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TECHNOLOGY OF OBTAINING A THERMAL INSULATION LAYER FROM MONOLITHIC NON-AUTOCLAVED STRUCTURAL AND THERMAL INSULATION FIBROPEN CONCRETE

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1. Introduction

According to the requirements of building codes, the layers of pavement should not only perceive load, but also affect the change in the depth of freezing of the subgrade (that is, it is assumed that capacity of the device of the corresponding heat-insulating layer).

This leads to an increase in thickness pavement, and usually to an increase in the cost of building roads. The way out of this situation is the use of new heat-insulating materials with a low coefficient of heat transfer water content and sufficient bearing capacity.

At the same time, in the process of road construction, the volume of layers pavement should be the same as the volume of the removed soil of the earthen trough.

Materials in the construction of pavement are arranged according to the decrease in strength in accordance with attenuation in depth of stress from temporary load. Consideration should be given to stiffness and coefficient thermal expansion of adjacent layers of pavement, since with a large difference in their hiking cracks appear in the clothes.

2. Methods and materials

There are several basic methods for calculating and the thickness of the thermal insulation layers of pavement:

- the DOTROPS method is based on determining the thermal resistance of the pavement structure (used in the calculation of road structures in the CIS countries);
- the UTMCAAS methodology is based on the use of the coefficient moisture conductivity coefficient, which is determined experimentally (it is allowed to use when calculating pavement structures in the CIS countries);
- CCOASROTC methodology, which is based on the climatic characteristics of a particular region of the country (criteria for winter water accumulation under pavement and winter frost heaving) is recommended for use in Russia. This technique in its original form requires a significant number of additional calculations, therefore, to facilitate the calculation mechanism, the norms it is recommended to use a nomogram;
- the COPBTR method is based on the calculation of pavement by thermal resistance, taking into account the volume of the calculated air temperature and the depth of zero temperature amplitudes (this technique did not find wide application, since it requires a significant number of special parameters that are not are always given in sufficient quantity in the normative literature);
- the TIATDOS method, which is based on taking into account the depth of soil freezing and empirically determines lazy coefficients. The essence of this technique is to align the boundaries of the freezing of the earth canvases under the carriageway of the road pavement and along the sidewalk (roadside).

3. Results and discussions

If different pavement designs have the same heat transfer resistance and the same external temperature, and the temperature from the pavement is different, then we get:

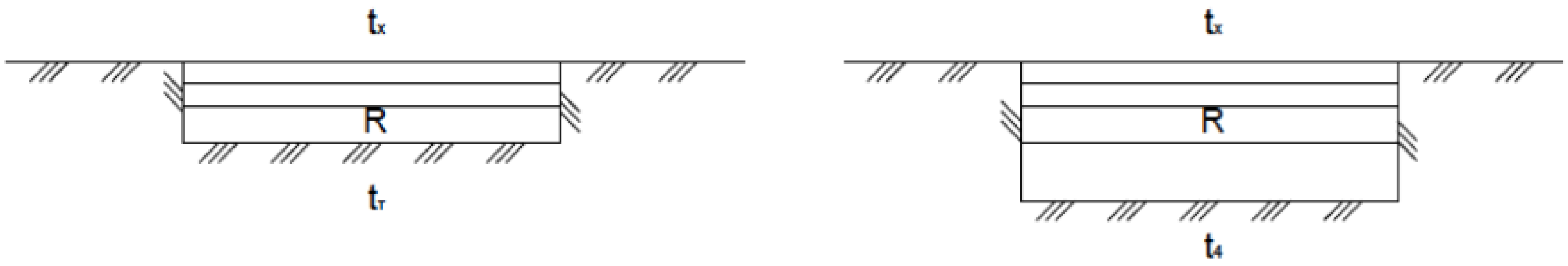

Figure 1. Diagram of two pavement structures with different temperature values on top of each
of the structures and different values of the heat transfer resistance of the structure.

The ratio of heat transfer resistance of various road structures is inversely proportional to the temperature difference on the outer and inner surfaces of these structures, that is, to the temperature difference on the surface of the pavement - the air temperature of the coldest five-day period for the region and the temperature of the subgrade of the pavement.

3. Results and discussions

In order to optimize the calculation algorithm for selecting the thickness of the heat-insulating layer from a monolithic of foam concrete reinforced with polypropylene fibers, nomograms have been developed. The calculation was carried out under the condition of ensuring the protection of the heat-insulating layer from moisture. The results of these studies are shown in Figures 3, 4.

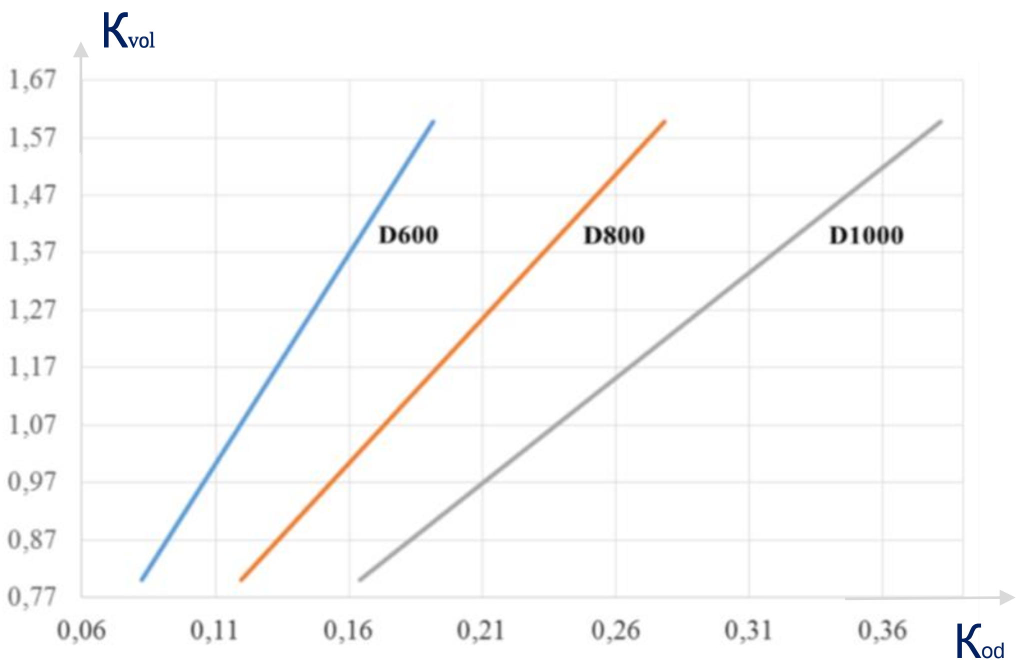

Figure 3. Nomogram for the base of sand.

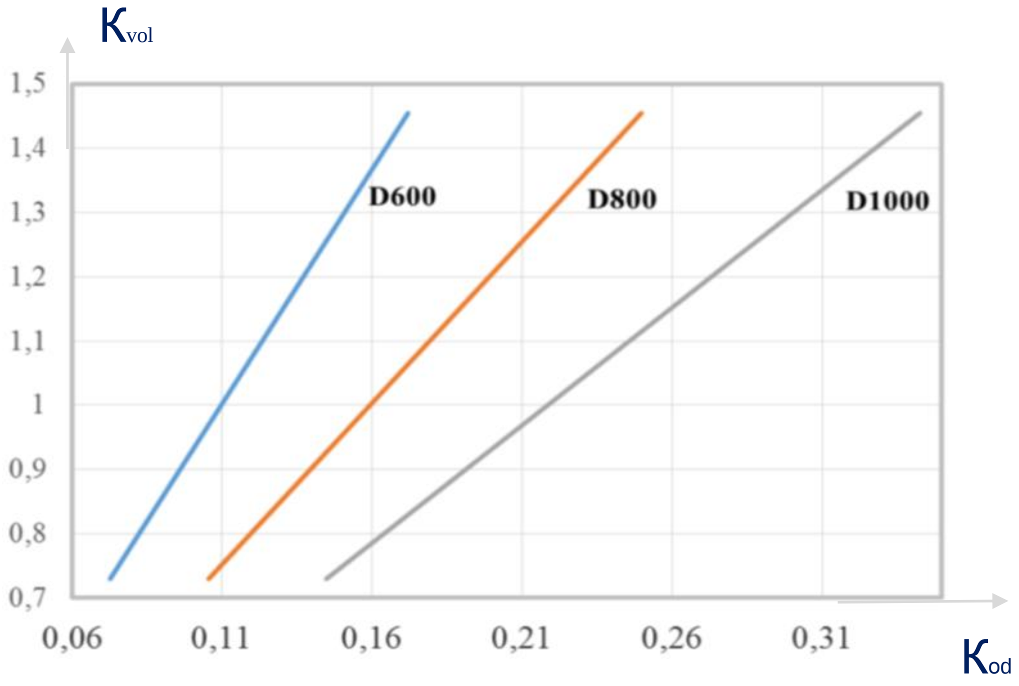

Figure 4. Nomogram for the base of sandy loam.

4. Conclusion

Fiber reinforcement allows the use of new design and manufacturing principles. As a result of combining the reinforcing elements and the matrix, a set of composite properties is formed, which not only includes the initial characteristics of its components, but also the qualities that individual components do not possess. The appearance of new properties in composites is associated with a heterogeneous structure, which determines the presence of a large surface, a section between the fibers and the matrix.

Dispersed reinforcement of concrete makes it possible to change the nature of its destruction from brittle to ductile due to the redistribution of stresses between the matrix and dispersed reinforcement.

The macrostructure of fiber foam concrete can be considered as a system consisting of two components - a concrete matrix and reinforcing fibers. The brittle matrix is a continuous structure-forming component. The introduction of reinforcing fibers gives it plastic qualities.

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Thank You for attention!