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Assessment of Compaction Temperatures on Hot Mix Asphalt (HMA) Properties

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Abstract

Hot Mix Asphalt (HMA) is one of the most commonest constructed asphalts in Iran and the quality control of constructed roads with HMA have been always paid due attention by researchers.
The quality control of constructed roads with this method is being usually carried out by measuring volumetric parameters of HMA marshall samples. One of the important parameters that has a critical role in changing these volumetric parameters is "compaction temperature"; which as a result of its changing, volumetric parameters of Marshall Samples and subsequently constructed asphalt is encountered with variations. In this study, considering the necessity of preservation of the compaction temperature, the effect of various temperatures on Hot Mix Asphalt (HMA) samples properties has been evaluated. As well, to evaluate the effect of this parameter on different grading, two different grading (Top coat index grading and binder index grading) have been used and samples were compacted at 5 various temperatures (including 85˚C, 100˚C, 115˚C, 130˚C, 145˚C and 160˚C).
In this case, some 78 Marshall Samples were made and each parameter (density, void, VFA, VMA, stability and Flow) was analyzed in separated figures. The final results indicate that the more the compaction temperature increases, the more the stability and VFA increases, while void decreases. Also, the results showed that with the increase of compaction temperature, the densities of samples increase, until the optimum temperature (this temperature in this study is 145˚C) and after this temperature the density decreases. Details of the results have been come in full text.

Keywords: Compaction Temperature, HMA, Volumetric Parameters, Marshall Method

1. INTRODUCTION

One of the most traditional constructed asphalts in Iran and across the world is "Hot Mix Asphalt".
Due to its high durability, solid production, temperature control, moisture and quick provision for traffic crossing, it is being still paid attention by many people.
Determination of volumetric parameters of HMA samples has vital importance for quality control of constructed roads. The compaction temperature is one of the parameters that can change the HMA volumetric parameters. According to the ASTM D 6926, (standard practice for preparation of bituminous specimens using Marshall Apparatus) the compaction temperature is the temperature in which bituminous should be heated to produce viscosities of 0.28 ± 0.03 pa.s. [1]

The compaction temperature is one of the major issues in HMA and also on of important criteria in the process of producing good quality of hot mix asphalt. Also, the temperature is a key factor in the control of bitumen viscosity, which affects its ability to coat and provide adequate lubrication for the aggregates and slides with each other.

2. OBJECTIVE:

The major purpose of this study is the surveying the effect of various compaction temperatures on HMA volumetric parameters. It should be stressed that for each sample, the amount of density, void filled with asphalt (VFA), air void (Va), stability and flow have been determined.

3. LABORATORIAL TESTS:

3.1. AGGREGATES GRADING:

In this study two mix designs were used and the gradation limit for the aggregates has been shown in the table 1 and their diagrams have come in figure1,2.