

## Research Notes

Program Steering Committee (PSC): Pavement

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Title: Rubber Binder Testing and Acceptance

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Product Category: New or improved technical standard, plan, or specification

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### **TITLE:**

Rubber Binder Testing and Acceptance

Evaluating concentric system for testing asphalt rubber with a dynamic shear rheometer

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### **WHAT IS THE NEED?**

The current Caltrans specification used for testing and acceptance of wet-process rubberized binders has been focused mainly on measuring the viscosity in the field using a handheld rotational viscometer. While viscosity is an important parameter for the workability of the binder and the mix, it does not directly relate to the in-service performance of the binder within a Rubberized-Hot Mix Asphalt (R-HMA). Additionally, due to the particulate phase of these binders, viscosity measurements alone lack sufficient accuracy to completely describe the complex properties of these binders. In the Performance Grading (PG) system for asphalt binders developed by the Strategic Highway Research Program (SHRP), the performance properties are determined using a Dynamic Shear Rheometer (DSR). However, as a result of testing equipment geometry limitations, Superpave binder tests are not appropriate for testing wet-process rubberized binders.

Therefore, new test procedures and equipment that can evaluate the performance characteristics of the wet-process rubberized binders are needed to ensure good performance in the field based on engineering properties; to aid pavement design using the engineering properties (including use in the mechanistic-empirical design); and to establish contract acceptance criteria for the wet-process rubberized binders.

### **WHAT ARE WE DOING?**

We contacted equipment manufacturers and discussed the new geometry and research plan. We identified previous and current projects where rubberized binder samples could be collected. We prepared conditioned samples for testing with DSR (short-term aging via

Thin Film Oven (TFO) and long-term aging via Pressurized Aging Vessel (PAV) in the laboratory). We evaluated the ability of the new system to provide DSR results for neat, Polymer Modified (PM), Terminal Blend (TR), and wet-process rubberized binders. We analyzed the new DSR system results and compared previous parallel plate DSR results for the neat, PM, and TR binders. We investigated the new system for rubberized binders with three different asphalt sources and four different base PG binders. We performed a thorough statistical evaluation of the repeatability and reproducibility of the concentric system.

### **WHAT IS OUR GOAL?**

Our goal is to develop new test procedures and equipment that can evaluate the performance characteristics for wet-process rubberized binders. We will also establish contract acceptance criteria for wet-process rubberized binders for the new DSR system.

### **WHAT IS THE BENEFIT?**

This study will develop DSR contract acceptance criteria for wet-process rubberized binders and is expected to include the following benefits to Caltrans:

- Minimizing the risk of designing and constructing R-HMA mixes with poor constructability and durability
- Minimizing the risk of designing and producing mixes that are susceptible to premature failure
- Establishing wet-process rubberized binder rheological properties using a modified DSR testing protocol and equipment geometry

### **WHAT IS THE PROGRESS TO DATE?**

All the DSR testings with parallel plate and the new concentric system are done. The statistical analyses revealed the expected results. Final report is underway.