Working characteristics of concrete-cored DCM piles under embankments

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Key objective

To illustrate the load transfer characteristics and settlement control mechanism of concrete-cored DCM piles under embankments

Key methodology

Long time field tests were conducted with the installation of settlement plates, multipoint settlement gauges, inclinometers, piezometers, pressure transducers, and steel stress meters

Major aspects investigated

1. To compare the foundation treatment effect between concrete-cored DCM pile and conventional DCM column.
2. To investigate the load transfer law of concrete-cored DCM pile under embankment.

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Key conclusions (1)

- Based on PLT for a single pile, the ultimate bearing capacity of the concrete-cored DCM piles is more than three times that of the DCM column composite foundation. It is shown that the concrete-cored DCM piles yield a stiffer foundation than the conventional DCM columns.

- Compared to the DCM column site, the concrete-cored DCM piles bear more upper load, and there is less embankment loading acting on the surrounding soil. Consequently, the excess pore pressure in the concrete-cored DCM pile composite foundation is lower than that in a conventional DCM column composite foundation.

- Under variable embankment loads, negative friction occurs at the upper section of the pile. The distribution law of skin friction of concrete-cored DCM piles under embankment loading is different from the result using PLT.

Key conclusions (2)

- Post-construction settlement of the concrete-cored DCM pile composite foundation is 37.0% (Site A), 68.3% (Site B), and 27.3% (Site C) of the post-construction settlement of the conventional DCM composite foundation (Site D). Moreover, the lateral displacement ratio of the concrete-cored DCM pile composite foundation is 0.12 (Site A), 0.09 (Site B), and 0.17 (Site C), smaller than that of the conventional DCM composite foundation (Site D). This indicates that the concrete-cored DCM pile-supported embankment performed better because it induced less deformation in both vertical and lateral directions under embankment loading.

Key conclusions (3)

- The field study indicates that concrete-cored DCM piles provide a viable and technologically sound solution for soft ground improvement under embankment loads when compared with conventional DCM columns.

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