

論 文 要 旨

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主論文題名 Geotechnical Research for Impacts of Groundwater Level on Ground Deformation in Bangkok, Thailand (バンコクにおける地下水位が地盤変動に及ぼす影響に関する地盤工学的研究)			
内容の要旨 Changing groundwater levels is a phenomenon that led to changes in ground displacement and pile-bearing capacity. The main causes of groundwater level change are groundwater pumping and soil characteristic. Their effect on the ground displacement rate settles rapidly. In Bangkok and urban areas, Thailand is also. The Thai government solved the land subsidence problem by controlling groundwater pumping. The groundwater level has a trend to recover to the ground surface. The soil strength during groundwater level recovery is fascinating when groundwater level recovers. Therefore, this research focuses on the behavior of ground displacement and pile-bearing capacity in groundwater level recovery to the ground surface. So, the objectives of this research are: to clarify the behavior of 1D consolidation during groundwater level change during both groundwater drawdown and groundwater recovery, to predict the possible behavior of ground displacement and pile-bearing capacity during groundwater recovery, to evaluate the effect of ground displacement base on the Terzaghi's one dimension consolidation theory and to verify and compare the results of ground displacement and pile bearing capacity between centrifuge test, PLAXIS3D and the previous research by another researcher. So, this research methodology separates to be three parts: the theoretical calculation method, the geotechnical centrifuge test and the Finite Element Method (FEM) by PLAXIS3D software. The theoretical calculation analyses only the stage of groundwater level recovery. The ground displacement rate can be 0.001 cm/yr. to 0.35 cm/yr. The centrifuge test determines three different stages of groundwater level as changing groundwater levels characteristic in Bangkok plain. The centrifuge test results showed that the ground displacement rate is 0.01 cm/yr. The PLAXIS3D result shows that the ground displacement rate continuously occurs at about 0.09 cm/yr., but the ground displacement is lower than the groundwater drawdown. The ground displacement results are not different between the centrifuge test and the PLAXIS3D test. Additionally, the results of PLAXIS 3D software confirm that the suction value has little effect during groundwater recovery. The pile bearing capacity presents by the results of the geotechnical centrifuge test and the results of PLAXIS 3D software. Following the result of the centrifuge test, the loading at the recovery groundwater level stage is more than at the groundwater level decrease. On the other hand, pile settlement in the recovery groundwater level stage has the highest settlement rate by the load and pile settlement relationship. The centrifuge test shows a maximum decrease in bearing capacity of about 25% at the groundwater level equal to the ground surface. In contrast, the results of PLAXIS3D show that the pile-bearing capacity decreases by about 8.33 percent. The soil strength results between the centrifuge test and PLAXIS3D software have a similar trend in each test during groundwater level change. All the results can summarize the effect of ground displacement and soil strength depending on the time-consolidation stage and soil characteristics.			

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