
Standard Practice for Materials Selection and Mixture Design of Permeable Friction Courses (PFCs)

AASHTO Designation: PP 77-14 (2020)¹

**Technical Subcommittee: 2d, Proportioning
of Asphalt–Aggregate Mixtures**

Release: Group 3 (July)



**American Association of State Highway and Transportation Officials
555 12th Street NW, Suite 1000
Washington, DC 20004**

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1. SCOPE

- 1.1. This standard covers the materials requirements and mix design of permeable friction course (PFC) asphalt mixtures.
- 1.2. *This standard may involve hazardous materials, operations and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard 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
 - R 30, Mixture Conditioning of Hot Mix Asphalt (HMA)
 - T 19M/T 19, Bulk Density (“Unit Weight”) and Voids in Aggregate
 - T 96, Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - T 104, Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
 - T 176, Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
 - T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Asphalt Mixtures
 - T 245, Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus
 - T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
 - T 304, Uncompacted Void Content of Fine Aggregate
 - T 305, Determination of Draindown Characteristics in Uncompacted Asphalt Mixtures
 - T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyrotory Compactor
 - T 326, Uncompacted Void Content of Coarse Aggregate (As Influenced by Particle Shape, Surface Texture, and Grading)
 - T 331, Bulk Specific Gravity (G_{mb}) and Density of Compacted Hot Mix Asphalt (HMA) Using Automatic Vacuum Sealing Method
 - TP 108, Abrasion Loss of Asphalt Mixture Specimens

2.2.

ASTM Standards:

- D3549/D3549, Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens
- D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

3. TERMINOLOGY

3.1. *Definitions:*

- 3.1.1. *asphalt binder*—an asphalt-based cement that is produced from petroleum residue either with or without the addition of modifiers.
- 3.1.2. *abrasion loss*—the loss of mass from an asphalt mixture specimen under the effect of abrasion.
- 3.1.3. *air voids*—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 total volume of the compacted specimen.
- 3.1.4. *breakpoint sieve*—the finest sieve to retain at least 10 percent of the aggregate fraction.
- 3.1.5. *draindown*—separation of asphalt binder from the coarse aggregate structure, generally during storage or transportation.
- 3.1.6. *permeable friction course (PFC)*—a special type of porous asphalt mixture with air voids of at least 18 percent used for reducing hydroplaning and potential for loss of friction resistance, where the function of the mixture is to provide a free-draining layer that permits surface water to migrate laterally through the mixture to the edge of the pavement.
- 3.1.7. *stabilizing additive*—materials used to minimize draindown of asphalt during transport and placement of PFC, which may include fibers, polymers, crumb rubber, or a combination of these additives.
- 3.1.8. *voids in the coarse aggregate (VCA)*—the volume of voids between the coarse aggregate particles, where this volume includes filler, fine aggregate, air voids, asphalt binder, and stabilizing additives, if used.

4. SUMMARY OF PRACTICE

- 4.1. Aggregates, asphalt binder, and stabilizing additives are selected that meet specification values. Trial aggregate blend gradations are selected and tested to determine the design aggregate gradation. The blends are compacted using a trial binder content in order to evaluate the trial mixes and select the design gradation to ensure stone-on-stone contact. Once a trial gradation is selected, the asphalt binder content is altered and the optimum asphalt binder content is selected based on meeting minimum binder content and air void requirements and ensuring stone-on-stone contact in the mixture. Stone-on-stone content is verified by ensuring the volume of voids in the mixture is less than or equal to the volume of voids in the dry-rodded coarse aggregate fraction of the design gradation. The mix design is further verified by determining the abrasion loss, which is used as an indicator of the durability of the mixture. The designed mixture is then evaluated for resistance to moisture susceptibility.