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UDC 625.73

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## **REDUCTION OF ROADSIDE AREA POLLUTION DUE TO CONTROL OF EQUALITY AND STRENGTH OF THIN ASPHALT CONCRETE LAYERS ON A HARD BASIS**

Recently, the construction of thin-layer asphalt concrete coatings on a cement-concrete basis began to be used frequently both in the reconstruction of roads and in new construction. The asphalt concrete layer should provide the possibility of comfortable and safe movement of vehicles on the road, improved smoothness and traction. Ensured high levelness and strength of the asphalt pavement will allow drivers to maintain a constant high speed of vehicles and reduce

roadside pollution from emissions of environmentally harmful products of fuel combustion. In the presence of significant damage and deformation of the coating, the driver is forced to constantly change the speed limit (slow down and increase speed), which will increase fuel consumption and increase environmental pollution.

Ensuring the reliability of such structures is not only an important practical task, but also a complex scientific problem. One of the important issues in this problem is the question of determining the temperature deformations and corresponding stresses in the asphalt concrete layers.

For the analysis of the stress-strain state of the combined slab, the condition of constant joint deformation of the asphalt concrete layer (coating) and the rigid base, ie reliable adhesion of the contact of the layers, is accepted.

If the asphalt concrete layer and the cement concrete slab have a reliable adhesion, they will have the same temperature deformations in the contact zone of the layers. At the same time, it should be taken into account that the linear coefficient of thermal expansion of cement concrete is much smaller than the linear coefficient of thermal expansion of asphalt concrete [1, 2, 3]. The thin layer of asphalt concrete has a modulus of elasticity much smaller than that of cement concrete, so the asphalt concrete layer is deformed together with the cement concrete slab, almost without affecting the deformation of the latter. As a result, there is a limitation of thermal expansion or compression of the asphalt layer.

Additional stresses at the bottom of the asphalt concrete layer due to the limitation of temperature deformation in the seasonal and

daily temperature cycle can be determined by the following dependence [4]:

$$\sigma_a = \frac{(\varepsilon_a^{\text{rel}} - \varepsilon_a^{\text{act}}) \cdot R_a^t}{(1 - \mu_a^t)} \quad (1)$$

$\sigma_a$  – temperature stresses in the asphalt concrete layer, MPa;

$\varepsilon_a^{\text{rel}}$  – relative temperature deformation of the asphalt concrete layer under the condition of free contact of the asphalt concrete layer and the cement concrete slab;

$\varepsilon_a^{\text{act}}$  – the actual relative temperature deformation of the asphalt concrete layer (subject to the monolithic contact of the asphalt concrete layer and the cement concrete slab);

$R_a^t$  – relaxation function of asphalt concrete at temperature (t), MPa;

$\mu_a^t$  – Poisson's ratio of asphalt concrete at temperature (t).

Under the condition of free contact of the asphalt concrete layer with the cement concrete slab, the relative deformation of the asphalt concrete layer is equal to:

$$\varepsilon_a^{\text{rel}} = \alpha_a \cdot \Delta t_a^{\text{mid}} \quad (2)$$

$\alpha_a$  – temperature coefficient of linear expansion of asphalt concrete, °C<sup>-1</sup>;

$\Delta t_a^{\text{mid}}$  – temperature change in the middle of the asphalt concrete layer, °C.

According to the results of experimental studies, it was found that the temperature coefficient of linear expansion of asphalt concrete differs for the heating and cooling regime and differs for different temperature ranges. From the results of the test we can conclude that when calculating the temperature stresses in the asphalt concrete layers on a rigid basis, it is necessary to take into account in which mode (heating or cooling) the structure works and in what temperature range.

To determine the influence of temperature and temperature range in which the structure operates, the calculation of free temperature deformations of the asphalt concrete layer with ShMA-15 (60/90) with a thickness of 5 cm on a cement-concrete basis during the year

The obtained results of calculations are presented in fig. 1.

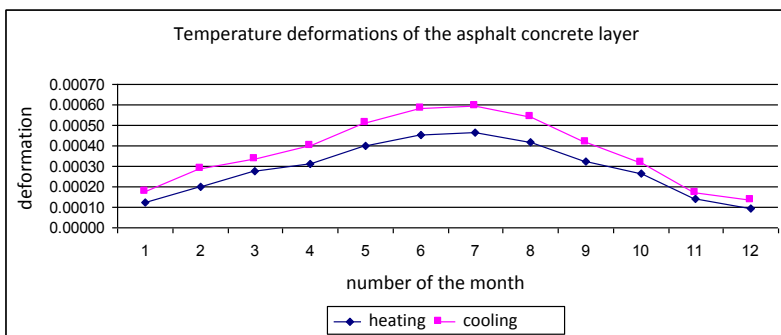


Figure 1 – Temperature deformations of the asphalt concrete layer during heating and cooling

Analysis of the calculation results shows that the temperature deformations of the asphalt concrete layer depend on the temperature regime (heating or cooling) and the range (magnitude) of temperatures

in which the structure operates. Therefore, when calculating the temperature stresses in asphalt concrete layers on a rigid basis should take into account the heated structure or cooled and in what temperature range the deformation occurs.

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UDC 528.4

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