COMPARISON BETWEEN THE NUMERICAL AND EXPERIMENTAL DYNAMIC RESPONSE OF A BRIDGE PIER MODEL STRUCTURE AT THE VOLVI – GREECE EUROPEAN TEST SITE

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ABSTRACT

This paper presents the results of the measured response of a model structure which is constructed at the Volvi – Greece European Test Site for Earthquake Engineering, in particular, a single bridge pier specimen built for the purposes of the currently running Euroseis-Risk program, which is supported by the European Union. Despite the disadvantages of being unable to produce significant in-situ levels of ground motion, when desired, as can be generated by an earthquake simulator, this is in part compensated by the realistic foundation conditions, which are present for this model structure that is supported on the soft soil deposits in-situ. The current extension of the in-situ facility includes the possibility of subjecting the model structures to low to medium intensity man-made excitations (i.e. a number of simple pull-out test) as well as explosions.

The main objective of the recent tests, which is discussed in this paper, is to identify influences on the dynamic structural response arising from the flexible support conditions. This paper describes the preliminary activities undertaken for the optimal design of the model structure and the subsequent set of parametric and sensitivity analyses that were performed in order to ensure that a) the forces available on site are adequate to trigger soil-structure interaction phenomena b) the frequency of the man-made excitation is such that could optimize the presence of damping of the coupled soil-foundation-structure system and c) that the foundation dimensions would be designed in a way that would prevent the, unfavorable at this stage, effect of rocking while remaining within the scale of the rest of the model structure. Along these lines, successive finite element analyses have been performed using alternative FE codes and the results of the optimization procedure have been compared with theoretical solutions. The experimentally observed response is aimed to be compared with numerical simulations at various stages of the construction process. Having captured the main in-situ dynamic characteristics of the model structure a level of agreement is established that allows for the numerical prediction under the aforementioned pull-out tests and explosions.

References

Keywords
Dynamic and Seismic behavior, In-situ testing and monitoring, Soil-foundation-structure interaction

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