Practical Considerations for

SELECTING A PERFORMANCE TEST FOR ASPHALT MIXTURES

Many performance test options exist for rutting and cracking evaluation of asphalt mixtures. Some are fundamental, while others are more empirical. Likewise, there are significant differences between tests related to total test time (specimen preparation + testing), complexity, and overall cost. Selecting the 'best' test can be a complex and debatable process.

Here are six practical considerations for selecting a performance test.

1. Test Must Correlate to Field Performance

The most important requirement in selecting a performance test is for it to correlate appropriately to observed field performance. Without adequate correlation, a test method must not be considered. This correlation work should be conducted on mixtures within a given location (e.g., state). Correlations from other locations can certainly be of value in the initial selection of candidate tests; however, lab performance test results must be correlated to field mixes within the same location. Tests that have been thoroughly validated in specific climates/markets must be examined carefully in other climates. Once correlation is established, it is critical for the agency to establish meaningful, but achievable, specification values (e.g., performance test thresholds) that consider the overall test variability.

2. Test Should Provide Timely Results

A critical consideration is the required time to generate a test result, or test turnaround time. Many performance tests take several hours to complete, from specimen preparation to obtaining test results. The goal of any testing protocol is to help ensure the designed and produced mixture will meet the required performance. A longer duration performance test will likely increase the time for mix design preparation, but most critical is the potential for substantial mix to be produced while awaiting a test result. This creates a considerable risk for the contractor and the agency. To manage this production associated risk, any quality control test should be available the same day the material is produced to provide feedback to the contractor for any necessary, real-time adjustments. The ideal test would provide results in a similar timeframe as traditional asphalt content, gradation, and volumetric property testing. Currently, this can only be achieved using empirical performance/index tests conducted on prepared gyratory compactor specimens without further specimen preparation being required (e.g., no cutting, trimming, extended curing, etc.).

3. Test Should Be Affordable for Widespread Use

While affordability is subjective, it would be economically advantageous for the industry to have the associated performance testing cost to be a low as possible, while providing the needed benefit. Cost may be reduced if there is an option to use equipment already available in laboratories (e.g., Marshall load frames) with minimal additional equipment cost (e.g., testing fixtures or jigs). Cost should not be the main factor in selecting a performance test, but when similar options exist for predicting performance, the more affordable test should be given proper consideration.

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Colas HMA Lab Engineer Samantha Dixon mixes, compacts, and extrudes a test specimen in the lab. (credit: Colas Solutions Inc.)

4. Ease and Safety of Fabricating Test Specimens

The amount of required specimen preparation should be as little as possible. In addition to the time requirement, safety is critical when sawing and cutting specimens. Many of the required specimen cuts expose personnel to significant, and perhaps unnecessary, safety hazards. Ideally, specimen cutting should be avoided, as it also increases the level of precision necessary to prevent the introduction of potential testing variability. The most desirable approach is to compact specimens in the gyratory compactor to the appropriate testing height and then test without further preparation.

5. Test Variability Should Be as Low as Possible

Low test variability is a desired characteristic of any test method and is especially critical for tests that may be potentially used for a 'go/no-go' decision or for acceptance and pay factor determination. The test must be both repeatable and reproducible and that precision be accurately established. Regardless of the test method selected, variability can be reduced by ensuring the same specimen preparation, handling, and testing protocols are followed by all parties performing testing. To constitute low variability, it is helpful to evaluate the variability of current tests being used. For example, TSR testing has what would be considered high variability, yet it is still used by some states for mix design acceptance. New tests may seem to have high variability, but may be similar or better than what is currently being used. If performance testing variability is necessarily higher, agencies should consider statistics in establishing 'go/no-go' criteria.

6. Test Results Analysis Should Be Straightforward

Keys to successful implementation are being able to 1) calculate the test results quickly and accurately, 2) interpret the results, and 3) make any necessary mixture adjustments. These efforts will require training of quality control personnel to ensure adequate understanding; however, testing and data analysis should not be so complex as to overwhelm the personnel. When choosing a performance test, consider whether field personnel have the necessary skills to perform the test and conduct the data analysis, or whether the test requires the acquisition of new skills. Preference should be given to tests that can be performed and analyzed without the additional burden of learning significant new skills.

> "Developing performance tests in the lab, then using them in the field to scientifically assess the product in real time, provides confidence to road owners that engineered asphalt will perform as expected.
>
> Jay Winford
> *President*
> *Prairie Contractors LLC*

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