ABSTRACT

Title

"Relative influence of soil-structure interaction effect and seismic input motion in long curved bridges"

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It has been already shown through recent research worldwide that not only the frequency content but also the incidence angle of earthquake excitation may play significant role in the response of structures especially in the case of irregular buildings or curved bridges (Sextos et al. 2004). However this phenomenon is not taken into account in all current codes (E39/99, EC8-Part 2). Along these lines, the scope of this study is to investigate the potential influence of the excitation direction of seismic motion in the case of long, curved bridges, using the most refined finite element model affordable in terms of computational cost. For this purpose, Krystallopigi bridge (Paraskeva et al., 2006) is chosen and modeled using the general purpose finite element program ANSYS. Krystallopigi bridge is a twelve span structure of 638m total length that crosses a valley, as a part of the 680Km EGNATIA highway in northern Greece. The deck, the piers and the piles are modeled as 3D beam elements as well as the piers are supported on pile groups of length and configuration that differs between support points due to the change of the soil profile along the bridge axis, an issue that has been accounted for in the modeling of the system. The abutments, embankments, and pile caps together with the entire soil volume are modeled using solid elements. As for the boundary conditions, appropriate dashpots are implemented on the lateral surfaces to diminish reflections of waves along these boundaries. Seismic input motion was defined in terms of displacements acting at the bedrock level after deconvolution process of specifically chosen natural accelerograms. The parametric study of different ground motion scenarios performed, highlights the complexity of the phenomenon and the difficulty in determining a 'critical' angle of excitation for all response quantities and all piers at the same time. However, the dispersion of the results obtained indicates that the error induced in seismic design when ignoring the influence of the direction of seismic excitation and the role of the soil-foundation system may be significant under certain circumstances.