



**INDIANA DEPARTMENT OF TRANSPORTATION  
DIVISION OF MATERIALS AND TESTS**

**BULK SPECIFIC GRAVITY  
OF AGGREGATE BLENDS  
IN HMA MIXTURES  
ITM No. 584-19**

**1.0 SCOPE.**

- 1.1 This test method covers the procedure to determine the bulk specific gravity (Gsb) of a combined aggregate blend used in the HMA mixture.
- 1.2 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
- T 84 Specific Gravity and Absorption of Fine Aggregates
- T 85 Specific Gravity and Absorption of Coarse Aggregate

**2.2 ITM Standards.**

- 207 Sampling Stockpiled Aggregates
- 571 Quantitative Extraction of Asphalt and Gradation of Extracted Aggregate from Asphalt Paving Mixture.
- 590 Total Aggregate Bulk Specific Gravity Determination from Extracted HMA or SMA Mixture

**2.3 Other References.**

- SP-2 Superpave Mix Design by Asphalt Institute

**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.

- 4.1 This ITM is used to determine the bulk specific gravity of a combined aggregate blend with recycled aggregate used in HMA mixture.
- 4.2 The bulk specific gravity ( $G_{sb}$ ) of a combined aggregate blend is calculated using the bulk specific gravity of the aggregate in the reclaimed asphalt pavement and the actual bulk specific gravity of the other aggregates.
- 4.3 The bulk specific gravity of an aggregate blend is used to perform a volumetric analysis on compacted HMA in accordance with AASHTO R 35.

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 Identify the coarse aggregate(s), fine aggregate(s) and reclaimed asphalt pavement selected for use in the mix design
- 7.2 Identify and record the actual percentages for each of the aggregate components used in the combined aggregate blend of the mix design
- 7.3 Obtain a representative sample of the recycled materials in accordance with ITM 207
- 7.4 Determine the bulk specific gravity of each of the coarse aggregate(s). The Department HMA Bulk Specific Gravities list **shall** be used
- 7.5 Determine the bulk specific gravity of each of the fine aggregate(s). The Department HMA Bulk Specific Gravities list **shall** be used
- 7.6 Record the bulk specific gravity of reclaimed asphalt shingles as 2.500
- 7.7 Record the bulk specific gravity of mineral filler(s) or baghouse fines as 2.800
- 7.8 Determine and record the total bulk specific gravity of the reclaimed asphalt pavement,  $(G_{sb})_{RAP}$ , in accordance with ITM 590
- 7.9 If the total  $(G_{sb})_{RAP}$  of the recycled aggregate is equal to or greater than 2.620 or equal to or less than 2.660, use 2.640 as the  $(G_{sb})_{RAP}$ . If the  $(G_{sb})_{RAP}$  is less than 2.620 or greater than 2.660, the Department will obtain a sample of the reclaimed asphalt pavement and determine the  $(G_{sb})_{RAP}$ .

- 7.10** Calculate and record the bulk specific gravity of the combined aggregate blend as follows:

$$(\text{Gsb})_{\text{TOTAL}} = \frac{P_1 + P_2 + \dots + P_N + P_{\text{RAP}} + P_{\text{RAS}} + P_{\text{BH}} + P_{\text{MF}}}{\frac{P_1}{G_1} + \frac{P_2}{G_2} + \dots + \frac{P_N}{G_N} + \frac{P_{\text{RAP}}}{(\text{Gsb})_{\text{RAP}}} + \frac{P_{\text{RAS}}}{2.500} + \frac{P_{\text{BH}}}{2.800} + \frac{P_{\text{MF}}}{2.800}}$$

where:

- $(\text{Gsb})_{\text{TOTAL}}$  = bulk specific gravity of the combined aggregate blend
- $P_1, P_2, \dots, P_N$  = percentages by weight of aggregates 1, 2...N
- $P_{\text{RAP}}, P_{\text{RAS}}, P_{\text{BH}}, P_{\text{MF}}$  = percentages by weight of RAP, RAS, Baghouse Fines and Mineral Filler
- $G_1, G_2, \dots, G_N$  = bulk specific gravities of aggregates 1, 2...N
- $(\text{Gsb})_{\text{RAP}}$  = bulk specific gravity of recycled aggregate
- $P_1 + P_2 + \dots + P_N + P_{\text{RAP}} + P_{\text{RAS}} + P_{\text{BH}} + P_{\text{MF}} = 100.0\%$

- 8.0 REPORT.** The Gsb of the combined aggregate blend is reported to the nearest 0.001.