

論 文 内 容 の 要 旨
Abstract of Dissertation

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One of the problems in urban cities nowadays is congestion. Underground space is a common alternative solution. In this case, the shield tunnelling is an effective method to build the underground space. Because it is efficient for minimizing disturbances to surroundings. In this method, segmental tunnel lining is commonly used. The lining is a primary structure because it supports surrounding ground and maintains the tunnel opening during its service life, and provides functions for the construction. Even though segmental lining is widely used in the shield tunneling method, in both the research and practice of tunnel lining design, the ground–lining interaction at the boundary between ground and lining in the tangential direction remains unclear; that is, the mobilizing shear stress due to load models and the degree of the bond in the tangential direction. Therefore, in this study, to investigate the effects of the tangential ground–lining interaction on segmental lining behavior and lining sectional forces under the various soil stiffness and the shallow and deep tunnels, a parameter study is carried out using a beam-spring model and ground springs, taking tangential spring stiffness, load models, coefficient of subgrade reaction, and overburden depth as parameters. The influence of the tangential ground-lining interaction parameters on lining behavior and their mechanism were clarified for a wide range of ground stiffness and deep/shallow tunnels. As a result, it was found that 1) the tangential spring constant has small effects on bending moment in the segment; 2) the initial tangential earth pressure due to the load model has significant effects on the sectional forces; 3) the initial tangential earth pressure and smooth slip boundary between ground and lining provide more safety from the viewpoint of design; and 4) in case of shallow tunnel in soft ground, tensile stress appears in the lining. Therefore, it is important to take the tangential ground-lining interaction conditions into consideration during tunnel lining design, since these conditions give much influence to bending moment in segmental lining.