MODERN METHODS OF REDUCTION OF NOISE OF ENCLOSING STRUCTURES IN THE REPUBLIC OF UZBEKISTAN

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Abstract - This article provides modern methods of isolating air noise by rational use of resources in the construction of residential buildings.
Index Terms - sound insulation index, air noise, enclosing structure,gypsum plaster, materials, KNAUF.

INTRODUCTION

Nowadays, the scope of sound coverage of all influential sounds, which can be transmit both by air and by rigid elements of building structures. Sound insulation properties of the wall of its thickness, mass, rigidity and proper construction.

An example can serve as a rule, lower because of the deviations in the erection. In contact with a wall or partition. Higher, maximum sound insulation attainment by an integrated approach, when all the shortcomings are taken into account [1,2,3,4].

Correctly determine the noise insulation index for enclosing structures, you should use the standard formula in which the decimal logarithms appear:

$$In = 32 \lg m + 2 \lg d \; 17 \text{ dB},: \qquad (1)$$

where,

- In – sound insulation index;
- m – surface density of wall material in kg / m ²;
- d –thickness of the air layer in the construction of the wall (multilayer wall).

If the calculated index is below the norm (41 dB) [1], then it is necessary to increase the thickness of the wall or choose a material with greater sound absorption.

With the help of this (1) formula, we determine the sound insulation index for the interior partition of 100 mm thick, using the example of the construction of a seven-story apartment house located in the Sergeli district.

Figure 1. Construction of new 7-storey houses in Sergeli district

The partition is constructed of cellular concrete blocks, whose density is 500 kg / m³. In order to obtain the parameter m necessary for the calculation, in this case it is necessary to multiply the total material density by 0.1 (10 cm = 0.1 m): m = 500 • 0.1 = 50 kg / m² surface density. Thus, it is possible to calculate the sound insulation index of air noise for a single-layer structure without an air gap. By reducing the formula known to us and substituting the values into it, we obtain:

$$In = 32 \lg 50 - 17 = 37 \text{ dB}. \qquad (2)$$

The lower permissible limit of sound insulation according to the standards is 41 dB, which is higher than the figure for our design. However, we counted only the building material without taking into account the finishing on both sides. If to use as a finishing plaster universal plaster (950 kg / m³), where we have a layer of 5 cm [5], it will increase the index of the surface density of the structure and with its account will be:

$$\mathbf{m} = 500 \cdot 0{,}1 + 950 \cdot 0{,}050 = 97{,}5 \text{ kg/m}^2.$$

Now calculate the index with a new parameter **m**:

$$In = 32 \lg 97{,}5 - 17 = 46{,}6 \text{dB} \quad (3)$$

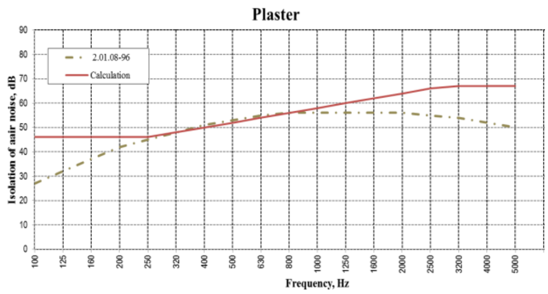

Figure 2. Graph of sound insulation using plaster universal plaster

Consequently, from fig. 2 we see that, according to the calculation (3), plastered on both sides with a layer of 5 cm, a universal gypsum plaster for a partition of 10 cm of cellular concrete with a density of 500 kg / m³, in its soundproofing properties already complies with the norms.

The sound insulation of any vertical enclosing structures affected by their mass. The heavier the wall, the less it is subject to vibrations, and consequently conducts sound worse. Thus, the best materials in terms of sound insulation is a solid ceramic, as well as hollow silicate brick, because they are the heaviest. At the septum of ceramic bricks with a thickness of 12 cm, the surface density will be 216 kg / m².

It should be borne in mind that, the openings and niches in brick and block walls reduce their mass, and thus worsen the soundproofing properties [4, 5].

In order to increase the sound-insulating properties of the partition, during the construction of the above-mentioned object, based on a "bed" was arranged, which was a lined solution liner covered with polyethylene film. It was necessary to take into account this meager layer with a different density to avoid refracting and scattering sound waves.

Laying on the film of the first row of wall elements was set so that the masonry solution filled all the cavities, and its layer was 1.5 cm. The wall from the floor screed also completely isolated by erecting it (the wall) on a film substrate and protecting it from the coupler with a foam polystyrene.

From the top, the partition not brought to the ceiling, but a gap of 1-1.5 cm was left, which was then filled with Knauf mineral wool with good sound absorption. This gap was also necessary in order to prevent transfer of load to the partition from the overlap.

With the bearing walls, the partitions were used in a traditional way - by placing in the masonry the anchors laid in the seams beforehand. At the junction of the septum and the supporting wall, the vertical seams were carefully filled with mortar.

Many modern wall materials are laid when filling only horizontal seams, and vertical ones remain dry, due to the presence on the lateral faces of the wall blocks of the groove-groove couplings. From the point of view of soundproofing, such masonry is less effective than with filled vertical seams. Therefore, in order to increase the soundproofing of the partition, all the seamswere filled without exception.

For placement of outlets and electrical wiring, as well as communication pipes in the walls, fines were applied. After laying wires and pipes, the fines were filled with plaster mortar to minimize losses in sound insulation. In turn, on the pipes before laying, porous shells of the appropriate diameter (strictly in size) were worn. These shells compensated for the temperature expansion of the pipes, and also excluded their direct contact with the walls, through the transmission of vibration.

Also, the location of water pipes and sewerage in the partitions between the bathroom and the living quarters was taken into account, measures were taken to thoroughly sound them. As a soundproof "clothing" for pipes of hot water supply and heating, foam polyethylene was used, followed by wrapping with mineral wool. This combination of material ensured the absence of air pockets that could form between the pipes and the wall as a result of reducing their diameter during cooling.

Plaster thickness of 8-15 mm on both sides of the wall has improved its soundproof properties by 2 ... 3 dB. The finishing of drywall sheets, which are fixed on cakes from mortar, is not recommended, since in this case the material will work as a resonating membrane, amplifying the sound. However, it is possible to improve the soundproofing properties of the brick wall with a pair of folded drywall sheets that tightly press a porous gasket against the wall, restraining the vibration of the skin.

The highest index of sound insulation has partitions, the design of which provides for the presence of an air layer, as well as a sound-absorbing layer of fibrous materials from KNAUF. Sound waves have the property of scattering at the boundaries of media with different densities. Therefore, the air layer, as it were, interrupts the movement of sound through the wall, refracts and dissipates it, and the second dense layer extinguishes already weakened waves.

During the experiment, the mineral wool was divided into an acoustic stream, reflecting it with the plane of a multitude of tiny fibers in different directions. If we used a skeleton partition, it would not be effective in terms of sound insulation if we simply fill the gap between the claddings with mineral wool, and especially foam, which does not have any sound-absorbing properties.

Therefore, our design had the following scheme: C 612 plating made by “Knauf” fibrous material-air interlayer-fibrous material-casing C 612 of KNAUF. In such a scheme, the fiber not only scattered the sound, but also suppressed resonant vibrations of the skin, and in the middle layer, there was the greatest loss of energy of the sound wave. Sound insulation at the same time was equally effective in both directions.

CONCLUSION

Consequently, the rational use of KNAUF's materials and effective solutions to isolate rooms from noise with the proper application of the foregoing technique of enclosing structures, provide a comfortable living environment..

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