Non-linear analysis of an integral bridge

ABSTRACT

This study describes the implementation of a 2-D finite element model of an integral abutment bridge (IAB) system which explicitly incorporates the nonlinear soil response. The superstructure members have been represented by means of three-node isoparametric beam elements with three degrees of freedom per node. The soil mass is idealized by eight node isoperimetric quadrilateral element at near field and five node isoparametric infinite element to simulate the far field behavior of the soil media. The non-linearity of the soil mass has been represented by using the Duncan and Chang hyperbolic model. The applicability of this model was demonstrated by analyzing a single span IAB. This study has shown that the soil nonlinearity has significant effect on the response of the structure, where the displacement that have been obtained on basis of nonlinear analysis is 1.5–2.0 times higher than that obtained from linear analysis. The stress magnitudes in the nonlinear analysis are also higher where in some point the difference reached almost 3 times.