



STUDY OF THE DYNAMIC RESPONSE OF A BRIDGE PIER MODEL STRUCTURE AT THE VOLVI – GREECE EUROPEAN TEST SITE

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ABSTRACT

This paper presents results of the measured and predicted response of a bridge pier model structure which has been erected at the Volvi-Greece European Test Site. The advantage at the Test Site is the realistic foundation conditions of model structures that are built there and are supported on soft soil deposits thus allowing the study of soil-structure interaction effects. This facility includes the possibility of subjecting large-scale model structures to low-to-medium intensity man-made dynamic excitations. After an initial laboratory testing of the bridge pier model under cyclic horizontal loads and the study of its cyclic post-elastic behavior, a series of low intensity excitations were performed at the test site for a period of two years. During this period, this model structure was in various configurations that included the presence or not of diagonal cables between the foundation and the deck, as well as the presence or not of extra mass at the deck, apart from the concrete slab. The deck acceleration response was recorded and was studied in the frequency domain in order to extract the most significant eigen-modes and eigen-frequencies for the various configurations of the pier bridge model. Moreover, an extensive numerical simulation of the response was also performed, including the flexibility of the foundation. Good agreement can be seen when the measured values are compared with the corresponding numerical predictions.

1. Introduction

Although the effect of soil-structure interaction on the dynamic response of typical residential or commercial structures and infrastructure (i.e. bridges, Kawashima 2000) has long attracted scientific attention, it is widely recognized that there is an urgent need for further experimental support and validation. This need is far more crucial in cases where the structure responds inelastically and/or the soil conditions favor the appearance of SSI phenomena. For these reasons, significant effort has been undertaken within the context of a number of projects, that has been continuously funded by the European Union for the last decade (Manos 2004, Pitilakis 1999, <http://euroseis.civil.auth.gr>). These projects were carried out at a large “natural”

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