

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

GUIDE TO DESIGNING ASPHALT MIXTURES
WITH RECLAIMED ASPHALT PAVEMENT

1. PURPOSE

- 1.1 To establish criteria for designing asphalt mixtures which contain reclaimed asphalt pavement (RAP) and Performance Graded (PG) Binders.
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2. SCOPE

- 2.1 This procedure is applicable to all asphalt mixture designs which contain both RAP and PG Binders.
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3. GENERAL

- 3.1 This MP does not alter the design specification requirements of the 401 Specification or MP 401.02.22. It is to be used only as a supplement to the specifications when designing RAP mixtures. It does not affect RAP mixtures which were designed through previously approved methods prior to issuance of this MP.
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4. REFERENCED DOCUMENTS

- 4.1 MP 401.02.22
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5. GUIDELINES

- 5.1 The following guidelines shall apply to all new mix designs which incorporate RAP with PG Binders.
- 5.2 For design purposes, the specific gravity of the virgin PG Binder shall be used as the specific gravity of the asphalt binder in the RAP. Also, the effective specific gravity of the aggregate in the RAP shall be determined and used as the bulk specific gravity of the RAP aggregate for calculation purposes.
- 5.3 If the amount of RAP in the mix is equal to or less than 15 percent, then the selected PG Binder to be used as the virgin asphalt shall be the same as the specified PG Binder for the region where the mix will be used. For example, if the specified PG Binder for the region is a PG 64S-22 then the PG Binder used in the RAP design shall be a PG 64S-22.
- 5.4 If the amount of RAP in the mix is 16 to 25 percent, then the selected PG Binder to be used as the virgin asphalt shall be one grade below both the high and low temperature grade of the specified PG Binder for the region where the mix will be

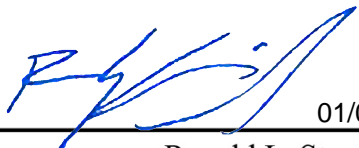
used. For example, if the specified PG Binder for the region is a PG 64S-22 then the PG Binder used in the RAP design shall be a PG 58S-28.

- 5.5 If the amount of RAP in the mix is more than 25 percent, then the blending chart described in Section 6.0 of this MP shall be used to select the high temperature grade of the virgin asphalt. The low temperature grade shall be at least one grade lower than the binder grade specified for the area where the mix will be used. The binder test data and the blending chart must be submitted along with the mix design package (JMF).

6. EXAMPLE USE OF BLENDING CHART

- 6.1 The dynamic shear rheometer (DSR) can be used to look at permanent deformation (rutting factor) of the binder, which is governed by limiting $G^*/\sin d$ at the test temperature. The maximum allowable value of the rutting factor shall be 2.0 kPa. A blending chart, similar to the viscosity blending charts used with viscosity graded asphalts, has been developed which plots $G^*/\sin d$ on a log-log scale on the y-axis as a replacement test for viscosity. Both the recovered asphalt and the virgin asphalt are tested at the high temperature of the specified binder to be used in the design. The test value $G^*/\sin d$ for each asphalt is plotted on the chart (the recovered asphalt result on the left and the virgin asphalt on the right) and connected with a straight line. The point on the chart where the plot of $G^*/\sin d$ intersects the y-axis ($G^*/\sin d$, kPa, at test temperature) at 2.0 kPa is represented on the x-axis (% virgin binder) as the minimum percentage of virgin binder to be used in the RAP design.
- 6.2 The attached example illustrates how the blending chart shall be used. The standard binder for the design in this example is a PG 64S-22. Test measurements for both the recovered asphalt and the virgin binder are taken at 64 °C. Point A on the chart represents the $G^*/\sin d$ value for the recovered asphalt. Point B represents the $G^*/\sin d$ test value for the PG 64S-22 binder which has a minimum requirement of 1.0 kPa. The line connecting points A and B intersects the 2.0 kPa rutting factor value at approximately 87% on the x-axis. This means that the minimum amount of virgin asphalt (PG 64S-22) used in the RAP design shall be 87%.

- 6.3 Looking at point C on the example chart, this represents $G^*/\sin d$ for a PG 58S-28 Binder which has been tested at 64 °C. A PG 58S-28 Binder would normally be tested at 58 °C and would have a minimum $G^*/\sin d$ value of 1.0 kPa. However, because this material is being used where the required binder is a PG 64S-22, the virgin binder must be tested at 64 °C. The higher test temperature results in a test value of less than 1.0 kPa, as illustrated on the chart attachment. The line connecting points A and C intersects the 2.0 kPa rutting factor value at approximately 75% on the x-axis. This means that the minimum amount of virgin asphalt (PG 58S-28) used in the RAP design shall be 75%.


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Ronald L. Stanevich, P.E.
Director
Materials Control, Soils and Testing Division

MP 401.02.24 Steward – Asphalt Section
RLS:J
ATTACHMENT

PG Binder/RAP Blending Chart

