Tunneling the Metro do Porto - Under Pressure in Porto Granite

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Abstract:
The tunnels of the Porto Metro Light Rail project form the heart of the new 70km transport system for the Metropolitan area of Opono, Portugal. Linking the historic central Trindade district with Vila Nova de Gaia to the South and Povoa do Varzim and Maia to the North and to the east Gondomar, this ambitious project got off to a rocky start. Following a tragic incident which resulted in the death of a member of the public and linked to the TBM excavation, the works were halted. The client, construction manager and contractor were forced to take a fresh look at their respective roles and then to take the necessary actions imposed by a government appointed Commission of Inquiry. The Commission outlined the steps required by all concerned so that tunneling could recommence. This paper will provide a general overview of the project, discuss the events leading up to the fatal collapse, treat the steps that were required to recover from the tragic events and conclude with the various solutions adopted, including the controversial use of Earth Pressure Balance techniques in rock, finally resulting in the successful completion of tunneling in late 2003.

Keywords: Porto Granite; project organization; Line C; Line S; commission of inquiry; granite under pressure; the PAT document; apparent density; belts scales; real time monitoring; fundamentals of earth pressure balance tunnelling; final observations.