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Keywords

Soil-structure interaction, large-scale, field testing, foundation impedance functions, rubber-soil mixtures

Figures

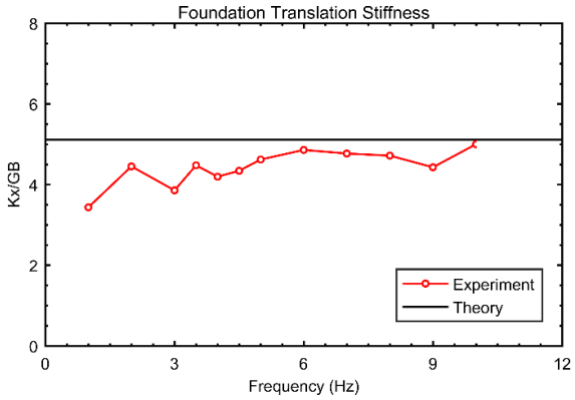

Figure 1. Comparison of experimental and theoretical horizontal foundation impedance function for horizontal translation

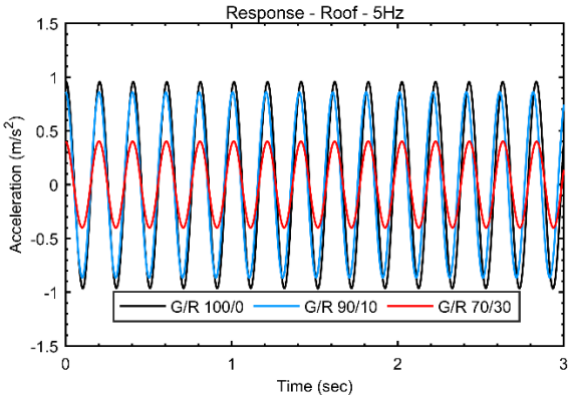

Figure 2. Influence of gravel (G) to rubber (R) per weight ratio mixture configuration in the recorded acceleration response of the roof

Main Results

Different projects were proposed and diverse tests were performed at the EuroProteas structure in Euroseistest: validation of 3D wave propagation models, calculation of foundation impedance functions, definition of design spectra considering soil-foundation-structure interaction, evaluation of 3d complex site effects, evaluation of the impact of structural rocking, foundation rocking isolation methods, investigation of rubber-soil mixtures as innovative isolation material, guidelines for metabarriers of seismic material, and investigation of scour effects.

Figure (a) shows the achieved comparison between the horizontal impedance functions from experimental recordings and from theoretical solutions (Pais & Kausel 1988) for a wide range of frequencies. Matching is satisfactory especially for frequencies between 2Hz and 10Hz.

Figure (b) shows the effect of the implementation of a rubber-soil mixture below the foundation on the recorded response at the roof of EuroProteas. The tested configurations have Gravel-to-Rubber weight ratios equal to 100/0, 90/10 and 70/30. A 50 cm thin layer of gravel-rubber mixture below the foundation with a gravel-to-rubber ration of 70/30 was found to cause a 60 % decrease in the recorded acceleration amplitude at the roof.

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List of Publications

Pitilakis, D., Vratsikidis, A. (2017). Dynamic system properties from real-scale free-vibration soil-structure interaction experiments. In Proceedings of the 7th International Conference on Advances in Experimental Structural Engineering. Pavia, Italy.

Vratsikidis, A., Pitilakis, D. (2018). Full-Scale Free- And Forced-Vibration Experiments At The EuroProteas SSI Facility: Experimental Data Exploitation. In Proceedings of the 16th European Conference on Earthquake Engineering, Thessaloniki, Greece

Pitilakis, D., Vratsikidis, A. (2018). Damping Calculation from Free-vibration Experiments At The Real-scale Structure Of EuroProteas. In Proceedings of the 16th European Conference on Earthquake Engineering, Thessaloniki, Greece.

Gatti F., Touhami S., Lopez-Caballero F., Pitilakis D. (2018). 3-D physics-based numerical investigation on the earthquake ground motion coherency in heterogeneous soil deposits. In Proceedings of the 9th Conference on Numerical Methods in Geotecnical Engineering, Porto, Portugal.

Vratsikidis A., Pitilakis D. (2019). Soil mass participation in soil-structure interaction by field experiments in EuroProteas. In: Silvestri, Moraci, editors. In Proceedings of the 7th International Conference on Earthquake Geotechnical Engineering, Rome, Italy, p. 681–8.

Palermo, A., Zeighami, F., Vratsikidis, A., Cheng, Z., Pitilakis, D., Marzani, A. (2019). Design of a medium-scale test for the assessment of a resonant seismic barrier within the ReWarD Project. In Proceedings of the 15th International Conference on Dynamical Systems - Theory and Applications, Lotz, Poland.

Access to Data and Services

All recorded data from the tests in EuroProteas and Euroseistest will be made available through the dedicated SERA-TA data portal (www.dap.series.upatras.gr).