CHAPTER V

DISCUSSION OF TEST RESULTS

5.1 Effects of temperatures on consolidated-undrained strength

The laboratory test results indicate that as the heating temperature is increased, the maximum effective stresses of the clay which have the natural water content ranging from 82.82 % to 63.44 % decreases for every tested cell pressure. This clay has the liquidity index ranging from 1.244 to 0.703. The strength parameters C and $\emptyset$ of this clay are also decreases with the higher testing temperature. However, the clay that possesses the liquidity index less than 0.5 (natural water content ranges from 45.63 % to 28.56 %) shows the increasing of the maximum effective stresses and also the strength parameters with the same testing conditions.

The change of maximum effective stresses of Bangkok clay with the increasing of heating temperatures may be explained on the characteristics of diffuse double layer of the clay particals. These diffuse double layer were explained by Yong and Warkentin (19) that the colloidal clay particles compose mostly of negative charges at the surface and attract the outer exchangeable positively charged cations. The exchangeable cations are not all held in a layer right at the clay surface, but are present at some average distance from the surface. The electrical force between negatively charged surface and positively charged ions attracts the cations to the surfaces, but their thermal energy makes them diffuse away from this space with a high ion

concentration. The balance of electrical attraction and thermal diffusion leads to a diffuse layer of cations, with the concentration highest at the surface and gradually decreasing with distance from the surface. This is often called the diffuse double layer inwhich one layer being the negative charges in the clay crystal or its surface, and the other layer being the diffuse layer of cations balancing the negative charge. After the clay sample is heated for a period of time, some of the thermal energy would increase the boundary of these diffuse double layer. The higher the heating temperature the bigger the diffuse double layers is resulted. The clay that possesses higher natural water content has larger spacing between the particles. The increasing in the size of diffuse layer would increases the repulsive force between the particles. Hence, the particles could be easily slipped away from each other under shearing force. Therefore, both strength parameters are decreased which results in decreasing effective stresses. The situation is not the same for the clay with the liquidity index less than 0.5 which were consolidated to same degree. This clay has smaller particles spacing. The increasing in the sizes of diffuse layer would permit the overlapping of double layer which induces some bound between particles. The shear strength parameters would then increase and also the effective stresses.

5.2 Effects of temperature on consolidation

At the same consolidation pressure, an increasing in temperature gives the increasing of the void ratio and the decreasing of coefficient of consolidation (Cv) at 90 % consolidation for all tested clay. These phenomena may be explained as follows. Because of the increasing of the diffuse double layers due to the increasing of heating temperature, the free water between clay particles and the drainage channels between particles are reduced. This free water is the part of water that can be drained out of the soil. Hence, at the same consolidation pressure the quantity of drained water of the clay samples are decreased. This phenomenon makes the void ratio which varies inversely with quantity of drained water to increase with the increasing of heating temperature at the same consolidation pressure. With the decreasing of the quantity of drained water and the drainage path between clay particles, the settlement of the clay which varies with the quantity of drained water is decreased and takes longer time to move through the narrower channels between the particles. Hence, the coefficient of consolidation, which gives the rate of settlement of the clays, is decreased with the increasing of the heating temperatures for the same consolidation pressure. These phenomena hold for all tested samples.