



0-6675: Evaluation of Bonus/Penalty Pay Adjustment Systems for HMA and Ride Specification of Concrete and Asphalt Pavements

Background

The current pay adjustment system for hot mix asphalt (HMA) production, placement, and ride consistently rewards contractors, although this procedure does not necessarily result in improved performance of constructed HMA pavements and longer service life. The current system needs to be changed in order to effectively improve the quality of pavements in Texas and provide performance-related incentives.

What the Researchers Did

Our literature review of pay adjustment and specification systems used by other states included examining approaches used to establish performance-related specifications and identifying quality control/quality assurance (QC/QA) parameters that significantly influence pavement performance.

We developed a database framework to relate data records in TxDOT's SiteManager QC/QA database and network-level performance data in the Pavement Management Information System (PMIS) database. A link between records in these databases was established based on Texas Reference Marker information. This step ensured the quality and integrity of the analysis by eliminating records with missing data and inconsistent performance trends. The result was a large dataset comprising more than 600 pavements across Texas with available QC/QA data and performance records spanning 3 to 10 years. The research team evaluated the influence of variations in the construction QC/QA parameters on pavement performance. Advanced statistical modeling of these relationships using econometric approaches established the significance, sensitivity, and consistency of these parameters in regard to pavement performance. The statistical models provided the tools necessary to evaluate the current pay adjustment system and develop new performance-related specifications.

What They Found

The statistical analysis of QC/QA parameters indicated that initial International Roughness Index (IRI) measurement, laboratory density, asphalt content, and in-field voids in the mineral aggregates (VMA) at the time of construction significantly influence pavement performance. The analysis indicated that roads that are initially smoother do last longer, higher laboratory densities are associated with longer pavement life, and higher asphalt contents and lower in-field VMAs are associated with lower initial roughness and hence indirectly influence pavement life. The data confirmed that interstate highways deteriorate more slowly than do other facilities, while higher-traffic facilities and facilities with slow-moving traffic deteriorate faster. The as-constructed initial ride quality is the dominant factor influencing pavement performance, such that an improvement in initial ride quality from 60 to 30 in./mile will increase the life of the pavement by 50 percent. Marginal improvements in pavement life can also be achieved through increased laboratory density and asphalt content or lower in-field VMA. These effects are marginal given the narrow ranges of these variables in the analysis data, which comprises only those projects that meet specification requirements. See Figures A and B for recommendations to revise the current pay adjustment factors. Recommendations are also made to revise the ride quality pay adjustment of

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HMA Schedule 1 (Figure C) and concrete pavements Schedule 2 (Figure D). The increased bonus and penalty values are to account for inflation; a much improved initial ride quality is now required to receive a ride quality bonus. The stringent penalty applied to concrete pavements is to cover the cost of an asphalt overlay to correct insufficient ride quality and encourage better construction practices to address roughness.

What This Means

The recommended changes to the current pay adjustment systems are based on statistical evidence

and engineering judgment to enhance the service life of HMA and concrete pavements in Texas and to substantially reduce long-term user costs associated with rougher pavements. The recommendations also serve to raise the bar for contractors and reward only those that ensure the quality necessary for improved performance and extended service life of HMA and concrete pavements. Recommendations are further made to track the performance of a number of projects over time to validate the project findings and the further development of performance-based specifications.

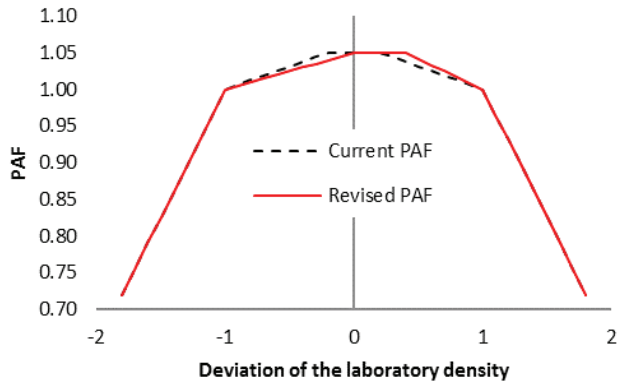


Figure A

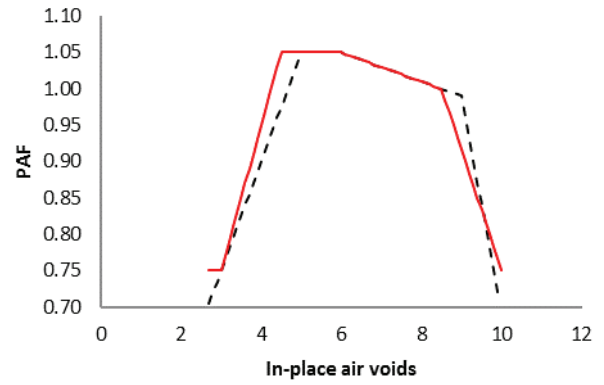


Figure B

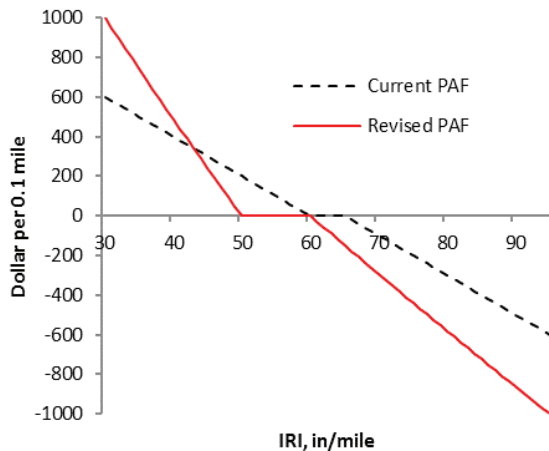


Figure C

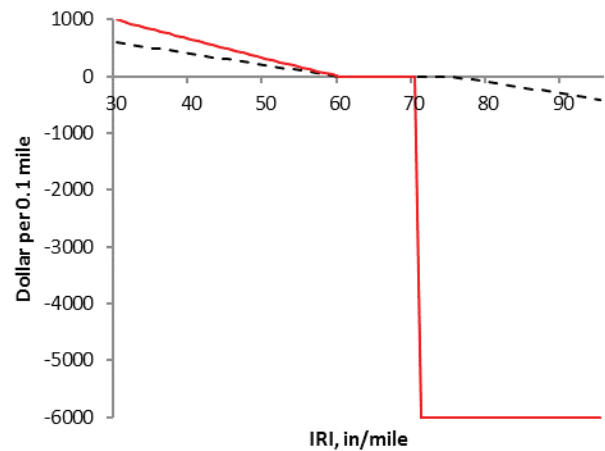


Figure D

For More Information

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