

**Evaluation of Rheological Properties of Binders in RAP without
Extraction and Recovery**

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ABSTRACT

Recycling of bitumen reclaimed from damaged pavements is one of the unique opportunities for reducing cost of pavement construction. It is also an opportunity to conserve natural resources and reduce the impact of bitumen and aggregate production on the environment. Re-use of binder, however, should be done properly by accounting for the characteristics of the aged bitumen. Aging of bitumen is known to cause significant changes in its properties as a result of oxidation and, in some cases, volatile loss. For many years estimating or measuring the properties of aged bitumen has been a challenge due to the unknown effects of using solvents to extract and recover the bitumen binders.

The aim of this research project is to develop a protocol to estimate the low-temperature rheological properties of binders in the RAP without the damaging effects of solvent extractions. The ultimate goal is to answer the question of when does the change in PG grade of fresh binder becomes a requirement in a mixture using RAP.

The procedure developed is based on testing of bitumen-RAP mortars produced by mixing the fresh (virgin) binder with a RAP material smaller than # 8 sieve. Different mortars were prepared, containing RAP material passing the #8 sieve and 15% by weight of fresh binder. Low temperature properties of these mastics were investigated by using the Bending Beam Rheometer test procedure that is specially modified for testing of the RAP mortars. Specifically, the modification involved the development of a new kind of mold and different testing parameters. The RAP material used in the experimental study were both extracted from real reclaimed pavement and prepared in the laboratory, by aging binder through repeated PAV cycles. The results are encouraging as they indicate the new procedure can capture the effect of aged properties of bitumen in the RAP and can be used to estimate the PG low temperature grade of the blended binder. Although data is limited in size, the modification of the BBR appears to be simple and provide repeatable data.

Key words: Bitumen, recycling, lab aging, field aging, rheological properties, master curves, Bending Beam Rheometer, Superpave, modeling.