ハノイ市における繊維質材料混合流動化処理土の埋戻し地盤への適用に関する研究

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Abstract

In this study, the applicability to back fill ground by Liquefied Stabilized Soil (LSS) mixed with fibered material in Hanoi city of Vietnam has been investigated. Research works including experiment and analysis have been conducted simultaneously aiming to promote the application of LSS in Vietnam in the coming time.

(1) Effect of time-dependency on strength and deformation characteristics of LSS mixed with fibered material was evaluated. A series of Consolidated–Undrained triaxial compression tests with measured pore water (CUB tests) under the various conditions at constant strain rates, constant deviator stress, and strain rates changed during monotonic loading have been carried out for LSS mixed with fibered material content of 0 and 20 kg/m^3 at curing time of 28 and 56 days, respectively. Based on the test results, it was found that the effect of time-dependency is not seen in stress-strain curve independently of curing time.

(2) The difference in triaxial shear property of LSS mixed with fiber material cured in laboratory and at field was investigated to be carried out a series of CUB tests for both specimens of LSS mixed with fiber material amount of 0 and 20 kg/m^3 prepared by trimming LSS retrieved from a model ground by block sampling and cured in laboratory at curing time of 28 and 56 days, respectively. Based on the test results, it was found that the maximum deviator stress in q~ε_a relations of LSS mixed with fiber material cured at field tend to be larger than that cured in laboratory, and the brittle property of LSS after the peak in q~ε_a relations has been improved to ductile property by the addition of fiber material even in field.

(3) In-situ stiffness of backfilling ground reinforced with fiber was investigated by using of portable Falling Weight Deflectometer at curing time of 28, 56 and 84 days, respectively. The stiffness was estimated by Young's modulus $E_{P.FWD}$ calculated from $K_{P.FWD}$-value. In parallel, in order to comparing with the tangent Young's modulus E_{tan} obtained from q~ε_a relations, a series of CUB tests have been carried out for specimens prepared by trimming LSS retrieved by block sampling from the model ground. It is considered that the $K_{P.FWD}$-value is able to estimate the stiffness of backfilling ground by LSS reinforced with fiber.

(4) A procedure for prediction of train-induced vibration from railway tunnels in conformity with condition of Vietnam has been established as an example for Hanoi metro line No.3. The vibration propagation from the tunnel into the ground surface was analyzed by the 2-D FEM. The numerical results in terms of vibration velocity allow estimating the vibration velocity level, and then it is applicable to the prediction of train-induced vibration. The calculated vibrations indicated to be higher than the allowable threshold, therefore appropriate measures should be taken to decrease these vibrations.

(5) Using the established procedure, mitigation of train-induced vibration as using LSS for backfill ground of cut and cover tunnel was evaluated. If the LSS can mitigate the ground vibration, it will be a new advantage, and then LSS will be promoted more to use especially in metro projects in Vietnam. Thus, it is considered that LSS has an effective potential in mitigation of the train-induced vibration.

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