

Geotechnical Engineering Seminar
Friday, March 7, 2008
Mason 142A, 12:00-1:00pm

Application of Ground Penetrating Radar to Detect the Grouting behind the Lining Segments of Shield Tunnel

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ABSTRACT:

The metro line in Shanghai, China is increasing currently at a speed of 20 km per year. By 2010, when Shanghai will host the World Exposition, a rail network with a total length over 400 km will be completed. The metro lines are constructed by using the shield tunnel method where tunnel boring machines are employed to excavate the soil or rock strata. In the shield tunnel method, after the lining segments are placed, the grouting mortar is injected behind the segment to strengthen and stabilize the tunnel structure. Since tunnel is a long flexible structure in the longitude direction and subjected by dynamic loads, uniformity and quality of the grouting has a great influence on long-term settlement. Current settlement control method is to carry on the second time grouting in the place where settlement has already happened.

To improve the effectiveness of the grouting treatment, real time geophysical monitoring is desired. In this work, Ground Penetrating Radar (GPR) was applied to detect the distribution of grouting before operation. GPR is a viable approach since: 1) detecting objects (concrete segments, grouting and soil) are in the depth of one meter or less; 2) dielectric parameters can be obtained from lab; 3) there is enough contrast in the dielectric properties among these three materials; 4) concrete segments has an even thickness of 35cm and only the boundary between mortar and soil needs to be detected. Among the three GPR frequencies 250 MHz, 500MHz and 1GHz used in the field tests, frequency at 500 MHz shows the most promising results.

BIO:

Fengshou earned his B.S. in Civil Engineering and M.S. in Geotechnical Engineering from Tongji University in China in 2004 and 2007, respectively. He is currently in his first year as a Ph.D. student at Georgia Tech working under the supervision of Dr. Haiying Huang.