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Jasur Rashidov
Tashkent Institute of Architecture and Civil Engineering
PhD candidate,
Tashkent, Uzbekistan

MEASURING SOUND INSULATION OF AIR NOISE

Abstract: *In this article described and systematized issues of organizing and conducting measurements of sound insulation of air noise with enclosing structures (soundproofing), requirements of normative and technical documentation of the Republic of Uzbekistan for measurement and processing of results considered.*
Key words: *Air noise, enclosing structures, measuring, sound insultion, laboratory conditions, normative and technical documentation, value.*
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Introduction

Use of building materials and structures in building acoustics suggests definition of their soundproofing properties. Measurement of insulation (sound insulation) of air noise by enclosing structures based on comparison of sound pressure levels in test (reverberation) rooms. To do this, the average sound of pressure levels measured and compared in successive frequency bands [1, 2,8]. When measuring sound insulation of enclosing structures in laboratory conditions, it is necessary to comply with requirements of normative and technical documentation of the Republic of Uzbekistan.

When performing acoustic tests, the following terms used with appropriate definitions. Isolation from air noise R, dB - a value characterizing the reduction of the level of air noise.

The actual airborne sound insulation R, dB is the tenfold decimal logarithm of the ratio of the sound power incident on the test sample to the total sound power transmitted in a low-level room, including bypass paths [3,4,5,6]. Airborne sound insulation (soundproofing) R, dB is the tenfold decimal logarithm of the ratio of the sound power incident on the test sample to the sound power transmitted through this sample.

The average sound pressure level in the room Lm, dB is the tenfold decimal logarithm of the ratio of squared sound pressure averaged in space and time to the square of the threshold sound pressure $p_0 = 20$ µPa. The given difference in sound pressure levels Dn, dB is the difference of the sound pressure levels averaged in space and time, created in two rooms by one or several noise sources installed in one of them.

Repeatability of the measurement results is value of embracing with 95% probability the absolute difference of the results of two measurements conducted in a short time interval and under the same conditions. The reverberation time T, s is the time required to reduce the sound pressure level in the enclosed space by 60 dB after the sound source is turned off. Sound insulation of the window unit RArpaH, dBA is the value used to estimate the reduction of the urban traffic flow by the window block.

The airborne sound insulation index Rw, dB is the value used to estimate the sound insulation of the structure by a single number and is determined by comparing the frequency characteristic of the air noise insulation R (f) with the special evaluation curve from [2]. Sample for testing product suitable technical characteristics of which completely correspond to the accompanying normative and design documentation submitted to the testing center (laboratory).

The product fragment is a part of the product reflecting its basic design features and soundproof characteristics. Frequency characteristic of airborne sound insulation R (f), dB - the value of insulation of

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air noise R in each of the one-third octave bands with frequencies Hz lying in the range of 100-150 Hz (in graphical or tabular form)[2,7,9,10].

Equivalent area of sound absorption A, m2 - surface area with a sound absorption coefficient equal to one, which would have the same ability to absorb sound, as well as all the combined surfaces of the enclosing structures of the test chamber.

Methods of research

Determine the sound pressure level; one or more microphones should be used. Measurements should be make in all one-third octave bands with average geometric frequencies of 100-31 50 Hz. The averaging time in the frequency range 100-500 Hz should be at least four s, and in the range 630-31 50 Hz - not less than 2 s. The loudspeakers in the measurement rooms must create a diffuse sound field. They should be located in at least two places in the high-level measuring room - in the corners at a distance of at least 2 m from the test object. The measuring microphone in rooms of high (HL) and low (LL) levels must be consistently installed in at least six points (at each position of the loudspeaker at three

points). The measuring points must be at least 1 m away from the surface of the enclosing structures, from each other and from the loudspeakers. The results of measurements represented by a protocol in the form of a table or a diagram for frequencies.

Measurement points corresponding to the measurement values must be connect to a straight line. According to the abscissa, the frequency should show in logarithmic scale; the ordinate should indicate the sound isolation values in decibels. The interval between the average one-third octave frequencies should correspond to 5 mm, between the values of the ordinate axis 1 dB - 2 mm. When printing a protocol, other scales of the diagram allowed.

Design points in production and auxiliary premises of industrial enterprises are chosen at workplaces and (or) in zones of permanent residence of people at a height of 1.5 m from the floor.

Evaluation of sound insulation by an auxiliary partition. When testing translucent enclosing structures, the insulation of air noise by the partition between HL and LL should be at all frequencies 6 dB higher than the value of the insulation value of noise transmitted directly through the test sample.
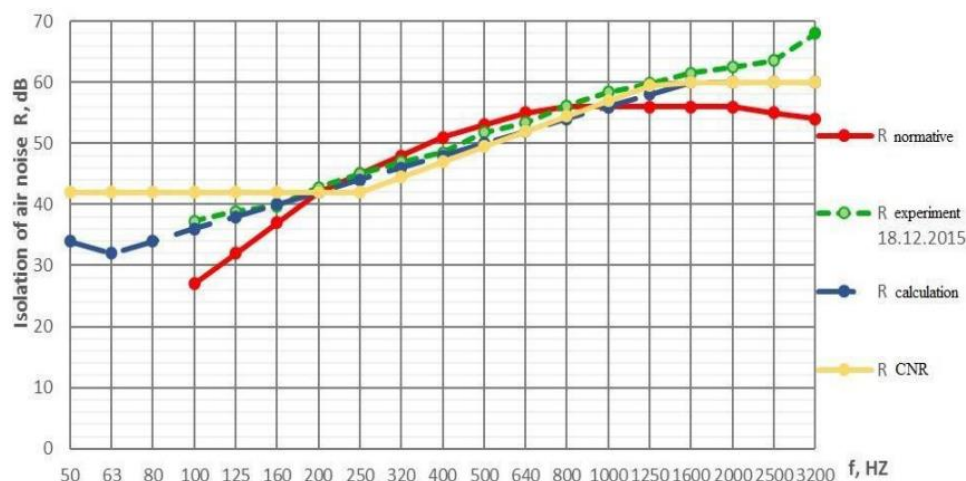

Fig.1.Frequency characteristics of sound insulation of air noise of silicate blocks with dimensions of 498x250x498 mm and density of 1800 kg / m³

Determine insulation of air noise by a partition, of silicate blocks with dimensions of 498x250x498 mm and density of 1800 kg / m³ is added to the test sample installed in it, so that it is flush with the partition. Slots between the additional layer and the test specimen should filled with sound absorbing material.

Perform measurements of noise insulation Rls if there is only a test sample in the opening of the auxiliary partition. Then, measurements are made of the insulation of air noise RIT after installation of an additional soundproof layer on the sample.

Results

When testing light-transparent enclosing structures, the test specimen installed in the test opening or inside the auxiliary partition. Slots between the auxiliary partition and the specimen to install in it must sealed with an elastic sealing material or special putty. Putty applied must meet requirements. The compliance of putty with these requirements achieved by conducting special tests.

Conclusion

Panel made of silicate block with a density of 1800 kg / m³, a modulus of elasticity of 7-104 N /

mm^2, a thickness of 10 ± 0.3 mm and a size of 498x250x498mm is mounted in the test opening between the HL and LL. All slots filled with putty of the chosen type and measurements made to determine the value of the noise reduction index (sound insulation) in one-third octave bands in the frequency range 1600-3150 Hz. First measurement should performed no later than 1 hour after the end of installation.

The measurement results must meet the following requirements:

1600 Hz ... R = (62.1 + 1.6) dB;

2000 Hz ... R = (64, b ± 1.2) dB;

2500 Hz ... R = (66.1 + 1.1) dB;

31 50 Hz ... R = (67.7 + 1.8) dB.

Repeated measurement should carried out after 24 hours. The deviation of the results should not exceed 0.5 dB.

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