

EU

Tunnel Boring Machines for Use in Squeezing Rock

The European tunnelling companies and engineers rank among the best tunnelling experts. An important basis for the success of the European tunnelling industry is its substantial experience gained using conventional tunnelling methods, which employ sequential excavation.

However, longer tunnels, often consisting of two separate tubes, shorter construction periods, lower construction costs and better working conditions and jobs are required. A high degree of mechanisation and the implementation of industrial production methods are essential to comply with these requirements. Therefore, excavation with TBMs is preferable to sequential excavation for long tunnel drives.

TISROCK (TBM-Tunnelling In Squeezing ROCK) is a €2 million EU-financed R&D programme aimed at improving the field of application of this method. The project started on 1st January, 2004 and will end on 1st January, 2006.

Its main objective is to develop a system for TBMs and lining allowing longer tunnels to be built through rock deformations that are unavoidable due to squeezing rock conditions, especially within the Alpine region. Costs and construction periods for long railway tunnels will be considerably reduced. Long Alpine tunnelling projects include the Ceneri base tunnel (15.4 km) in Switzerland, the Lyon-Turin base tunnel (52 km), the Wienerwald tunnel (12 km) and the Koralm tunnel (37 km) in Austria and the Brenner base tunnel (55 km) between Austria and Italy. These tunnels will make European traffic routes more efficient and relieve roads from freight and transit traffic.

For classical types of shield machines, the reaction forces are transferred to the concrete lining, which is installed under shield protection. TBMs incorporating shields are increasingly being employed for rock excavation. Two applications can be differentiated. Double shield TBMs are primarily applied for small diameter tunnels (< 7 m). Open TBMs and single shield TBMs are used for larger diameters (9 to 13 m).

Double shield TBMs have been considered recently for the construction of single-track tunnels because a better performance and higher advance rates can be achieved. Four double shield TBMs are in use at the Guadarrama tunnel in Spain. For the time being, this method can only be used for shallow tunnels with a low overburden.

To enable tunnelling through squeezing rock conditions over long distances with TBMs using segmental lining, it is necessary not only to develop appropriate machines but also deformable lining systems. Tunnelling in squeezing rock is only feasible at reasonable costs if a deformable lining system is available. However, the commonly employed concrete segmental lining behind shield machines is a rigid lining. Also, undesirable deviations of the circular shape are a result of twisted joints, which are formed between the segments. Therefore, further developments of the lining system are essential.

The TISROCK partners are:

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World Digest of Tunnels under Planning

Ireland. The N18/N7 Limerick Southern Ring Road (LSRR) Phase II plans an immersed tunnel to cross under the River Shannon with a dual carriageway. The LSRR Phase II is currently at the planning stage. The tunnel is proposed to be a double immersed tube with a length of approximately 600 m. Approximate external dimensions are 22.4 m in width and 8.18 m in height for an approximate internal dimension of a tube at 9.75 m wide and 4.9 m high. The tunnel will require excavating 400,000 m³ of soft alluvial silt on the riverbed. Construction is scheduled to start at the third or fourth quarter next year. The tunnel cost is estimated at around €150 million. The entire scheme including 10 km of dual carriageway, 2 km of single carriageway and the tunnel totals approximately €311 million. The project will be developed under a DBFO contract between the Irish government and a PPP concessionaire. Read E-News Weekly 48/2003. Visit www.midwestroads.ie and www.tunnelbuilder.com, ie/18.

Spain. The Ministry of environment has began work on the environmental impact study for the 65.3 km Castejón-Pamplona high speed link. A 320 m under Mount Plano is planned in Tafalla.

United States. New Jersey transportation officials have narrowed to four alternatives from the original list of 26 ideas the list of possible solutions to break a bottleneck where Interstates 76 and 295 and state Route 42 converge. Estimates for the various proposals range from \$150 million to \$300 million, with the tunnel as the most expensive of the four (alternative D). The 1.5 km tunnel would carry I-295 traffic in the Bellmawr area. Actual construction is targeted to begin in 2008. The project is not expected to be completed until 2010.

World Digest of Bids

Austria. Periodic notice for alterations to a railway station including a pedestrian tunnel. Tenders to be invited in October 2004 for work start in March 2005. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=022146-2004>, OJ S 25,

or contact Österreichische Bundesbahnen, fax +43 19300025682 or +43 662930004085. E-mail hans.froeschl@pe.oebb.at

France. Restricted call for bids, deadline 8th March, 2004 for supply of Abel brand low voltage and high voltage lighting products for 20,000 lights on Escota's highway network, including tunnels. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=018142-2004>, OJ S 21, or contact Escota, fax +33 492974010. E-mail service.ts@escota.net. Also visit www.abeleclairage.com

France. The tender to build a 300 m 15 sq m tunnel and a 200 m 5 m diameter shaft to access to the 2,600 m high Bure plateau has been declared void. Read E-News Weekly 36/2003.

Italy. Open call for bids, deadline 26th March, 2004 for construction of the Ölberg tunnel in the autonomous province of Bolzano in south Tyrol. This is a 380 m single-tube dual-lane tunnel, of which 330 m will be bored and 50 m in cut-and-cover. Drill/blast method with rock bolts, wire mesh and shotcrete for support. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=018982-2004>, OJ S 22, or contact Bolzano autonomous province, Bolzano, fax +39 0471412519.

Spain. Open call for bids, deadline 11th March, 2004 for design of the 2.5 km Soutomaioir-Vilaboa section of the high speed line in Pontevedra province in Galicia. Includes a 925 m tunnel. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=020198-2004>, OJ S 23, or contact Ministry of public works, fax +34 915979342 or 8470. E-mail vrpascual@mfom.es or cpublic@mfom.es

Spain. Open call for bids, deadline 11th March, 2004 for design of the 5.5 km Cerpozons-Portela section of the high speed line in Pontevedra province in Galicia. Includes a 840 m tunnel. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=020168-2004>, OJ S 23, or contact Ministry of public works, Madrid, fax +34 915979342 or 8470. E-mail vrpascual@mfom.es or cpublic@mfom.es

Spain. Open call for bids, deadline 4th March, 2004 for design of the 3.7 km Pocomaco-San Cristóbal section of the high speed line in La Coruña province in Galicia. Includes two cut-and-cover tunnels in Vio (200 m) and at the entrance of the San Cristóbal station (285 m). Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=020188-2004>, OJ S 23, or contact Ministry of public works, Madrid, fax +34 915979342 or 8470. E-mail vrpascual@mfom.es or cpublic@mfom.es

Spain. Open call for bids, deadline 1st March, 2004 for construction of section Luko-Gipuzkoa province of the A-1 highway between Vitoria-Gasteiz and Eibar in the Basque province of Alava. There is a 600 m twin tunnel in Luko, radius 6.8 m. Geology consisting of clayish marls and limestone. Excavation with roadheader. Support with Bernold steel plates and shotcrete. Visit <http://ted.publications.eu.int/udl?request=Seek-Deliver&language=en&docid=020886-2004>, OJ S 24, or contact Arabako Lanak, Vitoria-Gasteiz, fax +34 945131685. E-mail info@arabakolanak.com

World Digest of Contract Awards

Portugal. Constructora do Tâmega has won a €4.35 million contract to build the 363 m-long 18.5 m-wide Do Rego four-lane two-way tunnel in Lisbon. Work will begin in March. Read E-News Weekly 34/2003.

Spain. A €40.5 million contract has been awarded to Construcciones Paraño and Coprosa to build the 8.7 km Llera-Grado section, second carriageway, of the Oviedo-Salas highway. Read E-News Weekly

3/2003. Visit www.coproso.es. This section requires to build the 811 m Peñaflor tunnel in the Anzo massif. INCA secured a €1.16 million contract for work control and construction management. Read E-News Weekly 31/2003.

Spain. Eptisa secured a €1.23 million contract for work control and construction management of the 4.1 km Trubia-Llera section, second carriageway, on the Cantabrian highway A-63. Includes the 614 m Priañes tunnel and a 77 m cut-and-cover section. Read E-News Weekly 31/2003 & 22/2003. Eptisa already supervises the construction of the first carriageway. Read E-News Weekly 20/2003. Visit www.eptisa.es. The two carriageways are built by Tapusa, Aldesa Construcciones and Dicaminos. Read E-News Weekly 19/2003.

Spain. FCC has secured a nearly €4 million contract to build a 300 m-long 2.5 m-high Abandoibarra service tunnel in cut-and-cover, section Mazarredo-Parque in Bilbao for Bilbao Ría 2000. Visit www.fcc.es. Prointec won a €116,900 contract for work control and construction management. Visit www.prointec.es

World Digest of Ongoing Tunnelling



Picture 1: The 610 m-long 9 m-wide Schirmeck tunnel (Rothau side).

France. Tunnelling on the Schirmeck bypass to road RN 420 in Alsace has commenced one month ago. The contractors, Razel and Demathieu & Bard, are using the drill/blast method to cut through very hard and abrasive volcanic rock. Shotcrete and steel arches support the vault. The work is done for 24 hours a day from Monday 6 am to Friday 10 pm. To date, 28 m has been dug on the Rothau side. As the tunnel progresses, systematic investigation of the face is done to assess the nature and quality of the encountered ground. This allows to better define the support that must be implemented. On the Molsheim side, utility relocation has just started. The project will cost €16 million (equipment not included). Visit www.tunnelbuilder.com, fr/33.

Spain. A €3.1 million investment has been approved by the government to stabilise the slopes and portals of the La Molina tunnel in Asturias. Cracks appeared in the shotcrete lining at the south portal, indicating ground movements in the slope. Small collapses occurred also at the north portal. This is a 220 m railway tunnel, built by Constructora Hispánica and Cavosa, on the Oviedo-Trubia line operated by FEVE. Three branches of the narrow gauge railways (Oviedo, San Esteban de Pravia and Fuso de la Reina) converge in Trubia. The tunnel is designed to simplify the handling and shorten stopping times. Read E-News Weekly 6/2003.

World Digest of Inaugurations

Austria. The 9,919 m west bore of the Plabutsch tunnel on the Pyhrn highway A9 was officially inaugurated on 29th January prior to opening to traffic on 30th January at 0:00 o'clock. Construction started on 19th July, 1999 and cost €142 million, 25% of which on safety equipment. There are fire niches every 116 m and SOS call niches every 212 m. Renovation of the east tube will take place from February to October 2004. This will cost €16 million. Since 1987, more than 100 million vehicles have crossed through the east tube. Visit www.asfinag.at and www.tunnelbuilder.com, at/22.