

Evaluating the Small-Strain Mechanical Properties of Cement-Treated Clayey Soils Based on the Confining Pressure

Authors : Muhammad Akmal Putera, Noriyuki Yasufuku, Adel Alowaisy, Ahmad Rifai

Abstract : Indonesia's government has planned a project for a high-speed railway connecting the capital cities, Jakarta and Surabaya, about 700 km. Based on that location, it has been planning construction above the lowland soil region. The lowland soil region comprises cohesive soil with high water content and high compressibility index, which in fact, led to a settlement problem. Among the variety of railway track structures, the adoption of the ballastless track was used effectively to reduce the settlement; it provided a lightweight structure and minimized workspace. Contradictorily, deploying this thin layer structure above the lowland area was compensated with several problems, such as lack of bearing capacity and deflection behavior during traffic loading. It is necessary to combine with ground improvement to assure a settlement behavior on the clayey soil. Reflecting on the assurance of strength increment and working period, those were convinced by adopting methods such as cement-treated soil as the substructure of railway track. Particularly, evaluating mechanical properties in the field has been well known by using the plate load test and cone penetration test. However, observing an increment of mechanical properties has uncertainty, especially for evaluating cement-treated soil on the substructure. The current quality control of cement-treated soils was established by laboratory tests. Moreover, using small strain devices measurement in the laboratory can predict more reliable results that are identical to field measurement tests. Aims of this research are to show an intercorrelation of confining pressure with the initial condition of the Young modulus (E_o), Poisson ratio (ν_o) and Shear modulus (G_o) within small strain ranges. Furthermore, discrepancies between those parameters were also investigated. Based on the experimental result confirmed the intercorrelation between cement content and confining pressure with a power function. In addition, higher cement ratios have discrepancies, conversely with low mixing ratios.

Keywords : amount of cement, elastic zone, high-speed railway, lightweight structure

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