

Brazil



Name: Brazilian Tunnelling Committee (CBT)

Type of Structure: CBT is a committee of the Brazilian Society for Soil Mechanics and Geotechnical Engineering (ABMS). It is an open society based on membership

Number of Members: 254 Individual Affiliate Members and 23 Corporate Affiliate Members.

ASSOCIATION ACTIVITIES DURING 2018 AND TO DATE

Events:

CBT Talk, March - Lawyer Júlio César Bueno, from Pinheiro Neto Advogados, Legal criteria for the geological - geotechnical risks division in large infrastructure contracts and projects involving underground works of tunnels. São Paulo.

March, 14th - Posthumous homage to Don Deere and Richard Bieniawski. Attended by 50 people, including representative from ISRM, ITA, ABMS, ABGE and CBMR.

CBT Talk, April, 19th - Serra do Cafezal Tunnels. Talks about the Project, by the owner and designer. 110 participants. São Paulo.

May, 23rd - Young members event. Tunnel monitoring from the space. Invited companies IDS Brasil and TRE Altamira, represented by geologist Carolina de Athayde and engineer Javier García Robles. São Paulo.

June, 14th - Echo from the Dubai event. Event for local associates to hear from those that attended WTC in Dubai. São Paulo. 45 participants plus 100 participants online.

June, 23rd - Young members, site visit with 15 participants to line 4 São Paulo Subway.

July, 6th - Workshop organized by WG12 - Recommended Practices for Fiber Reinforced Concrete, by professor Antônio Figueiredo. São Paulo.

July, 18th - Lecture: shotcrete: cement/additive compatibility, microstructure and mechanical properties. By professor Antônio Figueiredo, USP, São Paulo.

July, 19th - CBT joined 10th International

Symposium on Field Measurements in Geomechanics - FMGM, Rio de Janeiro, with the section Civil tunneling: instrumentation and quality assurance, 100 participants.

August, 02 and 03rd - Course. Practical aspects on tunnel construction. By engineers Sergio Martins and Julio Di Dio Pierri. São Paulo.

September, 13th - Contractual tunnel practice seminar. Brasilia, DF.

October, 10th - Lecture: Practical and theoretical aspects on tunnel boring machines, with Herrenknecht AG.

October, 18 and 20th - Young Members, Lectures at Santo André Engineering Foundation. Santo André, SP. During academic week from civil engineering course. Attended by 50 participants.

October, 22nd - Young Members, Lecture at Mackenzie University. Innovation on underground excavation. By Fernando Abreu.

November, 08th - Round table about risks on underground projects. By: Luiz Guilherme de Mello, Eloi Angelo Palma Filho, Fernando Leyser Gonçalves, Marcio de Souza Santos, Pedro Teodoro França and Tiago Ern. With 77 participants. São Paulo.

November, 28th - CBT attended Summit

M&T Expo 2018, with 2 presentations: New technologies and equipment for underground mining, by Odilon Mendes from Normet, and TBM evolution on mechanized tunnels, by Edson Peev, from Herrenknecht AG. São Paulo.

December, 4th - Tunnel Day. More than 160 participants plus 60 online participants on this already established event organized by CBT. 2018's topic was shotcrete on underground construction. Realized in São Paulo.

Publication - Journal: Soils & Rocks (www.soilsandrocks.com.br), in English, published by the Brazilian Society for Soil Mechanics and Geotechnical Engineering (ABMS), the Brazilian Association for Engineering Geology and the Environment (ABGE) and the Portuguese Geotechnical Society (SPG). Three issues are released per year. As a sample, the following papers were published in 2018:

- Volume 41, N. 2, May-August 2018

<http://www.soilsandrocks.com.br/soils-androcks/SR41-2.pdf>

Case Study - Stability Assessment in Underground Excavations at Vazante Mine - Brazil L.T. Figueiredo, A.P.Assis 203 DOI: 10.28927/SR.412203

WG: no activities

CURRENT TUNNELLING ACTIVITIES

Due to the economic crisis in Brazil the year of 2018 was quite weak regarding infrastructure activities. Our numbers of tunnels show that roads and mining are the main areas for the length drilled during 2018. Nevertheless the services tunnels, mainly in sanitation projects, are also being constructed.

FUTURE TUNNELLING ACTIVITIES

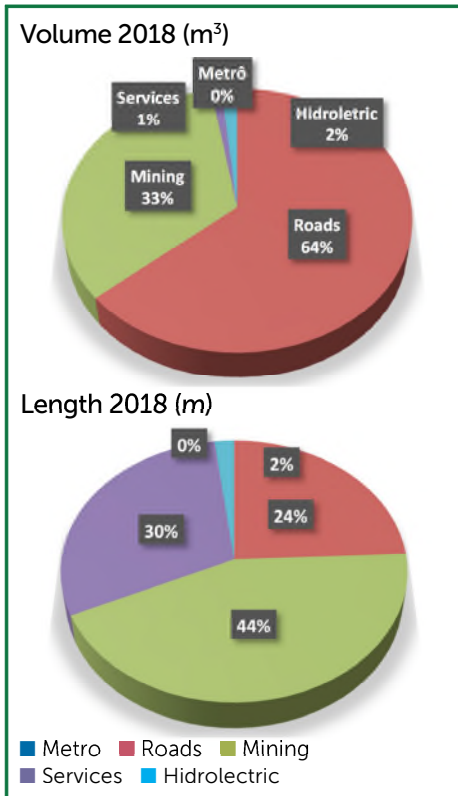
Metro de Fortaleza is one of the projects expected for 2019, and the ring road around Florianópolis. There are a number of unfinished tunnels to be continued,



Gal Costa Avenue, Salvador BA, tunnel 4 and 2.

please check the list in the box.

The economic activity is expected to improve in 2019, and it should reflect directly on the tunnelling activity. But we cannot give numbers for it.



STATISTICS

- 1. Length: total 56.094m (30% mechanized and 70% conventional)**
- 2. Volume: total 1.446.706m³ (1.1% mechanized and 98,% conventional)**
- 3. Amount (US\$ or EUR) of tunnelling/underground space facilities awarded in 2018: estimated US\$ 330.000.000,00**
- 4. List of tunnels completed**
Rodoanel Norte SP, Avenida Gal Costa Salvador BA Túnel 1, Avenida Gal Costa Salvador BA Túnel 2, Avenida Gal Costa Salvador BA Túnel 3, Avenida Gal Costa Salvador BA Túnel 4, Marginal Pinheiros, PCH Itapocuzinho 2, Pilar de Goiás, Mina Corpo Pequizaõ e Ingá.
- 4. List of tunnels under construction**
Metrofor CE, Nova Tamoios SP, Contorno de São Sebastião SP, PCH Rabo do Macaco SC, Coletor Tronco Cidade Nova RJ, Projeto TIETE SP, Programa Pró-Bilings, Coleta de Esgoto Rio Grande da Serra, Coleta de esgoto Goiás, Coleta de esgoto Rio de Janeiro, Coleta de esgoto Santa Cruz, Coleta de estogo Barueri, Projeto Tietê, BR 116 Serra do Cafezal, PCH Quebra Dentes RS, PCH Vila Galupo PR, Mining in MG and BA.

EDUCATION ON TUNNELLING IN THE COUNTRY

No undergraduate courses in Brazil focus on tunnel yet. Some universities have one or two disciplines related to underground construction, like Makenzi, USP, UNB. On post graduate courses, our references in Brazil are Brasilia Federal University and São Paulo University, São Carlos Engineering School. Efforts to spread the knowledge in tunnelling are carried out mainly by CBT.

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- Concrete class of C40/50 (f'c 48 MPa) at 28 days age, with a stripping strength of 14 MPa. Residual strength was specified to 3.2 MPa at l/150 according to ASTM C1609.
- The solution has proven very robust, with no issues during transportation, handing, launching, installation and shoving processes.
- The 100% BarChip fibre reinforced segments are the first of their kind to be used in North America.



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