Conclusions:

1. The main regulatory documents and recommendations for the design of FRP structures have been developed in the USA, Canada, Japan, Great Britain, Italy in recent years on the basis of the norms for the calculation of reinforced concrete structures made of steel reinforcement. Drafts of normative documents have been prepared in Ukraine and Russia.

2. The basic principles of calculation of elements with FRP are preserved as for reinforced concrete structures, taking into account the linear operation of FRP. The specificity of the work of FRP structures is taken into account by the introduction of special reducing factors for working conditions and the standardization of the characteristics of materials.

3. The issues of standardization of requirements for glass, organo and carbon fiber reinforcement have been worked out to a greater extent. The use of basalt-plastic reinforcement as prestressing FRP requires additional non-standardization.

4. The STO project developed in NOSTRO presents general design solutions and technological conditions, which mainly relate to geotechnical structures. There are no methods for calculating FRP structures and standardizing the design characteristics of such reinforcement in this document. In the Guidelines on the design and manufacture of concrete structures with FRP, recommendations are given for standardizing the characteristics of composite reinforcement based on basalt and glass roving.

UDK 699.844.1

EVALUATION OF THE EFFICIENCY OF PROTECTION AGAINST IMPACT NOISE OF EXPERIMENTAL FLOOR STRUCTURES

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Abstract. This article is devoted to an important problem of modern construction of multi-storey frame-monolithic residential buildings, namely the solution of the problem of sound insulation of premises from shock

noise. The article considers the structural and technological schemes of sound insulation of the floor of three types, using different materials to achieve regulatory requirements for sound insulation from impact noise. Field tests were carried out to determine the index of the reduced impact noise in a 24-storey frame-monolithic reinforced concrete building under construction.

One of the main disadvantages of high-rise buildings – noise. Both on the street and from neighbors around the house. Penetrating into the apartment, it causes irritation, sleep disturbance or focused work. It is no secret that high-quality sound insulation plays an important role in our lives and is necessary for our comfort. So, soundproofing is not a whim, but an urgent necessity. The problem of sound insulation of residential, industrial and office premises is becoming more relevant every year, which is primarily due to the growing number of noise sources, especially in large cities. Experts reveal the concept of sound insulation as a decrease in sound pressure when a wave passes through an obstacle: a wall, floor or ceiling. The sound wave in this case is the noise generated by dozens of sources, starting from the alarm of a car or a working machine and ending with water dripping from a loosely closed tap [1, 2].

Proper acoustics of residential premises has become an important stage of construction relatively recently. In order to reduce the cost of construction work, soundproofing of apartments was performed at a low level. However, today, after the adoption of new building codes, the requirements for permissible levels of noise, vibration and sound insulation of residential and public premises have increased significantly [3].

If the level of insulation of airborne noise of floor slabs is determined primarily by the massiveness and thickness of the floor slab, then in relation to the insulation of impact noise, the problem is always solved by additional structures.

Impact noise occurs when there is a direct mechanical impact on the floor. In the vast majority of cases, this noise is caused by the knocking of heels on the floor or moving furniture. Sound insulation of the floor is one of the most important problems of construction practice. It is almost impossible to provide normative requirements for impact noise insulation with the help of floor slabs alone. Thus, doubling the thickness of the floor slab increases the insulation of impact noise by only 9 dB, and the same increase in density, modulus of elasticity and loss factor increases the sound insulation by 4.5; 1.5 and 3 dB. At the same time it is necessary to consider that interfloor overlappings of all known types of apartment houses "do not reach" to standard values on isolation of shock noise, at least, on 18-22 dB. That is why in construction practice always use different designs of floors on an elastic basis, on logs with elastic linings, rolled energy-absorbing coverings [4].

The most important and most effective way to increase the insulation of impact noise, in terms of building acoustics, is a device of "floating" floor construction.

In the general case, the floating floor is a massive screed of concrete or cement-sand mixture, laid on the floor between the layer of elastic material. Floating floor screed should not have any rigid ties with the enclosing structures, so it is separated from the side surfaces of the walls and partitions by elastic gaskets (damping tape). As a material of an insulating layer, as a rule, plates from acoustic mineral wool on a basalt or fiberglass basis or various foamed polymeric rolled materials are applied.

The experiments were conducted in kind in the apartments of constructed buildings, in six apartments. Type 1 and type 2 structures between the fourth and third floors, type 3 structures between the fourth and fifth floors. For each type of sound insulation of the floor were allocated two apartments, for the feasibility of the results, and the exclusion of the error factor during the work [5, 6]. Structural and technological schemes of sound insulation of the floor were designed on the basis of the following materials:

- "Izolkap Fine" (polystyrene concrete with "Polyterm Fine" aggregate) – the facilitated dry mix for the device of a heat-sound-insulating coupler which belongs to a class of light concretes. The mixture consists of cement and aggregate – inert granules of expanded polystyrene (Ø 2-4 mm), with high thermal insulation capacity, treated with a special additive that helps to obtain a homogeneous mixture convenient for working with pumps and uniform distribution of the solution.

- roll material "Akuflex", which is based on specially treated polyester fibers, developed in accordance with the current requirements for acoustics of premises and working to absorb shock noise. The material is used as a sound-insulating substrate in the construction of floating floors, which is a layer between the screed and the floor finish (linoleum, laminate, parquet). In addition, Akuflex can serve as an elastic layer under the leveling screed for additional insulation from impact noise;

- sound-proof leveling coating "Styrofoam granules on elastic binder" is a ready-to-use granular mixture (granules Ø 6-8 mm) of elastic vibration-insulating material, which after application to the floor surface performs the function of sound-insulating gasket between the screed and the screed.

Thus, the following structural and technological schemes of floors were arranged, namely: Type 1 (56 mm – c/p screed M150, 4 mm – substrate "Akuflex", "Izolkap Fine" (polystyrene concrete with filler "Polyterm

Fine") – 20 mm, 180 mm – reinforced concrete plate), Type 2 (60 mm – c/p screed M150, 20 mm – "Styrofoam granules on elastic binder", 180 mm – reinforced concrete plate), Type 3 (80 mm – c/p screed M150, 4 mm – lining "Akuflex", 180 mm – reinforced concrete plate).

According to DBN B.1.1-31: 2013 "Protection of territories, buildings and structures from noise" the interfloor overlapping should have an index of isolation of air noise – $R_w \geq 52$ dB that is reached by a monolithic reinforced concrete overlapping at a thickness of 180 mm, and the index of the reduced shock noise under the floor – $L_{nw} \leq 55$ dB.

Impact noise insulation measurements were performed according to the methods of DSTU B B.2.6-86: 2009 “Structures of buildings and structures. Sound insulation of enclosing structures. Measurement methods ", DSTU B B.2.6-85: 2009 Constructions of buildings and structures. Sound insulation of enclosing structures. Assessment methods".

Results of field tests L_{nw}: Type 1 – 50 dB, 51 dB; Type 2 – 63 dB, 61dB; Type 3 – 60 dB, 59 dB.

Conclusions. Field tests of structures for impact noise allowed to choose the most rational option. Based on the indicators of the reduced impact noise L_{nw}, it is determined that the most effective design of sound insulation of the floor is – Type 1, which is 9.1% less than the regulatory requirements.

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