The Incident Due to Shield Tunneling and Its Restoration

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ABSTRACT

In this paper, two accidents due to shield tunneling and its restoration are reported. In the first part of this thesis, the case history associated with the geological conditions, causes of failure, and restoration related to the shield tunneling of Taipei Rapid Transit Systems（TRTS） Panchiao Line lot CD266 is investigated. Based on the field data, mechanical properties of Superjet-Midi（SJM）soilcrete are found.

1. SJM method can cause larger soilcrete column in the ground, and reduce the time for grouting.
2. Core recovery of samples varies from 90% to 99%, which is higher than the design requirement of 80%. Rock Quality Designation（RQD）of the specimen varies from 79% to 97%.
3. The uniaxial compressive strength q_u of the sandy soilcrete varies from 3.65 to 22.6 MPa, which is greater than the design requirement of 3.0 MPa. The q_u for clayey soilcrete varies from 1.88 to 10.0 MPa, which is higher than the design requirement of 1.0 MPa.
4. The modulus of elasticity of soilcrete varied from 350 to 1990 MN/m^2.
5. The permeability of soilcrete changes from 3.2 to 6.6 $\times$ 10^{-7} cm/sec, which is significantly lower than the design requirement of 10^{-5} cm/sec.

In the second part of this thesis, the heaving of runway of Song-Shan Airport due to tunneling with a shield machine for TRTS lot CB420 is investigated. It is found that, the mud injection pressure at the face, backfill pressure, and secondary grouting pressure are significantly greater than the limiting values assured for construction. The mud injection pressure at the face was even higher than the vertical overburden pressure（5.1 kgf/cm^2）. The fluid ejected to the ground surface was found to be the same as the mud injected at the face. It is reasonable to expect that, the amount and injection pressure applied to the mud at the face was too much high. The excess pressure in the ground causes an upward flow of fluid. The flow produces upward acting forces on soil layers and runway. The escaping grout tends to flow through localized cracks, and lift up the runway of the airport.