Abstract of Doctoral Thesis

Title：A STUDY OF COMPACTION PERFORMANCE AND QUALITY MEASUREMENT SYSTEM OF LIGHT COMPACTION MACHINES

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In earth works, the quality of compaction work on soils is a critical determining factor of structural quality, and careful execution is thus crucial, especially at narrow sites where light compaction machines must be employed. In such cases, ground settlement may cause unfavorable conditions such as unevenness of ground at junctions with adjacent structures or foundations. However, studies on works using light compaction machines have fallen behind those involving heavy compaction machines, and consequently, decisions at actual sites such as machine model selection and layer thickness determination are often based on unscientific criteria such as worker experience and availability of machines. The present study attempts to present a rationalized scheme for light-compaction machine works at narrow sites.

First, light-compaction machines were categorized by structure, and the representative specifications and features for each category were identified by examining the models available domestically. Next, to define the compaction performance, actual machines were operated in an experimental narrow site created within the test pit of the Public Works Research Institute. Then, a performance index of compaction work that can be calculated from machine specifications was formulated, focusing on the stress in soil generated by light vibrating-plate compaction machine. The applicability of the index was validated in the test pit, and some actual work situations are examined. A validation experiment was also carried out in the test pit on a newly-available system that employs an accelerometer for efficient compaction quality measurement at narrow-sites. Finally, a new method for compaction quality estimation based on the running speed of a light vibrating plate compaction machine was developed through numerical calculations and test-pit experiments.
It is hoped that the results of the present study will contribute to rationalized model selection and layer thickness determination, as well as efficient compaction quality measurement, in works using light compaction machines.