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Experimental Investigation of Industrial Hall Structures in the Full Scale

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Summary

This paper deals with a part of the integral report prepared within the framework of the project: Attesting of the Static and Dynamic Stability of Typified Moduli of the Hall Program of the Precast RC Structural System "AMONT-Krusce, Yugoslavia". In this phase of the project, adequate field experimental studies were performed by applying the method of measurement of ambient vibrations in order to define the dynamic characteristics of four different structures constructed according to this structural system. For the future application, more successful analytical modeling of this structural system is made possible based on the obtained experimental results.

Keywords: precast structure; ambient vibration method; dynamic characteristics.

1. Introduction

This work represents a part of the integral report prepared within the framework of the project: Attesting of the Static and Dynamic Stability of Typified Moduli of the Hall Program of the Precast RC Structural System "AMONT-Krusce, Yugoslavia".

For the purpose of definition of basic dynamic characteristics of constructed structures of precast hall program "AMONT-Krusce" an experimental nondestructive method based on measuring of ambient vibration has been applied. By use of this method resonant frequencies can be registered, that is corresponding vibration periods, and can be determined damping coefficients as well as shapes of vibrations at the defined resonant frequencies. These measurements are carried out at already constructed full-scale structures, so that obtained results reflect the real state of the structure. The results are the needed base for real analytical modeling of the structure that has to be done as a part of the analysis of seismic stability of the structure.

Complete processing and analysis of the obtained experimental data have been carried out and a part of the results from the investigation is presented in this paper.

2. Testing results

The integral report contains results from the performed experimental tests on the dynamic characteristics of four structures constructed according to the “AMONT” system. A part of testing results in the form of Fourier spectra for measured ambient vibrations is shown in Fig.1.

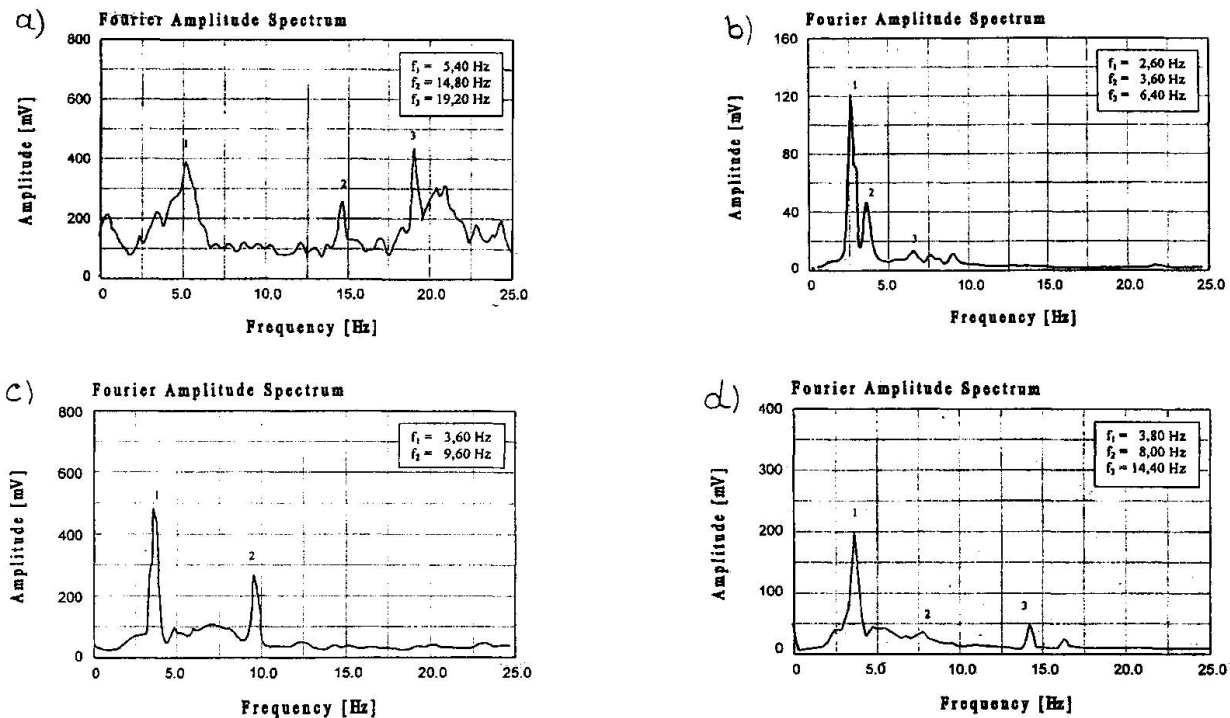


Fig. 1 Fourier spectra for measured ambient vibrations in transversal direction for: a) one-bay one-story structure; b) and c) two different two-story structures with two bays in the second story level, one without filling walls and the other with filling walls, respectively; d) two-story structure with one bay in the second story level.

3. Conclusion

Taking into account the integral results of defined real dynamic characteristics of chosen representative halls constructed in “AMONT” structural system, the following can be stated:

- Correct mathematical modeling and analysis is made possible based on the results of measured real dynamic characteristics of constructed buildings for the purpose of the future application.
- Very divergent opinions about the achieved “level of rigidity of connection” of some precast structural elements, which before has led to parametric analyses and fluctuation of results, are avoided now.
- Very useful information about influence of masonry and other finishing elements on dynamic characteristics of two similar two-floor structures for two different phases of construction is obtained.
- It is important to note that measured values are direct indicators only of the “initial” dynamic characteristics, which can be significantly changed after the first cracks, and particularly after the connections come into nonlinear range of behavior.