: +1 604 684 6241 Email: istewart@eba.ca Web: www.eba.ca | a) C\$55M b) C\$0.75M | Rock tunnel design, tunnel inspection, support design, geotechnical & geological mapping, geotechnical investigation, construction supervision, tunnel / surface instrumentation installation & monitoring, and seismic tunnel assessment. Other principal EBA practice areas include geotechnical engineering, mining, arctic engineering, environmental engineering and marine engineering. | Seymour-Capilano Twin Tunnels Project, N. Vancouver, Canada - Working for the Metro Vancouver in the assessment and mapping of geotechnical and geological conditions within two TBM driven tunnels in North Vancouver. Total tunnel length is 14.6 km, diameter of the tunnels is 3.8 m. The work involves producing sidewall maps of the tunnel, water inflow measurements and geological mapping, as well as rock sample collection and testing Cleveland Dam Elevator Shaft Installation, North Vancouver, Canada - Working for CWA Engineers, EBA are carrying out the design and rock support remediation for a 60 m deep airshaft at the Cleveland Dam. This included the installation of an elevator within the shaft. | Coquitlam Dam Tunnel, Vancouver, Canada - EBA were employed by the GVRD to assess the Coquitlam Dam outlet tunnel stability as part of a remediation program. The tunnels which have been driven in granodiorite were mapped and assessed geotechnically, permanent support was designed and the remediation construction was supervised by EBA First Narrows & Port Mann Water Supply Crossing, Vancouver, Canada - EBA were employed by the GVRD to assess the water supply tunnels and pipelines for water supply crossings. The finite element software FLAC was used to assess the seismic risk to the tunnel structures and drop shaft. Recommendations were made on remediation measures based on the results of EBA's investigations and seismic analyses RAV Line Site Investigation of Bored and Cut & Cover Section Marine Drive to Waterfront Station, Vancouver, Canada - Working for the principal contractor SNC Lavalin on the RAV line, EBA were coordinating the site investigations along the route with the supervision and logging of |
| EGIS Tunnels Les Pleiades No 35 Park Nord Ancey 74373 Pringy France Tel: +33 4 5027 3939 Fax: +33 4 5027 3940 Email: contact.egis-tunnels@egis.fr Web: www.egis.fr | a) US\$48M b) US\$22M | Geology, soil & rock mechanics, civil engineering, M&E, ventilation, fire studies, risk & danger studies, rescue & intervention plans, analysis of pollution, monitoring, diagnosis & renovation of tunnels, operation | Maurice Lemaire Tunnel, France – Project management (in JV) for design and construction of renovation for 7km tunnel. Administrative procedures (impact studies, environmental and groundwater studies, safety study); A89 Tunnels, Lyon-Balagny, France – Project management. Full design and site supervision of 3 tunnels - Violy (4km), Chassolet (1km) & Bussieres (1km); A8 Tunnel Renovation, France – Project management. Full design and site supervision for the upgrade of 5 tunnels and construction of a new 1km tunnel (Borne Romaine); Croix-Rousse Tunnel Renovation, France – Project management/design of the functional and technical programme for design & build contract | Thira Tunnel, Albania – Design of 5.5km long motorway tunnel; A51-Sinard, France – Full project management of tunnel drilling works and studies. Detailed design of engineering structures; Pir Panjal Road Tunnels, Kashmir, India – Design and studies for 8.7km of road tunnels; Lyon-Turin, France/Italy – Construction of St Martin La Porte gallery, two galleries and carried out pre-development work on site. Studies for main 52km tunnel; Grands Goulets Tunnel, France – Studies and works for several tunnels |
| ELEA IC Dunajska cesta 21 SI-1000 Ljubljana Slovenia Tel: +386 1 420 1060 Fax: +386 1 420 1066 Email: info@elea.si Web: www.elea.si | a) US\$4.4M b) US\$1.7M | Geological, geotechnical and numerical modelling, structural and tender design, electromechanical design, architectural design, construction supervision | Sentvid Tunnel System, Slovenia – Twin road tunnel in urban area; Vodole Tunnel, Slovenia – First tunnel in SLO with a Markovec Tunnel, Slovenia – Two twin road tunnels in urban area, length 4km (JV with IRGO consulting) (NATM: 105m2); Tabor and Barnica Tunnels, Slovenia – Two twin road tunnels, length 1850m (NATM: 105m2) including geological and geotechnical modelling and E&M equipment; Lesceveje Tunnel, Slovenia – Twin road tunnels; Cenkova Tunnel, Slovenia – Twin road tunnels; Karavanke Tunnel, Slovenia – Rehabilitation of highway tunnel; Sten Tunnel, Slovenia – Consultant for client; Encarnação Metro Station, Lisbon, Portugal; 3rd Development Axis, Slovenia – Studies | Sentvid Tunnel System, Slovenia – Various lots completed. Tunnel length approx. 3.5km (NATM); Tabor and Barnica Tunnels, Slovenia – Two twin road tunnels, length 1850m (NATM: 105m2) including geological and geotechnical modelling and E&M equipment; Karavanke Tunnel, Slovenia – Rehabilitation studies for a highway tunnel |

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
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| European Tunnelling Services 5 Fleet Road, Benfleet, Essex, SS7 5JE United Kingdom Tel: +44 1268 750708 Fax: +44 1268 750708 Email: gordon@grince.plus.com | Undisclosed | Advice on TBM selection, specification, procurement and manufacture | TBM Consultancy, CLRL, London, UK – Specialist TBM advisor to Crossrail promotor; Cross London Rail Links (CLRL). Member of Expert Panel. Lower Lea Valley Cable Tunnels, London, UK – Specialist TBM advisor to J Murphy & Sons, responsible for drafting TBM specification, procurement and manufacture; Thames Tideway Project, London, UK – Peer review member for Thames Water; Deerborn, USA – TBM expert working for insurers | Qumroud Water Transport Tunnels, Lots 1 & 2, Iran – TBM specification for Sabir Waterworks & Dam Company; Channel Tunnel Rail Link, Section 2, London, UK – Specialist TBM advisor to CTRL working on insurance claims |
| 3G Gruppe Triester Strasse 478a A-8055 Graz-Seiersberg Austria Tel: +43 316 3377 99 Fax: +43 316 3377 9911 Email: office@3-g.at Web: www.3-g.at | a) €3.8M b) €2.5M | Geological, hydrogeological and geotechnical services for design and construction structural design for Cut and Cover, NATM and TBM tunnel construction site supervision claim management tunnelling in squeezing ground tunnelling in complex and difficult geological and geotechnical environments | Metsovo Tunnel, Greece - Double tube, double lane highway tunnel, length: 3.5 km, cross section: 107 m ² to 142 m ² incl. a 1.8 km long ventilation tunnel parallel to the main tunnel. The NATM tunnel has an overburden of up to 600 m and is excavated in squeezing ground. Geotechnical and structural design of the second tunnel tube, cross passages and ventilation tunnel, technical supervision during construction Eisack Hydropower, Italy - Hydropower project, energy production: approx. 349 GWh/a, capacity: approx. 90, MW, hydraulic head: 346 m weir structure pressure tunnel: length approx. 23 km (TBM, diameter: approx. 5 m), surge tank, pressure shaft, power house chamber, tail water tunnel. Geological, hydrogeological and geotechnical field work and consulting services. Feasibility study, environmental impact study, preliminary design Dragachhu Hydropower Project, Bhutan - Hydro power project, capacity: approx. 100 MW, hydraulic head: approx. 300 m weir structure head race tunnel: approx. km (NATM, cross section: approx. 2 m ²), surge tank, pressure shaft, power house and transformer chamber, tail water tunnel. Design and supervision of investigation program, geological, hydrogeological and geotechnical field work and consulting services. Comparison of alternatives, feasibility study, detailed design. | Koraln Tunnel, Federal Railways, Austria - Construction lot KAT 1: double tube railway tunnel of 2.25 km length (NATM). Geological and geotechnical tender design. Construction lot KAT 2: double tube railway tunnel of 20.05 km length (NATM: 2.45 km, TBM: 17.60 km), access shaft with a depth of 60 m. Geological and geotechnical tender design. Tauern Gas Pipeline, Austria - Gas pipeline crossing the Austrian Alps from N to S, pipe diameter 900 mm, length: approximately 290 km (approx. 250 km trench section, approx. 40 km tunnel and micro-tunnelling section). Geological, hydrogeological and geotechnical investigation and design work. Route selection, feasibility study, environmental impact study, preliminary design Niayesh-Sadr Tunnel Project, Iran - Suburban double tube road tunnel of 2.77 km length (NATM), 4 ramp tunnels with bifurcations, access tunnel and shaft. Excavated cross section: minimum 185.8 m ² . Soft ground tunneling with low overburden. Geotechnical and design consulting services during construction |
| Gall Zeidler Consultants 44345 Premier Plaza Suite 210 Ashburn, Virginia 20147 USA Tel: +1 703 726 2700 Fax: +1 703 726 6999 Email: office@ gzconsultants.com Web: www.gzconsultants.com | a) US\$5M b) US\$5M | Worldwide services provided in the disciplines of Geotechnics, Tunnel Design and Civil Engineering including: Geotechnical Engineering, NATM/TBM Tunnel Design, Soil Improvement, (Ground Freezing, Grouting), Construction Design, Soil Structure Interaction Analyses and Design Calculations, Instrumentation & Monitoring, Claim Analyses, Tunnel Waterproofing, and Shaft Design | Caldecott Tunnel Improvement, 4th bore, Walnut Creek, California, USA - SEM highway tunnel, construction management services Devil's Slide Tunnel, Pacifica, California, USA - NATM highway tunnels, design, construction and support Dulles Corridor Metrorail, Northern Virginia, Dulles International Airport, USA Structure: TBM and NATM Subway Tunnels and Underground Station, design Trans Hudson Express Tunnel, Newark, New Jersey – New York, New York, USA - Single track railway tunnels and underground stations, design CrossRail, London, UK - Underground station, design and consulting | King's Cross Station Redevelopment, London, UK - Underground station redevelopment, consulting, construction management Fort Canning Tunnel and Realignment of Stamford Road, Singapore - Three Lane highway tunnel, design, site supervision Weehawken Tunnel, North Bergen, New Jersey, USA - Railway tunnel and station reconstruction, tunnel consultant Beacon Hill Station and Running Tunnels, Seattle, Washington, USA - running tunnels and station, design, tunnel consultant |
| GeoConSol 17 Everett Street, Sherborn MA 01770, USA Tel: +1 508 650 3600 Fax: +1 508 650 3688 Email: pjt@geoconsol.com Web: www.geoconsol.com | Undisclosed | Tunnels, tunnel boring differing site conditions, forensic investigations, construction productivity | Singkarak Hydropower Plant, Indonesia – Total of 7km, with diameters varying from 1.5m to 3m; Washington Subway, Washington DC, USA – 1.5km of 6m diameter tunnel; Various Pipe Jacking Projects (New England, Hawaii, California, Texas); DTSS, Singapore; Cable Tunnel, Singapore | Boston Harbor Outfall, USA; Boston Central Artery, USA; Metropolitan Water Reclamation District, Sewer Tunnels, Chicago, USA; Various Pipe Jacking Projects (New England, Texas, California); LA Subway, Los Angeles, USA; Tsen-Wen Water Supply Tunnel, Taiwan |
| Geoconsult Hözlstrasse 5 A-5071 Wals, Salzburg Austria Tel: +43 662 659 650 Fax: +43 662 659 6510 Email: office@geoconsult.at Web: www.geoconsult.at | a) US\$12.7M b) US\$10.4M | All ground conditions, from hard to soft rock, cohesionless sand & all cohesive soils and mixed face conditions. Conventional tunnelling, shield and TBM tunnels. Special expertise in compressed air, ground freezing and grouting | Brenner Base Tunnel, Austria – 55km rail tunnel. Preliminary design, EIS; Tapovan Vishnugad HEP, India – Design review, consulting & construction supervision; HSR Munich-Verona, Austria – Lots H2-2, H3-6, H4-3, H5, H6, H7 & H8. Detailed design & construction supervision; Pir Panjal Tunnel T80, India – 10km rail tunnel. Detailed design & construction supervision; Koralmtunnel, Austria – 32km rail tunnel. Design & EIS; Lowari Rail Tunnel, Pakistan – 8.5km rail tunnel; Metro Dubai, UAE – Detailed design for TBM sections; Metro Budapest, Line 4, Hungary – Tender & detailed design; Shimla Tunnels, India – 7 road tunnels; HSR Lahore-Rawalpindi, Pakistan; Lainberg Tunnel, 2nd Tube, Austria | Lyon-Turin HSRL, France/Italy – 53km + 12km tunnels EIS; Arlberg Rail & Road Tunnel, Austria – Preliminary, tender & detailed design; New MetroRail City Project, Contract 27/03, Perth, Australia – 800m twin tube bored tunnel (EPB), 1.5km C&C and 2 x underground stations; AGTS Tunnels, Atlanta, USA – Detailed design; A10 Katschbergtunnel, 2nd Tube, Austria – Preliminary & detailed design; BAB A38, Höllberg Tunnel, Germany – Preliminary, tender & detailed design of 2 road tunnels |

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TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|---|--|
| Geocontrol, S.A. Cristóbal Bordiú, 19-21, 5ª planta 28003 Madrid Spain T: 00 34 91 553 17 63 F: 00 34 91 554 93 96 www.geocontrol.es geocontrol@geocontrol.es | a) €5.3M b) - | Tunnel's Design Tunnel's Inspection and refurbishment Technical Assistance during tunnel construction Safety installations Escape route optimizations | Guadarrama Tunnels, Spain – Twin bore HSR tunnels, 28,3 km (4 double-shields TBM; Ø10 m). Construction's control; San Pedro Tunnels, Spain – 2 twin-tunnels, 9 km each. Construction's control. Abdalajís Tunnels, Spain – 2 twin tunnels, 8 km each (2 double shields TBM Ø10 m). Technical assistance. Barcelona Underground, Spain – Management of the extension of Line 3 (D&B) and expertise on Line 9 (EPB Ø12 m and TMB Ø12 m). Access NW to Santiago de Chile – 4 motorway tunnels (D&B 3,2 km). Technical Assistance. Variante Vespucio-El Salto-Kennedy, Chile – 2 twin motorway tunnels in Santiago de Chile for Dragados-Hochtief (1,6 km D&B). Lalín-Santiago High Speed Railway Line, Spain – Construction's control to ADIF during the construction (28 tunnels, 13 km, D&B). Design for the conversion to a high speed railway line of Lorca's Railway (Murcia). Design of the new high speed railway line Orense-Monforte-Lugo. Canabal's By-pass. Construction's control to the Administration during the construction of the New Highway GC-1. Section: Puerto Rico-Mogán (Canary Islands). Tunnel of Padornelo, Spain – Refurbishment of an old 6 km length tunnel in the High Speed Line to Galicia. Tunnel of Archidona, Spain – Technical Construction's control of a high speed railway tunnel 2 km length (D&B) in the new line between Bobadilla and Granada. | Technical Assistance during the construction of the underground works of the Confluencia Hydroelectric Power Station. Design of the section Armiñón-La Puebla de Arganzón which belongs to the High Speed Railway Line Madrid-French Frontier (2,5 km tunnel). Design of three cut and cover tunnels (500m, 750m and 150 m) of the section Campanas-Esqiroz, which belongs to the Cantabrian High Speed Railway Line (Pamplona). General Advisers of the works belonging to the High Speed Railway Line between Murcia and Almería. Inspection of the tunnels included in the Road Network (North of Spain). |
| Geodata Corso Duca degli Abruzzi 48/E I-10129 Torino Italy Tel: +39 011 5810 611 Fax: +39 011 597 440 Email: gd_commercial@geodata.it Web: www.geodata.it | a) €18M b) €12M | Planning and supervision of site investigations; risk analysis and management; design of tunnels in complex and/or difficult ground conditions; design and construction control of tunnels in urban areas especially mechanized tunnelling; design and construction management of long tunnels at great depth; value engineering; probabilistic design; risk-reduction-driven design; choice of construction method using decision tools and multi-criteria analysis techniques; design of innovative ground improvement solutions; management of tunnel construction and its induced effects using an in-house developed computer system code-named GDMS which is GIS-based and accessible via internet. | Istanbul Metro, Turkey – Construction design of 9km of NATM tunnels, of E&M systems, and of 16 stations. Construction follow-up of all the underground works except for the TBM tunnels Tabriz Metro Line 1, Iran - Conceptual and Construction Design of running tunnels (20.9km) and shafts Arroyo Maldonado flood-relief tunnels, Argentina – Construction management of two hydraulic tunnels, respectively 10 km and 5 km long North section of electrified double-track project, Malaysia - Construction Design and Supervision of Berapit and Larut tunnels Gran San Bernardo safety tunnel (5.94km), Italy-Switzerland border – Construction supervision Petrobras Gasoduto Caraguatatuba (5.1km), Brazil - Design & construct follow-up of TBM tunnelling Sochi Road and Rail link to the ski resort for 2014 Winter Olympic Games, Russia - Design of the tunnels, safety and ventilation concepts, operational aspects, and costs Minas and Union as well as Villadora and Chontal hydropower schemes, Ecuador – Updating of Feasibility Stud | Bologna Metro, Italy – Final design of the 7.86km long line including 12 stations and 11 shafts Torino Metro Line 1 extension to Lingotto, Italy – Design and construction follow-up of the 4.5km long, twin-track, single-bore, running tunnel and of the 6 stations Frejus railway tunnel refurbishment, Italy – Construction design and follow-up of the rail track lowering works, safety plants, and upgrading of the railway equipment Updating of the preliminary design of Gibraltar – Geotechnical studies, risk assessment, and choice of the most appropriate construction techniques High-speed railway Rio de Janeiro-São Paulo-Campina, Brazil – Site investigations and risk analysis for the 510 km long alignment Tunnel #4 (72km) on the west line of the mega S-N water transfer project, China – Consultancy on 13 key technological issues essential for engineering design, construction and investment budget of this extremely long tunnel at large depth Twin-bore Chaohe tunnel (18km) on the middle line of the mega S-N water |
| Geo-Design Ibsley House Mockbeggar Lane Ringwood Hampshire, BH24 3PR United Kingdom Tel: +44 1425 473005 Fax: +44 1425 473007 Email: geo-design@geo-design.co.uk Web: www.geo-designgroup.com | a)£0.8M b)£0.6M | Specialist design and feasibility reviews, Assessment of tunnelling conditions, State-of-the-art numerical modelling, Evaluation of in situ stress fields, Cavern design, Cavern performance monitoring, Large span caverns under limited cover, Caverns in sensitive urban environments. | HATS Stage 2A HK - Detailed design of temporary adit complexes for drill and blast tunnel at depth and associated hydrogeological impact assessments West Island Line, HK - Detailed design of main cavern and intersections for two metro station caverns Express Rail Link, HK - Review of design of bifurcation caverns and detailed hydrogeological Impact Assessment Gilgel Gibe II Hydro-electric Project, Ethiopia - Independent review of tunnelling conditions Brisbane Airport Link, Australia - Highway Cavern Review and Independent Design Assessment Canal Basin Cavern and Mine Gallery, UK - Stability assessment and review of stabilisation options Bincombe Tunnels, UK - Assessment of impact on tunnel by proposed road cutting. Investigation of construction shaft. | Tel-Aviv Jerusalem Railway - Review of tunnel bifurcation and four track station caverns Rosia Montanna, Romania - Review of mine stabilisation feasibility Dublin Metro North, Ireland. Reference design of O'Connell Street Stop (station located within cavern) Gautrain Project, South Africa - Independent checking engineer of three bifurcation caverns and station caverns, including stacked station cavern Gerrards Cross, UK - Review of causes of tunnel collapse Dublin Port Tunnel, Ireland - Detailed Design of cross overs and associated cavern complex DTSS, Singapore - Review of chamber collapse causes. Dublin Metro North, Ireland - Concept design for O'Connell Street Station Cavern Wren's Nest, UK - Detailed review of stabilisation options for Seven Sisters Mine for future public access Triangeln Station Cavern, Malmo Sweden - Feasibility assessment of cavern construction Steelport Pump Storage Scheme South Africa - Review of cavern design. Bramhoek PSS, Scheme South Africa, Review of cavern design. |

TUNNELLING CONSULTANTS

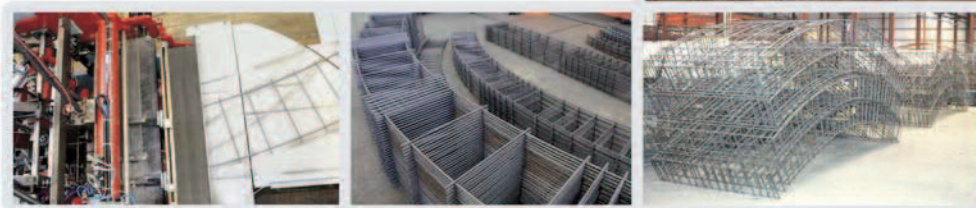
| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|--|---|
| Geosigma Box 894, SE-75108 Uppsala Sweden Tel: +46 18 650 800 Fax: +46 18 121 302 Email: rikard.dahlstrom@geosigma.se Web: www.geosigma.se | a) US\$11M b) US\$8M | Site investigation (geological, hydro geological, geophysical), ground water, pollutants in soil and rock, Geotechnical Baseline Reports, design of underground works | Geological Deep Repository (for high level nuclear waste), Sweden – Site investigation; Citybanan Rail Tunnels, Stockholm, Sweden – Project management; Ådalsbanan Railway Tunnels, Härmösand, Sweden – Project management; Hallandsås Railway Tunnel, Sweden – Member of the technical committee | Geological Deep Repository (for high level nuclear waste), Sweden – Pre studies; Ådalsbanan Railway Tunnels, Härmösand, Sweden – Geophysical site investigation; Citybanan Rail Tunnels, Stockholm, Sweden – Rock characterisation |
| GIUA & Partners 59 Viale Parioli 00197 Rome, Italy Tel: +39 06 8069 1529 Fax: +39 06 8075 575 Email: info@giuapartners.com Web: www.giuapartners.com | Undisclosed | Design/engineering for lighting, ventilation, safety system, electrical equipment, fire protection, traffic control (CCTV, PMV, etc), risk analysis, CFD. | Motorway Terni-Rieti, Italy - Design and safety system for 3 bi-directional tunnels (6km in total) Giovanni XXIII Urban Tunnel, Italy - Supervision on safety system for the upgrade (2 tubes, 3km each) SA-RC Highway, Macrolotto 3, Italy - Final Design for E&M and safety system for 5 tunnels (6km in total). | Statal Road SS42, Tonale, Italy - E&M and safety system design for 3 single tube, bi-directional tunnels (6.1km in total) Saudi Arabia - Final design of E&M system for 36 tunnels (12km). |
| GOBA PO Box 180 Sunninghill 2157 South Africa Tel: +27 11 236 3300 Fax: +27 11 807 8535 Email: dienies@goba.co.za. Web: www.goba.co.za | a) US\$35M b) - | Drill and blast tunnelling, hard rock and soft ground TBM tunnelling, design and construction supervision, claims evaluation and adjudication, DABs and mediation | Lesotho Highlands Water Project – Feasibility studies of future development options for further phases. Detailed feasibility study for Phase 2, including preliminary design of 40km of hard rock tunnels | Durban Harbour Tunnel, South Africa – 600m long sub-aqueous tunnel excavated 35m below sea level with mixed shield slurry TBM, with precast segmental lining and tunnel gradient up to 20% Gautrain, South Africa – Underground works design for bidding consortium for 15km of high speed rail link Leeuwkes Relief Outfall Sewer Tunnel – Drill and blast tunnel Lesotho Highlands Water Project – Mohale-Katse Tunnel, 32km hard rock TBM tunnel. Matsoku Diversion Tunnel, 6km drill and blast tunnel |



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TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|--|---|
| Golder Associates 2390 Argentia Road Mississauga Ontario, L5N 577 Canada Tel: +1 905 567 4444 Fax: +1 905 567 6561 Email: tunnels@golder.com Web: www.golder.com | Undisclosed | Environmental permits, risk management, site characterisation, tunnelling methodology, ground response, ground improvement, ground water control, rock support, pressure tunnel design, instrumentation, tunnel rehabilitation | Upper Mamquam Hydro Project; Second Narrows Water Tunnel, BC, Canada; Low Lift Pumping Station Tunnel, Hamilton; St. Lawrence River HDD Crossing, Quebec; York Peel Water Main & Sanitary Sewers, Ontario; Hallandsås Tunnel, Sweden; Lumwana Mine Development, Zambia; Underground Command Post, South Korea; Lyon-Turin HSR; Turin Metro; Milan-Napoli HSRL; Bakun Water Supply, Philippines; KHNP Cooling Water Tunnels, S Korea; Nathpa Jhakeri HEP, India; Dendrobium Mine Access; Cincinnati CSO, Ohio; Pittsburgh North Shore Transit Connector, Pennsylvania; Pine Mountain Highway, North Carolina; Blue Ridge Outlet & Nancy Creek Tunnels, US | 2nd Auckland Harbour Crossing, New Zealand; Bondi Sewage Treatment & Perth Railway Tunnels, Australia; Antamina Mine Diversion & Decant Tunnels, Peru; Brightwater Sewer Tunnels, US; San Vicente Water Supply and Arrowhead East & West Inland Feeder Tunnels, US; Edmonton South LRT, Canada; Heart Lake Sewer Rehabilitation and Canadian Library of Parliament Access Tunnels, Canada; East Side Access, NY, US; Mission Valley East LRT, US; PATH Tunnel, New Jersey, US |
| Gruner Consulting Engineers Gellertstrasse 55 CH-4020 Basel Switzerland Tel: +41 61 317 6161 Fax: +41 61 312 4009 Email: mail@gruner.ch Web: www.gruner.ch | a) US\$46.6M b) US\$8M | Civil engineering, underground structural engineering, hydroelectric and hydraulic engineering, tunnel safety, tunnel aerodynamics | Gotthard Base Tunnel, Switzerland – (GBTN), planning application and detailed scheme for two 20km long single track tunnels (Erstfeld-Amsteg-Sedrun), with intermediate attack at Amsteg | J2 Sissach Bypass, Chienberg Tunnel, Switzerland – Design and site supervision (in JV), ecological site supervision; B33 Hornberg Bypass, Hornberg Tunnel, Germany – Design of M&E installations, tunnel ventilation including escape galleries and air locks, energy supply, lighting, telecoms, traffic management; Munich-Verona rail link, Germany – (Radfeld-Baumkirchen section) design, site inspections; A16 Transjurane motorway, Beuchille tunnel, Switzerland – Detailed design/production information |
| Halcrow Group Vineyard House 44 Brook Green London W6 7BY United Kingdom Tel: +44 20 7602 7282 Fax: +44 20 7603 0095 Email: halcrow@halcrow.com Web: www.halcrow.com | a) US\$671 b) - | Conceptual, preliminary & detailed design, settlement analysis & building damage assessment, contract documents & procurement strategy, tender & detailed design for contractors, project modelling, project & construction management | Tottenham Court Rd Station Upgrade, London, UK – Multi-disciplinary design services to increase station capacity, including new, enlarged escalators, new tunnels, new station concourse; Northern Line Package 4, RIBA Stage D, London, UK – Preparation of RIBA D outline design for cooling options for two stations; Vauxhaull Station Step Free Access, London, UK – Detailed design of tender documents for step-free access (RIBA Stages E F G) and congestion relief (RIBA Stages E F G), through re-arrangement of existing facilities; Highbury & Islington Station Step Free Access & Capacity Enhancement, London, UK – Modernisation and enhancement of station and step free access to platforms | Crossrail, Isle of Dogs-Abbey Wood (MDC4), London, UK – Design of south east section of Crossrail, including 7 shafts, 3 portals and underground station; DLR Ext to Woolwich, UK – Performance specification for life safety & ventilation systems for a 2.6km light rail extension & underground station; HSL Zuid Rail Tunnels, The Netherlands – Aerodynamic calculations for 3 tunnels, using 1D ThermoTun tunnel aerodynamics programme; Edinburgh Airport Rail Link, Scotland – Design of proposed rail link |
| Haley & Aldrich 465 Medford Street Suite 2200 Boston MA 02129-1400 USA Tel: +1 617 886 7400 Fax: +1 617 886 7600 Email: info@haleyaldrich.com Web: www.haleyaldrich.com | a) US\$75M b) US\$29M | Geotechnical site investigation and ground characterisation, tunnel and shaft design, microtunnel design, HDD design, construction management | Easterly CSO Plan, Cleveland, US – Preliminary engineering for over 15km of rock tunnels, 4.6km of soft ground tunnels, and 12km of conduit; APM, Washington Dulles Airport, US – Underground engineering, construction monitoring for tunnels between main terminal and concourses; Providence CSO, Providence, US – Field investigation, geotechnical design and construction phase services for 4.8km of rock tunnel; Potomac Bi-County Supply Main, MD, US – Alignment study-phase geotechnical study for an approximately Ø2.1m, 8km long treated water main; Croton Water Treatment Plant Project, NY, US – CM geotechnical support for underground WTP and tunnels; Design of over 30 large Ø HDD crossings | Detroit River Outfall Tunnel No.2, Detroit, US – Geotechnical investigations/design and construction phase services for 1,850m tunnel (slurry TBM); Alvarado Trunk Sewer Phase II Tunnel, San Diego, US – Tunnel redesign for Ø0.75m HDPE carrier pipe beneath 8-lane highway; Alvarado Water Treatment Plant Conveyance Tunnel, San Diego, US – Design recommendations and CM; St George HEP, Canada – Geotechnical studies and tunnel design; Numerous small diameter tunnels for various water and WW projects, CA, US |
| Hatch Mott MacDonald Transportation & Tunnels 27 Bleeker Street Millburn NJ 07041 USA Tel: +1 973 379 3400 Fax: +1 973 376 1072 Email: corporate@hatchmott.com Web: www.hatchmott.com | Undisclosed | Soft ground and hard rock tunnelling, TBMs, slurry shields, EPBMs, single pass pre-cast concrete linings, geotechnical services for tunnelling, risk management tunnel ventilation, fire/life safety | East Side Access, NY, US – CM services; Transbay Terminal, SF, US – PM; Middlesex Tunnel, NY, US – Design and CM for sewer tunnel; North Dorchester Bay CSO, Boston, US – CM services; Calif High Speed Rail, US – On three teams studying sections between LA and SF; LAWA Expansion, US – Design; Dulles MetroRail, US – PM for new rail link; Silicon Valley Rapid Transit, US – Design/programme controls; Cross Sound Link, NY, US – Project and design development for 29km highway tunnel; Niagara Tunnel Project, Canada – Procurement of DB team and CM; Spadina Extension, Canada – PM for new transit line in Toronto; Southeast Collector, York Region, Canada – Design and CM services | Dulles APM Tunnels, US – Design of tunnels and ventilation for tunnel network; Beacon Hill Station/Tunnels, US – Design and CM services; Mission Valley East LRT, US – Design/CM support for light rail tunnel; Lower Northwest Interceptor, CA, US – Design and CM support services for twin subaqueous sewer tunnel crossings; Brightwater Sewer Tunnels, US – Design of precast concrete segmental linings; Elizabethtown Water Tunnel, US – Design/CM |
| HBI Haerter Ltd. Stockerstr. 12 8002 Zurich Tel: +41 44 289 3900 Fax: +41 44 289 3999 Email: info.zh@hbi.ch Web: www.hbi.ch | a) CHF6M b) CHF6M | HBI's services focus on the design, planning and execution of projects in the field of tunnel ventilation, prediction of emissions, safety issues as well as the aerodynamics and thermodynamics of road and rail tunnels. HBI offers the entire range of services related to tunnel ventilation - from first feasibility studies, measurements, detail studies to project execution. | Road tunnels: Frankenschnellweg Nürnberg, Fürstenfeldbruck, Hestlach, Kirchberg and Schlossberg, Kö-Bogen, Düsseldorf, Rheinufer, Riederwald, Scheibengipfel, Schwäbisch Gmünd, Starnberg, Stübecken, Wagenburg, Seelisberg, Förbifart Stockholm, Schwamendingen, Sellero, Piottino, E65 Greece, Elefsina-Patras, Route de Nations, A26 Linz, S1 Wien, Brisbane NLT, Attiki Odos, Schweizerhalle, Saas, Küblis, Rocade Nord, Tunnel du Chat, Cassanawald, La Clusette, Landwassertunnel, Giesbachtunnel, Elbtunnel, Roveredo, Brusei Rail tunnels: Gotthard, Ceneri, Loetschberg and Brenner Base Tunnel, Prague-Beroun, Brussels Airport Link, Metro Barcelona, Metro Athens, Mobility Hub Augsburg, Rail Tunnel Velsen, Ferrocarril Transandino Central, CEVA-project, Engelberg Tunnel, Eppenberg Tunnel | Road tunnels: Ditschhardt, Elbquerung, Flughafen Nürnberg, Hohentwiel, Hugenwald, Kohlberg, Leutenbach, Leuze-, Berger-, Rosenstein Stuttgart, Schwänenplatz, Oberkassel, Reichswaldallee, Reutherberg, Rheinallee, Wattkopf, Staufer, Barbarossa, Löwenherz, Apollo, Diana, Norra lenken, Bulle, Nordtangente Basel, Kristiansand, Nagu, Jøkeri 2, Tromsø, Tampere, Dublin Port Tunnel, Brisbane ALNB, A14xA86 La Défense, Ligerz, Kulmtunnel, Chêne-Bourg, Collonge, La Linea, D1 Dubna Skala, Langfjordtunnel, La Spezia, SS640 Caltanissetta, Isla Bella, Piottino Rail and metro tunnels: Loetschberg Base Tunnel, U-Bahnhof Marienplatz, Jungfraubahn, Stadtbahn Karlsruhe Kombilösung, Mobile Tunnel Ventilation of Rhätische Bahn Air quality (only): Reservekraft Rigshospitalet, Nordea Nødstrøm, |



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TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|---|--|
| HNTB Corporation 715 Kirk Drive Kansas City MO 64105 USA Tel: +1 617 542 6900 Fax: +1 617 428 6905 Email: hcaspe@hntb.com Web: www.hntb.com | Undisclosed | Tunnel design, programme management, geotechnical interpretation, safety systems, ventilation design, seismic retrofit of tunnels, lighting, control systems, construction management, permitting, planning studies, risk management | Devil's Slide Tunnel, California, US – Dual 4000ft long, 30ft wide, NATM highway tunnels through various rock formations and fault zones, in an active earthquake area. Tunnel traverses through a mountain and is approx. 300ft below groundwater levels; Dulles International Airport Tunnels, Washington DC, US – 10 mile long, US\$400M loop tunnel system to support a new Automatic People Mover, baggage transport system, etc. between terminals – TBM, C&C and NATM; Port Washington Road Relief Sewer, WI, US – 2 mile long rock tunnel with 2 x Ø30ft work shafts located 300ft below ground; County Grounds Floodwater Bypass Tunnel, WI, US – 1 mile long, Ø17ft soft ground tunnel (EPBM) | Minneapolis St Paul Light Rail, Minneapolis, US – Design and construction management of dual 7,400ft long, Ø20ft EPB bored tunnels and mined station; CA/T Project, Congress to North Street (Section 17A), Boston, US – Design of a 3/4 mile long cut & cover tunnel, including ventilation, lighting and life/safety systems; Feasibility Study, Dallas, US – Feasibility study for 5 miles of dual highway tunnels; Northwest Side Relief Sewer, Milwaukee, US – Design and CM of 7.2 mile long, Ø20ft CSO and storage tunnel |
| Hyder Consulting 29 Bressenden Place London SW1E 5DZ United Kingdom Tel: +44 20 7316 6000 Fax: +44 20 7904 9064 Email: corp.marketing@hyderconsulting.com Web: www.hyderconsulting.com | a) US\$41.3M b) US\$7.12M | Planning and design of caverns, rock tunnels, soft ground tunnels, immersed tube, cut & cover, box jacks & microtunnels for rail, road, water and utilities. Geotechnical, civil, M&E, operations and maintenance, risk management | Kowloon Southern Link, HK – Independent checking engineer for M&E works; Lai Chi Kok Drainage Tunnel, HK – Feasibility study and preliminary design; Lai Chi Kok Reservoir Transfer Tunnel, HK – Feasibility study; Epping to Chatswood Rail Link, Sydney – Independent project verifier; Doha North STW, Qatar – Detailed design of 20km sewers; Manton Shaft, UK – Ø25m shaft and microtunnels; Dubai Light Rail, UAE – Design of 2 stations; Abu Dhabi Sewerage Master Plan, UAE – Preliminary design; Circle Line, Stage 2, Singapore – Detailed design for 4 stations; North South Bypass, Brisbane – Lead consultant in JV and tender design of 5.3km twin bore road tunnel under Brisbane River | Cross City Tunnel, Sydney, Australia – Independent project verifier; Lane Cove Tunnel, Sydney, Australia – Feasibility and preliminary and tender design, expert advice on ventilation of 3.5km motorway tunnel; Taiwan HSR C230&240 – Mined and cut & cover tunnels; Nickel Mine, Western Australia – Preliminary design of access adit; Fernleigh Tunnel, Newcastle, Australia – Rehabilitation of old brick lined rail tunnel; Kuala Lumpur Sewerage Scheme, Malaysia – Temporary works design checks |
| Hydrocoop Dobsinskeho 32, PO Box 92, SK-81005 Bratislava 15 Slovakia Tel: +42 124 5522 116 Fax: +42 124 5640 927 Email: hydrocoop@hydrocoop.sk Web: www.hydrocoop.sk | a) US\$1.94M b) US\$1.3M | Design of trenchless sewers DN2600-3000 | Bratislava Waste Water Treatment Plant, Slovakia – Renewal and extension of Petrzalka waste water treatment plant; Bratislava Waste Water Treatment Plant, Slovakia – Renewal and extension of Vrakuňa waste water treatment plant; Galanta Region Sewerage Systems, Slovakia – Sewerage system for 12 villages around Galanta Town | Malokarpatsky Region Sewerage System, Slovakia – Main pressure sewer DN200-DN600, length approx 30km, for transport of waste water to central WWTP |
| IC Consulanten Kaiserstrasse 45 A-1070 Vienna Austria Tel: +43 1 52 169 Fax: +43 1 52 169 15 Email: j.kleberger@ic-salzburg.at Web: www.ic-group.org | Undisclosed | Geological and geotechnical field work in difficult terrain, risk analysis and management, vibration prognosis and mitigation, geothermal energy extraction, geotechnical and structural design for NATM and TBM tunnels, cavern design | Kalambaka Igoumenitsa, Greece – Ioannina-Igoumenitsa section, design; Wienerwald Tunnel, Austria – Double-tube single-track rail tunnel, length 11.2km, TBM and NATM, detail design and geotechnical site supervision; Lainzer Tunnel, Austria – Single-tube double-track rail tunnel, NATM and C&C, detail design and geotechnical site supervision; HSR Porto Vigo, Lots 1A/1B, Portugal – Alignment selection, ground modelling and tunnel design, tunnels total approx. 42km; Sentvid Motorway Tunnel and Caverns, Slovenia – Geological and geotechnical modelling, risk assessment, design assistance and geotechnical supervision; Limberg HEP, Kaprun, Austria – Expanding existing HEP | Domokos- Lianokladi, Greece, Lot 367 – Independent checking engineer; Parcheggio San Giusto Trieste, Italy – Urban underground parking caverns, ground investigation, modelling, detailed design and execution design; Inoi-Chalkida Rail Tunnels, Greece – NATM design; Motorway Suao Hualien, Taiwan – Preliminary design, total length 28km; Metro Lisboa, Portugal, Linha Vermelha, Station Encarnacao – Design of NATM structures; Egnatia Odos, Greece – Tunnels Kostaraktos and Malakassi A and C |
| IGT Geotechnik & Tunnelbau Mauracherstrasse 9 A-5020 Salzburg Austria Tel: +43 662 641 7270 Fax: +43 662 662 6417 2921 Email: salzburg@igt.co.at Web: www.igt.co.at | a)US\$11.2M b) US\$10.5M | Design, construction supervision, consultancy and project management for all underground constructions. Geotechnical measurements and interpretation. | Tunnel Bejaia, Algeria - three road tunnels, total length: 2.1km, detail and application design Railway Tunnels Tizi Ouzou-Thenia, Algeria - four tunnels total length: 2.7km Railway Tunnel Ramdane, Algeria - Length: 2.8km Lainzer Tunnel lot LT31, Vienna, Austria - Construction supervision, railway tunnel, 3km, cross section approx. 145m ² , emergency exits, side gallery methode Rapid Railway Vienna – Graz, Austria - Preliminary design, feasibility studies, approval design, tunnel length 23-26km, two single-track tubes, TBM or NATM A14 Tunnel Pfänder, Austria, second tube - length: 6.6km project management, supervision, TBM-shield | A10 Tauern tunnel, Austria – Second tube, length: 6.5 km, detail and application design Metro Kadiköy-Kartal, Istanbul, Turkey - Detail design, application design. 8.6km, six underground stations, NATM and TBM Achraintunnel, Highway Bregenzwald L200, Austria - Detail design, consulting, two tunnels with three lanes, length 3340m, cross section 124.5m ² resp. 142.4m ² |
| IL-Laabmayr & Partner Preishartlweg 4 A-5020 Salzburg Austria Tel: +43 662 430 703 Fax: +43 662 430 70333 Email: office@laabmayr.at Web: www.laabmayr.at | Undisclosed | Road tunnels, railway tunnels, caverns, undergrounds, city railways, galleries, tunnel safety, tunnel refurbishment, tunnel inspection, rock mechanics, soil mechanics | Bosruck Tunnel, Austria length 5.5km 2nd tube, design, tender documents Tunnels "Klaus", "Traunfried", „Spering“, „Falkenstein“ Austria, (4 tunnels, 2nd tubes length 2.9km, 2.2km, 0.8km, 0.5km), overall design Kieler Förde, Germany, renovation of undersea supply gallery, design, site supervision Tunnel "Götschka" – Austria, double tube motorway tunnel, 2 x 4,43km, design, tender docs Lainzer railway tunnel, LT31, Austria, site supervision Ofenauer and Hiefler Tunnel, 4 Tunnels "Werfen" - Austria, motorway tunnel (0,4-2,0km), design for refurbishment, tender docs Tramway Linz, Harter Plateau Line, 2 x 0.98 km single-track tramway tunnels, Austria overall project design, tender docs, site supervision, geotechnical advice City Railway Tunnel Saarbrücken, "Spitzeich" – Germany – refurbishment, design, tender docs. | Tradenberg Tunnel, Austria, detailed design, geotechnical advice Tunnel Eibesbrunn, Austria, detailed design (cut and cover) A7 – Motorway Tunnels, Austria, operational concept Bosruck Tunnel, Austria tunnel renovation 1st tube, design, tender documents Katschberg and Tauern Tunnel, Austria, safety assessment according to Austrian law, operational concept, fire tests and safety plan Ganzstein Tunnel, Austria, 2nd tube Lainberg, Tunnel, Austria, 2nd tube Kirchdorf-Kaltenbach Tunnel, Austria, geotechnical advice Lainzer Rail Tunnel, Austria, geotechnical specialist advice Hengstberg Rail Tunnel, Austria, geotechnical specialist advice Fort Canning Tunnel, Singapore – Construction supervision for SCL- tunnel Waldeck HEP, Germany renovation of surge tank, design, tendes documents |

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|---|---|
| ILF Consulting Engineers Feldkreuzstrasse 3 A-6063 Rum Innsbruck Austria Tel: +43 512 2412 0 Fax: +43 512 2412 5900 Email: info@ibk.ilf.com Web: www.ilf.com | a) €166M b) €20M | Cut and cover, mined tunnels (NATM), bored tunnels (TBM); consulting services, design and planning, procurement of equipment, supervision and project management, start-up and operation | Metro Warsaw, Line 2 (length: 6.5km, TBM), Poland; London Underground Crossrail Project, United Kingdom - length: 7km; Oslo-Ski Railway Tunnel, Norway - length: 18km, TBM; THE (Trans-Hudson Extension) Project II, USA - railway station platform, length: 550m, width 30m, height: 30m; Perschling Railway Tunnels, Austria -Reiserberg: 1.4km, Stierschweiffeld: 3.3km, Raingruben: 2.8km; Niagara Tunnel Project, Canada - water conveyance system, length: 10.4km; Gotthard Base Tunnel, Switzerland -length: 57km; Pfänder Tunnel, Second Bore, Austria - road tunnel, length: 6.7km; Bosruck Tunnel, Second Bore, Austria - road tunnel, length: 5.4km; Devil's Slide Tunnel, USA - road tunnel, northbound tunnel, length: 1,249m, southbound tunnel, length: 1,265m; Maliakos-Kleidi Motorway Tunnels, Greece - Tembi I: 1.9km, Tembi II: 6.0km, Platamonas: 3.3km | Sound Transit University Link, USA - LRT line, length: approx. 5km; North LRT Extension – Downtown to NAIT, Canada - North Bound Tunnel, length: 367m, South Bound Tunnel, length: 391m |
| Ingetec Carrera 6, No. 30A-30 Bogotá Colombia Tel: +57 1 323 8050 Fax: +57 1 288 4513 Email: correo@ingetec.com.co Web: www.ingetec.com.co | Undisclosed | Analysis, design, technical advisory during construction, supervision and CM of underground works as part of HEP developments, water supply and road projects | Porce III HEP, Colombia – Detailed design for a 680MW HEP, works include diversion tunnel (653m), headrace (12.65km), discharge tunnel (827m), construction adits (1.87km), powerhouse access (493m); Porce IV HEP, Colombia – Feasibility review and detailed design for 410MW HEP, works include diversion tunnel (920m), bottom discharge tunnel (625m), discharge tunnel (4.97km) and headrace (268m); El Plantanal HEP, Peru – Feasibility review and detail design for 220MW HEP, works include 12.38km headrace and 933m of construction adits; Rio Guarino Water Transfer, Columbia – Detailed design and construction supervision; Manso HEP, Columbia – Detailed design for 4.44km water transfer tunnel | Mantaro HEP, Peru – Review of operation and condition of 20km conveyance tunnel; Xalabal HEP, Guatemala – Bid design for 90MW HEP, including 4.72km headrace; Xalala (330MW), Serchil (135MW) and Chulac (440MW) HEPs, Guatemala – Review of feasibility designs; Boruca (Veraguas) HEP, Costa Rica – Feasibility design for 608MW (station) and 23MW (microstation) HEP, including 10.4km headrace, 1.56km diversion tunnel, 1.4km access tunnel, 2.45km discharge tunnel and 2.37km of construction adits |
| Intergeo Robinigstrasse 93 5020 Salzburg Austria Tel: +43 662 455 007 0 Fax: +43 662 457 316 Email: salzburg@intergeo.at Web: www.intergeo.at | a) US\$3.95M b) US\$2.3M | Engineering geological investigation, hydrogeological investigation, NATM design and consulting in rock and soft ground, geotechnical consulting | Tschirgant Tunnel Project, A12 Tyrol, Austria – 400m long single-tube road tunnel, plus escape tunnel (4.4km), NATM: General alignment, corridor investigations, geological investigation, general design, detailed design, tender documents, environmental assessment; Lillenberg Tunnel, Völkermarkt, Austria – 1.37km single-tube road tunnel, plus escape gallery, NATM and C&C: Geological investigation, general design, detailed design and tender documents; Grünburg Tunnel, Austria – 1.16km single-tube road tunnel, NATM: Construction supervision; BEG, Lot 4-3 & Lot 3-6, Stans, Austria – 1 x 700m long and 1 x 840m HSR tunnels, NATM and drill and blast. Construction supervision | Anillo Tunnel, Egnatia Odos, Greece – Twin 2.2km NATM highway tunnels: Category III checking (geological, statical and support check), consulting services during execution; Panagia Tunnel, Egnatia Odos, Greece – Twin 2.3km NATM highway tunnels: Category III checking (statical and support check); Brnje, Brezik and Plasina Tunnels, Croatia – 2 x 1.55km, 2 x 500m, 2 x 2.3km NATM highway tunnels (Zagreb-Split): Construction supervision |
| Jacobs Associates 465 California Street Suite 1000 San Francisco CA 94104 USA Tel: +1 415 434 1822 Fax: +1 415 956 8502 Email: info@jacobsf.com Web: www.jacobsf.com | a) US\$27.8M b) - | Planning, design and construction engineering for underground projects, particularly tunnel, shafts and deep foundations. Trenchless technology, relining, and rehabilitation. Detailed structural design and monitoring of complex ground support systems. Construction management. Claims and dispute resolution. | Caldecott Tunnel Improvement Project, Alameda/Contra Costa Counties, CA: Technical design lead on the new two-lane highway tunnel. This NATM tunnel in weak rock will be 1,036 m long, 15 m wide, and 9.8 m high; Chattahoochee Sewer Tunnel Construction Management, Cobb County, GA: Construction management services for a 15.3-km-long, 457-mm-diameter sewer tunnel excavated by hard rock TBM; University Link Light Rail, Seattle, WA: Project management and design of 5.1 km of twin-bore, soft ground tunnels and two below-grade, cut-and-cover stations. Guideway tunnels will be excavated through glacial soils using pressure face TBMs; Los Angeles Ocean Outfall, Los Angeles, CA: Feasibility and preliminary design for a new tunnel and ocean outfall to convey treated wastewater. The proposed onshore tunnel will be approximately 9.7 km long and will measure some 406–508 mm in diameter; D.C. Water and Sewer Authority CSO Control Plan, Washington D.C.: General consultant for tunnels and geotechnical engineering of a four tunnel system that will comprise 21 km of storage and conveyance conduits ranging in diameter from 4.6 to 7 m; Northern Diversion Sewerage Project Stages 1 & 2, Melbourne, Australia – Tunnel and shaft design and construction services on both stages of the new 12.5-km sewer pipeline project. | Arrowhead Tunnels of the Inland Feeder System, San Bernardino, CA: The project consists of two 5.7-m (19 ft) excavated-diameter tunnels: the 9.6-km (6 mi) East and 8-km (5 mi) West contracts. This 71-km (44 mi) water conveyance system of tunnels and pipelines will extend from the termination of the State Water Project in San Bernardino to the Colorado River Aqueduct. Scope of work included planning the geotechnical investigation, providing tunnel and portal designs, authoring the Geotechnical Baseline Report, serving as Engineer of Record for all drawings and specifications, and providing construction engineering services; Narragansett Bay Commission Combined Sewer Outflows, Phase I, Providence, RI: Jacobs Associates provided construction management and resident engineering for shafts and tunnels in joint venture with Gilbane Building Company. The project centerpiece is a 30-ft (9 m) excavated-diameter, TBM-driven tunnel extending 4.8 km (3 mi) at a depth of 76.2 m (250 ft) through sedimentary rock formations. |
| Jacobs Engineering Group 95 Bothwell Street Glasgow G2 7HX United Kingdom Tel: +44 141 204 2511 Fax: +44 141 226 3109 Email: marketing@jacobs.com Web: www.jacobs.com | a) US\$7.8bn b) US\$50M | Design, EU safety requirements, settlement & building assessments, operation & management, assessment & refurb, ventilation & fire engineering, project & construction management, feasibility studies | Glendoe HEP, Scotland – Client's engineer, 17km of tunnels; Dublin Metro, Ireland – Preparation of reference design for 14km; Dartford Crossing, Kent, UK – Operation & maintenance; Port of Miami Tunnel, Florida, USA – Design; Upper Rouge CSO, Detroit, USA – Design and construction management for 12km CSO; Brightwater, Washington, USA – Construction management for 22km sewer tunnel; North Shore Connector, Pittsburgh, USA – Client's programme / construction manager for mass transit; Hartsfield Jackson Airport APM, Atlanta, USA – NATM design; Kowloon Southern Link, HK – Design of KDB400 (1km twin C&C) and independent checking engineer for KDB200 (1.2km twin TBM) | National Grid Cable Tunnels, London, UK – Feasibility study route assessments; Heathrow and Ramsgate Tunnels, UK – Safety compliance; Tottenham Court Road Station, London, UK – Tunnel, E&M, utility diversions & settlement assessment for upgrade; DLR Extension, London, UK – Lender's technical advisor; Dartford Cable Tunnel, UK – Design & supervision; Limerick Immersed Tube, Ireland – Technical advisor; Zahreh-Krasikov Rail Corridor, Czech Republic – Supervision & cost control |

J

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|--|--|
| Jason Consultants Group Suite 605 95 Wilton Road London SW1V 1BZ United Kingdom Tel: +44 1480 860899 Fax: +44 1480 869234 Email: david.abbott@jasonconsult.com Web: www.jasonconsult.com | Undisclosed | Design engineering for underground utility infrastructure, including: Tunnelling, microtunnelling, jacked structures, HDD, management, market and economic studies, expert witness, education and training | Upper Jones Falls Interceptor, Baltimore, USA – Technical advisor for 6,500ft of 48" sewer to alleviate flooding in north-west Baltimore. To be undertaken by slurry microtunnelling through weathered rock and river deposits: Evaluation and recommendations relating to alignments & construction documents, CM support including submittal reviews for trenchless works, inspector training & production monitoring during pipe installation; Fontibon Storm Water Collectors, Bogota, Colombia – 7km of storm water interceptor: Working for client Empresa De Acueducto Y Alcantarillado De Bogota (EAAB), technical review of the project, including tunnelling methods, schedule, costs, specifications & implementation | National City, VA, USA – Technical advisor for feasibility study & design of 1,800ft of 12" sewer along heavily trafficked highway. Evaluation & recommendations relating to proposed alignments, site investigation needs & interpretation, construction documents; Green Mount Interceptor, Baltimore, USA – Technical advisor for 6,300ft of 36/48" sewer to alleviate flooding. To be undertaken by slurry microtunnelling through weathered rock and river deposits: Evaluation & recommendations relating to alignments, SI & interpretation |
| Jenny Engineering 2 Edison Place Springfield NJ 07081 USA Tel: +1 973 379 6699 Fax: +1 973 379 6774 Email: jec@jennyeng.com Web: www.jennyeng.com | Undisclosed | Planning, feasibility, design, project management, construction management, geotechnical engineering, shafts, rehabilitation, asset management | THE Tunnel, NJ/NYC, US – Project controls, design review and CM services for a 28ft diameter, 10-mile long, twin rail tunnel. Construction by TBM, cut & cover, sequential excavation and drill & blast; USDOT-FTA, USA – Project management / oversight services for Denver Light Rail West Corridor, and San Francisco Third Street Light Rail Projects; NYCDEP Rondout-West Branch Tunnel & Shaft Rehabilitation, Upstate NY, USA – CM services for 650ft deep tunnel and shaft rehabilitation | City Water Tunnel No. 3, NYC, USA – Geotechnical engineering and CM services for new rock TBM water tunnels and deep shafts; ConEdison-First Avenue Steam Tunnel, NYC, USA – Design and construction management services for a new 12ft diameter, 4200ft long TBM tunnel Little Walnut Creek South Tunnel, Austin, TX, USA – Design and construction management services for a new bypass tunnel; Lincoln/ Holland Highway Tunnels and PATH Subway Tunnels, NYC, USA – Design and CM services |
| John Reilly Associates 1101 Worcester Road Framingham MA 01701 USA Tel: +1-508-879-3434 Fax: +1-508-872-2764 Email: Contact@JohnReillyAssociates.com Web: www.JohnReillyAssociates.com | a)<US\$1M b)<US\$1M | Owner's management, organization, strategy, delivery options, cost and risk evaluations, WSDOT's Cost Estimate Validation Process (CEVP), risk management process, procedures, code compliance and risk workshops for underground construction, tunnels and infrastructure programs | Alaskan Way SR99 Deep bore tunnel, Seattle WA USA - Management, strategy and technical assistance, CEVP application SR520 Lake Washington Floating Bridge, Seattle WA USA - Management, strategy and team-alignment, CEVP cost/risk estimating Interstate-5, Columbia River Crossing, Portland Or – Vancouver WA USA - Management, strategy and team-alignment, CEVP cost/risk estimating Lake Mead Tunnel Intake #3, Las Vegas NV, USA - Risk review consulting, compliance with ITIG Code, workshops | Bus Rapid-Transit Program, Mississauga-Toronto, Canada - Contracting options & delivery recommendations Jumeira City, (Meraas Corporation) Dubai - Management, strategy and team-alignment, Contracting options & delivery recommendations Omaha CSO Program, Risk workshops, Omaha NB, USA Utah Dept of Transportation, Salt Lake City, UT, USA - CEVP cost-risk process implementation & workshops |
| Jordan, Jones & Goulding 6801 Governors Lake Pkwy Norcross Georgia 30071 USA Tel: +1 770 455 8555 Fax: +1 770 455 7391 Email: relibay@jig.com Web: www.jig.com | a) US\$71.6M b) US\$10.6M | Tunnel design and engineering, geotechnical sub-surface & geophysical investigations, hydrogeology assessments, risk assessment, allocation & management, environmental permitting, public involvement | Automated People Mover - Hartsfield Jackson Atlanta International Airport, Atlanta, Georgia – The Department of Aviation of the City of Atlanta, Georgia is planning an extension to its existing Automated People Mover (APM) from Concourse F at Hartsfield Jackson Atlanta International Airport (HJIA). This extension includes two, twin-bore tunnels. Their alignments follow the existing APM tracks eastwards beneath Concourse E, underneath Taxiway D, and daylight at the east portal near the Cargo Service Road; West Area CSO Tunnel, Atlanta, USA – 8.5 mile long, Ø24ft, sewer tunnel. Managing partner of design JV, ongoing CM services required to complete the project in Nov 2007 | South Cobb Tunnel & Pump Station, Atlanta, USA – Design of a Ø24ft, 30,000ft tunnel & pump station |
| KBR (Kellogg Brown & Root) Hill Park Court Springfield Drive Leatherhead Surrey, KT22 7NL United Kingdom Tel: +44 1372 865000 Fax: +44 1372 863282 Email: Dougal.Monk@kbr.com Web: www.kbr.com | a) US\$9.6M b) US\$9M | Programme management, project management and construction supervision, tunnel project multi-discipline planning, design, budgeting and scheduling, procurement and contract engineering, urban cable tunnels | Beddington to Rowdown 400kV Cable Tunnel, London UK – Project management, design management (civil, M&E, cabling), construction supervision, outline design, planning, environmental, and third party coordination of a US\$1bn, 10km long, 3m i.d., 60m maximum depth cable tunnel formed of a 6 x trapezoidal pre-cast concrete lining for client National Grid; Los Angeles County Metropolitan Transit Authority - Metro Gold Line Eastside Extension Light Rail Transit Project, LA, US - Project management, construction management and inspection of two 2,250m long, 6.4m diameter tunnels up to 20m deep, formed of a 5 piece trapezoidal pre-cast concrete lining with a project cost of US\$360M | Dublin Port Tunnel, Ireland - Construction supervision services for client, Dublin City Council for a 5.5km long, 10.4m diameter highway tunnel; London Connection Cable Tunnel Project, London, UK – Design, project management, construction supervision, support to planning, environmental and third party consultation for client, National Grid of a 22km long, 3m diameter cable tunnel |
| Lachel Felice & Associates 11411 NE 124th Street Suite 275 Kirkland Washington 98034 USA Tel: +1 425 820 0800 Fax: +1 425 820 9892 Email: leckert@lachel.com Web: www.lachel.com | a) US\$7.4M b) US\$6.6M | Road, water conveyance, hydro, and sewer tunnels, alignment and feasibility studies, design/build, cost analysis, rehab, construction management, dispute resolution, modelling, lining design, NATM, D&B, TBM construction | Big Walnut Augmentation/Rickenbacker Sanitary Interceptor Project, Columbus, Ohio, USA – Geotechnical investigation and design of approx. 38,000ft of 168 and 144in diameter tunnel; IH 635 Managed Lanes Project, Dallas, USA – Geotechnical engineering and preliminary tunnel design services for sections of twin multi lane tunnels; Lake Dorothy Hydro Project, Juneau Alaska, USA – Final tunnel design services for the project which involves 1000ft of hard rock D&B, with lake tap, and a TBM starter tunnel | Big Walnut Augmentation/Rickenbacker Sanitary Interceptor Project, Columbus, Ohio, USA – Geotechnical investigation and design of approx. 38,000ft of 168 and 144in diameter tunnel; IH 635 Managed Lanes Project, Dallas, USA – Geotechnical engineering and preliminary tunnel design services for sections of twin multi lane tunnels; Lake Dorothy Hydro Project, Juneau Alaska, USA – Final tunnel design services for the project which involves 1000ft of hard rock D&B, with lake tap, and a TBM starter tunnel |

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TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|--|--|---|
| London Bridge Associates Cranhurst Lodge 37-39 Surbiton Hill Road Surbiton Surrey, KT6 4TS United Kingdom Tel: +44 20 8399 8614 Fax: +44 20 8399 4208 Email: sales@lbassoc.co.uk Web: www.lbassoc.co.uk | a) US\$7M b) US\$5.7M | Construction planning, project costing, construction management & technical support at all stages of project life cycle and for all underground techniques, project management and risk management. Fire Safety advice for road tunnels including TSO role. | Crossrail, London UK – SCL and Liverpool Street Design packages; construction planning, project costing and design coordination support to the Mott MacDonald team; Dublin Metro North, Ireland – 8.5km twin bore tunnel and 7 deep stations; providing construction planning and traffic management services to the Rail Procurement Agency DART Underground Project, Dublin; construction planning and programme support to the ARUP/HALCROW JV developing the reference design; A3 Hindhead Tunnel, UK, production supervision for the SCL lined road tunnel and fire safety services to Balfour Beatty Brighton Wastewater Treatment Project, production supervision as part of the Costain/4D team Gibraltar Airport Access Road Tunnel, fire safety and M & E concept design services to Govt Gibraltar as part of the Gifford Team. Sydney Metro, project costing as part of the Turner and Townsend project development team | Dublin Port Tunnel, Ireland – 2.5km, Ø12m bored tunnels with 1.5km cut and cover work as part of KBR construction supervision team; Holmsdale Tunnel, M25, UK – Civil and M&E refurbishment working as an integral part of the Costain Capita Symonds design and build team; Victoria Station Upgrade (VDSU) Construction planning and programming as part of the detailed design team; Cooling the Tube, London, UK – assurance services; Paddington Integration Project, London, construction planning and programming of civil and M & E works |
| Metroul 3bis Gutenberg Street, Sector 5, Bucharest, 050027, Romania Tel: +40 31 104 7107 Fax: +40 21 312 4335 Email: metroul@metroul.ro Web: www.metroul.ro | a) US\$14M b) - | Shield tunnels, cut and cover, pipe-jacking, soft ground tunnels | Bucharest Metro, Line 5, Romania – Technical specifications for Metro Line 5 including 9km running tunnel and 13 stations; Bucharest Metro Airport Link, Romania – Feasibility study for Metro link between “Henry Coanda” (Otophe) international airport and existing Metro network in Bucharest, 17km with 19 stations; Bucharest Metro, Line 4, Romania – underground section from Mai to Laromet | Underground Parking Studies, Bucharest, Romania – Feasibility studies for 5 underground parking locations in the city; Pipe-jacking – 4m diameter underground crossing of two aqueducts |
| Moergeli+Moergeli Consulting Engineering Rosengartenstrasse 28 CH 8716 Schmerikon Switzerland Tel: +41 55 282 5001 Fax: +41 55 282 5002 Email: info@moergeli.com Web: www.moergeli.com | a) US\$0.25M b) US\$0.1M | Risk assessments & risk management, safety & health management, machinery & system safety, CE conformity assessments based on new machinery directive 2006/42/EC incl. safety-related parts of control systems by new ISO 13849-1:2006. | Gotthard Base Tunnel, Switzerland - Safety & health management, second level support CE conformity assessment, risk assessments, user instructions & technical documentation for SMS Concast Devil's Slide Tunnel, Pacifica/CA, USA - Risk Management, second level support Cut Utility Tunnels, Miami/FL, USA - Risk management, design criteria for design build contract. | Gotthard Base Tunnel, Switzerland - CE conformity assessment, risk assessments, user instructions & technical documentation for Herrenknecht AG, new/revamped Steel Bridges (“Worms” – World's first – 600m long systems/plants) to concrete final lining behind advancing Tunnel Boring Machines (TBM) / Trailing Back-up Equipment |
| Moretrench 100 Stickle Avenue Rockway NJ 07866 USA Tel: +1 800 394 MORE (6673) Fax: +1 973 627 6078 Email: pschmall@mtac.com Web: www.moretrench.com | a) - b) US\$60M | Construction dewatering & groundwater control, groundfreezing, grouting systems, earth retention & underpinning, rock protection, micropiles, slurry trenches | New York City Water Tunnel No 3, USA – Groundfreezing, dewatering, groundwater treatment, micropiles; Providence CSO Tunnel, Rhode Island, USA – Groundfreezing; Beacon Hill Station, Seattle, USA – Dewatering; Big Walnut Augmentation/Rickenbacker Interceptor, Ohio, USA – Slurry wall; Niagra Facility Tunnel, Queenston Heights, Canada – Groundwater treatment; Automated People Mover, Dulles Airport, USA – Groundwater treatment; A2nd Avenue Subway, New York, USA – Dewatering, groundwater treatment; North Shore Connector, Pittsburgh, USA – Dewatering, compaction grouting; Brightwater Conveyance System, Seattle, USA – Groundfreezing | East Side Access, New York, USA – Grouting, groundwater control, groundwater treatment; South Ferry Terminal, Manhattan, USA – Dewatering, ejector wells |
| Mott MacDonald St Anne House, Wellesley Road Croydon, CR9 2UL United Kingdom Tel: +44 208 774 2000 Fax: +44 208 681 5706 Email: tunnels@mottmac.com Web: www.tunnels.mottmac.com | a) US\$1.2bn b) US\$60M | Planning, design, construction management of all forms of tunnels and underground works, full support services in geotechnical and environmental engineering, specialist expertise in linings, modelling, design of tunnel ventilation | Crossrail, London, UK – Multi-disciplinary design services; A3 Hindhead, UK – Detailed design & supervision; Victoria Station Upgrade, UK – Detailed design; Thames Tideway, UK – Studies into proposed 30km tunnel; Thames Water, London, UK – Design of Ring Main extns; National Grid Tunnels, London, UK – Design & preparation of tender docs; Budapest Metro, Line4, Hungary; Batapaati Nuclear Waste Storage, Hungary; Delhi Metro, India; Mine access tunnels, Chile – Preparation of tender docs; Heathrow Baggage Tunnels, UK – Design & construction supervision; Bunji Hydro Project, Pakistan – Design & supervision; Marina Coastal Expressway, Singapore; Down Town Line, Singapore | T5, Heathrow, UK – Design & CM of LU extensions and a 4.2km storm water tunnel; Durban Harbour Tunnel, SA – Design & CM; SMART Project, Malaysia – Design & supervision of a 9.7km combined use tunnel; Crossrail, London, UK – Multi-disciplinary development of designs; Brighton & Hove Sewerage, UK – Preliminary design of new tunnels; Cable Tunnel, Singapore; Interconnector Project, Dublin – Preliminary design; Karahnjukar Hydro Scheme, Iceland – CM for over 60km of hard rock tunnels |
| Movares Nederland Daalseplein 101 PO Box 2855 3500 GW Utrecht The Netherlands Tel: +31 30 265 4531 Fax: +31 30 265 3492 Email: stephan.letanche@movares.nl Web: www.movares.com | a) US\$209M b) US\$37M | Bored tunnels, submersed tube, cut and cover, sprayed concrete, tunnel installations, tunnel safety, risk management | Rehabilitation of 2 Rail Tunnels, Fatima/Albergaria, Portugal – Preliminary design for structural lining, track infrastructure, superstructure, drainage, catenary and E&M installations for two tunnels, each approx. 660m long; De Bongerd Road Tunnel, Amsterdam, The Netherlands – Feasibility, location, alignment & urban development studies, as well as preliminary design for twin 500m cut & cover road tunnel and service tunnel; North-South Metro Line, tunnel under Central Station, Amsterdam, The Netherlands – Due to the wooden pile foundations of the station, tunnel will be built by ‘Sandwich Construction’. Project management, E&M installations, geotechnics, environmental and civil engineering. | Sophia Railway Tunnel, Zwijndrecht, The Netherlands – 8km tunnel, 4km of which is bored with Ø9.75m; Groene Hart Rail Tunnel, The Netherlands – 7km long double-track, Ø14.5m single bore TBM tunnel, built at a max depth of 37m below ground water level, in soft soils with high water pressures; Oude Maas and Dortsse Kil Immersed Tube Tunnels, HSR South, The Netherlands – Project management and contract management of 1 x 1.4km and 1 x 1.5km double-track tunnels at 18-20m below water level |

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TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|--|---|---|
| Mueser Rutledge Consulting Engineers 14 Penn Plaza 225 West 34th Street - 2nd Floor New York, NY 10122 Tel: +1 917 339 9300 Fax: +1 917 339 9400 Email: hlacy@mrce.com Web: www.mrce.com | Undisclosed | Geotechnical and foundation engineering services including groundfreezing, feasibility, alternate alignment studies, rock tunnels, soft ground tunnels, mixed face tunnels, cut and cover, microtunnelling, HDD, NATM, TBM, Drill and Blast, Shafts | World Trade Center redevelopment including 1, 2, and 3 WTC, Security Center, Memorial, PATH terminal MGM Grand Mina Zayed Development, Abu Dhabi Hoboken Ferry Terminal, Hoboken, NJ Second Avenue Subway, New York, NY LIRR East Side Access, New York, NY #7 Line Subway Extension, New York, NY Cannelton Hydroelectric Project, Cannelton, KY Con Ed Harlem River Utilidor Tunnel, New York, NY Hudson River Park, New York, NY | Four Seasons and Legg Mason Tower, Baltimore, MD CitiField Stadium, Flushing Queens, NY Yankee Stadium, Bronx, NY New York Law School Expansion, New York, NY AMTRAK Thames River Bridge, Groton, CT |
| Mueser Rutledge Consulting Engineers 14 Penn Plaza 225 West 34th Street - 2nd Floor, New York, NY 10122 Tel: +1 917 339 9300 Fax: +1 917 339 9400 Email: hlacy@mrce.com Web: www.mrce.com | Undisclosed | Geotechnical and foundation engineering services including groundfreezing, feasibility, alternate alignment studies, rock tunnels, soft ground tunnels, mixed face tunnels, cut and cover, microtunnelling, HDD, NATM, TBM, Drill and Blast, Shafts | World Trade Center redevelopment including 1, 2, and 3 WTC, Security Center, Memorial, PATH terminal MGM Grand Mina Zayed Development, Abu Dhabi Hoboken Ferry Terminal, Hoboken, NJ Second Avenue Subway, New York, NY LIRR East Side Access, New York, NY #7 Line Subway Extension, New York, NY Cannelton Hydroelectric Project, Cannelton, KY Con Ed Harlem River Utilidor Tunnel, New York, NY Hudson River Park, New York, NY | Four Seasons and Legg Mason Tower, Baltimore, MD CitiField Stadium, Flushing Queens, NY Yankee Stadium, Bronx, NY New York Law School Expansion, New York, NY AMTRAK Thames River Bridge, Groton, CT |
| Murphy & Sons, J Hiview House Highgate Road London NW5 1TN United Kingdom Tel: +44 20 7267 4366 Fax: +44 20 7482 3107 Email: tunnels@murphygroup.co.uk Web: www.murphygroup.co.uk | a) £480M b) £35M | All underground works including tunnels for water and sewerage, utility services, rapid transit and main line railways, repair and refurbishment of existing tunnels, installation of high voltage cable systems. Extensive specialist plant holding of TBM's and associated tunnelling equipment. | Coldharbour Lane FAS, Brixton, London for Thames Water Utilities - comprising TBM driven tunnel (2.44m ID x 5250m) plus multiple pipe jacked connections and open cut works in a restricted urban area; Harefield to Southall Gas Pipeline, West London, UK, for National Grid Transco - tunnelling and shaft sinking works to enable the construction of a 1220mm ID welded steel gas mai, comprises of three separate drives totalling 2.45km | Lower Lea Valley Cable Tunnel, Stratford, East London, UK for the Olympic Delivery Authority - This project formed part of the enabling works involving the diversion of overhead power lines underground to clear the Olympic site. This design and construct project included the driving of two parallel tunnels 6km long (NGC tunnel 4.15m ID & EDF tunnel 2.82m ID) plus 10 no. shafts ranging from 7.5m to 15m ID and depths to 40m. Tunnels were driven using 4 Lovat TBM's from one central site. All mechanical and electrical systems were also included in the scope; Bankside To Farringdon Cable Tunnel, London, UK, for EDF Energy - comprising of a total of 3km of machine driven tunnel plus 6 shafts carried out from restricted sites in a heavily urbanised area. Cable installation and mechanical and electrical services are also included in the scope. |
| MWH Americas, Inc. 370 Interlocken BLVD., Suite 300 Broomfield, CO. 80021 USA Tel: +1 300 410 4000 Fax: +1 303 410 4100 Email: info@mwhglobal.com Web: www.mwhglobal.com | a) US\$1.45 bn b) US\$35M | All areas, full-service firm providing project and program management, design engineering and construction management hard and soft ground tunnelling, shafts, rock caverns, microtunneling, and trenchless technologies ground characterization inspections, geotechnical instrumentation hydraulic modelling electrical and I&C systems gates and valves inspections risk management claims management, disputes resolution. | Brightwater Conveyance, Washington, USA - JV design and support during construction 5 shafts, 16.8 km of 4.4m to 5.9m diameter EPB and slurry TBM excavated tunnels, four headings, plus three microtunnel connections for wastewater effluent and influent conveyance. Lake Mead Intake No. 3, Nevada, USA - JV design and support during construction D-B Contract 10m diameter shaft, 4.3km, 6.1m diameter EPB tunnel and lake tap Connecting Tunnel - 170m of 4.3m diameter drill-blast tunnel and 7.6m diameter gate shaft Pump Stations - 70m x 10m cavern, 705m, 4.3m wide tunnel, and 10m diameter surge shaft for water supply system. TARP Connecting Tunnels and Gates - Thornton Composite Reservoir, Illinois, USA - Design and support during construction 396m of 9.8m diameter drill and blast tunnel 100m deep, 19.3m diameter gate shaft. Neelum-Jhelum Hydroelectric Project, Pakistan - JV Design and CM 47km, 7.3-9.7m diameter drill-blast tunnels Powerhouse - 131m x 21m cavern. Upper Northwest Interceptor 9, California, U | Pinalito Hydroelectric Project, Dominican Republic - Design/Owner's engineer 14.35km, 3.5-5.0m diameter TBM and drill-blast headrace tunnel. Tekeze Hydroelectric Project, Ethiopia - Construction Management and construction engineering 1450m, 7.5m diameter drill-blast tunnels underground powerhouse: 95m x 18m. Lake Hodges to Olivenhain Pipeline, California, USA - Design/Owner's Engineer 1 shaft, 1.8km, 3.3m diameter drill-blast tunnel for water supply and pumped storage hydroelectric |
| Nick Barton & Associates Fjordveien 65c Høvik Norway Tel: +47 6753 1506 Fax: +47 6753 1506 Email: nickbarton@hotmail.com Web: www.qtbm.com | Undisclosed | Rock mass quality assessment, tunnel/cavern support, seismic velocity - quality linkage with depth, groutability, TBM prognosis with Qtbm model, shear strength of rock joints and rock masses | São Paulo Metro, Line 4, Brazil - Consultant group reporting to CVA consortium concerning the causes of the Pinheiros metro station accident in January 2007; SRK/Anglo American - TBM prognosis, based on extensive core logging and modelling using Qtbm for 8km Los Bronces mine access tunnel; La Higuera HEP, Chile - Rock classification and tunnel design advisor to Brazilian contractor Queiroz Galvão. Focus on rock reinforcement on the 18km headrace tunnel; Danish Geological Institute, GEUS - Feasibility study for deep and shallow pumped hydro projects in Denmark; Skanska - Rock quality, support, seismic integration, for new E18 road tunnels in Finland; Planservi/Odebrecht, Panama y | Seymour Capilano Water Project, Greater Vancouver Water District, Canada - Advice concerning rock quality questions at a deep access shaft and at twin TBM tunnels; CFRD Campos Novos HEP, southern Brazil - Expert to Munich Re and IRB insurance group, concerning concrete cracking, tunnel gate failure and reservoir loss; Skanska, Botnia Rail Tunnels, Sweden - Independent expert; Lysaker-Sandvika Rail Tunnel, Oslo, Norway; "Rock Quality, Seismic Velocity, Attenuation & Anisotropy" - 730 page book |

N

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|--|---|---|
| Norconsult Vestfjordgaten 4 N-1338 Sandvika Norway Tel: +47 6757 1000 Fax: +47 6754 4576 Email: company@norconsult.no Web: www.norconsult.no | a) US\$136.7M b) US\$13M | Lake taps/underwater piercings, undersea tunnels, underground hydrocarbon storage, engineering geology, advice and follow-up for tunnels in poor rock mass conditions, unlined pressure tunnels and shafts | Jinjing Access Tunnels, China – Advice for twin 17.5km tunnels with up to 2.5km overburden in karstified marble; Ziangan Undersea Road Tunnel, China – Advice for 5.7km twin tunnel & service gallery; Chiquicamata Copper Mine, Chile – Planning & follow-up of repair of underground transfer for conveyor belt cavern; Greater Istanbul Water Supply Project, Turkey – Construction advice for 5.5km undersea tunnel; City Rail Project Bergen, Norway – Detailed design & preparation of tender docs for 4 tunnels; Sauda HEP, Norway – Construction design & follow-up; Kjonesfjorden HEP, Norway – Construction design & follow-up; Breidalen Water Transfer Tunnel, Norway – Construction follow-up | Ovre Otta HEP, Norway – Construction design & follow-up of 20km of tunnels and 2 power caverns; Ormen Lange Land Terminal, Norway – Construction advice & follow-up for 2 x 2km cooling water tunnels & underground cavern; Upper Tamakoshi HEP, Nepal – Feasibility study for 10km tunnels & power cavern; Jong-Asker Rail Project, Norway – Construction follow-up of 6km tunnels; Xiluodu HEP, China – Planning advisory services for 12,600MW underground plant; Aura HEP, Norway – Planning & follow-up |
| OTB Engineering Ltd 4 La Gare, 51 Surrey Row, London SE1 0BZ Tel: +44 207 981 9881 Fax: +44 207 099 2611 Email: info@otbeng.com Web: www.otbeng.com | Undisclosed | Planning, design & construction of tunnels & underground structures engineering geology & geotechnics instrumentation & monitoring protection of underground & surface assets electrical & mechanical engineering risk management expert advice & management for major projects | Thirra Tunnel, Albania – Tunnelling advisors to 5.3km road tunnel Jubilee Line Tunnel Strengthening – Project management and identification of remedial options Green Park Station Step Free Access – Independent design check of SCL shaft and tunnel linings Thames Tideway Lee Tunnel – Geotechnical, tunnelling and planning advisors Victoria Line Mid-Tunnel Ventilation – Project management and detailed design of ventilation improvements Crossrail – Construction planning for detailed design London Bridge Station – Protection of underground assets. | ViaMadeira, Portugal – Lender's technical advisor for 23 highway tunnels Euston Station – Identification and evaluation of tunnelled options for congestion relief Wood Green Station Step Free Access – Detailed design of SCL shaft and tunnel linings Dorchester Hotel Service Tunnel – Detailed design of SCL shaft and tunnel linings Tottenham Court Road Station – Assessment of impact from utility diversions. |
| Parsons Brinckerhoff One Penn Plaza New York, NY 10119 USA Tel: +1 212 465 5000 Fax: +1 212 465 5096 Email: info@pbworld.net Web: www.pbworld.com | a) US\$1.2bn b) US\$250M | All types & forms of underground construction: drill & blast, TBM, EPB, slurry shield, immersed tubes, NATM/SEM, cut & cover, pipe jacking, microtunnelling, slurry walls, pile foundations, shafts, ground freezing, seismic engineering, tunnel security and explosion-resistant design. | Marmaray Project, Istanbul, Turkey – Design and construction supervision East Side Access, New York, USA – Design Shenzhen Metro Line 3, China—project management & design ARC/Trans-Hudson Express Tunnel, New York, New York, USA—design Alaska Way Viaduct Tunnel, Seattle, Washington, USA—design North-South Bypass Tunnel (Clem7), Brisbane, Australia—design Brisbane Airport Link, Brisbane, Australia—design Port of Miami Tunnel, Miami, Florida, USA—owner's engineer East Side CSO Tunnel, Portland, Oregon, USA—design North Dorchester CSO, Boston, Massachusetts, USA—design and construction services New Tyne Crossing, Newcastle, UK—design Zheng Xi Passenger Dedicated Line-China High Speed Rail Project, China—project management & construction supervision Shanghai-Chongming Island Link, Shanghai, China—tunnel ventilation system design New Croton Aqueduct, New York, New York, USA—inspection & repair services Croton Aqueduct Water Treatment Plant Tunnels, New York, New York, USA—design Detroit River Outfall | Central Link Light Rail, Seattle, USA – construction management; Los Angeles Metro Gold Line Eastside Extension, Los Angeles, California, USA—design; Epping-Chatswood Rail Line, Sydney, Australia—design and construction support; West Side CSO Tunnel, Portland, Oregon, USA—design; Shanghai Metro Yang Pu Line, Shanghai, China—technical support; North Dorchester CSO Tunnel, Boston, Massachusetts, USA—design and construction services; Taiwan High Speed Rail—programme management and design; Doyle Drive Replacement Project, San Francisco, California, USA—design; Singapore Deep Tunnel Sewerage System – programme management; Lane Cove Tunnel, Sydney, Australia—design |

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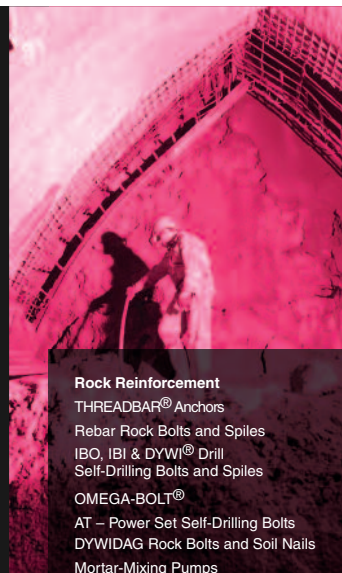
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GROUND CONTROL SOLUTIONS



Each tunnel has a different geology and requires specific customized products and systems. DSI Tunneling Products and Systems match these requirements perfectly.

Our extensive R&D activities guarantee innovative, flexible and reliable underground support products to control every imaginable condition. We offer a complete line of high-quality ISO 9001:2000 certified and patented products. DSI is a leading company in the development, production and application of ground control solutions for the tunneling market. In line with our strong service approach, we are always committed to satisfying our customers' demands.



Rock Reinforcement

- THREADBAR® Anchors
- Rebar Rock Bolts and Spiles
- IBO, IBI & DYWI® Drill Self-Drilling Bolts and Spiles
- OMEGA-BOLT®
- AT – Power Set Self-Drilling Bolts
- DYWIDAG Rock Bolts and Soil Nails
- Mortar-Mixing Pumps

Rock Support

- Steel Arches and TH-Beams
- Liner Plates
- Pantex® Lattice Girders
- AT – LSC-Elements
- Lining Stress Controllers

AT – Casing System

- AT – Pipe Umbrella Support System
- AT – Drainage System
- AT – GRP Injection System

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South America
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 Cerro Santa Lucia 9801
 Quilicura-Santiago de Chile
www.dsi-sopropint.cl

EMEA
 DWYDAG-Systems
 International GmbH
 4061 Pasching, Austria
www.alwag.com

APAC (ASEAN)
 DWYDAG-SYSTEMS
 INTERNATIONAL PTY. LTD.
 Charlestown NSW 2290, Australia
www.dsiminingproducts.com/au

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|--|--|--|
| Parsons Corporation 100 West Walnut Street Pasadena California 91124 USA Tel: +1 626 440 4000 Fax: +1 626 440 6337 Web: www.parsons.com | a) US\$3bn b) US\$50M | Tunnel engineering and design, including hard rock and soft ground TBMs, single pass tunnel construction, advanced waterproofing systems, electrical, mechanical, ventilation, and fire and life safety systems | High Speed Rail, San Jose-Merced, CA, US; Trans Hudson Express Tunnel, NY/NJ, US; Caldecott Tunnel, CA, US; Caltrain Extension, CA; Tembi Tunnels, Greece; Al Salam Street Tunnel, Abu Dhabi; Red & Green Metro Lines, Dubai; Palm Island Tunnel, UAE; Brightwater, WA, US; South Cobb Tunnel, GA, US; Dulles Airport People Mover, US; Austin Downtown Tunnel, TX; San Vicente Tunnel, CA, US; Doha Expressway, Qatar; Doha Residential Development, Qatar; SDLAC-JWPCP Tunnel & Ocean Outfall, CA, US; Springs Bypass, Irvington Tunnels, CA, US; Lake Mead Intake No. 3, NV, US; Sandy River Conduit Replacement, OR, US; Central Outfall Sewer Phase 2, LA, US | CTRL, UK – Government's Representative & Technical Advisor (JV); Eisenhower-Johnson Memorial Tunnel, CO, US – Inspection; OCS2 Ellis Street Interceptor, CA – PM/CM, design review; Kern River No. 1 Tunnels, CA, US – Design for rehabilitation; Railway Tunnels, Greece – PM/CM, engineering reviews & advisory; Central Outfall Sewer Phase 1, LA – Design for rehabilitation; Coldwater Sanitary Relief Section A, US – Design of wastewater tunnel; International Linear Collider, US – Study, >100km physics tunnels |
| Pinninger Geotechnik, Dr Kirchweg 16 D-94505 Berried Germany Tel: +49 9905 7070 360 Fax: +49 9905 7070 361 Email: geotechnik@pinninger.de Web: www.pinninger.com | Undisclosed | Geotechnical consulting, especially for rock and soil abrasivity and excavatability including field and laboratory investigations. Geotechnical documentation, instrumentation and field measurements | Kopswerk II, Lot 1, Austria – 5.5km double-shield TBM headrace tunnel, geotechnical documentation, sampling, laboratory investigations, consulting; Aica-Mules Exploratory Tunnel, Italy – 10.5km double shield TBM tunnel (6.3m diameter), plus 1.8km NATM tunnel, geotechnical monitoring supervision | Vomp-Terfens Tunnel, Austria – 8.5km NATM railway tunnel, geotechnical documentation, sampling, field and laboratory investigations and consulting; Achrain Tunnel, Austria – 3.2km NATM road tunnel, geotechnical documentation, sampling, laboratory investigations and consulting |
| Porr Tunnelbau Absberggasse 47 1103 Wien Austria Tel: +43 50 626 0 Fax: +43 50 626 1533 Email: tunnelbau@porr.at Web: www.porr.at/tunnelbau | Undisclosed | NATM excavation in hard rock and soft ground, TBM in hard rock, shielded TBM with EPB or slurry, pipe jacking with cutter or all kinds of TBM | Lainzer Tunnel LT 33, Vienna, Austria - One double-track railway, length 3.60km Reservoir power Station Limberg II, Salzburg Austria Tauern-tunnel - Second tube, 6.5km NATM tunnel in squeezing ground H3/4 Münster - Wiesing, Tyrol, Austria - Double track railtunnel, length 5.6km Waidhofen/Ybbs, Loweraustria - Road-tunnel, one tube, length 1.1km Finnetunnel, Germany - Hydroschild, open mode, railway-tunnel, length 2x7.5km Osterberg, Germany - NATM railtunnel, two tubes, length 2.2 km Biel Bypass Switzerland - EPB Ø 12.60m, length 6.0km Tunnel Eierberge, Germany, length 3.7 km, double track tunnel Brenner Basetunnel, exploration tunnel, 6.0km | Ganzstein Tunnel 2nd Tube, Styria, Austria - NATM roadtunnel, length 2km U2/1 Metroline Vienna, Austria - Ground freezing with brine + liquid nitrogen, diaphragm walls, bores piles, groundwater lowering LF Moos, Switzerland - waterreservation S 35 Tunnel Kirchdorf - Kaltenbach, Styria, Austria - road tunnel, two tubes, length 7.5km Schaal Local bypass, Germany, length 1.20km |
| Pöyry Infra Hardturmstrasse 161 CH-8037 Zurich Switzerland Tel: +41 44 355 5555 Fax: +41 44 355 5556 Email: uwe.jaeger@poyry.com Web: www.poyry.ch | a) €21.7M | Railway, Mass transit tunnel, Road and Water tunnelling projects Planning, engineering design, construction supervision, safety management, environmental impact assessment, project management, and operations and maintenance support. Experience on tunnel projects includes geotechnical, civil and structural engineering, the E & M and ventilation systems design and fire life safety services. | AlpTransit Gotthard, Twin-tube high-speed railway tunnel, 57 km, Switzerland, Design, Construction supervision and project management for tunnelling, electromechanics, ventilation & safety, rail systems, 1994 Sao Paulo Metro, Line 4 Extension, Brazil, Project Management, Lender's Engineer, 2009 Zurich Center Line Station & Tunnel, Switzerland, Design & Construction Supervision, 2000 Western Metro Extension, Helsinki, Finland, Detailed design of access tunnels and underground stations, 2009 Melamchi Water Diversion Scheme, Central Nepal, 2008-, 26.5 km water transfer tunnel, Design review and construction supervision Metro Warsaw Line 2, Poland, Planning & consultation, 2008 Zhengzhou - Xi'an Passenger Dedicated Line, China, Design review and construction supervision, 2006 Brenner Base Tunnel, Austria/Italy, Data management, 2008 Ring Rail Link Helsinki, Finland, detailed design of twin tunnel & underground stations, 2008 | Tehran-Shomal Freeway, Iran, 44 double track tunnels, Consulting support services 2007-2008 Highway 1, E18 Muurla-Lohja motorway tunnels, Finland, 7 twin tunnels, drill and blast total combined length 10.3 km, 2005-2008 N20 National Highway, Section N20.1.4, Ristet Exit & Entry Tunnels, Switzerland, Design of the civil works and E&M equipment, Construction supervision and Project management, 1989-2008 Tauern-tunnel / 2nd tube, Austria, Data management in tunnel construction projects, 2006-2008 Vuosaari Harbour, Savio railway tunnel, Finland, D&B method, 13.5 km, 1996-2008 |
| Pro Iter Via GB Sammartini 5 20125 Milano Italy Tel: +39 02 6787 911 Fax: +39 02 6739 1146 Email: mail@proiter.it Web: www.proiter.eu | a) US\$10M b) US\$2M | Civil engineering design for roads and highways, railways, environment, rock and soft ground tunnel design, geotechnical and geomechanical advice, soil improvement design, soil structure interaction analyses and calculations | Tehran Metro, Line 7, Iran – 13km EPB tunnel (north-south stretch), Ø9m, in urban area; Catania-Syracuse Motorway, Sicily, Italy – Five twin tunnels (12km), geotechnical and geomechanical assessment and design, viaducts foundations and retaining structures design, slope stabilisation; Brenner Base Tunnel, Italy/Austria – First lot of Brenner Base Tunnel, Aica pilot tunnel and Unterplattner service tunnel (approx 12km), detailed design, including both traditional and mechanised driving in hard rock, underburden of about 1300m | A1 Motorway, Barberino-Florence Section, Italy – Le Croci tunnel (1.6km driven in weak and hard rock) & Case Forno (third lane extension); A1 Motorway, Firenze Sud-Incisa Valdarno Section, Italy – 3rd lane extension, final design of S. Donato tunnel, about 2km long, driven in weak rock; A1 Motorway, Barberino del Mugello-Firenze Nord Section, Italy – Final design of 12 tunnels in hard rock, approx 7km; St Petersburg Metro, Russia – Access tunnel design; Valtellina State Road, Italy – Final design of 3 tunnels |
| Ramboll Gruppen Teknikerbyen 1 2830 Virum Denmark Tel: +45 4598 6000 Fax: +45 4598 6990 Email: oo@ramboll.dk Web: www.ramboll.com | a) US\$790M b) US\$39.5M | Cut & cover, immersed tube tunnels, rock tunnels, M&E including tunnel ventilation and fire safety | E18 Grimstad-Kristiansand Project, Norway – 7 x rock tunnels and 1 x cut & cover tunnel: Main consultant (in cooperation with Bilfinger Berger Technisches Büro); Malmo Citytunnel, E201, Sweden – Geotechnical & hydrogeological services, M&E, rescue/ventilation shafts & participation in design management; Limerick Tunnel Scheme, Ireland – Cat III check for 900m immersed tube; Citybanan, Södermalm Lot, Sweden – Preliminary design for rail tunnel. 1.5km rock tunnel and cut & cover; Skansenlöpet Tunnel, Norway – 500m tunnel crossing. Geotechnical, M&E and structural design | Norra Länken, Lot K2, Sweden – Preliminary design; Marselisborg Tunnel, Denmark – Preparation of tender docs for EIA for a 2km road tunnel; Bording-Låsby Motorway, Denmark – Assistance in connection with the EIA for a new motorway; Steinberget Tunnel, Norway – Design of all works in connection with a 1.3km road tunnel in Trondheim; E18 Larvik, Langangen Bridge, Norway – Engineering services for new road with 4 rock and 1 concrete tunnels; Nordhavnsvejen, Denmark – Studies for bored and C&C tunnels |

TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|--|--|--|
| Sauer Corporation, Dr G 560 Herndon Parkway Suite 310 Herndon VA 20170 USA Tel: +1 703 707 0700 Fax: +1 703 707 0703 Email: washington@dr-sauer.com Web: www.dr-sauer.com | a) US\$6M b) US\$6M | NATM/SEM and TBM tunnelling, subway stations, urban tunnelling (all ground conditions), tunnel inspection, rehabilitation and waterproofing design, CM & supervision, cost estimating, feasibility studies, value engineering | Devil's Slide, CA, US – Inspection and CM, scheduling and claims services; MUNI Subway, San Francisco, US – Preliminary engineering design, scheduling and cost estimating; East Side Access, CM009, NY, US – Engineering support during construction; University Link, Seattle, US – Final design of SEM tunnels and waterproofing of stations; Silver Line Phase III, Boston, US – Preliminary engineering for NATM section, waterproofing design; Pajares Rail Tunnel, Spain – Detailed design and 3D FE analyses; Tottenham Court Road Station, UK – Detailed design and FE analyses; Bond Street Station, UK – Preliminary design for station upgrade; Metro Red Line, Tel Aviv, Israel – Design oversight | Beacon Hill Station, Central Link, Seattle, US – Final design and construction inspection services for deep soft ground tunnels; North Shore Connector, Pittsburgh, US – Design and construction support services for the waterproofing of two cut & cover stations and associated tunnels; WASA CSO, Washington DC, US – Participate on Expert Review Board; Love Field Tunnel, Dallas, US – Conceptual designs and feasibility studies; Tysons Corner Tunnel, VA, US – Preliminary engineering design of large bore TBM tunnel alternative |
| Schroeder et Associes SA 8 Rue des Girondins, L-1626 Luxembourg Tel: +352 4431311 Fax: +4352 443131524 Email: contact@schroeder.lu Web: www.schroeder.lu | a) US\$29M b) US\$2.9M | Design of road and rail tunnels, including their technical equipment, in soft and swelling rock | Tunnel Gousselerbiert, Luxembourg – 2.6km, 4 lane motorway tunnel; Tunnel Grouff, Luxembourg – 3km, 5 lane motorway tunnel; Tunnel Staffeler, Luxembourg – 2km, 4 lane motorway tunnel; Tunnel Gaalgebiert, Luxembourg – 1km rail tunnel; Tunnel Ettelbrück, Luxembourg – 1km, 3 lane road tunnel | Undisclosed |
| Scott Wilson Scott House Alencon Link Basingstoke Hants, RG21 7PP United Kingdom Tel: +44 1212 148103 Fax: +44 1212 123088 Email: info@scottwilson.com Web: www.scottwilson.com | a) US\$442M b) US\$4.7M | TBM, drill & blast, pipe jacks, directional drilling, immersed tube tunnels, cut & cover, microtunnelling, SCL tunnels, segmental linings, tunnel inspection, assessment, feasibility, specialist advice, ground probing radar, lining surveys | Tsuen Wan Drainage Tunnel, HK – Detailed Design including segmental lining, in-situ lining, chambers and temporary support; Braamhoek Hydropower, SA – Technical advisor for cavern, tunnels and shafts; Combe Down Mine, Bath, UK – Design and construction supervision; Laliki Tunnel, Poland – Tunnelling advice and supervision; Perpignan-Figueras HSL, Spain/ France – Commercial Advisor and Independent Monitoring and Certification of the works on 44.5km HSR link; Glenfield Tunnel, UK – Specialist advice and detailed design of remedial works; Waverley Line Tunnels, UK – Inspection, assessment and advice of remedial works; Gasworks Tunnel, UK – Inspection, assessment and design of remedial works | Vigoumenitsa-Ioninia Railway, Greece – Detailed design; Cooling the Tube, UK – Outline designs for new ventilation shafts and tunnels; SFA, UK – Feasibility for step free access to Green Park station; Wrens Nest Tunnel, UK – Inspection and preliminary design; Edinburgh Airport Rail Link, UK – Lead consultant; Saudi Landbridge Project, Saudi Arabia – Tunnel design; Worcester Inlet Works, UK – Detailed design; River Trent Crossing, UK – Design and advice regarding pipejacked crossing |
| SETEC 58 quai de la Rapée F-75583 Paris Cedex 12 France Tel: +33 140 046 783 Fax: +33 140 045 737 Email: tpi@tpi.setec.fr Web: www.setec.fr | a) US\$183M b) US\$12.8M | Engineering services for all types of underground projects, risk analysis, geological & geotechnical studies, ground structure interaction modelling, CFD modelling of fires, electromechanical supervision, site management | Toulon Road Tunnel, France – 1800m NATM bored tunnel; Mont Sion Highway Tunnel (A41), France – 3100m EPBM twin bored tunnel; Bocognano Road Tunnel, Corsica – 400m NATM tunnel; Chavanne Tunnel, Rhin-Rhone high speed rail line, France – 2000m long NATM tunnel; Zaouiat Highway Tunnel, Morocco – 500m long NATM twin bored tunnel; Channel Tunnel Fire Repair Works, France/UK – Repair and refurbishment following fire in September 2008; A8 Motorway Tunnels Renovation, Nice, France | Lyon-Turin Base Tunnel, France/Italy – Twin 52km long high speed rail tunnel under the Alps, studies for reference preliminary design; A86 West Motorway, Paris, France – Detailed design of electromechanical and electrical equipment |
| Shannon & Wilson Inc 400 N 34th Street Suite 100 Seattle Washington USA Tel: +1 206 632 8020 Fax: +1 206 695 6777 Email: clw@shanwil.com Web: www.shannonwilson.com | a) US\$48M b) US\$3.2M | Geotechnical investigations and assessments, dewatering and environmental assessments HDD microtunnelling and large tunnel design Construction management Design build assistance | Alaskan Way Viaduct & Seawall Replacement Project, Seattle, WA. Shannon & Wilson provided geotechnical engineering recommendations for replacement alternatives, including cut and cover tunnels, sequentially excavated tunnels, elevated structures, and at-grade sections. Shannon & Wilson has also developed geotechnical recommendations for the seawall, retrofit of the Battery Street Tunnel, and sensitive utility relocations; Link Light Rail Beacon Hill Project, Seattle, WA. This project consists of 1 mile of twin transit tunnels, a deep underground binocular station with twin platform tunnels, ancillary ventilation and emergency egress shafts, a headhouse at the top of each shaft, a west portal structure beneath I-5 and an east portal structure. Shannon & Wilson provided geotechnical exploration and design input for conceptual through final design; Sandy River Conduit Crossing Design-Build, Sandy, OR. Shannon & Wilson is providing services for tunnel construction as part of a team tasked with putting two primary water conduits beneath the Sandy River. | Donner Pass Tunnels Clearance Improvement Program, Sacramento, CA to Reno, NV. Shannon & Wilson prepared plans and specifications for enlarging 25 tunnels for double-stack and Chrysler car clearance. Several of the tunnels required re-mining or undercutting. Prior to notching with a road header the tunnels were grouted and reinforced with rock bolts; Bellevue Interceptor Pipe Replacement, Bellevue, WA. Shannon & Wilson provided geotechnical recommendations and construction considerations for the replacement of a portion of the Bellevue Interceptor Pipeline using trenchless methods. Shannon & Wilson also assisted in the preparation of the plans and specifications for the pipe-jacking and geotechnical instrumentation |
| Sinotech Engineering Consultants 14F, 171 Nanking East Road SEC 5, Taipei 10570, Taiwan PR China Tel: +886 2 2769 8388 Fax: +886 2 2766 9186 Email: sinotech@sinotech.com.tw Web: www.sinotech.com.tw | a) US\$111M b) US\$4.5M | Shaft sinking, ground treatment, precast linings, planning, design and supervision for highway, railway, metro, hydropower, water supply and sewage in soft and firm ground | Taipei MRT, Taiwan – Detailed engineering design for DK 192, DK 194, DK147, and DG168; Tseng-Wen Reservoir Transbasin Project, Taiwan – General consultant; Chu-Kong 161kV cable tunnel, Taiwan – Basic design consultant; Song-Hou 345kV and 161kV tunnel, Taiwan – Basic design consultant | Taipei MRT, Taiwan – Detailed design for DD189 and DD188; Hsueshan Tunnel, Taiwan – Detailed design and construction supervision; Yuanshantze Flood Diversion Tunnel Project, Taiwan – Basic design and construction consultation; |
| Snyder Engineering LLC 4251 Kipling Street, Suite 550, Wheat Ridge, Colorado 80033-6800, USA Tel: +1 303 420 1544 Fax: +1 303 420 1843 Email: lsnyder200@cs.com | a) US\$0.2M b) US\$0.2M | Design, development, operation & maintenance of all types of hard rock TBMs & soft ground shielded machines, consulting on TBM design, TBM failure analysis, technical support | Claim review San Vicente Pipeline Project Review of machine specifications for upcoming tunnel projects | Undisclosed |

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TUNNELLING CONSULTANTS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|---|---|
| STF Consult Lindauer Strasse 3b D-86399 Bobingen Germany Tel: +49 8234 904 9930 Fax: +49 8234 904 9931 Email: thomassteinfeld@aol.com | Undisclosed | All aspects of segmental lined tunnels: manufacturing of segments, plant set-up, planning and commissioning of factories for pre-cast segments, works preparation for segment plants and TBM sites | Now Doha International Airport, Doha Qatar – Cut & cover tunnels for Midfield and Free Trade Zone Area: Double box sections each 20m wide with three lane traffic management. Construction manager on behalf of SGW JV; Sydney Desalination Plant, Sydney, Australia – 2.5km long twin tube bore into the sea for salt water intake and brine outlet. Conducted plant audits, review of factory set-up and checking on mould & precast manufacturers; Airport Link and Northern Busway, Brisbane, Australia – Responsible for planning of all precast works; Metro Line 2, Sofia, Bulgaria – Budget, tender and pricing for precast segments, plants and moulds | HSRL Munich-Verona, Lot H 8 Tunnel Jenback, Austria – Ø11.63m segmental lined TBM tunnel. Layout, planning, equipment selection and start-up of the precast factory; Gold Coast Desalination Alliance, Southport, Australia – 4km Ø2.8m i.d.TBM tunnel for sea water supply for desalination plant. Checked site set-up of precast subcontractor and mould manufacture process |
| T TEC Barbarossastraat 35 6522 DK Nijmegen The Netherlands Tel: +31 24 3820430 Fax: +31 24 3229589 Email: info@tec-tunnel.com Web: www.tec-tunnel.com | a) US\$8.5M b) US\$8.5M | Bored tunnels, immersed tunnels, technical systems, tunnels traffic management systems, safety, operation, management and maintenance | Busan koje Link, South Korea – Immersed tunnel for dual-carriage motorway link between Busan and the island Geoje. Total length of the tunnel 3700km. Immersed section 3,240km comprising 18 elements of 180m each; Coatzaocalcos Immersed Tunnel, Mexico – Tunnel for a dual lane motorway comprising 5 elements of 140m each with a total length of 1500m; N201 Diversion Aalsmeer, Uithoorn, The Netherlands – Motorway diversion including a tunnel across the Ringvaart close to Schiphol Airport; North south line extension Metro Amsterdam The Netherlands – Immersed tunnel across the river IJ, a twin bored tunnel (3.8km) and 4 stations in the inner city of Amsterdam | 2nd Coentunnel The Netherlands – Immersed tunnel across the Noordzee kanaal in Amsterdam. Located next to the existing Coentunnel; Hubertustunnel, The Hague The Netherlands – Underground road connection: total length ±2000m, the underground part has, inclusive of slip roads, a length of 1700m and consists of a twin bored tunnel with an outer diameter of 10.2m |
| Tunnelling Ltd Unit 4 La Gare, 51 Surrey Row, London SE1 0BZ, UK Tel: +44 2079819889 Fax: +44 2070992611 Email: info@tunnellinglimited.com Web: www.tunnellinglimited.com | Undisclosed | All disciplines and all activities - from concept to feasibility; through financing, planning and design; to procurement, construction, facility operation, maintenance and refurbishment. | Undisclosed | Undisclosed |
| U Underground Professional Services Corporation Street Rugby Warwickshire CV21 2DW United Kingdom Tel: +44 1788 538 731 Fax: +44 1788 534 699 Email: info@unps.co.uk Web: www.unps.co.uk | a)£5M b)£5M | Permanent & temporary works design for transport and utility projects, feasibility studies, buildability advice, research and development, geospatial surveys, management of tunnel lining manufacturing facilities, risk management. | Belfast Sewerage Scheme, Ireland – Permanent & temporary works design of 10km tunnels, 38m ID pump station, 28 shafts & outfall Croydon Cable Tunnel, UK – Permanent & temporary works design for 10km tunnel London Water Ring Main, UK – Permanent & temporary works design for 4.5km extension between Honor Oak and Brixton and 4km extension between Stoke Newington and New River Head AX4 Framework, United Utilities, UK – Permanent & temporary works design for 20 shafts Coppermills Transfer Pump Shaft, | Hendon-Colindale Cable Tunnel, UK – Permanent & temporary works design for a 2.5m ID cable tunnel and 2 shafts King's Cross Station Redevelopment, London – New access tunnels to the Victoria Line, Picadilly Line, & Northern Line. CAT III Checking Services |
| V Viglconsult A-6780 Schruns Batloggstreet 36 Austria Tel: +43 5556 77844 Fax: +43 5556 77844 13 Email: office@viglconsult.at Web: www.viglconsult.at | Undisclosed | Design, consultancy, numerical modelling, risk inspections, soil mechanics, rock mechanics, engineering geology | Beles – HPP, Ethiopia – headrace & tailrace tunnel, 7.20m diameter segmental lining design and consultant, tunnel design, grouting Veligonda I -HPP, India – water transfer tunnel, 7.20m diameter segmental lining design Metro Kadiköy-Kartal, Istanbul, Turkey – 5.70m, mono-shell lining, segmental lining design Kaiser-Wilhelm Tunnel, Germany – railway tunnel 9.00m diameter, mono-shell segmental lining system, consultant (design phase) Palomino - HPP, Dominican Republic - headrace tunnel, 3.96m diameter, consultant Las Placetats | Kopswerk II – HPP, Austria - headrace tunnel 4.90m diameter, executive design and geological/geotechnical supervision Tunnelkette Perschling, Austria - railway tunnel, 12.12m diameter segmental lining design, TBM supervision Val Passiria - HPP, Italy – headrace tunnel, 3.04m diameter, segmental lining design and consultant Extension Hieflau - HPP, Austria - headrace tunnel, 5.60m diameter, segmental lining design and consultant |
| W WBI Henricistrasse 50 52072 Aachen Germany Tel: +49 241 889 870 Fax: +49 241 889 8733 Email: wbi@wbionline.de Web: www.wbionline.de | a) US\$6M b) US\$4M | Geotechnical consulting, planning, design of NATM and mechanised tunnelling, tenders, construction management and supervision, 3D FE analysis with in-house software, risk and claim management | Stuttgart 21: two 25km railway tunnels, ground and tunnelling expert Tunnel Schwabisch Gmund, Germany - 2,130m, detailed design Tunnel Rosenstein, Germany - two 750m two-lane road tunnels, ground expertise Kallidromo Tunnel, Greece - two 9,025m railway tunnels, tender design, detailed design, site supervision | Carmel Tunnels, Haifa, Israel - two 4.7km two-lane road tunnel, tender design, tender detailed design, tunnelling expert, tunnel management New Schluchterner Tunnel, Germany - 3,995m railway tunnel, geotechnical engineer on site, consulting services during heading and for optimisation of heading Tunnel Leutenbach, Germany - two 1.7km two lane highway tunnels, tunnelling expert and review engineer Jagdberg tunnel, Germany - two 3km three lane highway tunnels, ground expertise, tender design and tender |

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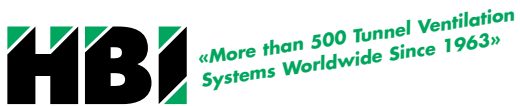
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TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|---|--|
| Acciona Infraestructuras Avenida de Europa 18 Alcobendas 28108 Madrid Spain Tel: +34 91 663 2850 Fax: +34 91 663 2840 Email: webmail-infraestructuras@acciona.es Web: www.acciona-infraestructuras.es | a) US\$10bn b) US\$551M | Underground construction: rail, road, metro, sewer, hydro electric, by TBM (EPB, gripper, double-shield, single-shield), conventional (mechanical, Drill & Blast) and cut & cover methods | M30 South Bypass, Madrid, Spain – 3.6km, Ø15m EPB; Pajares Tunnel, Lot 1, Spain – Rail, 2 x 10.5km, Ø10m; L9 Barcelona Metro, Spain – 11km, EPB Ø12m; Bologna Railway, Italy – 2 x 6km, EPB Ø9m; Santoña Sewer Tunnel, Cantabria, Spain – 4 km, D&B, Ø5m; Malata Outfall, Coruña, Spain – 7km, TBM Ø3.5m; Grado Doriga Highway, Asturias, Spain – 2 x 0.9km; Villargordo-Venta del Moro, Valencia, Spain – Rail, 3km; Guadarrama, Spain; Horcajada– Naharros, Spain; Basurto Tunnel, Bilbao, Spain; Timijiraque Tunnel, Spain; L5 Barcelona Metro, Spain; Ojos de agua Hydro Project, Chile; Ralco Hydro Project, Chile; Metronorte, Madrid, Spain; Metroren Gijón, Spain | Plataforma de la LAV León-Asturias, Spain; Plataforma de LAV Vitoria, Bilbao-San Sebastián, Spain; Fase IV Tamaraceite-Tenoya-Arucas costa, Gran Canaria, Spain; Nueva Carretera Icod de los Vinos, Santiago del Teide, Tenerife, Spain; Túnel de la Lobera, Navarra, Spain; Autovía B-40, Olesa de Montserrat- Viladecavalls, Barcelona, Spain; Variante de Camarillas, Spain; Eje Atlántico de Alta Velocidad, Galicia, Spain; Túnel de Sabadell, Spain; Aeropuerto de Málaga, Spain |
| A E Yates Cranfield Road Lostock Industrial Estate Lostock Boston BL6 4SB United Kingdom Tel: +44 1204 696 175 Fax: +44 1204 669 008 Email: trenchless.solutions@aeayates.co.uk Web: www.aeyates.co.uk | a) US\$44M b) US\$30.5M | Mechanised pipejacking and microtunnelling, owners and operators of a versatile fleet of small diameter TBMs and slurry systems, and HDD machines up to 70t pullback | Asselby-Pannal 1220 gas pipeline rail crossings, UK – 4 x rail crossing near Leeds using Ø1500 Herrenknecht and Iseki machines; Colchester-Horkesley A12 crossings, UK – 2 x 60m crossings of A12 using Soltau; Greenlaw Park II Project WP 170, Glasgow, Scotland – 3 x 6.5m i.d. shafts (6m clay, 9m rock and 12m clay), 2 x tunnels, Ø1800mm x 160m long in clay using HK backacter and Ø1500mm x 240m long in rock using HK slurry | Milford Haven-Aberdulais 1220 Gas Pipeline Crossings, South Wales – 1 x Ø1200mm, 4 x Ø1500mm crossings, from 40m-100m long, and 5 x Ø1800mm crossings 70m - 330m long and various shafts; Locks Lane, Purton, Swindon, UK – Combined sewer, 31m of 600mm i.d. pipejack in 1 span using Iseki Unclemole. Construction of 2 x shafts from Ø2.2m to Ø3m up to 6m deep; A76 Tunnelled Crossing, Ayrshire, Scotland – 34m of 1800mm i.d. pipejack in 1 span using Herrenknecht backacter |
| Alpine Mayreder Bau Alte Bundesstrasse 10 5071 Salzburg/Wals Austria Tel: +43 662 8582 401 Fax: +43 662 8582 400 Email: office-tunnel@alpine.at Web: www.alpine.at | Undisclosed | Tunnels & caverns in soft soil or hard rock, vertical & inclined shafts; NATM (also under compressed air) with pipe screen cover, sidewalls; TBM/TBE drives; Solutions for difficult ground; Foundation engineering | Gotthard Base Tunnel, Switzerland - (in JV), 2 of 5 Lots, HSR, twin TBM tunnels, total length 72.4km; Circle Line, Singapore Metro - Contracts 852 and 855 (both in JV), total length 11.9km; Ermenek HEP, Turkey - 2 TBM tunnels (8km: Ø6.6m, 4km: Ø4m), powerhouse, shafts, power cavern; HSR Nuremberg-Ingolstadt, Germany - Middle section, Lot B (in JV), 3 tunnels total length 15.5km (NATM); Ningbo Expressway, China - 42.25km 4-lane motorway inc. 10 tube tunnel, total length 7.3km (NATM); Tsankov Kamak HEP, Bulgaria - double curvature arch dam, diversion, road & pressure tunnels (NATM) | Western Bypass, Zurich, Switzerland - (in JV) 2 x 4.4km, 143-160m2, 2 x 2.8km pilot tunnel (Ø5m), widened with TBE to Ø14.4m, other sections by drill & blast; Yellow River Diversion Project, China - Lot 1, Pumping Station No. 1 & 2. Station No.1, intake (1km Ø4.5m) and 10 inlet branch tunnels (25m Ø2m), outlet pressure shaft (142m id 5.2m), tunnel no. 4 (1.7km Ø5.6m), pump Station No.2 and underground reservoir; Athens Metro, Greece - Line 2 Ext. 1.46km NATM, 920m by open face shield |
| Amalgamated Construction Unit 4A, Birchwood One Business Park, Dewhurst Road Warrington, Cheshire WA3 7GB, UK Tel: +44 1925 838070 Fax: +44 1925 816670 Email: info@amco-construction.co.uk Web: www.amco-construction.co.uk | a) US\$108M b) US\$26M | Full face tunnel boring, drill & blast, pipe-jacking, micro-tunnelling, shaft sinking, tunnel refurbishment, shaft refurbishment, underground asset management, asset surveys, design and construct contracts | Barrow-in-Furnace Flood Relief Works - Construction of 1 500m x 2.1m i.d. p.c.c segmental tunnel utilising a Lovat M101 TBM, together with excavation of a 23.6m i.d x 30m deep diaphragm walled underground storage tank and two 3.66m i.d. segmental shafts; Mersey Queensway Road Tunnel Improvements, Merseyside, UK - Construction of new emergency escape routes and refuges with the under-deck area of the tunnel, including construction of new escape tunnel (complex logistics, with materials access only once every 4 weeks) | Katrine Water Project RWPS & Tunnelling Works – Construction of a Ø15m, 29m deep pumping station shaft, 2 inlet tunnels in hard igneous rocks using drill & blast, and 3 outlet tunnels installed by pipe-jacking using an Akkerman Drum Cutter; Bray Head Rail Tunnel Refurbishment – Scheme forming part of the DASH upgrading project for Irish Rail. Drilling and grouting to stabilise 410m of tunnel lining and facilitate water management by way of radial drainage |
| Amberg Technologies AG Trockenloosstrasse 21 CH-8105 Regensdorf Switzerland Tel: +41 44 870 92 22 Fax: +41 44 870 06 18 Email: tunnel@amberg.ch Web: www.amberg.ch/at | a) €8.8M b) €18.8M | Specialised tunnel measurement systems and consulting. Automated tunnel surveying solution, motorised laser system for tunnel set out, profile control, 3D laser scanning for complete tunnel structure analysis. | Durchmesserlinie Zurich, Switzerland - TBM guidance of two TBMs, 3D profile surveys, tunnel scanning, comprehensive geotechnical monitoring for the ATW consortium Ceneri Base Tunnel, Switzerland – Automatic monitoring of the highway A2 above the north portal of the Ceneri Base Tunnel. Integrated monitoring system including total stations, GPS, inclinometers and extensometers. Automated publishing of monitoring results and alarm functions online with Amberg's GEOvis web software Gotthard Base Tunnel, Switzerland – For the TAT consortium (lot Faido and Bodio) Amberg is providing comprehensive geotechnical monitoring, 3D profile surveys, tunnel scanning and high-resolution images, geometry with Amberg's proven GRP 5000 system. | Kerenzerberg Tunnel, Switzerland - Kinematic laser scanning with Amberg's road tunnel scanning system. Total of 11 kilometres including digital laser reflection image for crack detection and crack mapping with Amberg's TunnelMapTM Katzenberg Tunnel, Germany – 9.3 kilometres rail tunnel, application of TMS Tunnelscan. |
| Andrade Gutierrez Rua Dr. Geralso Campos Moreira 375, 4th Floor São Paulo Brazil Tel: +5511 5502 2084 Fax: +5511 5502 2089 Email: flavio.henrique@andradegutierrez.com.br Web: www.andradegutierrez.com.br | a) US\$2.02bn b) - | EPC/turnkey contracts for all types of underground construction (soil & rock) in NATM, TBM/EPBM, cast in-situ linings, shafts, soil treatment, etc. ISO 9001, 14001 and OHSAS 18001 certification for subway works | São Paulo Metro, Line 4 / Yellow (Consortium), Brazil – 12.8km of railway including 6.4km of tunnel by EPBM & 4.7km in NATM. Excavation area for NATM works is 64-69m2, Ø9.46m TBM. Construction time frame is 56 months. Project comprises a total length of 14.2km and includes 10 stations, 12 ventilation and emergency exit tunnels and maintenance yard. NATM in rock, decomposed rock, soils and saprolite; TBM in tertiary soils from the São Paulo and Resende basins. Key milestones in Line 4 include the Pinheiros River crossing (NATM in rock), and interconnections with Line 1 (Luz Station), Line 3 (Republica Station), Line 2 (Paulista Station) and with CPTM railway's Line C (Pinheiros Station). | São Paulo Metro, Line 2 / Green - Carlos Petit Well/Embucaçu Station - Lot 1, Brazil – Twin tunnel in soil with NATM, within urban area, lined with shotcrete, variable transverse section up to 100.4m2, main tunnel and auxiliary tunnels totalling 2.29km, and twin tunnel in soil to house the Station proper (147m). Vila Mariana vent shaft (Ø12.6m) in urban area. Trench-based excavation of Chacara Klabin Station in soil, at depth of 21.6m, including foundations and concreting. Execution of diaphragm walling |

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TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|--|--|--|
| Balfour Beatty Major Civil Engineering 86 Station Road, Redhill, Surrey, RH1 1PQ, United Kingdom Tel: +44 1737 785138 Fax: +44 1737 785000 Email: sharon.cox@bbcel.co.uk Web: www.bbcel.co.uk | Undisclosed | Large diameter tunnel construction for highways and railways including cut & cover, segmental linings with full face TBMs, drill & blast, NATM and sprayed concrete linings (SCL) | A3 Hindhead Scheme, UK – 1.9km tunnel to tackle congestion on this busy route, improve road safety and remove traffic from the village and surrounding area. Contract awarded in 2002 as Early Contractor Involvement (ECI) scheme; King's Cross Station, London, UK – Construction of underground ticket hall and installation of M&E equipment | AlpTransit, Lötschberg Tunnel, Switzerland – Part of JV responsible for Steg and Raron southern sections, comprising 21.3km of 9.4m dia rock tunnel; Nam Cheong Station, Hong Kong, PR China – Complex interchange station for KCRC's West Rail project, based on top down construction |
| Balvac 24 Woodside Business Park Birkenhead, Wirral, CH41 1EL United Kingdom Tel: +44 151 6500184 Fax: +44 151 6500358 Email: gerry.lister@balvac.co.uk Web: www.balvac.co.uk | a) US\$24M b) US\$4M | Vacuum assisted resin injection, leakage control through injection, structural strengthening, stabilisation of brick work & masonry, precision grouting, stabilisation of track ballast, asset solutions & technical project management | Glasgow Underground, Scotland – 5 year framework contract for rail block grouting, structural strengthening and leakage control by injection methods and sprayed concrete | Terminal 5, Heathrow Airport, UK – Leak sealing and vacuum-assisted resin injection; Conwy Tunnel, North Wales – Regular structural maintenance; Dartford Tunnel, UK – Injection and leak sealing trials plus structural maintenance |
| Barhale Construction Barhale House Bescot Crescent Walsall WS1 4NN United Kingdom Tel: +44 1922 726700 Fax: +44 1922 726856 Email: info@barhale.co.uk Web: www.barhale.co.uk | a) £157M b) £50M | Tunnelling, microtunnelling, shaft sinking, pipe-jacking, open-cut drainage, steel fabrication, utility networks, maintenance operations, railtrack crossings, slurry treatment, plant innovation, lateral connections Clover | Road West Ham—1200, 1000 & 600mm id Microtunnelling, shafts and associated structures Newtown—1200 & 600 Microtunnelling with shafts and associated structures Newton Le Willows—1500 Microtunnelling rail and river crossings Nant Pibwr— Design & Construct- 3 by 30m 1200mm id Culvert relining Rhosferrig Rail Tunnel— Relining and remediation to existing Network Rail tunnel lining Westerleigh Bristol – Under track Crossing by microtunnelling | Wraysbury Inlet Tunnel Reline, London, UK – Design & construct 2900m of 2.23m i.d. reinforced relining & temporary works Queen Mother Reservoir, London, UK – Design & construct 1000m of 2.23m i.d. reinforced concrete tunnel lining & 343m of 2.20m i.d. steel welded pipe relining London, UK – Inspection maintenance & repairs to 32km tunnel system Westbourne Grove London, UK – Construction of 15m i.d. shafts & 1500mm i.d. tunnelling Wandsworth, UK – 1200mm i.d. microtunnel & associated shafts |
| Beton- und Monierbau Bernhard Hoefel Straße 11 A-6021 Innsbruck Austria Tel: +43 512 23110 Fax: +43 512 392655 Email: office@bemo.co.at Web: www.bemo.net | a) €97.3M b) €95.7M | Tunnelling, microtunnelling, shaft sinking, pipe-jacking, open-cut drainage, steel fabrication, utility networks, maintenance operations, railtrack crossings, slurry treatment, plant innovation, lateral connections | HSR-line Ebensfeld-Erfurt, Germany – Tunnels Lichtenholz Kulch, twin-track railway tunnel, two tubes (0.9+1.3 km) incl emergency shaft and gallery, Baumleite Tunnel – 1.3km twin-track railway tunnel, one tube, 125-161 m ² incl emergency shaft & gallery, D&B, NATM Schulberg Tunnel, Germany – 687m 2-tube motorway tunnel in challenging geological conditions, NATM Neuer-Kaiser-Wilhelm Tunnel (NKWT), Germany – 4.2km 1-track TBM railway tunnel, one tube, eight crosspassages to the Old Kaiser Wilhelm Tunnel with diverse cross-sections (NATM) Detailed primary and secondary-lining Tunnel-Design by BeMo for Tunnel Baumleite, Schulberg | Alte Mainzer Tunnel Modernisation, Mainz, Germany – Reinstatement and enlargement (45m ² to 126m ² using bolt-grouting: radial comprehensive grouting - BeMo value engineering proposal) of the existing very shallow double-track railway tunnels (662m "Mainz Hbf" and 246m Mainz South) running 4-20m underneath existing structures, e.g. main roads, buildings, ancient walls. Built in the late 19th century and opened in 1883, the two tunnels situated in the city centre of Mainz had to be enlarged |
| Bilfinger Berger Tunnelling Division Landsberger Strasse 290a D-80687 Munich Germany Tel: +49 89 74817 252 Fax: +49 89 74817 307 Email: georg.wicklmayr@bilfinger.de Web: www.civil.bilfinger.com | a) €4.2bn b) €573M | Design and build of large international tunnel projects (road, rail, metro, sewer, water & power supply), TBM tunnelling (slurry, EPB, hard rock, double shield), conventional tunnelling (NATM, tunnel excavator, roadheader, drill and blast) | Emergency Tunnel Frejus Lot 1, Modane, France- 1.2km D&B tunnel with in-situ concrete lining, 5.3km TBM tunnel Ø9.20m, 18 XPs Citybanan Stockholm, Lot Odenplan and Vasatunnel, Sweden - 1.17km double track rail tunnel, 700m station cavern, XPs and various service tunnels, D&B method XFEL Hamburg Lot 1 & 2, Germany - 5.8km R&D tunnel, TBM Ø5.2/4.50m, 7 shafts and 1 research building Wehrhahnlinie Duesseldorf Lot 1, Germany - 3.4km subway tunnel, TBM Ø9.49m, 5 stations, 2 ramps Durchmesserlinie Zurich, Weinbergtunnel, Switzerland - LOT 3.1: 130m tunnel excavation below existing train station "Südtrakt". LOT 3.2: 4.4km railway tunnel, TBM Ø11,28m. 4km rescue tunnel, TBM Ø4.75m, XPs @ 300m Gotthardt Base Tunnel, Lot Sedrun, Switzerland - Railway tunnel 18,3km, D&B method, 18 XPs, 800m deep access shaft, 1.76km multifunction structure ESCSO Portland, USA - 8.8km sewage tunnel, TBM Ø7.74m, 7 shafts, 3.1km microtunnelling Clem 7, Brisbane, Australia - 6.8km double tube roadway tunnel, 4km with TBM Ø12.4m, 2.8 km | Citytunneln Malmö, Sweden - 4.6km double tube railway tunnel, TBM Ø8.93, 13 XPs, 280m Station, 4 pressure equalisation shafts, 2 exit shafts, 360m open cut, 440m ramps E 18 Grimstad-Kristiansand, Norway - 11.5km Road tunnel, D&B method, XPs @ 250m Descenderie de Modane, France - 2.9 km exploratory tunnel 70m ² , D&B method Kirchenwald Tunnel, Switzerland - 3.1 km double tube road tunnel 82m ² , D&B method, 6 XPs, 2 emergency adits, 1 vent shaft, 2 vent buildings |
| Bouygues Travaux Publics 1 avenue Eugène Freyssinet 78061 Saint-Quentin-en-Yvelines Cedex France Tel: +33 1 30 60 31 66 Fax: +33 1 30 60 44 28 Email: bouyguesstp@bouygues-construction.com Web: www.bouygues-construction.com | a) US\$1.67bn b) US\$430M | All underground construction works. Tunnel and caverns in all type of soil, drill and blast, slurry and EPB shield and hardrock TBM, road headers, NATM, shaft drilling; Total control of geometry and quality; Design and engineering capacity for these projects | Gautrain – Rail Link, South Africa: 80 km – Concession, included 11.7 km D&B and 3 km TBM; DSD – Hong Kong West Drainage Tunnel : 10.5 km TBM – 8 km adds – 32 Dropshafts; Salazie – Water Tunnel, La Réunion Island: 8 km TBM; Tyne Tunnel - Newcastle, England – immersed tube + tunnel rehabilitation; Les Grands Goulets – Road Tunnel, France : 2 x 1.65 km D&B; Cairo Metro Line 3, Egypt: 3.5 km TBM – 5 underground stations; Tunnel de Toulon, France: 1.8 km Roadheader; Frejus and Haut Bugey, France: Rehabilitation of railway tunnel for TGV; Flamarville – Nuclear Power Plant, France; Olkiluoto – Nuclear Power Plant, Finland | A41 – Motorway, France: 18.8 km – Concession, included 2x3 km TBM; Chong Ming – Motorway, China : 2 x 7 km TBM dia. 15 m; Castle Peak – Cable Tunnel, Hong Kong : 4.5 km TBM; Andra, France: 500 m deep shafts and galleries for nuclear waste experimental storage; Masan Bay Bridge – Cable stayed bridge, Korea; East Tsing Yi – Interchange, Bridges, Hong Kong; Tanger Port – Roll on – Roll off – prefabricated caissons, Morocco; Nelspruit stadium, South Africa Highway 2000 Motorway 34 km, Jamaica |

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|---|--|
| CDM 50 Hampshire St Cambridge MA 02139 USA Tel: +1 617 452 6000 Fax: +1 617 452 8000 Email: geotechnical@cdm.com Web: www.cdm.com | Undisclosed | New Austrian Tunnelling method, Groundfreezing, Conventional Tunnelling with Tunnel Boring Machines (TBM), Drill and Blast, Pipe Jacking, Microtunnelling and Underground Mining | Harbor Siphon, NYC Harbour, USA – Water main – siphon, precast segments, 3076m, 3.7m diameter, EPB. Brightwater, King County, WA, USA – BT-1, 4320m, 5.9m diameter, EPB. BT-2, 3570m, 5.2m diameter, Slurry TBM. BT-3, 6185m, 5.2m diameter, Slurry TBM. BT-4, 6490m, 4m diameter, EPB. Conveyance. Cowskin Creek, Topeka, KS, USA – Sewer force main, steel casting, 286m, 1.23m diameter, HDD. Homestead Interceptor, Hartford, CT, USA – Interceptor sewer, jacked pipe, 1052m, 1.85m diameter, MTBM. SRVSA, Somerset, NJ, USA – Outfall, steel liner plate, 66m, 2.77m diameter, Shield. Potomac Interceptor, Arlington, VA, USA – interceptor, casing pipe, 364m, 1.85m diameter, Pipe jacking. | Ellis Ave, Fountain City, CA, USA – Sewer interceptor, ribs and lagging, 1600m, 2.77m diameter, EPB. SWWM – No 11 and 12, Charlotte, NC, USA – Water main, rock bolts / steel liner, 708m, 2.46m diameter, TBM. Swamp Creek Connector, King County, WA, USA – Consolidation sewer, jacked pipe, 748m, 1.85m diameter, MTBM. Lowell St Tunnel, Fall River, MA, USA – Connection tunnel, bald, 80.6m, D&B. Third St Tunnel, Fall River, MA – Connection Tunnel, bald, 18.5m, 1.85m x 2.77m diameter, D&B. |
| Costain Costain House Nicholson's Walk Maidenhead Berkshire SL6 1LN United Kingdom Tel: +44 1628 842444 Fax: +44 1682 842362 Web: www.costain.com | a) US\$1.7bn b) US\$50M | Mechanised tunnelling, shaft sinking, hand tunnelling, drill & blast, water, power, rail and highway tunnels, pipejacking, compressed air works, project management, risk management, refurbishment, SCL | Hampton Pump Out Shafty and Connection Tunnels – 40m deep x 15m i.d. shaft with segmental precast lining and SCL, 3m i.d. connection tunnel with SCL, 1.8m i.d. pipejack; Brighton and Hove Wastewater Treatment Scheme – Preferred bidder for 9km segmental tunnel and 2km of pipejacked and 16 shafts up to 20m i.d.; Holmesdale Tunnel Refurbishment – Refurbishment of existing road tunnel on twin 3 lane motorway including modernisation of M&E and tunnel services | Margate and Broadstairs Wastewater Treatment Scheme – Design and construction of 2km of 2.87m i.d. segmental tunnel, four associated segmental shafts, 600m of 1.8m i.d. pipejacked tunnel including marine recovery of TBM, 15m i.d. shafts, two x twin bore pipejacked railway crossings; CTRL C240 – 4.8km of twin, 7.2m i.d. running tunnels, cross passages, ventilation shafts, establishment and operation of a precast concrete lining factory |
| CSM Bessac ZI de la pointe 31790 St Jory France Tel: +33 5 61376363 Fax: +33 5 61092629 Email: csmbessac@ csmbessac.com Web: www.csmbessac.com | a) US\$44M b) US\$44M | All tunnelling projects executed with TBM (EPB, compressed air, slurry, digging arm) with i.d. up to 5m | Oued Mkacel Collector, Algiers, Algeria – 4500m long, Ø4m sewage tunnel using Bessac EPBM. Design/build contract; Pointe Pescade Tunnel, Algiers, Algeria – 3500m long sewer tunnel, Ø4m Bessac TBM; Interceptor IFT Bogota, Colombia – 10km, 3.7m i.d. EPBM, design/build; Sea Outfall Rabat, Morocco – 800m, 2m i.d. with slurry machine; Chouilly Tunnel, France-Switzerland – 2200m, 2.5m i.d. with compressed air machine; Sewer Tunnel, Reims – 700m, 3.1m i.d. with compressed air machine; Lyon carrée de la soie – 1000m, 2m i.d. with slurry machine; DPLB, Paris, France – 150m, 4m i.d. with compressed air; CPCU, Paris, France – 400m, 1.4m i.d. slurry TBM | Enertherm, Paris – 1300m, 3.1m i.d.; Cachan, France – 500m, 1.8m i.d.; Alicante, desalination plant, Spain – 1000m, 3m i.d.; Ellis avenue, California, USA – 1650m, 2.8m i.d.; Mantes la Jolie, France – 1000m, 1.8m i.d.; Sables d'Olonne sea outfall, France – 620m, 1.4m i.d.; Lyon A42, France – 90m, 2.9m i.d. |
| Chantiers Modernes Rhone-Alpes 24 Rue Champ Dolin BP610 F-69804 Saint Priest France Tel: +33 4 7890 0091 Fax: +33 4 7890 1459 Email: lbaviere@chantiers- modernes.fr | a) US\$38M b) US\$22M | Tunnels & underground works in all types of ground, from hard rock to soils, D&B, mechanical excavation, tunnel refurbishment, shotcreting, cut & cover, civil works | Tunnel u Bois de Peu, Besançon, France – 520m long twin road tunnels as part of Basançon ringway, drill & blast; ; Chavanne Tunnel, Belfort, France – 1970m long rail tunnel for French high speed rail, drill & blast, cut & cover; Tunnel de Rochefort, Tech et Poliénas, France – Refurbishment of three rail tunnels | A40 Motorway, France – Civil works as part of refurbishment programme; Nouveau tunnel du Lioran, France – 1515m long single tube road tunnel, drill & blast; A43 Motorway, Tunnel de L'Épine, Southern Tube, France – Complete refurbishment of a 3120m long road tunnel; Tunnel de St Germain, Talloine, France – Refurbishment and concrete lining of 2 road tunnels in service; St Martin d'Estreaux, France – Refurbishment of railway tunnel |
| Denys Industrieweg 124 9032 Wondelgem Belgium Tel: +32 9 254 0111 Fax: +32 9 226 7771 Email: info@denys.com Web: www.denys.com | a) US\$165M b) US\$60M | Pipe jacking, slurry TBM drives, shaft sinking, concrete piles, diaphragm walls | AVorst Sewer, Brussels – Pipe jack sewer DN2000, 1000m, slurry and reservoir of 18,000m ³ ; Sowaar-Bierset Sewer, Liege – Pipe jack sewer DN2000, 2600m, slurry TBM and shaft sinking depth 40m; Mechelen Sewer, Mechelen – Pipe jack sewer DN1600, 740m, slurry TBM, 3 shafts & pumping station; AWW-Water Supply, Antwerp – Pipe jack DN1200, 600m, slurry TBM; Algiers Sewer, Algeria – Pipe jack DN1800, 3000m, inc. 6 shafts; Schuman-Josaphat Rail Extension, Brussels – Pipe jack DN3000, 800m; Aide Sewer, Grace Hologne & Montegnee – Pipe jack DN1600, 2100m, and 5 deep shafts | Boot, Brussels – Pipe jack sewer DN2500 = 1700m, DN2200 = 3020m, DN1800 = 1900m, DN900 = 180m; Woluwe, Brussels – Pipe jack sewer DN2000 = 1000m, DN2200 = 1300m, DN1600 = 900m, DN1200 = 700m, DN900 = 500m, inc. pumping station; Gas Pipeline, Lyon – Casing tube for pipeline, DN2800, 550m pipe jack under the river Rhone; BAM, Antwerp – Utility tunnel pipe jack, DN1800, 100m |
| DMT Am Technologiepark 1 D-45307 Essen Germany Tel: +49 201 172 1970 Fax: +49 201 172 1971 E-mail: exploration@dmtd.de Web: www.dmt.de | a) US\$105.3M b) US\$26.3M | Tunnel survey, especially gyro control measurements, fundamental network measurements, 3D laser scanning and surface movement monitoring, online vibration and noise monitoring | Brenner Base Tunnel, Italy – Seismic exploration ahead of the tunnel face, rockburst monitoring, gyro control measurements; Gautrain Tunnels, South Africa – Gyro control measurements; Pajares Tunnel, Spain – Gyro control measurements; Jenbachtunnel, Austria – Gyro control measurements; Pfänder Tunnel, Austria – Online vibration and noise monitoring; Emscher Sewer Tunnel System, Germany – Fundamental network survey, gyro control measurements, 3D laser scanning | Karahnjukar Hydro Power Project, Iceland – Several gyro control measurement campaigns; Roppener Tunnel, Austria – Online vibration and noise monitoring |
| Dragados Avenida Tenerife 4 San Sebastian de los Reyes 28700 Madrid Spain Tel: +34 91 703 8239 Fax: +34 91 703 8657 E-mail: infoacs@ grupoacs.com Web: www.dragados.com | a) US\$9.2bn b) US\$789M | TBM in hard rock with double shield and soft ground using EPBMs, drill & blast, NATM, roadheaders, ground treatment, soil improvement, monitoring, precast segment manufacture, plan/build/operate tunnel concessions | East Side Access, New York, USA – Four tubes bored by two hard rock TBMs, total length of 7.5km. Grand Central Terminal, construction of two caverns below the station for future ESA station; Pajares Tunnel, Lot 2, Leon, Spain – 5.4km decline tunnel at 6%, followed by twin 4km tunnels (as part of 24km long tunnel for HSR), double shield, Ø10.2m; Line 9 Barcelona Metro, Spain – Subway tunnel, total 15km long, 2 x EPBMs drives, Ø12m; Tunel sur Los Bronces, Chile – Exploratory tunnel drive, 8.3km long at el. 3800m, TBM Ø4.5; Girona Station Access Tunnel, Spain – 2.5km high speed rail tunnel, Ø12m EPB, and cut & cover station; Metro Madrid L11, Spain – Twin track subway extension 4km, plus station | Dos Valires, Andorra – 3km road tunnel by drill & blast; Seville Metro Line 1 – 3km twin tunnel, Ø6m EPBM; Talave Water Tunnel – 7.5km, Ø4m double shield TBM; M-30 Tunnel, Madrid, Spain – Road tunnel, 3.6km long, EPB Ø15m; Pertus Tunnel, French/Spanish border – Twin HSR tunnel, 2 x 8.4km long, 2 x double shields, Ø10m; El Salto Tunnel, Chile – Twin 2km long road tunnels for road concession, drill & blast; Line 3, Barcelona Metro, Spain – Drill & blast extension; Metro Argentina, Buenos Aires – Lines A and H |

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TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|--|---|--|
| F Frontier-Kemper Constructors 1695 Allen Road PO Box 6690, Evansville Indiana, USA Tel: +1 877 554 8600 Fax: +1 812 428 0337 Email: information@frontierkemper.com Web: www.frontierkemper.com | a) US\$125M b) US\$80M | Shaft and slope sinking, conventional and TBM tunnelling, shaft and tunnel lining, large diameter raise boring, manufacture and installation of hoisting and conveying equipment for mines and tunnels (through FK-Lake Shore Division) | Seymour-Capilano twin tunnels completion project, north Vancouver, British Columbia, Canada - twin 3.8m diameter tunnels with about 4,344m remainin. Work includes tunnel support and control of ground water, D&B excavation of underground chambers, excavation of twin 290m, 4m diameter raise bored shafts, installation and backfill grouting of steel lining in all shafts and portions of the tunnel and interconnection pipes from shafts to nearby water mains | Ashlu Creek Hydroelectric Tunnel, Squamish, British Columbia, Canada - 4.3km, 4.1m diameter hard rock tunnels with a 130m deep, 3.5m diameter raised bored shaft. |
| G Geotechmin 9 Lyulin Plainina Str Sofia 1600 Bulgaria Tel: +3592 9650221 Fax: +3592 9526080 Email: office@geotechmin.com Web: www.geotechmin.com | a) US\$58M b) US\$9.2M | Tunnelling in hard rock, civils, drainage, sewerage tunnels, mine and dressing ore production tunnels, recent experience in metro stations and urban tunnelling | Ellatzite Mine, Etropole, Bulgaria – Drainage adit 840, 2100m, 12.4m ² drill and blast, various support required, 570m, 10.4m ² drill and blast clean water tunnel for environmental protection; Sofia Metro Station 9, Bulgaria – Construction of the vertical access shaft for TBM launch, construction of the Dragan Tsankov connector tunnel, 208m, 72m ² NATM tunnel | Ellatzite Mine, Etropole, Bulgaria – completion of a 1900m, 7.4m ² drainage adit with various support requirements |
| Guy F Atkinson Construction LLC , 200 Union Blvd Suite 400 CO 80228 USA Tel: +1 303 985 1660 Fax: +1 303 985 1449 Email: bill.cahoone@atkn.com Web: www.atkn.uk | a) US\$3.1bn b) US\$300M | Mining and tunnelling (including shaft sinking) via drill and blast, TBMs and roadheader. Specific expertise in NATM | Highland Boy Drainage Gallery, Kennecott Utah Copper Corp, (Rio Tinto), Salt Lake City, UT, USA; Detailed engineering, design and procurement support for all permanent facilities, excavation and support of 15ftx15ft x 8000ft long tunnel; North Ore Shoot Shaft Collar Recovery Project, Kennecott Utah Copper Corp, (Rio Tinto), Salt Lake City, UT, USA; North Ore Shoot shaft collar recovery; Capitol Peak Tunnel Project, Defence Threat Reduction Agency, White Sands Missile Range, NM, USA; Excavation and maintenance of a tunnel complex by drill and blast | Claremont Tunnel Seismic Upgrade, EBMUD, Oakland, CA, USA; West APM Tunnel, Dulles International Airport, Washington, DC, USA; East APM Tunnels and Stations, Dulles International Airport, Washington, DC, USA; Lime Creek Access Slopes, Martin Marietta Materials, Ames, IA, USE; Port of Will County (POWC) Decline, Mining International, Joilet, IL, USA; Balmat Mine, St Lawrence Zinc, Gouverneur, NY, USA; Leeville Mine, Newmont Gold, Carlin, NV, USA |
| H Hazama Corporation 2-2-5 Toranomon Minato Ku Tokyo 105-8479 Japan Tel: +81 3 3588 5760 Fax: +81 3 3588 5755 Email: info@hazama.co.jp Web: www.hazama.co.jp | a) US\$2.04bn b) US\$335M | All underground works, including H&V shield method, two-stage shield method, tunnel seismic prediction, new pre-lining support method | Hydraulic Power Plant No 3, Miyazaki, Japan – Penstock tunnel (48° inclined adit) 150m x 4 and powerhouse cavern (24m x 24m x 188m); Yamaura Section of Chikushi Tunnel, Kyushu Shin-Kansen Line, Saga – 2.38km twin-track single-tube tunnel of 73m ² cross section (whole tunnel length 11.9km); Takada-Nishi Section, Yokohama city loop railway, Kanagawa, Japan – Construction of 1.3km long twin tunnels Ø5.38m, EPB; SJ62(1), Central Circular Shinjuku Route, Tokyo Metropolitan Expressway, Tokyo, Japan – Construction of a cut & cover highway tunnel and ventilation station | Itsutsugaoka Tunnel Project, Aichi, Japan – 321m long binocular tunnel with no drift for construction of central pillar, excavation is carried out by short bench cut method; Okura Tunnel Project, Fukuoka – 170m long expressway widening (cross section of 155m ²); Route 171 Shimizu Multi-Service Tunnel, Osaka, Japan – Construction of a 2.8km long Ø4.3m diameter tunnel by EPBM; Subway Line 13 Project, Shin-Sendagaya Section, Tokyo, Japan – Construction of an underground station by cut & cover |
| Hindustan Construction Hincon House Lal Bahadur Shastri Marg Vikhroli (West) Mumbai 400 083 India Tel: +91 022 2571 5332 Fax: +91 022 2579 4771 Email: ajit.pradhan@hccindia.co.in Web: www.hccindia.co.in | a) US\$550M b) US\$85M | All underground works: tunnels include TBM tunnels, hydro electric projects, highways, sea link projects, nuclear power plants | Currently executing 6 major HEP projects (value US\$560.8M), 3 nuclear projects (value US\$197.9M), 17 transportation projects (value US\$1bn), 7 water supply projects (value US\$738.7M), and various other projects (value US\$152.7M). HEP's include: Chamera HEP, Stage III, Himachal Pradesh, India – (231MW) Diversion tunnel, surge shaft, pressure shaft, etc; URI HEP, Stage II, J&K, India – (240MW) Diversion tunnel, gravity dam (38m high), underground powerhouse, etc; Chutak HEP, Kargil, J&K, India – Comprising Barrage, coffer dams, headrace tunnel, surge shaft, pressure shaft, powerhouse, tailrace, etc. | Tala HEP C1, Bhutan, India – (1020MW) comprising Ø6.8m, 356m long diversion tunnel, 92m gravity dam, 6.4km long Ø6.8m headrace, etc; Tala HEP C4, Bhutan – (1020MW) includes 7.18km headrace (Tala is one of the largest HEPs in Asian Sub Continent) |
| Hochtief Construction Opernplatz 2 D-45128 Essen Germany Tel: +49 201 824 2959 Fax: +49 201 824 3894 Email: tunnelling@hochtief.de Web: www.hochtief-construction.de | a) US\$2.9bn b) US\$642M | All underground works: tunnels and caverns in soft soil or hard rock, with/without ground-water, drill & blast, slurry and EPB shield and hardrock TBM tunnelling. Tailored solutions for complex projects and adverse ground; concrete linings, fire protection | Hafencity U4 Tunnel, Hamburg – 2x2.8km metro tunnel, Ø6.5m slurry shield; Jenbach Tunnel, Austria – 4km long twin-track HSR tunnel, Ø13m TBM; Lainz Tunnel, Austria – 3km long twin-track HSR tunnel; Schlüchtern Tunnel, Germany – 4km long, Ø10.3m EPBM tunnel; Glendoe HEP, Scotland – 17km of hard rock tunnelling by TBM and D&B; Ring Road Prague, lot 514, Czech Rep – 2x1.3km road tunnel, d&b; Metro Nuremberg U3, Germany – 2x1.1km metro tunnel, c&c, NATM; Gotthard Base Tunnel, Switzerland – Bodio/Faido, length 33km/30km, Ø8.8m/Ø9.3m hard rock TBM | Copenhagen Heating Tunnel, Denmark – 3.9km Ø5.1m EPBM tunnel; Safety Tunnel, Lugano, Switzerland – 2.3km, hard rock TBM Ø5.1m; Airport Light Rail Tunnel, Hamburg, Germany – Twin rail tunnel, 600m long, Ø6.6m slurry shield; Epping to Chatswood Rail Link, Sydney, Australia – Two x 12.7km, 7.2m dia, hard rock TBM; Herrentunnel Lübeck, Germany – 780m road tunnel, slurry shield, Ø10.4m; CTRL Contract 320, London, UK – 2 x 2.5km tunnel, Ø8.15m slurry shield; Sophiaspoortunnel, Netherlands |

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|--|--|
| HW Dewatering Hoelscher Wasserbau GmbH International Division Hintern Busch 23 49733 Haren, Germany Tel: +49 5934 707-588 Fax: +49 5934 707-26 Email: info@hw-dewatering.com Web: www.hw-dewatering.com | a) €40M b) €10M | Dewatering, groundwater control, water treatment, well drilling | Finnetunnel, Highspeed railway, Erfurt – Leipzig, Germany - Groundwater lowering, water treatment Wehrhanlinie Düsseldorf, Germany - Groundwater lowering, water treatment | North-South underground line, Cologne, Germany - Groundwater lowering, water treatment Underground line 6, Munich, Germany - Groundwater lowering, water treatment City-Tunnel, Leipzig, Germany - Groundwater lowering, water treatment District Heating Tunnel, Copenhagen, Denmark - Groundwater lowering, water treatment |
| Implenia Construction Bahnhofstrasse 24 CH-5001 Aarau Switzerland Tel: +41 62 832 0534 Fax: +41 62 832 0501 Email: victor.wetterwald@implenia.com Web: www.implenia.com | a) US\$1.28bn b) US\$360M | All underground works: tunnels & caverns in soft ground & hard rock, TBMs, TBEs, hydroshield, slurry shields, D&B, concrete linings (segmental & cast-in-situ), shaft sinking, rehabilitation of existing tunnels, pipe jacking | Gotthard Base Tunnel, Switzerland – Bodio 16km Ø8.8m, Faido 15km Ø9.2m TBM and Sedrun 6km Ø9.4m in disturbed zone (D&B); Roppener Tunnel, Austria – 5.1km twin motorway tunnel; Alberg Tunnel, Austria – Evacuation tunnels for parallel railway and road tunnel, 15km; Lungern Bypass, Switzerland – 4.5km long road tunnel, hard rock TBM; Uetliberg Tunnel, Zurich, Switzerland – 4.5km long road tunnel, Ø4.5m pilot bore expanded to Ø14.4m with TBE; Aeschertunnel, Zurich, Switzerland – 2.5km long, jetting/roadheader; Lausanne Metro, Switzerland – Soft ground tunnelling, Lots 1030, 1100, 1200 & 1600; Bulle Bypass, Switzerland – Dewatering gallery, 1.3km and 600m | Flims, Switzerland – Bypass road tunnels, 2.9km & 462m by D&B; Gotschna, Klosters, Switzerland – 4.5km D&B; Oenzberg Tunnel, Switzerland – 2.28km Ø12.33m hard rock/Mixshield TBM; A9 Lausanne-Montreux, Switzerland – Renovation of 2 motorway tunnels; San Bernardino Tunnel, Switzerland – Renovation of 6.2km road tunnel; Zurich-Thalwil HSRL, Switzerland – Hard rock TBM drive 5.58km, soft ground hydroshield 730m. Two single track (1.31km/610m) D&B tunnels; Zurich Airport – 2 x 1km metro tunnels |
| Jäger Bau Batlogg Strasse 95 6780 Schruns Austria Tel: +43 5556 7181 0 Fax: +43 5556 7181-818 Email: office@jaegerbau.com Web: www.jaegerbau.com | a) €90.3M b) €47.3M | All underground works in hard rock and soft ground with or without ground water. Hydro power plant structures, caverns, road and railway tunnels, drinking water and irrigation tunnels, shafts. Drill and blast excavation, NATM, hard rock, single and double shield TBMs, EPB shields. | Katzenbergtunnel, Germany – twin tube single track railway tunnel 9,385 m, two EPB shields with hard rock excavation facilities, dia 11.12 m, monoshell segmental lining Wienerwald-Tunnel, Vienna, Austria – twin tube single track railway tunnel 10,750 m, 2 single shield TBM, dia 10.69 m, segmental + cast-in-situ lining HPP Parbati III, Lot 2, India – powerhouse cavern DBM 203,452 m ³ , 9,994 m of various service and supply tunnels and shafts, DBM 456,495 m ³ Eyholz Tunnel, Switzerland – twin tube road tunnel 3,500 m, DBM, X-section 125 m ² Osterberg Tunnel, Germany – twin tube single track railway tunnel 2,082 m, DBM, X-section 100 m ² PSS Vianden, Luxemburg – caverns 80,000 m ³ , vertical shaft 300m dia. 4.5m, 1,400m of various service and supply tunnels Tunnel Abdalajis, Spain – twin tube single track railway tunnel 7,070 m, DS-TBM, dia 10.0 m, precast | segmental lining HPP Parbati Stage II, Lot 3, India – two inclined (30 deg) hydro power pressure shafts each 1,500 m long, DS-TBM, dia 4.88 m, precast segmental lining Achrain Tunnel, Austria – 3 lane road tunnel 3,340 m, DBM, X-section 140 m ² HPP Kopswerk II, Austria - power house cavern 120,000 m ³ DBM, 1,400 m of various service and supply tunnels 70,000 m ³ DBM HPP Hiefiau, Austria – HRT 4,900 m, DS-TBM dia. 6.18 m, 700m DBM, X-section 30 m ² , monoshell segment lining Wiesing Tunnel, Austria – single tube double track railway tunnel 671 m, DBM, X-section 120 m ² , access tunnel 170 m DBM, X-section 50 m ² |
| John Holland 70 Trenerry Crescent Abbotsford Vic 3067 Australia Tel: +61 3 8413 6462 Fax: +61 3 9934 5269 Email: tunnellingho@jhg.com.au Web: www.johnholland.com.au | a) US\$2.23bn b) US\$263.4M | Slurry TBMs, EPBMs, hard rock TBMs, roadheaders, drill & blast, pipe jacking and ground freezing. In 2008, John Holland used 8 different TBM's (3 slurry, 2 EPB, 3 hard rock) and placed orders for a further four TBM's and eleven 300kW roadheaders | Airport Link & Northern Busway, Brisbane – D&C contract comprising 2 x 2.45km road tunnels by 2 x Ø12.5m EPBMs, 2 x 2.2km 3-lane road tunnels by 11 x 300kW roadheaders and a 470m long 2-lane bus tunnel by roadheader; Bluewater Desalination Project, Sydney – D&C contract includes twin Ø4.1m Inlet and Outlet tunnels, each 2.5km long, excavated by 2 x hard rock TBMs; Northern Sewerage Project, Melbourne – 4.7km of Ø4m EPBM tunnel, 4.5km of Ø3m EPBM tunnel, 3.2km of Ø3m. Hard rock TBM tunnel, 8 shafts; Melbourne Sewer Replacement – 2.2km of Ø3m EPBM tunnel and 6 shafts (depth 15m); Sugarloaf Pipeline, Victoria – Alliance contract for 70km pipeline, including 1km of Ø2.4m pipejack | Gold Coast Desalination Plant, South East Queensland – Alliance contract that included twin Ø3.4m Inlet and Outlet tunnels, each 2km, excavated by two slurry TBMs; Kowloon Southern Link, Hong Kong – D&C contract that included twin 1.1km rail tunnels excavated by an Ø8m Slurry TBM; EastLink Project, Melbourne – D&C contract for the construction of 42km of motorway, which included twin 3-lane road tunnels excavated by 4 x 300kW roadheaders |
| Joseph Gallagher Neagron House Stanford Road, Orsett Essex RM16 3BX UK Tel: +44 1375 672070 Fax: +44 1375 672073 Email: headoffice@josephgallagher.co.uk Web: www.josephgallagher.co.uk | a) £35M b) £16M | Any hand work tunnels, TBM tunnels and all forms of shaft sinking in wet or difficult ground deep or large diameters. Sprayed concrete in and around difficult existing structures. Design and Build contracts with early contractor involvement. | Green park SFA for Tubelines 30 m deep elliptical shaft sink in shotcrete and a stub tunnel 12m high. All works constructed touching two station tunnel, two cross passages and below an escalator. RC concrete linings and ticket hall upgrade. West Ham FAS for Thames Water 1.2Km of 1200mm pipe jack and over 20 shafts up to 23m deep and 7.5 m diameter, several hand tunnels and the shaft finishing package. The Dorchester Hotel 120m service tunnel 4m dia along Park Lane London with 4m shafts 12m deep in liner plates and shotcrete linings. | Multiple shafts and pumping stations. Up to 25m diameter and 35m deep. Completed 6 shafts for ground treatment on the Amsterdam Metro for Saturn returning to construct 4 permanent shafts 6m dia up to 43m deep; Supplied labour and TBM crew to West Ham FAS for 2.87 Lovat drive 4Km long. Several rail interface contracts for both shafts and small tunnels below live railways. Several deep basements with both sheet piling and bored piles followed by RC structures |
| Kenny Construction Co 250 Northgate Parkway Wheeling, IL 60090 USA Tel: +1 847 541 8200 Fax: +1 847 541 8358 Email: pkenny@kennyconstruction.com Web: www.kennyconstruction.com | Undisclosed | All underground work: hard rock tunnels machine bored or D&B, EPBM tunnels, SEM tunnels, all soft soil tunnelling methods, microtunnels, large caverns, subways, shaft caissons and tunnel rehabilitation by various lining methods | WePower, Elm Road Generating Station, USA – 27ft tunnel and 4 x lake intake shafts for existing and new generating facilities; Calumet Deep Tunnel Valve Chamber, USA – Deep tunnel, 300ft deep valve chamber and underground control station; Brightwater Conveyance System, East Contract, Seattle, USA – 14,050ft of Ø16'8" precast concrete segmentally lined tunnel and associated structures; Edison Tunnel and Force Mains, Sayerville, USA; Vulcan Materials Corporation Starter Pit and Ancillary Facilities, McCook, USA; Commonwealth Edison Company, Chicago, USA – 4 x river tunnels for power distribution | USACE McCook Reservoir and Valve Chamber, Illinois, USA; Commonwealth Edison Company, Chicago, USA – 15ft diameter Chicago River crossing for power distribution; Lake Michigan Tunnel & Intakes, USA – 9,000ft of Ø27ft TBM tunnel, 3 x shoreline power plant connection shafts and 4 x lake intake connection shafts |

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|--|--|---|
| Kiewit Construction Co 3555 Farnham Street Suite 200-E Omaha Nebraska 68131 USA Tel: +1 402 346 8535 Fax: +1 402 346 8610 Email: undergroundinfo@kiewit.com Web: www.kiewit.com/underground | a) US\$5bn b) US\$128M | All underground construction including: TBM tunnelling (hard rock, slurry and EPBM), NATM, drill & blast, mechanical excavation, cut & cover, rehabilitation, microtunnelling, shaft construction | East Side CSO Tunnel, Portland, Oregon, US – 29,000ft long, 25ft-diameter slurry TBM tunnel, a precast single pass liner and 9 shafts along the alignment; Devil's Slide Tunnels, Pacifica, US – 4,100ft long, 10m-wide NATM twin-bore highway tunnels with cast-in-place concrete final liner, permanent electrical and mechanical system; Harlem River Tunnel, Bronx to Manhattan, New York, US – Two 165ft-deep shafts connected by a 675ft-long drill & blast horseshoe tunnel; Sandy River Conduit Relocation, Oregon – 30ft-diameter construction shaft to a depth of 85ft; two drilled 9ft-diameter shafts to a depth of 110ft; and a 13ft-diameter modified horseshoe tunnel | Lake Hodges, Escondido, USA – Excavation of a 5,850ft long, Ø12"6' horseshoe shaped tunnel with 120-inch steel liner and 12ft diameter vertical shaft; Cavern No 2, West Virginia, USA – Construction of a liquid storage cavern consisting of a network of approximately 14,500ft of 15ft and 20ft wide x 27ft tall drill & blast tunnels with shotcrete final liner; Wheeler Gulch, Parachute, USA – Construction of 3,200ft long tunnel that is 24ft wide x 20ft tall, using a roadheader |
| L Lemminkäinen Infra Esterinportti 2 00240 Helsinki Finland Tel: +358 2071 53608 Fax: +358 2071 51302 Email: risto.kupila@lemcon.fi Web: www.lemminkainen.fi | a) US\$1.1bn b) US\$117.6M | Hard rock railway and motorway tunnels, parking caverns, oil and gas caverns | Multi Utility Tunnel, Helsinki, Finland – Construction of a 2200m section of drill & blast multi-purpose utility tunnel; Kroksberg, Härnösand, Sweden – Construction of a 4540m long railway tunnel; Bjässholmen, Härnösand, Sweden – Construction of a 3490m railway tunnel; Torbacken-Hede, Lilla Edet, Sweden – Construction of a 3030m railway tunnel; KEHU, Helsinki, Finland – Construction of a service tunnel by drill and blast in the centre of downtown Helsinki | E18 Motorway Tunnels, Finland – 4 tunnels with a total length of 4429m; VUOLI, Vantaa, Finland – 2 railway tunnels, total length of 5736m; Askottsberget Railway Tunnel, Kramfors, Sweden – 3270m railway tunnel; Asa Tunnel, Kungsbacka, Sweden – 1850m railway tunnel |
| M Marti Contractors Ltd. Civil Engineering & Managing Services Grubenstrasse 11 CH-3322 Schönbühl Switzerland Tel: +41 31 388 7520 Fax: +41 31 388 7521 Email: contractors@martiag.ch Web: www.martiag.ch | Undisclosed | Underground construction including mechanised full face tunnelling, drill & blast tunnelling, production of segmental concrete linings, waterproofing systems for tunnels | Bibra Tunnel, Germany - 6.5km twin rail tunnel by drill & blast Katzenberg Tunnel, Germany - 9km twin rail tunnel by two TBMs Pump storage scheme Nant de Drance, Switzerland - tunnels, caverns and shafts by TBM and drill & blast Pump storage scheme Limmern, Switzerland - tunnels, caverns, shafts and dam construction Oshlid Tunnel, Iceland - 5.3km road tunnel by drill & blast Tunnel de Bure, Switzerland - 3.1km road tunnel by TBM Galleria Vedeggio-Cassarate, Switzerland - 2350m road tunnel with vent shaft, by drill & blast Tunnel Graiteri, Switzerland - 2462m road tunnel by roadheader and drill & blast Tunnel du Bois de Montaigne, Switzerland - two tubes 800m road tunnel, by drill & blast | Isisberg Tunnel, Zurich, Switzerland 4650m long twin tube highway tunnel, excavated by Ø11.86m TBM Tunnel Boric, Slovakia 1000m twin road tunnel by drill & blast Metro Lausanne, Lot 1700, Switzerland 665m with roadheader and umbrella jet grouting Tunnel Raimeux 3220m by drill & blast, roadheader and jet grouting Lötchberg Base Tunnel, Switzerland Lot Steg, 9500m hard rock TBM drive, Ø9.4m. Lot Raron 10,000m with Ø9.4m TBM and 4600m long drill & blast section |
| McNally International 1855 Barton Street East Hamilton Ontario, L8H 7L8 Canada Tel: +1 905 549 6561 Fax: +1 905 549 3548 Email: hamilton@mcnallycorp.com Web: www.mcnallycorp.com | Undisclosed | All areas of tunnel construction including soft ground conventional and EPB with concrete segments, rock with roadheaders, TBM's and drill and blast. Subway tunnels, water and wastewater | Western Regional Conveyance Tunnel, Kentucky - 9.9km, 3.7m diameter rock tunnel with 2.6m i.d. pipe for sanitary sewer Herridge feeder main, Peel region, ON - 1,755m, 3m diameter tunnel, in shale, Robbins TBM, 2.1m concrete pressure pipe grouted in place for water main Dixie Road Sanitary Sewer, Peel region, ON - 2,165m tunnel with 96inch pipe grouted in place 535mm to 750mm diameter. | Bathurst/Langstaff Trunk Sewers, York Region, Ontario, Canada – Design-build sewer 8.6km of Ø3.3m tunnel via EPBM with precast lining, includes six x sealed shafts YDSS Interceptor, 19th Avenue, York Region, Ontario, Canada – Construction of 4.2km of Ø3.3m sewer tunnel via EPBM with precast lining, includes 5 x sealed shafts Sudbury Rock Tunnel, Sudbury, Ontario, Canada – 6.5km of 2.1m x 1.5m D&B rock tunnel including 3 shafts and connections |
| Metrostav Kozeluzska 2246 180 00 Praha 8 Czech Republic Tel: +420 266 709 245 Fax: +420 266 709 193 Email: info@metrostav.cz Web: www.metrostav.cz | a) US\$978M b) US\$262M | Cut and cover, drill and blast, cover and cut, NATM tunnelling | IV.C2 Metro, Prague, Czech Republic – Double track single tube tunnel, 793m long, NATM; Héoinsfjaröargöng Tunnel, Ólafsvör, Iceland – 3.8 + 7.5km long NATM tunnel between Siglu and Héoins; Lucica Tunnel, Highway A6 Rijeka-Zagreb, Croatia – 590m long NATM tunnel; New Connection, Prague, Czech Republic – Main Railway Station, Masaryk RS-Liben-Vysocany-Holesovice, driven section 2.4km long, cut & cover section 280m long; Tunnel Blanka, Inner City Ring Road, Prague, Czech Republic – Myslbekova Street-Pelc Tyrolka Section, NATM and cut & cover, total of 6.4km | Panenská Tunnel, D8 Highway, Kninice, Czech Republic – 1.9km road tunnel, NATM; Libouchec Tunnel, D8 Highway, Czech Republic – Twin road tunnel, NATM; Valik Tunnel, D5 Highway, Plzen bypass, Czech Republic – 2 x 330m long NATM twin road tunnel; Klimkovice Tunnel, D47 Highway, Czech Republic – Twin road tunnel, 2 x 678m long, NATM; Euerwang Tunnel, Ingolstadt-Nürnberg, Germany – 1.6km long NATM tunnel; Mrázovka Tunnel, Prague, Czech Republic – Twin road tunnel, 653m long |
| Morgan Est Suite 6, Bloxham Court Corporation Street Rugby Warwickshire CV21 2DU United Kingdom Tel: +44 1788 517750 Fax: +44 1788 517762 Email: info@morganest.com Web: www.morganest.com | a) US\$809M b) US\$128M | Tunnels in soft ground & rock utilising EPB, slurry & traditional techniques. Wide experience of SCL & associated techniques, including patented lining & sealing methods. Shaft sinking, upgrading & facility management, precast linings | Belfast Sewerage Scheme, Northern Ireland – D&C project comprising 10km tunnels, Ø38m pumping station, 28 x shafts and marine outfall; Beddington-Rowdown, Croydon Cable Tunnel, UK – D&C of Ø3m Cable Tunnel, 10km. long, 3 Shafts, in water bearing chalk; London Water Ring Main Extensions, UK – D&C projects. Honor Oak to Brixton: 4.5km Ø3.05m tunnel in water-bearing chalk. Two pump shafts up to 50m deep. Stoke Newington and New River Head: 4km Ø2.85m tunnel, 2 Shafts up to 45m deep, in clay and sands; Coppermills Transfer Pumping Shaft – D&C of 15m i.d. 30m deep shaft, 25m tunnel, 280m of relining and major modifications to existing facilities | Kings Cross Station Redevelopment, UK – D&C of new Access Tunnels to Victoria Line, Piccadilly Line and Northern Line, including extensive SCL and cast iron linings; Hendon Cable Tunnel, UK – D&C of Ø2.5m tunnel, 2 shafts 20m deep, in clay; Ross on Wye Flood Alleviation Syphon, UK - Ø2.1m Tunnel, 389m long, in sandstone and mudstone; BT Tunnels Framework, UK – Uplift and maintenance of 25 existing facilities; DLR Extn to Woolwich, UK – Construction of new Station and twin Ø4.2m, 2.1km tunnels |

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|---|--|
| Murphy & Sons, J Hiview House Highgate Road London NW5 1TN United Kingdom Tel: +44 20 7267 4366 Fax: +44 20 7482 3107 Email: tunnels@murphygroup.co.uk Web: www.murphygroup.co.uk | a) US\$674M b) US\$54M | All underground works: tunnels for water and sewerage, utility services, rapid transit and main line railways, underground storage, caverns, deep hand mined piles in confined city centre sites. Specialist plant holding includes fleet of tunnelling equipment | Lower Lea Valley Cable Tunnel, East London, UK – Diversion of overhead power lines underground to clear the Olympic site. D&C project includes the driving of two parallel tunnels 6km long (NGC tunnel Ø4.15m & EDF tunnel Ø2.82m) plus 10 shafts. Tunnels driven using 4 Lovat TBM's from one central site; Lower Lea Valley Cable Tunnel, East London, UK – Installation and commissioning of 2 circuits of 132kv power cables, control systems and connections to existing EDF network; Harefield-Southall Gas Pipeline, West London, UK – National Grid Transco project involving tunnelling and shaft sinking works to enable construction of a Ø1220mm welded steel gas main. Three separate drives totalling 2.45km | Bankside To Farringdon Cable Tunnel, London, UK – Comprising of a total of 3km of machine driven tunnel plus 6 shafts carried out from restricted sites in a heavily urbanised area. Cable installation and mechanical and electrical services also included in the scope |
| Nicholson Construction 12 McClane Street Cuddy, PA 15031 USA Tel: +1 412 221 4500 Fax: +1 412 221 3127 Email: info@nicholsonconstruction.com Web: www.nicholsonconstruction.com | a) US\$100M b) US\$100M | Earth retention systems (rock & soil anchors, diaphragm walls), ground treatment including: Rock grouting (cement, low-mobility & asphalt grouting), soil grouting (jet, compaction, microfine & chemical grouting), deep mixing, slurry trench walls | North Shore Connector, Pittsburgh, USA – Jet grouting, soil mixing, diaphragm walls for new light rail transit tunnels and stations; World Trade Centre Transit Hub, NYC, USA – Part of JV that is installing micropiles and tieback anchors for new underground hub; Block 76, Salt Lake City, USA – Design-build earth retention package for a mixed use development, including diaphragm walls and soil nailing; Oakwood CSO Tunnel, Detroit, USA – Grouting for sewer tunnel; McCook Reservoir, Stage 1, Chicago, USA – Using an Integral Computerised Grouting System (ICGS), constructing a double line grout curtain to depths of 120m; World Trade Centre Memorial Liner Wall, NYC, USA – Anchored diaphragm wall | Dearborn CSO Grouting Programme, Michigan, USA – Grouting for a sewer tunnel; Miamitown Interceptor Sewer, Ohio, USA – Shaft using overlapping jet grout columns; North Kenmore Shaft, Washington, USA – Diaphragm wall shaft for excavation support for 2 x tunnels and 1 x microtunnel launch; Upper Northwest Interceptor (Sections 3 & 4), Sacramento, USA – Jet grouted 5 shaft eyes for microtunnel drives; New York Law School, USA – Diaphragm wall for underground building expansion |
| Nishimatsu Construction 1-20-10 Toranomon Minato-Ku Tokyo 105-8401 Japan Tel: +81 3 3502 0232 Fax: +81 3 3580 2745 Email: webmaster@nishimatsu.co.jp Web: www.nishimatsu.co.jp | Undisclosed | Caverns and underground storage, cut & cover, drill & blast, geotechnical instrumentation, grouts/grouting, pipe and box jacking, soft ground tunnelling, turnkey projects | Shimada No 1 Tunnel (Out Bound), 2nd Tomei Expressway, Japan – 2.7km, 175m ² cross section road tunnel; C828, Nicoll Highway Station, Singapore – Construction and completion of station at Nicoll Highway and Boulevard, including 1.4km of dual single-track Ø6.7m metro tunnel; C823, Old Airport Road, Tanjong Katong & Paya Lebar Station, Singapore – 1.7km of dual single-track Ø6.7m metro tunnel; Nam Theun II HEP, CW2, Lao People's Democratic Republic – 1.5km of Ø10m headrace tunnel, 1.1km of Ø8.2m-Ø10.4m pressure tunnel and vertical shafts; Tsengwen Reservoir Trans Basin Water Diversion, Taiwan – 14km headrace tunnel Dublin Port Tunnel, Ireland – 2.5km of twin two-lane Ø11.8m | road tunnels; CTRL Contract 220, UK – 7.5km of twin single track, Ø8.1m railway tunnel; Kaohsiung Metro, Red & Orange Lines, CR2, Taiwan – 6.9km of twin-track Ø5.6m rail tunnel; Suzuka Tunnel Up Line, Japan – 4km of 150m ² cross section road tunnel; SJ46 (Phase 2) Tunnel, Japan – 1.1km of Ø11.4m road tunnel |

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SCHAENBURG MAB

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|--|---|
| Novatecna Rua Banibas 142 05460-010 São Paulo Brazil Tel: +55 11 3813 8700 Fax: +55 11 3031 7967 Email: novatecna@novatecna.com.br Web: www.novatecna.com.br | Undisclosed | Tunnel consolidation with horizontal jet grouting, specifically in difficult conditions such as shallow cover and high permeability sandy soils | São Paulo Metro, Line 4 / Yellow (Vila Sonia-Luz), Brazil – This line will connect the Luz District with Vila Sonia District in the west. Performed horizontal jet grouting, forepoling, horizontal drains and vertical jet grouting for several access tunnels, stations and metro tunnels; São Paulo Metro, Line 2 / Green (Ana Rosa-Tamanduatei), Brazil – Extension of Line 2 / Green, stage one includes 3.4km of new line. Performed 20,000m of jet grouting columns in 2005 and continue to work through 2006 and early 2007 for conclusion of the first stage and for the remaining 3.4km of tunnels; Barcelona, Spain – Full scale test for consolidation of a rail tunnel in high-permeability sand soil, by 360° jet grouting and soil cement | Caracas Metro, Venezuela – Long-term work (5 years) on Line 4 of the subway. Performed 50,000m of vertical jet grouting of various column diameters, 40,000m of horizontal jet grouting for soil consolidation of tunnels and stations Plaza Venezuela and Plaza Italia |
| Obayashi Corporation Shingawa Intercity Tower B, 2-15-2 Konan Minato-ku Tokyo 108-8502 Japan Tel: +81 3 5769 1254 Fax: +81 3 5769 1962 Email: webmaster@obayashi.co.jp Web: www.obayashi.co.jp | a) US\$12.5bn b) - | Caverns/underground storage, nuclear waste repositories, cut & cover, D&B, geotechnical instrumentation/engineering, grouting, immersed tube tunnelling, pipe and box jacking, soft ground tunnelling, turnkey projects | Dubai Metro, Phase 1, UAE – Design/build contract for 52.1km LRT, includes 4 underground stations, 3.5km long shield tunnel and 1.4km cut & cover tunnel; Central Link Light Rail, C710 Beacon Hill, Seattle, USA – 2.3km LRT construction, including 2 parallel 1.3km long x Ø5.7m EPB tunnel; Metro Gold Line Eastside Extension, USA – Design/build contract for 8.2km subway, twin bored 2.1km long Ø6.4m tunnel and cut & cover sections; West Area CSO Storage Tunnel & Pumping Station, USA – 13km of Ø7.3m TBM tunnel and associated works; Taipei MRT, Xinyi Line, Contract CR580B, Taiwan – 2.3km subway, including twin 1.6km long x Ø6.1m EPB tunnel and 2 underground stations | Second Bangkok International Airport Project, Thailand – Works for runway, taxiway, roadway and drainage works; Uinta Basin Replacement Project, USA – Irrigation dam improvement works including cutoff trench, grout curtain and foundation treatment; Transmission Cable Tunnel, Singapore – Design-build contract for 3.2km long Ø3.7m tunnel for cable transmission |
| Obras Subterranas C/Lopez de Hoyos 135 28002 Madrid Spain Tel: +34 9 1782 3400 Fax: +34 9 1562 4298 Email: central@obrassubterranas.es Web: www.obrassubterranas.es | a) US\$281.6M b) US\$281.6M | All types of tunnelling, including road, rail, metro, hydro, utility and mine access tunnels. Drill & blast, NATM, TBM, EPBM tunnelling, shaft sinking, raise boring | Mondragon-Elorrio HSR, Vizcaya, Spain – Construction of a 3.5km rail tunnel; Arraiz-Basauri HSR, Vizcaya, Spain – Construction of a 2.5km rail tunnel; La Robla-Pajares HSR, León, Spain – Construction of a 5.1km rail tunnel; Pajares Tunnel, León, Spain – Construction of a 7.5km double shield TBM tunnel; Aranjuez-Ontígola HSR, Madrid, Spain – Construction of a 2.5km rail tunnel; Variante de San Julian HSR, Orense, Spain – Construction of a 2.2km long rail tunnel; Almuñecar-Tamaray, Malaga, Spain – Construction of a 6.2km road tunnel; Nerja-Almuñecar, Malaga, Spain – Construction of a 3.8km road tunnel | San Pedro HSR, Madrid, Spain – Construction of a 12km drill & blast rail tunnel; Guadarrama Tunnel, Madrid, Spain – Construction of a 3km road tunnel; Piqueras Tunnel, Soria, Spain – Construction of a 2.5km drill & blast road tunnel; Central Hidroeléctrica La Muela, Valencia, Spain – Construction of a 1km hydropower tunnel; Aguablanca, Badajoz, Spain – Construction of a 2.8km long mine access tunnel; Solter Tunnel, Madrid, Spain – Construction of a 900m road tunnel |
| Pacific Blasting & Demolition 3183 Norland Avenue Burnaby, BC V5B 3A9 Canada Tel: +1 604 291 1255 Fax: +1 604 291 2813 Email: ronw@pacificblasting.com Web: www.pacificblasting.com | a) US\$65M b) - | Drill and blast tunnelling, rock slope stabilisation including shotcreting, rehabilitation | NVI Mining, Myra Falls Operations, Campbell River, BC, Canada – Development of North Ramp Portal for their new underground mine. Project involved rock slope stabilisation above the new portal location as well as drilling and blasting of the starter tunnel for the new decline; Granville Station Skytrain Tunnel, Vancouver, BC, Canada – Project involved construction of a new tunnel entrance into the existing Granville Skytrain station. Tunnel constructed in soft sandstone from level 7 of the underground parkade at 610 Granville Street, passing 23m below the St Regis Hotel. A cross cut and a decline provided handicapped access into the existing inbound and outbound Skytrain tunnels | Miller Creek Hydroelectric Tunnel, Pemberton, BC, Canada – 1050m long, 2.75m x 3m water diversion tunnel to feed water into a 4.5km long penstock supplying a 26MW power station. Tunnelling was carried out in hard diorite using drill and blast techniques with 60m long portion at the intake end carried out in soft ground using NATM. This is a “green” energy run-of-the-river project |
| Patel Engineering Patel Estate Road Jogeshwari (West) Mumbai 400 102 India Tel: +91 22 678 2916 Fax: +91 22 678 2455 Email: headoffice@pateleng.com Web: www.pateleng.com | a) US\$167M b) US\$100M | 56 years of experience in dams (concrete and roller compacted), tunnels, powerhouses, caverns, microtunnels via TBM (first company in India to use this method), shafts, irrigation and other civil engineering works | >65 civils projects, including: Koyna HEP, Stage IV, Maharashtra, India – Extension of headrace; Parbati HEP, HP, India – 3.5km HRT; Sewa HEP, J&K, India – Underground surge & pressure shafts, penstocks; Teesta HEP, West Bengal, India; Serlui-B HEP, India; Kameng HEP, AP, India – 16.1km HRT, u/g surge & pressure shaft; Priyadarshini Jurala HE Project, India; Single Line BG Tunnels, 1, 2, 3, 4, 5 & 6, India; Rampur HE Project, Packages I & II, India; Loharinaga Pala HE Project, India; Tuirial HEP, Mizoram, India; N/F Railway, Assam, India – Tunnel no 7 & 10, total length 5km; Four National Highways Projects, NHAI, India; Six Lift Irrigation Projects, India; | Microtunnelling works, Mumbai, India – Installation of sewers and water mains at various locations by microtunnelling, pipejacking and horizontal directional drilling at 14 locations in Mumbai |
| Pigott Drilling Shafts PO Box 63 Preston PR4 0BT UK Tel: +44 (0)1772 690076 Fax: +44 (0)1772 690840 Email: info@osdmud.co.uk Web: www.solidseparation.com | a) £3M b) £2.5M | Solid/liquid separation for tunnelling, micro-tunnelling, pipejacking, civil engineering, diaphragm walling, piling, soil washing, canal, dock and reservoir dredging and directional drilling applications. | Adelaide Desalination Project, Australia - Supply of 2 No. 500m ³ /hr slurry treatment plants for construction of tunnels Lai Chi Kok Transfer Scheme, Hong Kong - Supply of a 100m ³ /hr STP for tunnelling works. | Southern Regional Water Pipeline Alliance, Brisbane, Australia - supply of slurry treatment plant and centrifuges to support two AVN1800 pipejack TBMs Kowloon Southern Link, Kowloon, Hong Kong -supply of a slurry treatment plant to work in support of a Herrenknecht 8.0m diameter slurry TBM |

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|--|--|---|---|--|
| Pihl & Son, E Nybrovej 116, DK-2800 Kgs Kgs. Lyngby, Denmark Tel: +45 4527 7200 Fax: +45 4527 7100 Email: pihl@pihl-as.dk Web: www.pihl-as.com | a) €69.3M b) - | All underground tunnels and caverns in hard rock with or without groundwater. Drill & blast, slurry and EPB shield and hard rock TBM tunnelling | Söderströmstunneln, part of the new Stockholm City Tunnel, Stockholm Sweden - submerged tunnel and a bored tunnel, total 300m, Pihl-Züblin Consortium Norra Länken, Stockholm, Sweden - 80m "Top Down" and blast tunnel, design-and-build contract JV Pihl-Züblin RV567 Road, Bergen, Norway, 1.55km long blast tunnel, main contractor. | Malmö City Tunnel, Malmö, Sweden - 4.6km long drilled double tunnel, each with a diameter of 9m, turnkey contractor in joint venture with Bilfinger Berger AG and Per Aarsleff A/S. Pihl was responsible for concrete works. |
| Pohl cz Nádražní 25 252 63 Roztoky Czech Republic Tel: +420 233 089 412 Fax: +420 220 912 299 Email: pohl@pohl.cz Web: www.pohl.cz | a) US\$17.5M b) - | Infrastructure, mining & environmental tunnels, NATM, small diameter TBMs, rock & soft ground tunnelling, microtunnelling, pipe jacking, shotcrete, grouting, refurbishment, maintenance & cleaning | Olomouc Sewer System Upgrade, Czech Republic - Microtunnelling of sewer network, 2m dia, segmental lining and grouting. Pipejacking dia 1.4m. Traditional tunnelling of sewer galleries; Prague Smichov, Czech Republic - Power cable tunnel, traditional tunnelling, shotcrete primary lining and cast insitu final lining; Prague Kunratice, Czech Republic - Traditional tunnelling of collector, grouting and shotcreting; Roztoky Sewer Network, Czech Republic - Traditional tunnelling of sewer galleries, including grouting shotcreting and repairs | Prague Flushing Gallery, Vltava River, Czech Republic - Upgrade of concrete tunnel, traditional tunnelling, grouting and shotcreting; Prague Sewer Network, Letenska, Czech Republic - Upgrading of sewer galleries, including traditional tunnelling, grouting shotcreting and repairs; Brno City Centre Collector, Czech Republic - Traditional tunnelling of collector, grouting and shotcreting; Plzen Prazdroj Brewery, Czech Republic - Tunnelling near industrial buildings, galleries and shafts |
| Porr Tunnelbau Absberggasse 47 1103 Wien Austria Tel: +43 50 626 0 Fax: +43 50 626 1533 Email: tunnelbau@porr.at Web: www.porr.at/tunnelbau | Undisclosed | NATM excavation in hard rock and soft ground, TBM in hard rock, shielded TBM with EPB or slurry, pipe jacking with cutter or all kinds of TBM | Lainzer Tunnel LT 33, Vienna, Austria - Double-track railway tunnel, length 3.60km; S35 Tunnel Kirchdorf, Kaitenbach, Styria, Austria - Twin tube road tunnel, 7.50km long; Limberg II Powerstation, Salzburg, Austria; Tauern Tunnel 2nd Tube, Austria - 6.5km NATM tunnel in squeezing ground; H3/4 Münster-Wiesing, Tyrol, Austria - Double track rail tunnel, 5.6km long; Waichhofen/Ybbs, Lower Austria - Single tube road tunnel, 1.1km long; Finnetunnel, Germany - Open mode hydroshield, 2 x 7.7km long railway tunnel; Schaala Local Bypass, Germany - 1.20km long; Osterberg, Germany - NATM twin-tube rail tunnel, 2.2km long; Biel Bypass, Switzerland - EPB Ø12.60m, 6km long | Ganzstein Tunnel 2nd Tube, Styria, Austria - NATM road tunnel, length 2km; Tunnel Brixlegg, Lot H2/1, Tyrol, Austria - 3.47km twin-track rail tunnel + rescue tunnel, NATM; U2/1 Metroline Vienna, Austria - Ground freezing with brine + liquid nitrogen, diaphragm walls, bored piles, groundwater lowering; U2/5 Metroline Vienna, Austria - 1.7km long, Ø6.5m slurry TBM; Wientalsammelkanal, Vienna, Austria - 2x30m deep shafts, sewer 2.6km, EPB Ø8.6m; LF Moos, Switzerland - Water storage |
| Pozzi & Martinenghi Via Alba 84 33100 Udine Italy Tel: +39 0432 480306 Fax: +39 0432 481688 Email: info@pozzi-martinenghi.com | a) US\$8M b) US\$7M | Waterproofing, design of automated scaffolding systems (up to 20m diameter), technical advice on waterproofing specifications, injections, grouting, leak sealing, steel linings, shafts and caverns | Venice Link, Italy - Artificial tunnels, part of the new motorway near Venice, second section; Tabor and Barnica Tunnels, Pod Nanos, Slovenia - Waterproofing works; Foundations, Sofia, Bulgaria - Foundations works for a building site in the city centre | Milan Metro, Italy - Waterproofing of Pero Station and 4 x tunnels. All structures under groundwater level. Double waterproofing membrane with vacuum system, injection of structural joints; Salerno-Reggio Calabria Motorway, Italy - Waterproofing of Costa Inconronata Tunnel near Polla; CERN, Atlas 2, Gex (F), France/Switzerland - Waterproofing of two caverns; Mala Kapela Motorway Tunnel, Croatia - Waterproofing works; Dublin Port Tunnel, Ireland - Tunnel waterproofing, injection & leak sealing |
| Razel 3 rue René Razel Christ de Sclay 91892 Orsay France Tel: +33 169 856 908 Fax: +33 169 856 843 Email: pramond@razel.fr Web: www.razel.fr | a) US\$583M b) US\$52.5M | All types of contract management (partnering, BoQ, design & construct), all types of tunnels (rail, road, metro, utility) using all excavation methods (D&B, NATM, soft ground & hard rock TBMs, compressed air, highly squeezing rock) | Gallery of Rizzanese, Corse, France; Line 4 Extension, Paris Metro, France; Lyon/Turin HSR, Saint Martin la Porte, Savoy, France - 2.3km long exploratory gallery, drill & blast; Salazie Upstream Gallery, La Réunion Island - 8km hydraulic tunnel, Ø3.2m by double shield TBM and drill & blast; Railway Tunnels, Algeria - Renovation of 4 x rail tunnels, total length 1.3km | Cap La Houssaye, La Réunion Island, France - Road tunnel; Lyon/Turin HSR, Modane, Savoy, France - 4km long exploratory gallery, drill & blast; Tunnel Ivry Massena, Paris, France - 2km EPBM sewer; Salazie Downstream Gallery, Reunion Island - 10km water transfer tunnel, TBM and drill & blast; Toulouse Metro, France - 4.2km twin-track TBM tunnel, plus 5 x stations with diaphragm walls; La Vache Noire, Arcueil, Val de Marne, France - Service tunnel |
| SC Sopmet 3 Gutenberg Street Section 5, Bucharest Romania Tel: +40 21 313 3078 Fax: +40 21 312 4717 Web: www.sopmet.ro | a) US\$2.59M b) US\$1.8M | Horizontal directional drilling, auger boring, pipe jacking, pipe ramming | Bucharest-Constanta Railway, Romania - Culverts and slope protection as part of rehabilitation project; Line CF Bucharest, Constanta, Romania - 80m pipejack with 2.2m diameter prefabricated pipe; Line CF Jacobeni-Sadova, Romania - Pipejacking with 2.2m diameter prefabricated pipe; Rehabilitation of Bucharest-Constanta Railway, Pedestrian Tunnel, Baneasa Station, Romania | Line CF Sibot-Curtia, Romania - Pipejacking with 2.2m diameter prefabricated pipe; Line CF Sibiu-Viritt, Romania - Pipejacking with 1.4m diameter prefabricated pipe; Rehabilitation of Eroci-Revolutier-Square, Bucharest, Romania - Pedestrian tunnel |
| Seli Piazza G. Marconi 26/c Palazzo Dell'Arte Antica 00144 Rome Italy Tel: +39 06 592 9241 Tel: +39 06 592 6220 Email: selispa@selitunnel.com Web: www.selitunnel.com | a) US\$220M b) US\$220M | Tunnel construction, tunnel design and design/manufacture of TBM and special equipment for underground works. Company section specifically dedicated to manufacturing, overhauling and designing equipment for mechanised tunnelling. | Brenner Base Tunnel - 9.9km railway tunnel (DS TBM Ø6,30m) segmental lining Thessaloniki Metro, Greece - 7.7km twin tunnel (2 x EPBM Ø6,19m) segmental lining Rome Metro, B1 Line, Italy - 6.06km tunnel (2 x EPBM Ø6,79m) segmental lining Tsuen Wan Tunnel, Hong Kong - 5.1km tunnel (DSU TBM Ø7,27m) segmental lining New York ESA Tunnel - 3.7km tunnel (DSU TBM Ø6,71m) NATM Los Bronces Tunnel, Chile - 8.1km tunnel (DSU TBM Ø4,5m) NATM Kishanganga Hep, India - 14.6km tunnel (DS TBM Ø6,10m) segmental lining Sochi Olympic Games, Russia - supply DS TBM Ø6,18m Suruc Water Tunnel, Turkey - 17km tunnel (DS TBM Ø7,80) segmental lining Pando Tunnel, Panama - 5.16km tunnel segmental lining Monte Lirio Tunnel, Panama - 7.87km tunnel segmental lining | Athens Metro-Elliniko, Greece - 4.59km metro tunnel (EPBM Ø9,44m) segmental lining Passirio Hydroelectric Project, Italy - 5.88km head race tunnel (DS TBM Ø3,7m) segmental lining Sant Just Tunnel, Spain - 5.30m water diversion tunnel (DSU TBM Ø5,98m) segmental lining Gilgel Gibe II Hydroelectric Project, Ethiopia - 25.8km water diversion tunnel (2 x DS TBM Ø6,98m) segmental lining Beles Multipurpose Project, Ethiopia - 12km head race tunnel and 7,2km tailrace tunnel (1xEPBM Ø8,10m, 1xDSU TBM Ø8,07m) segmental lining Blue Tunnel (Mavi), Turkey - Equipment Supply (DS TBM Ø4,88m) segmental lining |

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TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|--|---|
| Shaft Sinkers Centex Office Park CNR Katherine Street & Centex Close Standton 2148 South Africa Tel: +27 11 445 4300 Fax: +27 11 444 4410 Email: sinkers@shaftsinkers.co.za Web: www.shaftsinkers.co.za | a) US\$150M b) US\$10M | Earth retention systems (rock & soil anchors, diaphragm walls), ground treatment including: Rock grouting (cement, low-mobility & asphalt grouting), soil grouting (jet, compaction, microfine & chemical grouting), deep mixing, slurry trench walls | Impala, RSA – Main shaft with ancillary development & equipping (1,921m deep, Ø10m), 2 x vent shafts (1,703m deep, Ø9m & 1,437m, Ø6.8m), fridge shaft (1,361m deep, Ø6m), main shaft (1,648m deep, Ø10m); Leeuwkop, RSA – Main shaft with ancillary development & equipping (1,648m deep, Ø9.8m), vent shaft (1,260m deep, Ø7.6m); Lonmin, RSA – Roland shaft with 22 lV haulage development and equipping (6.5m wide x 4m high), Saffy shaft (various), Hossy shaft (various); Phakisa, Phase 3, RSA – Ex Freddie's 4 shaft (2,471m deep, Ø7.1m); Moab Khotson Mine, RSA – Vent bypass (Ø7.1m), batch plant operations, excavation of silos and orepasses | Impala, RSA – Sinking of ventilation shaft with ancillary development & equipping (1,451m deep, Ø5.6m); Lonmin, RSA – Development of three declines and Hossy shaft with ancillary development; Black Mountain Deep Shaft Project, RSA – 1,752m, Ø7.4m |
| Skanska BS Kosovska cesta 16 97174 Prievidza Slovakia Tel: +421 46 5190 198 Tel: +421 46 5424 494 Email: skanska.bs@skanska.sk Web: www.skanska.sk | Undisclosed | All forms of tunnelling and underground construction for civil, transportation and environmental projects | Sitina Tunnel, Highway D2, Lamasska cesta-Stare Grunty, Slovak Republic – Twin 1.4km long highway tunnel, cross section 79-108m ² ; WWTP & System, Povazska Bystrica, Slovak Republic – Construction of waste water sewerage system and new sewer collector (21.4km), restoration and completion of waste water treatment plant; Sal'a Waste Water Disposal System, Slovak Republic – Rehabilitation and extension of current sewage network; E18 Highway Tunnels, Orosnaki & Karmainen, Helsinki, Finland – 2 x highway tunnels: Orosnaki 2 x 653m, Karmainen 2 x 2.2km; 513 Highway Tunnel, Vestec-Lahovice, Prague, Czech Republic – Ring road tunnel for city | Trojane Highway Tunnel, Slovenia – Twin tube highway tunnel, 2.9km. Final lining, reinforcement works and main drainage construction; Valik Tunnel, Czech Republic – 329m road tunnel; Avigliana Tunnel, Italy – 1.9km road tunnel with 183m cut & cover section and 6 x emergency bays; Vuossari Tunnels, Helsinki, Finland – 2 x 1.52km double-tube rail tunnel and 14 short interconnection tunnels; WWTP & Waste Water Sewerage System in Banska Bystrica, Phase I, Slovak Republic |
| Strabag Donau-City Strasse 9 A-1220 Vienna Austria Tel: +43 1 22 422 0 Fax: +43 1 22 422 227 Email: tunnel@bauholding.at Web: www.strabag.com | a) US\$7.2bn b) US\$293M | Cavems/underground storage, nuclear waste repositories, cut & cover, drill & blast, ground stabilisation/improvement, hydro electric projects, mine development, shaft sinking/ drilling, shotcreting, soft ground tunnels | AlpTransit, Lötschberg Base Tunnel, Mitholz Lot, Switzerland – 2.1 km of drill & blast high speed rail tunnel, through hard rock; AlpTransit, Gotthard Base Tunnel, Amsteg Lot, Switzerland – 2 x 11.3km of TBM driven railway tunnel, Ø9.55m, in hard rock; Krapina-Macelj, A2 Phym Motorway, Croatia – 6 twin tube highway tunnels, drill & blast; Perschling Tunnel, Austria – 3 single tube rail tunnels (Reiserbergtunnel, 1.3km; Stierschweiffeldtunnel, 3.3km; and Raingrubentunnel, 2.7km); Niagara Tunnel, Canada – Diversion tunnel for HEP, 10.4km, Ø14.4m, TBM; Tunnel Vomp-Terfens, Lot H5, Austria – 5.8km long railway tunnel, drill & blast excavation | Highway Tunnels, Croatia – Tunnel Gric (2 x 1.2km), Tunnel Brinje (2 x 1.6km), Tunnel Hrastovec (2 x 1.1km), all D&B; Highway Tunnels, Austria – Tunnel Spital (2 x 2.4km), Tunnel Semmering (2 x 3.4km), Kienbergtunnel (2 x 1.4km), Herzogbergtunnel (1 x 1.9km), all D&B; LT22, Vienna, Austria – 1.7km single track rail tunnel; Frankfurt-Cologne HSRL, Germany – 11 tunnels totalling 17.1km; Borcka and Muratli HEPP, East Anatolia, Turkey – All underground works (D&B), including road tunnels |
| Taisei Corporation 1-25-1, Nishi-Shinjuku Shinjuku-ku Tokyo 163-0606 Japan Tel: +81 3 3348 1111 Fax: +81 3 3345 0481 Email: t-ito@intl.taisei.co.jp Web: www.taisei.co.jp | a) US\$13.7bn b) US\$800M | All types of underground construction (NATM, cut & cover, immersed tube, pipe & box jacking, TBMs including open, EPB and slurry shields) transportation, hydro, irrigation, utilities, etc. | Algeria East-West Motorway – Four tunnels with a total length of 3.6km; Marmaray Railway Bosphorus Tunnel, Istanbul – Undersea immersed/TBM/NATM tunnel with a total length of 13.3km; Singapore Circle Line, Contract 854 MRT, Singapore – TBM tunnel 10.8km long; Brightwater Conveyance System, WA, USA – Conveyance tunnel for new sewer system, TBM tunnel; Kyogoku Hydroelectric Power Plant, Japan – Underground powerhouse and tunnels | Palm Jumeirah Vehicular Tunnel, Dubai, UAE – Undersea tunnel 1.4km long; D2 Motorway, Bratislava, Slovakia – NATM tunnel 2.4km long; Tokai-Hokuriku Highway Hida Tunnel Phase 4 – NATM and TBM tunnel 10.7km in length; Namikata LPG Storage, Japan – Underground tank and ventilation tunnel |
| Tony Ridley Hyperbaric Associates 26 The Street Surlingham, Norwich Norfolk, NR14 7AJ United Kingdom Tel: +44 1508 538 838 Fax: +44 1508 538 936 Email: info@hyperbaric-tunnelling.com Web: www.hyperbaric-tunnelling.com | a) £0.6M b) £0.54M | TBM intervention, all work in compressed air, mixed gas & saturation techniques, medical support, rescue & extrication, occupational safety & health (tunnel/TBM & general site), training and instruction – consultancy and site based personnel in relation to all services | Los Teques Metro Line 2 – Los Teques, Caracas, Venezuela – Metro Tunnel, twin 5.8 diameter tunnels over 11km - Consultancy and Onsite Support Services for: Work in Compressed Air, TBM Intervention, Occupational Safety & Health, Rescue & Extrication and all associated Training Thessaloniki Metro – Thessaloniki, Greece – Metro Tunnel, twin 6.0 diameter tunnels over 7.7km - Consultancy and Onsite Support Services for: Work in Compressed Air, TBM Intervention, Occupational Safety & Health, Rescue & Extrication and all associated Training Belfast Sewers Project – Belfast, Northern Ireland – Sewer Project, Multiple Tunnels & Shafts Mixed Diameter – Consultancy and Onsite Support Services for: Work in Compressed Air, TBM Intervention, Shaft Construction, Work in Contaminated Ground, Occupational Safety & Health, Rescue & Extrication and all associated Training. | Barcelona Metro Line 9 – Barcelona Spain – Metro Tunnel, Twin 9.4 diameter tunnels over 9km - Consultancy and Onsite Support Services for: Work in Compressed Air, TBM Intervention, Occupational Safety & Health, Rescue & Extrication and all associated Training Sao Paulo Metro – Sao Paulo, Brazil - Metro Tunnel, Twin 9.4 diameter tunnels over 12km - Consultancy and Onsite Support Services for: Work in Compressed Air, TBM Intervention, Occupational Safety & Health, Rescue & Extrication and all associated Training Dubai Metro Red Line – Dubai UAE, Metro Tunnel, Twin 9.6 diameter tunnels over 4.7km - Consultancy and Contingency for Onsite Support Services for Training Project Hobson – Hobson's Bay, Auckland, New Zealand. |
| Traylor Bros PO Box 5165 835 N. Congress Avenue Evansville IN 47716-5165 USA Tel: +1 812 477 1542 Fax: +1 812 474 3223 Email: underground@traylor.com Web: www.traylor.com | a) US\$267M b) US\$117M | EPB, TBM and mechanised shield tunnelling, compressed air, drill & blast, manufacture of precision pre-cast concrete segmental linings | San Vicente to Second Aqueduct Pipeline Project, San Diego, USA – 17.7km water conveyance tunnel. Ø3.2m tunnel will connect existing aqueduct to the San Vicente reservoir. The system will provide additional storage during wet periods, and another water source during dry periods or if the main aqueduct should suffer earthquake damage; LAMTA C0800 Metro Gold Line, LA, USA – Twin 2.3km subway tunnels, excavated with 2 x EPBMs in alluvial geology, 4 x cross passages and 2 x sump structures; San Vicente Pipeline Tunnel Segments, San Diego USA – Manufacture and install precast concrete tunnel segments | NEIS, LA, USA – 8.5km of Ø4m sewer tunnel utilising 3 x TBMs. Of the 3 x drives, 2 in predominantly alluvial soils, below the water table. 3rd drive in siltstone/claystone. 10 x shafts; Dulles Airport Tunnel Segments, USA – Manufacture and supply precast concrete tunnel segments; LAMTA C0800 Metro Gold Line Tunnel Lining Segments, LA, USA – Manufacture and install precast concrete tunnel segments; NEIS Tunnel Lining Segments, LA, USA – Manufacture and install precast concrete tunnel segments |

TUNNELLING CONTRACTORS

| Company information | (a) Turnover (b) Turnover in tunnelling | Areas of expertise | Tunnel contracts underway | Recent tunnel contracts |
|---|--|---|---|---|
| TW Mechanical Headings Shawell Lutterworth Leicestershire LE17 6AS Tel: +44 1788 861 793 Fax: +44 1788 861 793 Email: alex.r.menhinick@carillionplc.com | a) US\$12.2M b) US\$12.2M | Directional drilling, guided boring, auger boring, pipe jacking | Carlisle-Gretna Green, M6 Extension (Guardsmill), UK – Service & drainage crossings for Carillion. 20 x 40m guided auger bores & directional drilling crossings, Ø125mm-600mm; Foul Drainage & Storm Drainage, New Housing, GKL Northern Ltd, UK – Guided boring 225 x Ø450mm foul drainage, 3 x pipejacks Ø1200mm & 1500mm, totalling 200m; Deeside, A5117 Extension (Chester), UK – Service & drainage crossings. 5 x 40m guided auger boring & directional drilling crossings for Carillion, sizes from Ø225mm-750mm. 120m pipejack, Ø1200mm | Carlisle-Gretna Green, M6 Extension (Guardsmill), UK – Service & drainage crossings for Carillion. 20 x 40m guided auger bores & directional drilling crossings; Foul Drainage & Storm Drainage, New Housing, UK – Guided boring 225 x Ø450mm foul drainage, 3 x pipejacks Ø1200mm & 1500mm, totalling 200m; Deeside, A5117 Extension (Chester), UK – Service & drainage crossings. 5 x 40m guided auger boring & directional drilling crossings, sizes from Ø225mm-750mm. 120m pipejack, Ø1200mm |
| Vinci Construction Grands Projets 5 cours Ferdinand-de-Lesseps 92851 Rueil-Malmaison France Tel: +33 1 4716 4700 Fax: +33 1 4716 3360 Email: info@vinci-construction.co.uk Web: www.vinci-construction.com/projets | Undisclosed | TBM tunnelling: open shield, EPB, slurry shield, Mixshield 'All in the tube' concept (devised for the El Azhar road tunnels in Cairo, Egypt, which ensures safety in tunnels without ancillary structures), patented 'dual-layer' segments (2002) | Brightwater conveyance system, central contract, Brightwater tunnel, sections 2 and 3, Seattle - Underground works including 9.7km bored with bored with a slurry pressure TBM (external diameter 5.3m) , 2 access shafts (28 and 60m deep) and a 1km long connecting sewer (with a diameter varying from 0.92 to 1.83m) of which 500m bored with a microtunnel boring machine Athens metro, extension of line 2 towards Elliniko - Detailed design, management and synthesis of this 5.7km long structure, which includes a 5.100m TBM bored tunnel, 4 stations and 600m cut and cover sections Cairo metro, line 3, phase 1 Construction of 5km of tunnels (bored with slurry pressure Herrenknecht TBM, excavated dia. 9.40m) and 5 underground stations Cairo metro, line 3, phase 2 - Construction of 7.2 km of tunnels (bored with slurry pressure Herrenknecht TBM, excavated dia. 9.40 m) and 4 underground stations Hallandsås tunnels, Sweden - Design and Build contract for two open shield (hard rock) / slurry pressure Herrenknecht TBM bore | Duplex A86, Paris - West motorway tunnel, East 2 section, design and build contract, electromechanical installations and testing of a 5,430 m long single tube urban motorway tunnel over 2 superimposed levels - Excavated section 106m ² - Bored using earth pressure/slurry pressure TBM - bored Ø 11.60m - internal Ø 10.4m - 1 interchange, 1 ventilation shaft and 4 emergency shafts Duplex A86, Paris - West motorway tunnel, East 1 section, design and build contract, electromechanical installations and testing of a 4,536m long single tube, double-deck urban motorway tunnel. Excavated section 106m ² - Bored using earth pressure/slurry pressure TBM - bored Ø 11.56m - internal Ø 10.4m - 2 interchanges, one ventilation shaft and three emergency shafts. |
| Wayss & Freytag Ingenieurbau Eschborner Landstraße 130-132 D-60486 Frankfurt AM Main Germany Tel: +49 69 7929 400 Fax: +49 69 7929 491 Email: info@wf-ib.de Web: www.wf-ingbau.de | a) US\$335.7M b) - | TBM tunnels, Mixshield, Hydroshield, EPBMs, slurry and hard rock tunnelling, NATM, cut & cover, design-build projects | Hubertus Tunnel, The Netherlands – 1.6km long, Ø9.6m, slurry shield; North-South City Line, Cologne, Germany – Two single-track rail tunnels & 7 x stations, total length 4.9km by 2 x Ø8.39m slurry TBMs; Katzenberg Tunnel, Germany – Two single-track railway tunnels, 2 x Ø9.3m, using 2 x Ø11.12m EPB shields; Moosach Tunnel, Munich, Germany – Two single track rail tunnels and 2 x stations, 2.4km, Ø7.35m slurry shield; Finnetunnel, north of Weimar, Germany – Two single track rail tunnels, 7km using 2 x Ø10.9m slurry shields, convert to open rock after first 1.5km; Diabolo Tunnel, Brussels, Belgium – Two single track rail tunnels, each 1.1km underneath runway; Ems Dollard, Germany/Netherlands | Munich Underground Railway, Line 3 North, Section 2, Germany – Two single track rail tunnels & 2 x stations, 2.4km, Ø7.35m slurry shield; Grouff Tunnel, Luxembourg – Twin 3.26km long drill & blast road tunnel; Vienna Metro, Line U2, Section 2, Austria – 2 x twin bore metro tunnels, 2 x 1.3km NATM; Uetliberg Tunnel, Zurich, Switzerland – 2 x motorway tunnels, 8.2km; North/South Link, Antwerp, Belgium – 2 x single track rail tunnels 1,228m long Ø7.3m |
| YIT Corporation PO Box 36 Fin-00621 Helsinki Finland Tel: +358 20 433 2399 Fax: +358 20 433 3706 Email: postit@yit.fi Web: www.yitgroup.fi | a) US\$2.06bn b) US\$40M | Underground blasting and reinforcement works in hard rock, shaft development works (for existing hoisting shafts in underground mines), underground mine development and production works | Meilahti-Pasila energy tunnel, Helsinki, Finland – 1.5km of energy tunnel excavation and rock reinforcement works; Ring Road I tunnels, Espoo, Finland – Two 4-lane rock and concrete tunnels; Turku Water underground water storage, Turku, Finland – Excavation and rock reinforcement works of 200,000m ³ water storage; City Center shafts, Helsinki, Finland – Shaft excavations for underground parking facilities; Maunula sewage tunnel, Helsinki, Finland – Refurbishment of existing 1km rock tunnel | Kittilä Gold Mine, Finland - 4.5km decline and development tunnels; Tunnel renovation Jyväskylä-Jämsänkoski, Finland - Refurbishment of 2.5km rail tunnels; Extension of Terminal 2, Helsinki-Vantaa Airport, Finland - Baggage tunnel and civil engineering works; Munkkisaari-Vanhankirkon puisto, Helsinki, Finland - 1.5km long tunnel for Helsinki Energy; VUOLI Project, Contracts 2 & 5, Helsinki, Finland - 5km of rail tunnels; Viikinkaari cable tunnel, Helsinki, Finland - 1.5km long tunnel |
| Züblin, Ed Albstadtweg 5 D-70567 Stuttgart Germany Tel: +49 711 7883 9704 Fax: +49 711 7883 261 Email: natascha.hentschel@zueblin.de Web: www.zueblin.de | a) US\$2bn b) US\$130.4M | Caverns/underground storage, nuclear waste repositories, cut & cover, drill & blast, ground stabilisation/improvement, hydro electric projects, mine development, shaft sinking/ drilling, shotcreting, soft ground tunnels | Isisbergtunnel, Switzerland – Twin 4.6km hard rock Ø11.6m TBM tunnels; Brixlegg Tunnel, Lot 5, Austria – 7.7km 3-track rail tunnel, NATM; Katzenberg Tunnel, Germany – 2 x 9.38km single-track rail tunnels, 2 x TBM drives, NATM cross passages, cut & cover sections; North/ South Line, Amsterdam Metro, Netherlands – 4 x sections of twin single-track tunnel, totalling 6.2km, slurry/EPB shield Ø7.12m. Extensive ground treatment, construction of cross passages in ground freeze; North-South City Line, Lot 2, Cologne, Germany – Two single-track rail tunnels using 2 x Ø8.4m TBMs, total of 5.38km; Kopswerk II HEP, Austria – Underground powerhouse, transformer cavern and total of 1.6km drill & blast tunnel; Wienerwald Tunnel, Austria | AlpTransit, Lötschberg Base Tunnel, Mitholz Lot, Switzerland – 2.1km of drill & blast high speed rail tunnel, through hard rock; Schottenberg Tunnel, Germany – 3-lane road tunnel and parallel rescue gallery; Hestenberg Tunnel, Germany – 2-lane road tunnel, 734m long, drill & blast; Bierhäuselberg, Austria – 2 x single track rail tunnels, NATM; Munich Subway, U3 Nord, Germany – 2-track and 3-track rail tunnel, approx. 2.8km and station, NATM with extensive ground treatment measures |

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FOR SALE

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- 1 TBM Herrenknecht M-365 M, year 2001, Ø3.11 m
- 1 excavator CATERPILLAR 325 C CR/BKW 222
- 4 excavator CATERPILLAR 330 C L-HD
- 4 crawler excavator Liebherr R 900 HDS bit
- 1 excavator Liebherr, type 944 HDS, year 1999
- 2 Diesel locomotives SCHÖMA, type CHL 200 G, track 900mm, year of construction 2006
- 1 DIESEL locomotive SCHÖMA CFL 200, track 900mm
- 2 DIESEL locomotives SCHÖMA CFL 180 B-B, track 900mm
- 2 DIESEL locomotives SCHÖMA/Hudson, 135 KW, track 750mm
- 1 Rotations-dump, type Rowa, for 2 waggons
- 28 Rotation-muck-car, type Hudson, track 750mm, 4.75m³
- 2 fan model KORFMANN, type AL 16/AL 17 FU
- 5 fan model Zitron, type ZEL 1-18-160/4
- 2 fan model Zitron, type ZEL 1-24-630/6
- 7 fan model KORFMANN, type ESN 9-300
- 3 fan model Zitron, type ZEL 1-14-75/7
- 1 Tunnel conveyor, length 4,000m, width 1,200mm
- 5 Conveyors belt, length 500m, width 650mm
- 6 Air-cooling-systems WAT, Type DV 300; including Korfmann-fans

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Dates & Events

26 JANUARY 2010

George A. Fox Conference: Tunnel Shaft Construction, New York, USA

The ninth annual George A. Fox New York construction conference will be held in Manhattan. The conference is sponsored by the Underground Construction Association of SME (UCA of SME). Contact: email: bonic@smenet.org; tel: +1 303 948 4216 fax: +1 303 979 3461; web: www.smenet.org

4-5 MARCH 2010

World Tunnel Congress China, Shanghai, China

The WTCC will focus on China's challenge to build 300km of tunnel every year. Contact: email: yi.wang@hznzmedia.com; tel: +86 21 5101 3735 or +86 21 5101 3738; fax: +86 21 5101 6269; web: www.hznzmedia.com/events/WTCC

17-19 MARCH 2010

ISTSS 2010 Frankfurt, Germany

The 4th International Symposium on Tunnel Safety and Security. Manuscript abstracts should be submitted to the Secretariat by 01 June 2009, poster abstracts by the 01 October 2009. Contact: Anders Lönnermark, SP Technical Research Institute of Sweden; tel: +46 10 516 56 91; email: anders.lonnermark@sp.se; web: www.sp.se

17-19 MARCH 2010

INTERtunnel RUSSIA 2010 Expocentr, Moscow, Russia

INTERtunnel Russia 2010 provides an opportunity for suppliers of products and services to the tunnelling sector to showcase their capabilities and exchange ideas and experiences. INTERtunnel RUSSIA will be held at the Expocentr in Moscow, Russia. Contact: email: intertunnelrussia@mackbrooks.com; web: www.intertunnelrussia.com

18-19 MARCH 2010

4th China Tunnel Summit, Shanghai, China

Among the key issues of this summit will be: World & China tunnelling development trends; Hard rock TBM issues & solutions in city subway tunneling; subsea tunnelling and speeding construction. Contact: email: marketing@merisis-asia.com; tel: +86 21 62478898; fax: +86 21 62478838; web: www.merisis-asia.com/tunnel2010

19-25 APRIL 2010

Bauma 2010, Munich, Germany

The 29th International Trade Fair for Construction Machinery, Building Material Machines, Mining Machines, Construction Vehicles and Construction Equipment will be held in the Messe Muenchen Messegelaende 81823, Munich, Germany. Contact: email: info@bauma.de; tel: +49 89 949 11348; fax: +49 89 949 11349; Web: www.bauma.de

2-7 MAY 2010

North American Society for Trenchless Technology No-Dig 2010, Chicago, USA

The 2010 NASTT No-Dig show will be held at the Renaissance Schaumburg Hotel and Convention Center, Chicago. The conference theme is "Rebuilding North America's

Underground Infrastructure Using Trenchless Technology" and will include infrastructure investment; social costs and impacts; industry trends, advancements and new concepts. Contact: NASTT; web: www.nodigshow.com

14-20 MAY 2010

2010 ITA World Tunnel Congress, Vancouver, Canada

Not long after the 2010 Winter Olympics, the International Tunnelling Association (ITA) visits the spectacular city of Vancouver, British Columbia, for its yearly conference and exhibition. The usual combination of working groups, open sessions and technical talks will all be included. Contact: web: www.wtc2010.org

8-10 JUNE 2010

InterTunnel 2010, Turin, Italy

Tunnelling exhibition aimed specifically at clients, contractors and consultants involved in the construction of and equipping and operation of tunnels. Contact: Mack Brooks Exhibitions; web: www.intertunnel.com

9-11 JUNE 2010

Swiss Tunnel Congress, Lucerne, Switzerland

Tunnelling developments in the Alps will doubtless be a talking point at the Swiss Tunnelling Society's STC. The event will be held at the KKL Lucerne. Contact: fgu@thomibraem.ch web: www.swisstunnel.ch

14-16 JUNE 2010

International Conference Underground Construction Prague 2010 Transport and City Tunnels

The Czech ITA-AITES Tunnelling Association will host its 11th International Conference at the Clarion Congress Hotel Prague. Lectures will be simultaneously interpreted into English, German and Czech. Contact: Czech ITA-AITES; tel: +420 266 793 479; email: ita-aites@metrostav.cz; web: www.ita-aites.cz

15-17 JUNE 2010

European Rock Mechanics Symposium (EUROCK 2010)

Eurock 2010 is an ISRM Regional Symposium of Europe. The Symposium covers all the aspects of rock mechanics and rock engineering. Contact: Jean-Paul Dudt, Laboratory for Mechanics of Rock (LMR). EPFL-ENAC-

LMR Station 18 CH-1015, Lausanne; tel: +41 21 693 23 25; fax: +41 21 693 41 53; email: lmr@epfl.ch; web: www.lmr.epfl.ch

19-23 JUNE 2010

North American Tunneling Conference, Portland USA

The 2010 NAT will be held at the Marriott Downtown Waterfront Hotel in Portland, Oregon. Conference and exhibition information and registration is available on the SME web site. Contact: Society for Mining, Metallurgy and Exploration (SME); web: www.smenet.org.

BRITISH TUNNELLING SOCIETY

21 JANUARY 2010:

Construction of Deep Shafts

The presentation will review the current situation with regard to deep shaft construction in the UK and worldwide. It will cover the geological and hydrogeological data requirements for designing deep shaft linings and the methods for their design and construction will be discussed. Presented by Alan Auld of Alan Auld Associates and Dave Setchell of Cementation. 6pm start at the ICE.

10 FEBRUARY: Joint Meeting with MinSouth.

Construction of Road Tunnels in Iceland Hédinsfjardargöng Project

The speakers will present the history and highlight the main problems, which were met during the planning and construction of the Hédinsfjardargöng Project.

10 FEBRUARY: Gotthard Base Tunnel Project - Switzerland, Transco Sedrun

Michael Gutzeit & Hans-Juergen Bartschat of Bilfinger Berger Ingenieurbau will give a presentation on the challenges faces on the Gotthard Base Tunnel project.

23 - 27 OCTOBER, 2010

ISRM international Symposium 2010 and 6th Asian Rock Mechanics Symposium, New Delhi, India

Contact: Mr. V. K. Kanjlia, Member Secretary, Indian National Group of ISRM; tel: +91-11-2611 5984/2688 2866/2410 1591; fax: +91-11-2611 6347; email: uday@cbip.org/ cbip@cbip.org; web: www.arms2010.org

12 - 16 SEPTEMBER 2010

6th International Symposium on Sprayed Concrete, Norway

Sixth International Symposium on the modern use of wet-mix sprayed concrete for underground support will be held in Tromsø, in the north of Norway. Contact: Siri Engen The Norwegian Society of Graduate Technical and Scientific Professionals - Tekna; fax: +47 22 94 75 01

A DATE TO REMEMBER...

If you know of a tunnelling related conference, event, seminar or exhibition that is not listed here, we would be delighted to hear from you. Please contact the editor by post, email, fax or through our web site: Editor, 'Tunnels & Tunnelling International', John Carpenter House, 7 Carmelite Street, London, EC4Y 0BS, United Kingdom.

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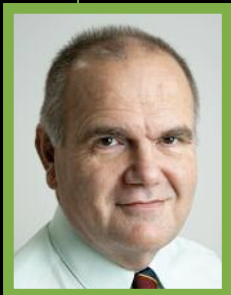
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