Standard Practice for

Superpave Volumetric Design for Asphalt Mixtures

AASHTO Designation: R 35-17[1]

Technical Section: 2d, Proportioning of Asphalt–Aggregate Mixtures

Release: Group 3 (August 2017)

AASHTO

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1. SCOPE

1.1. This standard practice for mix design evaluation uses aggregate and mixture properties to produce a hot mix asphalt (HMA) job mix formula. The mix design is based on the volumetric properties of the asphalt mixture in terms of the air voids, voids in the mineral aggregate (VMA), and voids filled with asphalt (VFA).

1.2. This standard practice may also be used to provide a preliminary selection of mix parameters as a starting point for mix analysis and performance prediction analyses that primarily use T 320 and T 322.

1.3. Special mixture design considerations and practices to be used in conjunction with this standard practice for the volumetric design of Warm Mix Asphalt (WMA) are given in Appendix X2.

1.4. *This standard practice may involve hazardous materials, operations, and equipment. This standard practice does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- M 320, Performance-Graded Asphalt Binder
- M 323, Superpave Volumetric Mix Design
- R 83, Preparation of Cylindrical Performance Test Specimens Using the Superpave Gyratory Compactor (SGC)
- R 30, Mixture Conditioning of Hot Mix Asphalt (HMA)
- R 76, Reducing Samples of Aggregate to Testing Size
- T 2, Sampling of Aggregates
- T 11, Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 84, Specific Gravity and Absorption of Fine Aggregate
- T 85, Specific Gravity and Absorption of Coarse Aggregate
- T 100, Specific Gravity of Soils

- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 195, Determining Degree of Particle Coating of Asphalt Mixtures
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Hot Mix Asphalt (HMA)
- T 228, Specific Gravity of Semi-Solid Asphalt Materials
- T 275, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Paraffin-Coated Specimens
- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- T 320, Determining the Permanent Shear Strain and Stiffness of Asphalt Mixtures Using the Superpave Shear Tester (SST)
- T 322, Determining the Creep Compliance and Strength of Hot Mix Asphalt (HMA) Using the Indirect Tensile Test Device
- T 324, Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures
- T 378, Determining the Dynamic Modulus and Flow Number for Asphalt Mixtures Using the Asphalt Mixture Performance Tester (AMPT)

2.2. *Asphalt Institute Standard*:

- SP-2, Superpave Mix Design

2.3. *Other References*:

- LTPP Seasonal Asphalt Concrete Pavement Temperature Models, LTPPBind 3.1, http://www.ltppbind.com
- NCHRP Report 567: Volumetric Requirements for Superpave Mix Design

3. TERMINOLOGY

3.1. *absorbed binder volume* (V_{ba})—the volume of binder absorbed into the aggregate (equal to the difference in aggregate volume when calculated with the bulk specific gravity and effective specific gravity).

3.2. *air voids* (V_a)—the total volume of the small pockets of air between the coated aggregate particles throughout a compacted paving mixture, expressed as a percent of the bulk volume of the compacted paving mixture (Note 1).

Note 1—Term defined in Asphalt Institute Manual SP-2, Superpave Mix Design.

3.3. *binder content* (P_b)—the percent by mass of binder in the total mixture, including binder and aggregate.

3.4. *design ESALs*—design equivalent (80 kN) single-axle loads.

3.4.1. *discussion*—design ESALs are the anticipated project traffic level expected on the design lane over a 20-year period. For pavements designed for more or less than 20 years, determine the design ESALs for 20 years when using this standard practice.

3.5. *dust-to-binder ratio* ($P_{0.075}/P_{be}$)—by mass, the ratio between the percent passing the 75-µm (No. 200) sieve ($P_{0.075}$) and the effective binder content (P_{be}).

3.6. *effective binder volume* (V_{be})—the volume of binder that is not absorbed into the aggregate.