ABSTRACT

Inelastic behavior in pier of bridge

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This dissertation constitute an effort of numerical simulation of an experimental model that was developed in the Laboratory of Strength of Material in the department of Civil Engineers In this order, the experimental model was a simulation of an existing pier, that was constructed in the area of lake Volvi for the EUROSEISTEST program. To summarize, focus of this dissertation was :

- Verification or convergence between the experimental and numerical results of the previous dissertation, in relation with new simulations that was developed in different program.
- Approximation of the characteristics of dynamic soil – structure – interaction.
- Investigation of the dynamic response of the pier.
- Appreciation of the influence of soil of the foundation on the response of structure.
- Comparison of the responses between a fixed bridge and a bridge with spring foundation.
- Extraction of final conclusions.

This dissertation begins with the investigation of the reliability of the experimental and numerical simulations of the previous dissertation. The possible unreliability of the experimental model is due to its small dimensions. Due to small dimensions, the seismic waves are trapped. Instant result of this phenomenon is to influence the response of the model under dynamic and seismic loads. On the other hand, the unreliability of the numerical model is due to the difficult simulations of soil as a n element without tensile strength. In a next level, the efforts are focused on the convergence between the numerical and experimental results of the previous dissertation and new numerical simulations in a different program (ABAQUS). In this

stadium, it is not tried to correct the problems that were described, because the focus was the convergence of the results. In a next stadium, it is tried to improve the model for an effort to approach the natural phenomenon. It is imported in the simulations the inelasticity of the soil and the geometrical non-linearities that are developed in the pier, such as the sliding and the rocking of the foundation. From this investigation it is extracted a formula M-θ, which include all the phenomenon that were described. This relation is imported in a model of a real bridge, and the results of this analysis are compared with the results of an analysis, that the pier of the bridge is fixed.