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Protection to railway traffic noise in the case of a multilevel residential building from the city of Cluj-Napoca

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Abstract

The paper describes how was measured the noise level at the façade of a multilevel residential building from the city of Cluj-Napoca, Romania. The building has two sides parallel to the railway situated at a distance of about 20 m from it. Because of the small distance the noise level produced by the trains is much over the admitted limit at the building's façade and therefore it was necessary to design a noise protection barrier between the building and the double railway to fully meet the fundamental requirement applicable to constructions "insulation to noise". The aim of the acoustic design presented in the paper was to ensure that the noise level measured at 2 m from the building façade respect the noise design standards from Romania, which are in full agreement with the European norms.

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1. Introduction

The paper describes how was measured the noise level exceeding the admissible limit at the façade of a multilevel residential building from the city of Cluj-Napoca, Romania. The residential building is situated in

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Răsăritului street in Mărăști neighbourhood and it is V shaped. In the area where measurements were performed, the building has two sides parallel to the railway situated at a distance of about 20 m from it. Because of the small distance and because the railway is in embankment, the noise level produced by some of the trains exceeds 90dB, much over the admitted limit at the building's façade provided in [1] which is $L_{\text{equivalent}} = 50\text{dB(A)}$. The area under study from 73 Răsăritului street and subjected to railway noise is marked in Fig. 1, taken from [2].



Fig. 1. Satellite View for 73 Răsăritului Street from Cluj-Napoca, Romania.

When measurements were performed, the residential building was in the construction process, and its structure was already ended. The height regime of the building is Garages + Basement + Ground Floor + 4 Floors. The structure of the building contains reinforced concrete frames and diaphragms, and the external walls are made of a 20 cm thick gas formed concrete layer, a 10 cm mineral wool insulation layer and another layer of 10 cm of gas formed concrete. The windows have a PVC joinery and are triple glazed (Fig.2).



Fig. 2. The residential building in 73 Rasaritului street: (a) – south façade; (b) - north façade; (c) - the train as seen from the north façade.

All these features of the closing elements aimed at reducing the external noise entering the inside of the apartments; however, the very high level of noise produced by trains required the design and placing of a noise protection barrier between the multilevel residential building and the double railway.

2. Measurement performance

The acoustic measurements were performed with the high performance Bruel&Kjaer equipment from the Faculty of Civil Engineering of Cluj-Napoca composed of: a special software PULSE “FFT&CPB Analysis 7700” installed on a Dell laptop, PULSE Sound&Vibration Analyzer, type 3560B and a Microphone type 4189 provided with a tripod. To check up the measurements, a Voltcraft soundmeter was used; the measurements made with the two kinds of equipment presented very close values. The noise level outside of the building Leq [dB(A)] was measured during a period of time with a Bruel&Kjaer Hand - held Analyzer Type 2270. The acoustic measurements had as a main aim the determination of the noise level at the passing of the trains in front of the multilevel residential building along one of the two senses of traffic, as the railway was a double one. In the Cluj-Napoca Town Hall, there is a noise map [3] which contains a Plan of Action for the prevention and reduction of the environmental noise in the city of Cluj-Napoca; however, this plan does not contain specific issues, such as the residential building mentioned. Figure 3 presents images taken during measurements. The acoustic measurements were made according to [1] at 2 m away from the façade section of the residential building placed at 20 m from the railway.

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