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ANALYSIS OF THE TEMPERATURE INFLUENCE OF ASPHALT INSTALLATION ON HOLLOWS IN THE ASPHALT LAYER

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SUMMARY

The asphalt layer is an important financial part of the total cost of road infrastructure, so it is necessary to analyze and consider all the elements that may affect the quality of the same. One of them is certainly the influence of temperature during the installation of asphalt mass. Namely, neither high nor low temperature of asphalt and the environment are favorable for its installation, so it is necessary to find optimal conditions for the installation of asphalt in order to achieve the best possible results of compaction and cavities in the asphalt layer.
The aim of this research is to find the optimal conditions for its installation by comparative analyzes of different temperatures of the asphalt mixture and the environment, in order to obtain the lowest percentage of cavities in the asphalt layer.
The legal regulations, ie technical conditions, define the minimum temperature of the asphalt mixture as well as the limit air temperature during the installation of asphalt, but special emphasis is placed on the impact of the temperature of the asphalt installation on the cavities in the asphalt layer. Therefore, the paper observes the optimal temperature of the asphalt mixture so that the smallest possible percentage of cavities in the asphalt layer is obtained.

Keywords: asphalt mixture temperature, installation, cavities

INTRODUCTION

The temperature of the asphalt mixture during the installation of asphalt became especially important because it directly affects the quality of work performed, and was limited by the temperature of the asphalt mixture in the asphalt base, the length of transport of asphalt mixture, vehicle quality, air temperature, etc. [1] [2]

If shrinkage due to cooling is prevented, then tensile stress increases in the asphalt material with decreasing temperature, which can lead to breakage (appearance of microcracks in the bonding matrix) if maximum tensile strength is reached, which is especially pronounced during asphalt rolling. Simply put, the stress in the asphalt sample gradually increases in parallel with the temperature drop, until the sample breaks. [3] [4]

The research in this paper is based on the analysis of the influence of asphalt mass temperature on the percentage of cavities in the asphalt layer.

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2. ANALYSIS OF THE INFLUENCE OF THE TEMPERATURE OF ASPHALT INSTALLATION ON HOLLOWS IN THE ASPHALT LAYER

If we observe the influence of the temperature of the asphalt mixture on the cavities in the asphalt layer, we will use the temperature of the asphalt and the cavity as input data.

Table 1. Input data for the analysis "Installation temperature - cavities"

No Sample	Temperature installation(?C)	Type of asphalt	cavities (%)
1.	136,30	BNS22	2,90
2.	139,90	BNS22	2,50
3.	123,80	BNS22	3,60
4.	112,80	BNS22	6,90
5.	152,90	BNS22	5,01
6.	157,80	AB16	5,00
7.	155,40	AB16	2,30
8.	154,20	AB16	2,50
9.	158,40	AB16	1,60
10.	160,40	AB16	2,20
11.	155,90	AB16	1,90
12.	160,10	AB16	2,80
13.	160,70	AB16	3,00
14.	157,40	BNS22	2,40

As we can see from Table 1, we have samples for two types of asphalt, so in the analysis we will divide the asphalts by types and observe them that way. We will first observe the samples from the BNS22 asphalt.

Table 2. Input data for the analysis "Asphalt temperature - cavities - BNS22"

No Sample	Temperature installation (?C)	type of asphalt	cavities (%)
1.	136,30	BNS22	2,90
2.	139,90	BNS22	2,50
3.	123,80	BNS22	3,60
4.	112,80	BNS22	6,90
5.	152,90	BNS22	5,01
14.	157,40	BNS22	2,40

In accordance with the input data, we obtained the following diagram describing the influence of asphalt temperature on the cavities.

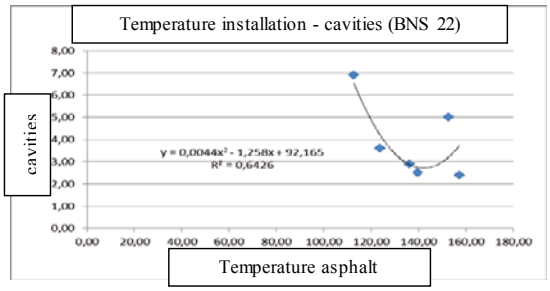

Figure 1. Dependence diagram "Asphalt temperature - cavities - BNS22"

For AB16 asphalt we use the following input data:

Table 3. Input data for the analysis "Asphalt-cavity temperature -AB16"

No sample	Temperature installation (?C)	type of asphalt	cavities (%)
6.	157,80	AB16	5,00
7.	155,40	AB16	2,30
8.	154,20	AB16	2,50
9.	158,40	AB16	1,60
10.	160,40	AB16	2,20
11.	155,90	AB16	1,90
12.	160,10	AB16	2,80
13.	160,70	AB16	3,00

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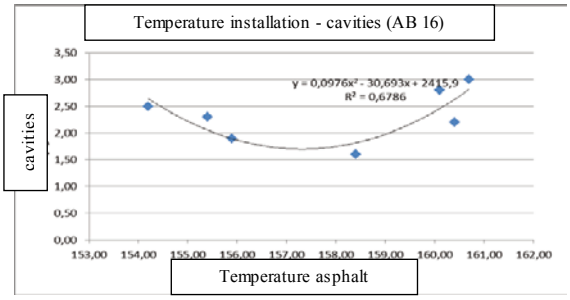

Figure 2. Dependence diagram "Asphalt temperature - cavities - AB16"

From the diagrams in Figures 1 and 2, it can be noticed that the smallest percentage of cavities in the asphalt layer from the aspect of asphalt installation temperature for BNS22 asphalt at a temperature of about 145 °C. For AB16 asphalt, the smallest cavity is at an asphalt temperature of about 157 °C. [5]

At the temperature of the asphalt above or below the stated values, a higher percentage of cavities appears.

We conclude that the optimal asphalt temperature for asphalt installation from the aspect of cavities is 145-157 °C.

We will confirm the conclusion with the following diagram in which all samples are combined. The data from Table 1 were used as input data.

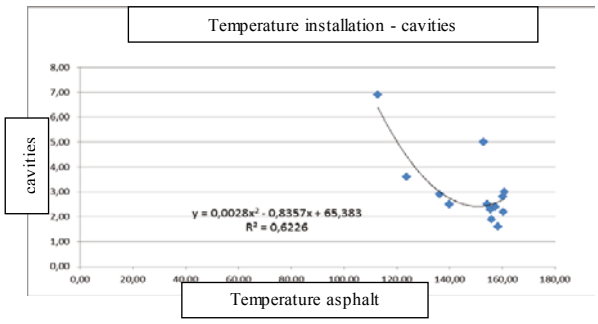

Figure 3. Dependence diagram "Asphalt temperature - cavities"

From the diagram in Figure 3, it is clear that the smallest percentage of cavities at the asphalt temperature is 145-157 °C. Each higher or lower asphalt temperature causes a higher percentage of cavities in the asphalt layer.

3. CONCLUSION

This paper presents research and analysis of the influence of asphalt mass installation temperature on the percentage of cavities in the asphalt layer. From the research in this paper, we can conclude that the control of temperature during the production and installation of asphalt is of great importance for the quality of work performed, as well as the durability of the performed layer.

It can be concluded that by increasing the outside temperature, and harmonizing the outside temperature and the temperature of the asphalt, we can create optimal conditions for compacting asphalt (as few roller passes as possible, as short a rolling time as possible to cool the asphalt). The diagram in the paper, for different types of asphalt, clearly shows the optimal limits of asphalt mass installation in which the smallest percentage of cavities.

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