It is appropriate to note that in the city of Warsaw, as in other cities in Poland, there are many examples of canopies and the professional approach of architects and designers is felt. You can also give similar examples in Slovakia and England (Fig. 2a and b).

a) b)

Fig. 2. Charac examples in Slovakia and England

a) The most common canopy design on the remains in Slovakia

b) Characteristic look awnings associated with England

Conclusions. As a result, it is considered possible to recommend that the municipal services of Odesa limit the number of canopy designs for equipping stops, and for their design and construction, involve qualified architects, designers, constructors, as well as historians studying the development of the city.

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COMBINED HEAT AND SOUND PROTECTION OF FLOORS OF APARTMENT BUILDINGS

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Abstract. The possibilities of using gypsum-containing materials for thermal and acoustic protection of interfloor floors are considered. The properties of compositions with heat and sound insulating aggregates are investigated. Mathematical models of the properties are constructed, which are used to analyze the role of components in providing thermal and acoustic characteristics. A compromise-optimal composition with improved properties is proposed.

State of the problem. The growing need for heat and sound insulating materials in the construction sector is due to increased requirements for energy efficiency and comfort of buildings. The use of energy-efficient soundproofing materials for building envelopes, including floors, is a feature of the application of energy-efficient soundproofing materials, which makes it possible to solve the main tasks of reducing the penetration of heat and sound into the premises and at the same time reduce the consumption of basic building materials, energy intensity and construction costs.

However, the results of sound insulation analysis show that it is difficult to establish a simple link between acoustic and thermal insulation [1].

For traditional building partitions and flooring materials, the trends in thermal and acoustic behavior are opposite rather than unidirectional; technical measures and solutions that improve their thermal resistance often reduce the degree of sound insulation. Homogeneous co Homogeneous structures require sufficient surface mass to obtain good acoustic performance, while high porosity is necessary for good thermal resistance. Considering interfloor floors as horizontal partitions, it is possible to apply to them the general physical principles of heat and sound energy propagation and transmission in building envelopes and, accordingly, heat and noise protection methods, the most rational of which is the formation of an intermediate layer of the floor structure from multicomponent mixtures with an optimal compromise set of specific sound and heat insulating aggregates.

Relevance of the study. Thus, the research and development of multicomponent gypsum-containing materials, taking into account the multidirectional requirements for their composition and structure, which provide optimal performance properties for a given intended use, is relevant.

The purpose of the work is to create waterproof multicomponent mixtures of gypsum binders with aggregates intended for thermal and sound protection of interfloor floors by forming a base for floors.

Analysis of research and publications. Massive homogeneous walls made of concrete, ceramic bricks or silicate blocks usually have good sound insulation and low thermal insulation qualities. As a rule, increasing the density of the material leads to a deterioration in thermal performance, with the exception of lightweight insulating materials such as extruded polystyrene (EPS). The trend in acoustic properties is exactly the opposite; increasing surface mass provides better sound insulation. If there is any correlation between sound insulation and thermal resistance, it is negative.

When looking for a correlation, various parameters can be considered, material density or porosity, partition thickness, mass per unit area, thermal resistance or thermal permeability and various acoustic unit values. Various models exist for estimating the thermal conductivity of porous materials. Preliminary conclusions based on measurements made for various building elements show that some exponential relationship between thermal conductivity and density or porosity of the material can be obtained [2]. Thermal conductivity depends on the specific phase and configuration of the component, the confining matrix, aggregate, pore structure, moisture, etc., so the relationships are not general and apply only to a specific type of building material.

Correlation between thermal resistance and sound insulation is possible for monolithic, homogeneous and relatively thick walls of the same structure [3]. However, the thermal permeability of such walls is so high that, if they are used for exterior cladding, they require additional insulation. Massive walls with additional cladding behave acoustically differently than bare homogeneous structures.

Thermal insulation materials such as mineral wool or expanded polystyrene have poor sound insulation and should not be used alone as a separate acoustic barrier. Mineral wool, on the other hand, is advantageous when used as an absorber inside the cavities of lightweight frame partitions. EPS is not suitable for this purpose due to its poor sound absorption. According to the rule of thumb developed on the basis of previous experience, the sound insulation capacity depends mainly on the resonant frequency, the lower the resonance, the better the acoustic performance of the wall.

Considering interfloor floors as horizontal dividing partitions, it is possible to apply to them general physical principles of heat and sound energy propagation and transmission in enclosing structures and, accordingly, methods of thermal and noise protection, the most rational of which seems to be the formation of an intermediate layer of floor construction from multi-component mixtures with an optimal-compromise set of specific sound and heat-insulating aggregates.

Results. The optimal set of performance characteristics of materials for the base of floors is realized in compositions with a matrix base and combined aggregate [4]. Three types of aggregates were used. Spherical expanded polystyrene granules, when introduced into the composite material, are able to provide mainly thermal insulation properties and reduce the average density of the material. Cork chips were introduced to improve sound insulation characteristics and reduce thermal conductivity. The crushed foam glass played the role of structure-forming particles and should provide water resistance. Its function may also be to have a positive effect on structural, mechanical, and thermal and sound insulation characteristics.

In the planned experiment, samples of 14 compositions with different component contents were made and their properties were investigated. Experimental and statistical models were constructed based on the data of their properties.

A useful task is the multicriteria optimal design of the composite composition, in which, along with the standard requirements for composite materials for floors, it is especially important to reduce thermal conductivity and sound transmission for air and impact noise. For these performance characteristics, the level of importance (priority) was chosen to be the highest during optimization using the desirability function method.

Conclusions. The possibility and expediency of replacing traditional cement-sand screeds in the floors of apartment buildings with lightweight screeds made of waterproof gypsum materials with heat and sound insulating aggregates was confirmed. As a result of the optimization, the following compromise-optimal material compositions were established As a result of the optimization, the compromise-optimal material compositions for lightweight waterproof screeds for floors were established.

Comparison of the floor with a screed of the proposed composition with the traditional one shows that when replacing the cement-sand screed with a lightweight one, the heat transfer resistance increases by 15%, the sound insulation against impact noise increases by 12%, the mass of 1 m2 of floor is 32 kg less, and the heat absorption index decreases to 6.35 W/(m^2·K).

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