

INVESTIGATING THE APPLICABILITY OF DIFFERENT STRUCTURAL CONFIGURATIONS FOR BRIDGE/ VIADUCT PIER IN LOCAL EXPRESSWAY

Ganaatheban M.* , Hidallana-Gamage H.D. and Indrajith W.P.R.

Department of Civil Engineering, University of Moratuwa, Moratuwa

In Sri Lanka, pile with tie-beam is commonly used as the substructure in most of the expressway bridges. Even though pile with tie beam may seem to be cost effective, the reliability of the substructure in some soil conditions, may be quite low. So, a study on this situation is helpful to identify a suitable structural configuration for substructure in terms of structural and economical aspects. For this study, a bridge on the Central Expressway which has pile with tie beam configuration, was considered and 4 other possible configurations which consist of piles and pile cap, were identified with the help of codes and some textbooks. Applicability of all five structural configurations were assessed under 3 different soil profiles, which could be seen at some locations of the Central Expressway, Sri Lanka. The assessment comprises of three major components. First one is geotechnical assessment and then, structural analysis and design, followed by cost analysis. All configurations were subjected to geotechnical assessment under all 3 soil profiles and configurations that showed satisfactory results, were considered in subsequent steps. With the help of Midas civil2020, variation in the internal forces at critical locations of the bridge were obtained and studied to obtain a proper understanding in the selection of suitable configurations. In order to reinforce the selection, a cost analysis was carried out after the detailed design. During this procedure, it was noticed that greater stability and serviceability contribute to the huge material usage in proposed alternatives than in existing configuration under selected soil profiles. Thus, proposed alternatives are more expensive than existing configuration. However, the main concern of this research is to ensure the structural stability in weak soil conditions, while making it economical. So, considering all aspects, it can be concluded that pile caps can be used with friction piles conveniently for weak soil conditions if proper controlled driving of piles can be ensured.

Keywords: pile; tie beam; pile cap; end bearing

* Correspondence: 160162d@uom.lk