Study on Relationship between Layer Thickness and Mat Density of Airport Asphalt Pavement Surface Layer for Higher Efficiency of Construction

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1. Introduction

In airport asphalt pavements, Standard Specifications for Airport Civil Works (referred to hereinafter as Standard Specifications) specifies that the layer thickness of the surface layer and base layer shall be 8cm or less. Increasing the layer thickness is considered effective for increasing construction efficiency. In summary, however, two issues exist in connection with increasing the layer thickness.

The first one is the problem of securing the mat density. As a specification limit for asphalt mixtures, Standard Specifications specifies that the mat density of Marshall specimens shall be 98% or more.

The second one is the problem of temperature descending time (time required for the asphalt surface temperature to fall from the temperature at the time of laydown of the mixture to the temperature provided at the time of opening to traffic). To prevent rutting after opening to traffic, Standard Specifications specifies that the pavement surface temperature at traffic opening shall be 50°C or less in case straight asphalt is used. However, as the layer thickness increases, longer temperature descending time can be expected.

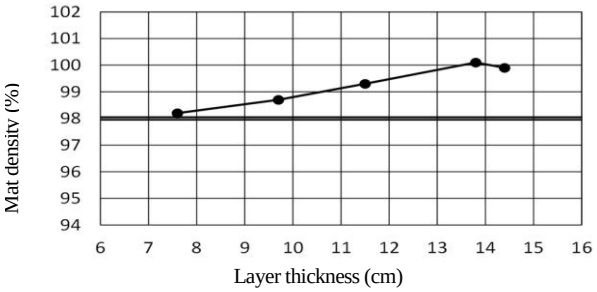
2. Study results

Test pavements were constructed by varying the layer thickness from 7 to 15 cm, on two types of base, i.e., an asphalt stabilized base and a granular base, and the relationship between the layer thickness and both mat density and temperature descending time was studied.

With the surface layers constructed on an asphalt stabilized base, the specification limit of 98% or more was obtained regardless of the thickness, and a tendency in which the mat density increased as the layer thickness increased could be seen. The higher stiffness of the base, this is attributed to high compaction due to the use of large-scale construction machinery. Moreover, the fact that heat transfer time became longer as the layer thickness increased, and as a result, a sufficiently high temperature could be maintained in the pavement, is also considered to be a cause.

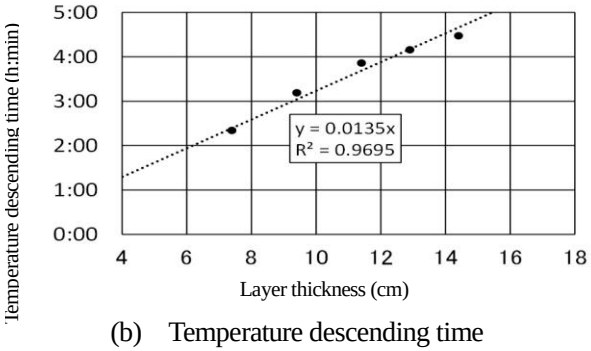
Regarding temperature descending time, in the range of layer thicknesses in this experiment, a proportional relationship was observed between the layer thickness and the temperature descending time.

In the future, the authors plan to construct a test pavement with a 10cm layer thickness on an asphalt stabilized base, which is considered to have a comparatively high potential for realizing an increase in the layer thickness, and conduct a further study.



(a) Mat density

Fig. Relationship between mat density and layer thickness.



(b) Temperature descending time

Fig. Relationship between temperature descending time and layer thickness.

【Reference】
Technical Note of National Institute for Land and Infrastructure Management No. 818
http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0818.htm