MRT Downtown Line Stage 3

Geophysical survey for pile length determination, using mise-à-la-masse, parallel seismic, and fluxgate magnetometry methods

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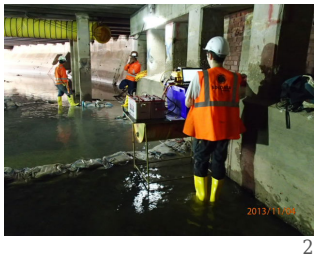
Singapore, Singapore
Started in 2013, 2 months

1



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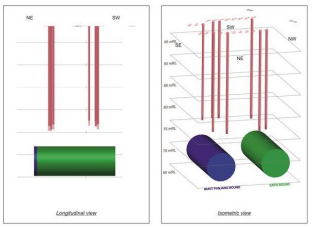

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The Downtown Line is the fifth Mass Rapid Transit line in Singapore and the third line to be entirely underground. It will connect the North-Western and Central-Eastern regions to the new downtown of Singapore. At about 42 km long, it will be the longest driverless rapid transit line in Singapore, and it will serve more than half a million commuters daily. Stage 3 will aid commuters going to the industrial areas in the East.

As per part of the specifications of the stage 3 contract No. C935, SOLDATA Geophysic was asked by the LJH joint venture to conduct a borehole geophysical survey to determine the length of 8 Nos. piles located in the tunnel vicinity.

These piles are supporting a traffic bridge and a pedestrian way crossing above the Rochor canal. To ensure proper tunnel excavation management, existing pile length had to be determined as they may be in conflict with the future tunnel works.

In accordance with the aim of the study, three methods were implemented, each focussing on a different physical characteristic:
• Mise-à-la-masse method
• Parallel seismic method
• Fluxgate magnetometry

The use of three different methods allows a conclusion to be drawn even if one of the proposed methods reveals itself to be inefficient due to unexpected geological conditions or other reasons. Parallel to the boreholes, the mise-à-la-masse results clearly showed electrical conductive structures and the parallel seismic results showed structures with high seismic velocities.

These structures were interpreted to correspond to the tested piles. The toes of these structures were detected and these results allowed the contractor to make a judgement on the expected length of the piles in the area of the tunnel.

Land Transport Authority

John Holland - Leighton Joint Venture

"We are pleased that our TBM has successfully passed through the Rochor canal bridge's foundation without any problem, following the conclusive geophysical survey." Tunnel engineer, LJHJV

Legends
1. MRT Downtown Line: the site
2. Execution of mise-à-la-masse method
3. Results obtained

Key figures
– Mise-à-la-masse (ETW): electrical resistivity contrast between soil and steel rebars
– 8 Nos. piles tested using combination of methods
– Parallel seismic (SFP): seismic velocity contrast between reinforced concrete and soil
– Tests performed from 6 Nos. boreholes drilled from existing Rochor Canal tunnel
– Fluxgate magnetometry (MGF): ferromagnetic properties of steel rebars
– Geology below canal: fluvial & marine sediments lying on Old Alluvium formation