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IMPORTANCE OF GEORGIA ZONING BY VERTICAL CLIMATIC ZONES FOR ROAD PAVEMENT OPTIMUM DESIGN

Abstract: The work describes the effect of temperature on asphaltic concrete pavement, how the asphalt concrete properties change at high temperatures and what is an effect of low (negative) temperature on the pavement; specific study result is given as an example and taking all the above mentioned into account the work emphasizes the problem that in some countries the territories still are not divided into climatic zones that is so important for the road industry.

Key words: climatic zoning, Benkelman beam apparatus, asphalt-concrete mixture, elasticity modulus, organic binder.

Language: English

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Introduction

The road pavement quality is a main determining factor of transport and operating conditions of modern automobile roads. It has a significant impact on such characteristics as driving speed, safety, ecological status etc.

Georgia is still guided by the acting standards accepted by the former Soviet Union prior to 1984, according to which the enormous territory of the former USSR was divided into V road climatic zones, and Georgia was included in IV climatic zone (Fig. 2). This zoning didn't take into account specific and climatic conditions due to mountainous relief of our country, which distinctively differ from the characteristics of the former IV climatic zone.

Hundred kilometers of roads constructed in Georgia, which have been designed according to acting standards of that time, prematurely came out of action and no more satisfy the modern operational characteristics that was mainly caused by the fact that the specific character of relief and climatic conditions at the territory of Georgia and their sharp change according to vertical tonality were not taken into account during designing.

Organic binding material (bitumen) and asphalt-concrete mixtures (both dense and porous) prepared on its basis are very sensitive toward temperature and their physical characteristics necessary for road pavement constructive layers designing, vary in a broad range taking into account the temperature

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regimes peculiar for one or another region. Even the fact, which side of the slope is occupied by the automobile road is of great importance for countries with mountainous relief.

Observations and long-term experience showed that road pavement is of very complicated nature and in order to become acquainted with its real nature we have to have the knowledge of many sciences, such as: construction mechanics, soil mechanics, organic chemistry, automatics – the newest field of engineering etc., so the problematic questions raised by us may be easily solved in the near future. The leading engineers of our country have sufficient experience of application of different local materials for designing and construction of road pavements, taking different climatic and operating conditions into account.

The relief of Georgia is very rugged and is characterized by a wide different of marks at relatively small distances. Lowlands, terraces, mountain passes follow each other, and gorges, deep ravines, mountain and lowland rivers are of frequent occurrence here.

Subtropical climate and high humidity are peculiar for Black Sea coast and entire Western Georgia, while the Eastern Georgia is distinguished by less humidity and continental climate. Climatic conditions sharply change at different altitudes above the sea level.

Below is represented a study carried out under field conditions, which clearly showed us how

important is the temperature for road pavement and what is a dependence of pavement surface temperature on its elasticity modulus.

For the road pavements tested by the paired (dual) car tires, the total elasticity modulus is calculated according to formula (1)

$$E_y = (1 - \mu^2) \rho / 0,4 \pi l D \quad (1)$$

where:

ρ – total wheel load;

l – elastic deflection of construction between wheel tires;

D – diameter of conventional round-shape elastic stamp, which transfers the load to the surface, $D = 0,33$ m.

The necessary elasticity modulus at the specific road section was satisfied within permissible error, when pavement surface temperature was equal to 7°C, while at temperatures higher than 28°C the total elasticity modulus was sharply dropped those points at the necessity of determination of running surface design temperature and calculation of pavement bearing capacity according to the elasticity modulus corresponding to design temperature.

The mentioned research was carried out using Benkelman beam apparatus owned by Sakgasmetsniereba LLC, at the territory of Mtskheta, at 492 m altitude above sea level, in different seasons. Results of the mentioned tests are shown in diagram №1.

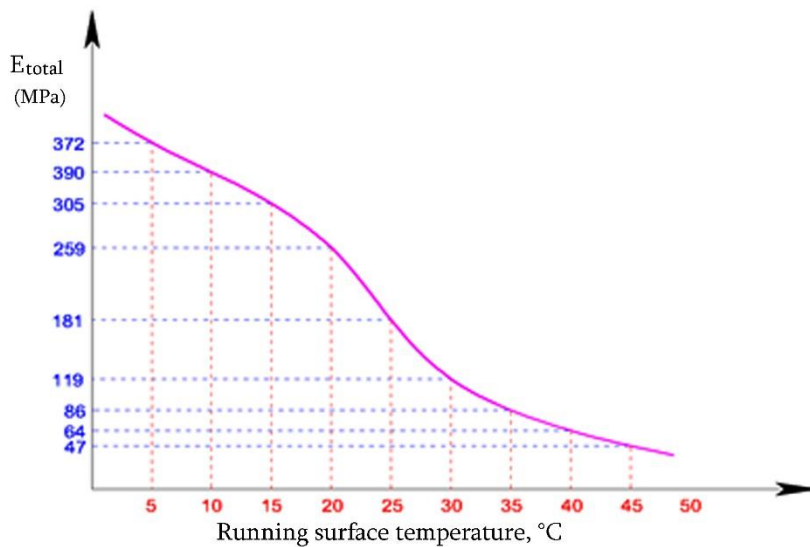


Diagram №1

It should be also mentioned the circumstance that at low temperature bitumen changes its properties, becomes brittle and easily getting cracked that in its turn has a negative effect on asphalt concrete pavement quality and substantially shortens the operating life.

As the practice shows, it is necessary to divide the territory of Georgia into vertical climatic zones

and the proper bitumen grade has to be selected for corresponding zone that enables us to develop the individual road pavement structure for one or another zone to secure the longer operation of the mentioned pavement. Taking all the above mentioned into account will allow us to spare finances, at the same time the road will be safer and technically sound that is so necessary for comfortable and rapid movement.

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