Recommend Approval: Team Leader 1-21-16 Date Assistant Division Chief 1/29/16 Date	Maryland Department of Transportation State Highway Administration Office of Materials Technology MARYLAND STANDARD METHOD OF TESTS	
Approved: Director 02/01/16 Date	**LABORATORY METHOD OF PREDICTING FRICTIONAL RESISTANCE OF A BLEND OF AGGREGATES**	**MSMT 416**

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):

$$V_b = \frac{(V_1)(X_1)}{100} + \frac{(V_2)(X_2)}{100} + \cdots + \frac{(V_n)(X_n)}{100}$$

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 I	
Dynamic Friction Value Categories	
Category	**DFV**
HDFV I	50
HDFV II	45
HDFV III	40
SDFV IV	30
SDFV V	25
LDFV VI	20

EXAMPLE:

	AGGREGATE, PERCENT PASSING			
SIEVE	#7	#8	#10	RAP
19.0 mm	100.0	100.0	100.0	100.0
12.5 mm	88.0	100.0	100.0	94.0
9.5 mm	63.0	89.0	100.0	84.0
4.75 mm	15.0	23.0	95.0	75.0
2.36 mm	4.0	5.0	66.0	65.0

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:

$$\frac{11.1}{17.3} = 64.2 + \frac{2.2}{17.3} = 12.7 + \frac{4.0}{17.3} = 23.1$$

$$64.2 + 12.7 + 23.1 = 100.0$$

Therefore:

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

$V_b = (45.0)\ (0.642) + (25.0)\ (0.127) + (30.0)\ (0.231)$

$V_b = 28.89 + 3.18 + 6.93 = 39.0$. **(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.