RESEARCH ON THE IMPROVEMENT OF SUBSTRUCTURE DESIGN FOR COST REDUCTION

Abstract : This study has developed design of buttered-pile foundations, integral abutments, and pile-to-pile cap connections. These will enable to reduce construction costs and life cycle costs of highway bridge substructures as well as to enhance the redundancy. We have proposed a method to estimate the sectional forces arising from consolidation loads to buttered piles in soft ground. The allowable ductility factor has been also proposed that has the same engineering back grounds as those of RC piers, metal piers, and other types of foundations. The integral abutments are one of the structural types of jointless abutment. Seismic design for soil liquefaction effects and durability of the connection between girder and abutment stem have been enthusiastically studied based on past case histories and some numerical attempts. Finally, we have proposed a draft design and construction manual for integral abutment bridges. In terms of pile-pile cap connection, we conducted experiments of pile-pile cap specimens with grouped piles or single piles. The experimental results showed the failure mechanism of grouped-pile foundation systems and we have proposed a new connection details that can achieve the required seismic criteria and reduce the distance between pile to pile cap edge.

Key words : cost reduction, battered pile foundation, integral abutment, bridge approach structure, pile cap