SmartMIX™

DRY MIX RUBBER ADDITIVE FOR
HIGH-PERFORMANCE PAVED SURFACES

GUIDE SPECIAL PROVISION FOR
SMARTMIX MODIFIED HMA MIXTURES

- **Description.** This work consists of furnishing and placing HMA mixture(s) using Superpave Mixture Design Methods. Furnish Superpave HMA mixtures according to prevailing Standard Specifications for Construction, except as modified herein. This specification includes mix specifications for recycled tire rubber modified Superpave HMA mixture(s). Adjust all equipment and methods as necessary to properly accommodate the modifications specified herein.

Furnish all HMA mixtures not specified herein according to Standard Specifications. Place all HMA mixtures according to Standard specifications and the Special Provision for HMA/Recycled tire Rubber Modified HMA Application Estimate.

- **Mix Design.** Furnish an HMA mixture design for the specified HMA mixtures to the Engineer and to the Construction Field Services Division. Perform Superpave mixture design according to Prevailing Standard Specifications for Construction, except as specified herein. The submitted designs will be evaluated according to the HMA Production Manual, Procedures for HMA Mix Design Processing.

Prepare the mix design(s) for SMARTMIX modified HMA mixtures with the following properties:

1. Design the mixture with 0.65 ± 0.10% SMARTMIX by weight of the mixture.
2. Treat the SMARTMIX as a fine aggregate.
3. The target air voids shall be 4.5% ± 0.5.

- **Recycled Mixtures.** Design and produce HMA mixture(s) to meet the criteria specified in prevailing specifications for RECYCLED HOT MIX ASPHALT MIXTURE OF LOCAL AGENCY PROJECTS, or similar specification.

- **Materials**. Furnish modified Superpave HMA mixture(s) consisting of aggregates of the highest quality available to meet the minimum specifications herein. Furnish a mix design according to the criteria and volumetric properties specified.

For mixture design purposes, top and leveling courses are defined as the mixture layers within 4 inches of the surface; the base course is defined as all layers below 4 inches of the surface. For mixture layers which fall within the 4 inch threshold, the following rule should apply: If less than 25 percent of a mixture layer is within 4 inches of the surface, the mixture layer should be considered to be a base course.

1. **Aggregates.** Furnish virgin aggregates free of topsoil, clay, and loam for use in plant mixed HMA mixtures, with no clay ironstone aggregate particles retained on the #8 and larger sieves.

2. **Pre-Swollen Recycled tire Rubber (SMARTMIX).** Furnish SmartMIX composed of recycled tire rubber, free from metal or other contaminants. Before the swelling process, furnish RTR according to Table 1. Obtain a certificate of compliance from the SMARTMIX supplier that the RTR has been:

i Saturated with a liquid reactant, extender oil, or asphalt binder,

ii Heated and reacted in a manner sufficient to complete the swelling process,

iii Cooled and coated with a flow agent to prevent particle agglomeration and allow for dry powder bulk packaging.

Obtain the Engineer's approval for alternate materials prior to shipping.

Add the SMARTMIX with the Reclaimed Asphalt Pavement (RAP) at the asphalt mixing facility. Use a separate feed system to store and proportion by weight the required quantity of SMARTMIX into the mixture with uniform distribution with a minimum tolerance of +/- 10% by weight of the SMARTMIX target dosage, (0.10% by weight of finished mix). Calibrate feed system prior mixing and furnish certificate to the Engineer prior to use. Furnish samples of SMARTMIX to the Engineer according to specifications for *Sampling and Testing for Performance, Quality Assurance, and Acceptance of Modified HMA Mixtures*.

Table 1. Gradation of the 20 minus Recycled tire Rubber to be used in SMARTMIX (before swelling process)

Manufacturer Sample ID:	20 minus
Sieve Size	% Passing
1.18-mm (#16)	98-100
0.841-mm (#20)	80-100
600-m (#30)	40-85
425-m (#40)	-----
300-m (#50)	15-25
150-m (#100)	-----
75-m (#200)	-----

3. **Asphalt Binder.** Use PG grade asphalt binder per the prevailing *Special Provision for HMA/Recycled tire Rubber Modified HMA Application Estimate*. Furnish samples of base binder to the Engineer for performance evaluation according to procedures in *Sampling and Testing for Performance, Quality Assurance, and Acceptance of Modified HMA Mixtures* or similar specification.

4. **SMARTMIX Modified HMA Mixture.** Furnish samples of HMA mixtures to the Engineer for acceptance and performance evaluation according to the prevailing *Sampling and Testing for Performance, Quality Assurance, and Acceptance of Modified HMA Mixtures* or similar specification

- **Measurement and Payment.**

Contract Item (Pay Item)	Pay Unit
HMA, _E_, Mod, RTR	Ton

Payment for ***HMA, _E_, Mod, RTR*** includes all equipment, materials, and labor necessary to perform mix design, furnish, place, and to perform the required quality assurance sampling and testing.

- **Sampling and Testing for Performance, Quality Assurance, and Acceptance of Modified HMA Mixtures**. HMA mixtures specified herein will be accepted according to the prevailing, *Special Provision for Acceptance of HMA Mixture on Local Agency Projects*, or similar specification, except as modified herein.

Furnish material samples as specified herein for all aspects of HMA production and placement. These samples will be utilized for acceptance testing as well as laboratory performance evaluation of the materials. In-place instrumentation and performance testing may be conducted by the Engineer.

1. **Materials:** Produce HMA mixture(s) according to the Job Mix Formula (mix design), within the uniformity tolerances listed in the prevailing specification for mix designs.

Coordinate sampling and/or furnish material samples and quality control test data to the Engineer as follows:

A. Aggregate. Furnish aggregates from stockpile sufficient to make 500 lbs of loose mixture for performance testing.

B. Asphalt Cement Binder. Perform quality control testing and furnish the following Test Data Certifications for each production lot of asphalt binder materials. In addition, furnish the following:

i. The refiner's full PG verification data for the base binder.

C. SMARTMIX Modified HMA Mixtures. Furnish samples for daily acceptance testing as directed. Furnish 600 lbs loose mixture for each mixture type in 3 to 5 gallon metal buckets (with tightly closed metal lids), sampled proportionately from each day of paving. Providing representative loose mixture samples obtained in accordance with agency mix sampling procedures, (with no segregation) is the responsibility of the contractor.

Obtain 6 (six) rectangular slab samples from each test section (as identified on the plans) from the finished HMA mat following placement. Saw cut samples with minimum dimensions 6" x 18", extending full depth of all HMA courses. Fill and compact the core-slab holes with an approved HMA mixture.

2. **Construction:**

A. Density. Pavement density will be measured by the Engineer with a Nuclear Density Gauge using the G_{mm} from the Job Mix Formula (JMF) for the density control target. **The required in place density of the HMA mixture shall be 93.0 - 98.0% of the G_{mm} for each mix.** The Contractor is responsible for establishing a rolling pattern that will achieve the required in place density.

B. Segregation. Use paving equipment and methods that will result in homogeneous placement of the loose HMA mixture throughout the paving width. If necessary, use "anti-segregation" components on the paver to ensure no segregation takes place, especially in the areas near the gearbox. Obtain at least 2 sets of samples taken from behind the paver in accordance with the prevailing sampling procedures or 6 inch diameter core samples for each mixture/paver combination. Each set of samples will consist of 3 samples from different centerline offset locations (9 samples), as directed by the Engineer. The Engineer will assess these samples for potential segregation of aggregates.

If evidence of segregation is found, suspend paving operations until the cause of segregation is identified and corrected. The Engineer may direct additional sampling and testing to confirm the degree and extent of the segregation and to assure that corrective action employed by the Contractor to eliminate the segregation is successful.

Propose remedial action for Engineer approval where segregated areas of inplace HMA pavement are confirmed. Perform remedial action as approved at no additional cost to the Department. Areas of confirmed segregated pavement will may be subject to penalties according to the requirements of the owner/agency as specified in *Special Provision for Acceptance of HMA Mixture on Local Agency Projects* or similar specification or provision.