

Nondestructive Elastic-Wave Tests of Foundation Slab in Office Building

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1 Introduction

The paper deals with the modern nondestructive elastic-wave testing of concrete in foundation slab in a very important office building put under the ground water level. After the construction water has appeared in lower level of the building. The reason for the tests was to find the place where water gets for building, and also check the technical condition of the foundation slab to take a decision about the range of repairs to be done to the foundation slab or about their strengthening.

2 Nondestructive Tests

The primary test methods were: Ultrasonic Tomography, Impulse Response and Impact-Echo technique⁽¹⁻⁴⁾. The auxiliary methods were: the electromagnetic method and the ultrasonic method. About 100 m² of foundation slab were tested at a time. Statistical tools were used to handle the results (unpublished) of the comprehensive nondestructive testing. On the basis of an analysis of the results, in particular the tomography images (fig. 1) and the distribution of the amplitude-frequency spectra of elastic waves (fig. 2) the damage was found. The damage had the form of cracks running along the foundation slab and delamination of the reinforcement concrete.

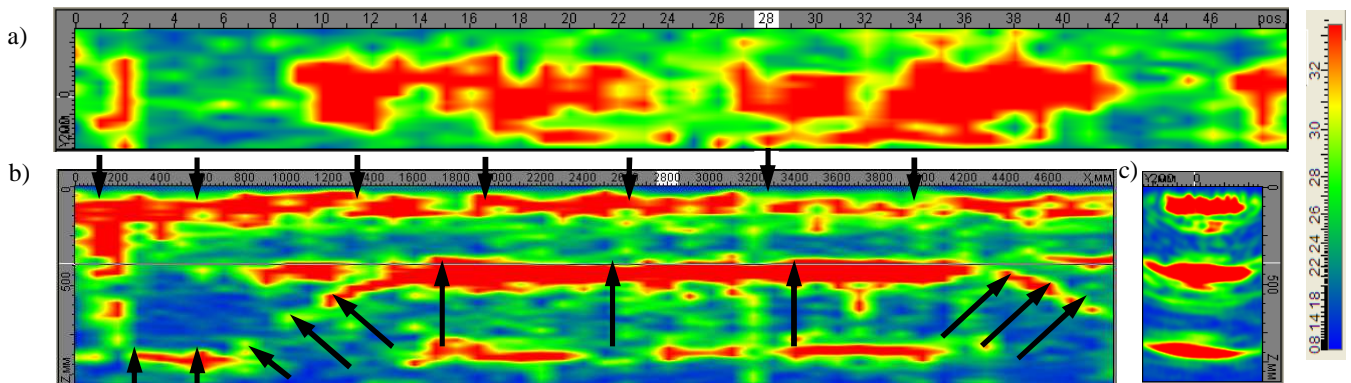


Fig. 1. Images of the foundation slab: a) C scan, b) D scan, c) B scan

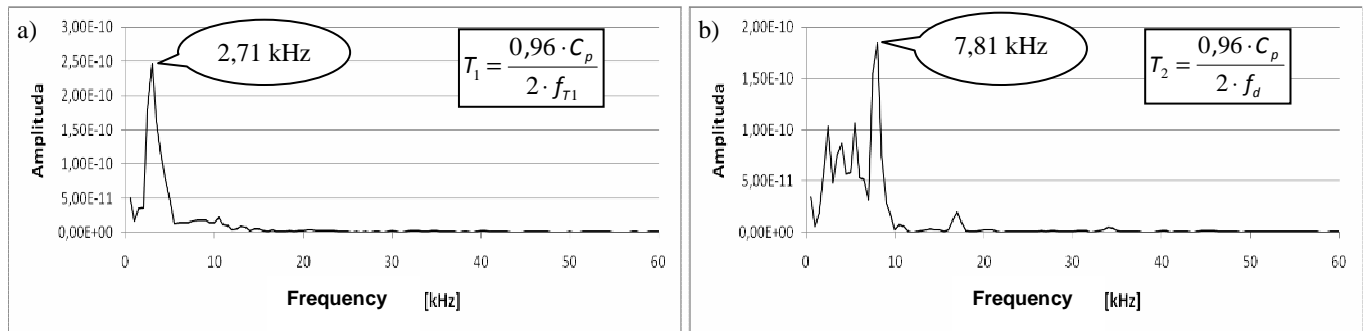


Fig. 2. Elastic wave amplitude-frequency spectrum when: a) no delamination defect is present, b) delamination defect is present

The depth of cracks were measured, the places of delamination were found, the thickness of slab did not conform to the design and zones of concrete containing honeycombing were identified. The results of the nondestructive tests and the analyses were corroborated by exposures.

3 Conclusion

The investigations of the foundation slab in the office building by means of three state-of-the-art nondestructive methods, i.e. the ultrasonic tomography impulse-response method and the impact-echo method, have demonstrated that the methods can be successfully used in combination to locate defective areas and delamination.

References

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