Phermphorn Buathong 2014: Stability Analysis of Excavated Slope Stabilized by DCM columns: Case Study and Parametric Analysis. Doctor of Engineering (Civil Engineering), Major Field: Civil Engineering, Department of Civil Engineering. Thesis Advisor: Associate Professor Warakorn Mairiang, Ph.D. 239 pages.

Recently, Deep Cement Mixing (DCM) columns have been used for permanent slope stabilization in several projects. However, the guideline for design and construction are not well developed. This research presents field observation, laboratory tests and numerical analysis.

Suvarnabhumi International Airport Drainage Canal project applied more than 300,000 DCM columns for stabilizing the canal slopes and roadway. The field observations showed that several failures occurred as the excavation of canal almost reached its proposed level.The failure modes were ranging from sudden failure, delay failure and creep type failure. The remedial solutions were additional DCM column, construction of counterweight berm, filling of surcharge water and arranging of construction sequences. The measured field lateral movements were used to determine elastic modulus of soil. The FEM back analysis indicated that the hardening soil model with $E_{50} = E_{oed}$ = 3,000-60,000 kPa and E_{ur}/E_{50} = 3 resulting the lateral movement close to the field measurement. The Mohr-Coulomb model with E_u/S_u = 300-1000 can also give a reasonable prediction result. The numerical analysis of one row of DCM columns found that the L_x/L = 0.29 to 0.86 and L_e/D_e = 3.6 were effective to give maximum Factor of Safety (FS). The numerical analysis of multi-rows DCM column revealed that L_e/D_e = 3 can provide the maximum FS. For both types, the FS of slope increased with decreasing DCM column spacing. Therefore, the spacing design is depended on the required FS. The analysis revealed that the perfect tangential columns were quite effective to control lateral movement and provide high FS. The possible alternative DCM arrangements are also studied for the comparative designs and further recommendation.

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