

“A Case Study of Assessing Sampling Location Impact on Asphalt Mixture Characterization and Test Variability”

Abstract:

Accurate quality assessment and acceptance testing of asphalt mixtures are essential to ensure consistency with performance standards, supporting pavement quality, durability, and long-term service life. One critical factor influencing these assessments is the location of sample collection. Agencies typically obtain Hot Mix Asphalt (HMA) samples either at the production plant or from the roadway, and each method has distinct advantages and limitations that can impact measured properties. This study examines the statistical variability of asphalt mixture test results through a case study involving multiple sampling locations. Samples collected from the plant, the material transfer vehicle (MTV), and the paver auger were tested in the laboratory and compared with the Job Mix Formula (JMF) to evaluate testing variability. Laboratory testing included volumetric properties such as asphalt content (AASHTO T 308-2022), aggregate gradation (AASHTO T30-2021), theoretical maximum specific gravity G_{mm} (AASHTO T209-2023), bulk specific gravity (AASHTO T166-2022), air voids (AASHTO T312-2022), and voids in mineral aggregate (ASTM D6995-2021). Performance testing included the Indirect Cracking Test (IDEAL-CT) (ASTM D8225-19), High-Temperature Indirect Tensile Strength (High-IDT) (ASTM D6931), and Asphalt Pavement Analyzer (APA) (AASHTO T 340-231). Statistical analyses, including paired t-tests and F-tests, were applied to determine significant differences in means and variances across datasets. The findings provide insights into the safety, practicality, and representativeness of different sampling methods, ultimately identifying the most reliable location for capturing in-place pavement material properties. This work contributes to improving Quality Assurance (QA) and acceptance procedures by optimizing sampling practices to ensure more accurate and reliable evaluation of asphalt mixtures.