Soft Ground Improved by Prefabricated Vertical Drains with Vacuum and Thermal Preloading

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Abstract : This study focuses on behaviors of improved soft clay using prefabricated vertical drain (PVD) combined with vacuum and electro-osmotic preloading. Large-scale consolidations of reconstituted soft Bangkok clay were conducted for PVD improvement with vacuum (vacuum-PVD), and vacuum combined with heat (vacuum-thermo-PVD). The research revealed that vacuum-thermo-PVD gives high efficiency of the consolidation rate compared to the vacuum-PVD. In addition, the magnitude of settlement of the specimen improved by the vacuum-thermo-PVD is higher than the vacuum-PVD because the assistance of heat causes the collapse of the clay structure. Particularly, to reach 90% degree of consolidation, the thermal-vacuum-PVD reduced about 58% consolidation time compared to the vacuum-PVD. The increase in consolidation rate is resulted from the increase in horizontal coefficient of consolidation, Ch, the reduction of the smear effect expressed by the ratio of the horizontal hydraulic conductivity in the undisturbed zone, kh, and the horizontal hydraulic conductivity in the smeared zone, ks. Furthermore, the shear strength, Su, increased about 100% when compared using the vacuum-thermal-PVD to the vacuum PVD. In addition, numerical simulations gave reasonable results compared to the laboratory data.

Keywords : PVD improvement, vacuum preloading, prefabricated vertical drain, thermal PVD
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