**SCOPE:**

This procedure is used to determine the required proportions of aggregates from two or more sources needed to meet the minimum dynamic friction value requirements for surface mixes. The values obtained from this procedure are used to predict the frictional properties of a combination of aggregates.

**REFERENCE DOCUMENTS:**

- E660 Standard Practice for Accelerated Polishing of Aggregates or Pavement Surfaces Using a Small-Wheel, Circular Track Polishing Machine
- E1911 Standard Test Method for Measuring Paved Surface Frictional Properties Using the Dynamic Friction Tester
- MSMT 215 Laboratory Method of Polishing Unbound Aggregates Using the Circular Track Polishing Machine
- MSMT 216 Measuring Frictional Properties of Aggregates Using the Dynamic Friction Tester

**TERMINOLOGY:**

- **Dynamic Friction Value (DFV)** - a measure of the degree of polish reached by a test specimen after being subjected to accelerated polishing using the materials, equipment and procedures described in MSMT 216.
- **Reclaimed Asphalt Pavement (RAP)** - removed and/or processed pavement materials containing asphalt binder and aggregate

**PROCEDURE:**

If a single source of aggregate does not conform to the requirements for DFV as specified in Table 901 D, it may be blended with aggregate from other sources to conform to the specification for blended aggregates. The blended aggregate percentages apply to the coarse portion only. Coarse aggregate, for blending purposes, is defined as material having a gradation equal to or greater than material meeting the requirements of M 43, size number 8. The resulting predicted blended DFV value must meet the minimum DFV category value in Table I.
When RAP is used, it will be considered one of the coarse aggregate sources only when the aggregate gradation in the RAP has less than 85 percent passing the 9.5 mm sieve. The coarse aggregate percentage used for the blending calculations is the percent of material retained on the 9.5 mm sieve. The predicted dynamic friction value of the blend will be determined with the RAP aggregate having a DFV of 30.

**Note:** Do not use crushed glass in surface mixes.

**CALCULATIONS:**
The maximum percentage of polish susceptible aggregate that may be used in a blend shall be determined as follows:

Two Aggregate Sources (one source may be RAP):

\[
V_b = \frac{(V_1)(X_1)}{100} + \frac{(V_2)(X_2)}{100}
\]

Three or More Aggregate Sources (one source may be RAP):

\[
V_b = \frac{(V_1)(X_1)}{100} + \frac{(V_2)(X_2)}{100} + \ldots + \frac{(V_n)(X_n)}{100}
\]

where:

- \(V_b\) = DFV required by specification,
- \(V_1\) = DFV of polish susceptible aggregate or RAP,
- \(X_1\) = percentage of polish susceptible aggregate or RAP,
- \(V_2\) = DFV of polish susceptible aggregate or polish resistant aggregate,
- \(X_2\) = percentage of polish susceptible aggregate or polish resistant aggregate,
- \(V_n\) = DFV of polish susceptible aggregate or polish resistant aggregate,
- \(X_n\) = percentage of polish susceptible aggregate or polish resistant aggregate

Note: Percent of \(X_1 + X_2 = 100\); or \(X_1 + X_2 + X_3 = 100\)
Table 1
Dynamic Friction Value Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>DFV</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDFV I</td>
<td>50</td>
</tr>
<tr>
<td>HDFV II</td>
<td>45</td>
</tr>
<tr>
<td>HDFV III</td>
<td>40</td>
</tr>
<tr>
<td>SDFV IV</td>
<td>30</td>
</tr>
<tr>
<td>SDFV V</td>
<td>25</td>
</tr>
<tr>
<td>LDFV VI</td>
<td>20</td>
</tr>
</tbody>
</table>

**EXAMPLE:**

<table>
<thead>
<tr>
<th>SIEVE</th>
<th>#7</th>
<th>#8</th>
<th>#10</th>
<th>RAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0 mm</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>88.0</td>
<td>100.0</td>
<td>100.0</td>
<td>94.0</td>
</tr>
<tr>
<td>9.5 mm</td>
<td>63.0</td>
<td>89.0</td>
<td>100.0</td>
<td>84.0</td>
</tr>
<tr>
<td>4.75 mm</td>
<td>15.0</td>
<td>23.0</td>
<td>95.0</td>
<td>75.0</td>
</tr>
<tr>
<td>2.36 mm</td>
<td>4.0</td>
<td>5.0</td>
<td>66.0</td>
<td>65.0</td>
</tr>
</tbody>
</table>

Percent + 9.5 mm of Source: 37.0 11.0 0.0* 16.0
Dynamic Friction Value (DFV) 45.0 25.0 25.0 30.0
Percent of Mix: 30.0 20.0 25.0 25.0

*Material not included in calculation. It is considered a fine aggregate.

Percent Coarse of Mix:

\[
\frac{(37.0)(30)}{100} + \frac{(11.0)(20)}{100} + 0 + \frac{(16.0)(25)}{100} =
\]

11.1 + 2.2 + 0 + 4.0 = 17.3

Percent Coarse for DFV Prediction:

\[
\frac{11.1}{17.3} = 64.2 \quad + \quad \frac{2.2}{17.3} = 12.7 \quad + \quad \frac{4.0}{17.3} = 23.1
\]

64.2 + 12.7 + 23.1 = 100.0

Therefore:

\[
V_b = \frac{(45.0)(64.2)}{100} + \frac{(25.0)(12.7)}{100} + \frac{(30)(23.1)}{100}
\]

\[
v_b = 28.89 + 3.18 + 6.93 = 39.0. \quad \text{(Note: Value equates to Category SDFV IV)}
\]
REPORT:

Report the percentages of polish susceptible and polish resistant aggregates of the blend to the nearest 0.1 percent.