

Applicability of Standard Density in QC and QA of Asphalt Surfacing

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Abstract

The significance of quality control and quality assurance at the compaction operation in the asphalt pavement has long been recognized by the industry since the compaction maintains the volume of air in the asphalt, which has a profound effect on pavement performance and pavement service life. As a compaction quality control parameter, the degree of compaction, expressed as a percentage ratio between field density and the reference density, is used in the pavement industry. There are several methodologies to establish the reference density to formulate the degree of compaction in the present. However, for decades, measuring densities from daily laboratory compacted samples during construction (Marshall Density) has been the mainstream practice to establish the reference density in Sri Lanka. The major drawback of establishing Marshall laboratory density as a reference density is its inability to represent any unnoticed material or plant variations in the field. This study focuses on solving the aforementioned constraint by developing a new systematic approach called the ‘Standard density method’ to establish the reference density. The standard density is determined as the mean value of densities of Marshall test specimens from morning and evening operations only for a specified number of days after the commencement of construction. This study aims to evaluate the feasibility of the concept of standard density method by comparing current practice with the proposed method. In-place density readings and their respective Marshall laboratory density measurements were collected from different road projects, and the compaction performance was evaluated according to the degree of compaction (at least 97 percent of reference density) in both the existing and proposed methods. To increase the reliability of this comparison, method comparison hypothesis testing (student t-test) was developed for both the existing method and the proposed method to analyze the compaction performance. This t-test was designed to support the alternative hypothesis ‘in-place density > 97% of reference density (from Marshall density & standard density)’. According to hypothesis test results, the analysis reveals a significant correlation in compaction rates between the current and proposed methods (significant at a 5% level of significance). Moreover, the study shows that the hypothesis mentioned above can be rejected only in the standard density method if any material or plant variations have occurred in the project; in addition, these hypothesis rejections appear after a considerable time period from the commencement of the construction.

Keywords: *asphalt concrete, quality control, degree of compaction, reference density*

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