

Mechanism of Sinkhole Development on Water-Bearing Soft Ground Tunneling

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Abstract : Underground excavations in an urban area can cause various geotechnical problems such as ground loss and lowering of groundwater level. When the ground loss becomes uncontrollably large, sinkholes can be developed to the ground surface. A sinkhole is commonly known as the natural phenomenon associated with lime rock areas. However, sinkholes in urban areas due to pressurized sewers and/or tunneling are also frequently reported. In this study, mechanism of a sinkhole developed at the site 'A' where a tunneling work underwent is investigated. The sinkhole occurred in the sand strata with the high level of groundwater when excavating a tunnel of which diameter is 3.6 m. The sinkhole was progressed in two steps. The first step began with the local failure around the tunnel face followed by tons of groundwater inflow, and the second step was triggered by the TBM (Tunnel Boring Machine) chamber opening which led to the progressive general failure. The possibility of the sinkhole was evaluated by using Limit Equilibrium Method (LEM), and critical height was evaluated by the empirical stability chart. It is found that the lowering of the face pressure and inflow of groundwater into the tunnel face turned to be the main reason for the sinkhole.

Keywords : limit equilibrium method, sinkhole, stability chart, tunneling

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