INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF MATERIALS AND TESTS

DELTA Pb (ΔPb) DETERMINATION
FOR DENSE GRADED HMA OR SMA MIXTURES
ITM No. 591-20

1.0   SCOPE.

1.1   This test method covers the procedure to determine the delta Pb, (ΔPb), which is the difference between the estimated total binder content of the mixture, $(Pb)_{EST}$, and the total binder content as reported on the DMF, $(Pb)_{DMF}$.

The $(Pb)_{EST}$ is derived from the effective binder content of the mixture, Pbe, and an estimate of asphalt binder absorption, $(Pba)_{EST}$.

1.2   The ΔPb determination begins by obtaining the aggregate bulk specific gravity list and instructions as well as any applicable addendums. The mixture type, the aggregate and recycled materials blend percentages, the total binder content and the mixture bulk specific gravity value must also be obtained from the DMF mix-design cover sheet.

1.3   This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0   REFERENCED DOCUMENTS.

2.1   AASHTO Standards.

R 35   Superpave Volumetric Design for Hot Mix Asphalt
R 46   Designing Stone Matrix Asphalt (SMA)

2.2   ITM Standards.

584   Bulk Specific Gravity of Aggregate Blends with Recycled Aggregate

2.3   Other References.

SP-2   Superpave Mix Design by Asphalt Institute
              Design Mix Formula Cover Sheet

3.0   TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.

4.0   SIGNIFICANCE AND USE. This test method covers the procedure to determine the ΔPb which is the difference between the (Pb)$_{EST}$ and (Pb)$_{DMF}$.

5.0   APPARATUS. The apparatus shall be as stated in the referenced test methods.

6.0   SAMPLING. Sampling shall be as stated in the referenced test methods.

7.0   PROCEDURE.

7.1   Determine the water absorption of the combined aggregates blend as follows:

(ABS)$_{TOTAL}$ = (ABS$_1$)(P$_1$) + (ABS$_2$)(P$_2$) + … + (ABS$_N$)(P$_N$) + (1.00)[(P$_{RAP}$) + (P$_{RAS}$) + (P$_{BH}$) + (P$_{MF}$)]

Where:
- (ABS)$_{TOTAL}$ = water absorption of the combined aggregates blend
- P$_1$, P$_2$…P$_N$ = percentages by weight of aggregates 1, 2…N as shown on the DMF cover sheet
- ABS$_1$, ABS$_2$…ABS$_N$ = water absorption of aggregates 1, 2…N
- P$_{RAP}$, P$_{RAS}$, P$_{BH}$, P$_{MF}$ = percentages by weight of RAP, RAS, Baghouse Fines and Mineral Filler as shown on the DMF cover sheet
- P$_1$ + P$_2$ + … + P$_N$ + P$_{RAP}$ + P$_{RAS}$ + P$_{BH}$ + P$_{MF}$ = 100.0%

7.2   Determine the estimated total binder content as follows:

$$(Pb)_{EST} = \frac{(Pbe)+(Pba)_{EST}}{1+\left(\frac{(Pba)_{EST}}{100}\right)}$$

Where:

$$(Pbe) = \frac{(VMA-AV)}{\left(\frac{Gmb}{1.03}\right)}$$

VMA = specification minimum VMA value
AV   = specification design target air voids
(Pba)$_{EST}$ = (0.50) x (ABS)$_{TOTAL}$ when (ABS)$_{TOTAL}$ < 1.25%
(Pba)$_{EST}$ = (0.65) x (ABS)$_{TOTAL}$ when 1.25% ≤ (ABS)$_{TOTAL}$ ≤ 2.50%
(Pba)$_{EST}$ = (0.80) x (ABS)$_{TOTAL}$ when (ABS)$_{TOTAL}$ > 2.50%

7.3   Determine the ΔPb as follows:

$$\Delta Pb = (Pb)_{EST} - (Pb)_{DMF}$$

8.0   **REPORT.** The ΔPb value is reported to the nearest 0.01.