

BEGIN - FIBER REINFORCEMENT FOR HMA & WMA

Description.

Furnish all materials, equipment, labor, and incidentals for mixing aramid fiber into HMA or WMA per this specification. Aramid fibers must be treated to prevent them from becoming airborne during the mixing process, and the treatment must become soluble in the asphalt. Treated aramid fiber shall be continuously fed and mixed into HMA or WMA per dosage and mixing requirements of this specification. A certified QA/QC mixing technician shall perform continuous feeding of the treated aramid fibers into the asphalt during plant mixing operations for all of the Fiber Reinforced HMA/WMA quantities required for the project, and a P.E. stamped certification report must be submitted upon project completion.

Definitions.

- a. "HMA" is hot mix asphalt, without aramid fiber.
- b. "Fiber Reinforced HMA" is hot mix asphalt including aramid fibers.
- c. "WMA" is warm mix asphalt, without aramid fiber.
- d. "Fiber Reinforced WMA" is warm mix asphalt including aramid fibers.
- e. "Aramid fiber" is pure aramid fiber meeting the material properties of this specification, without additive materials.
- f. "Treatment" is the binder material used to facilitate the proper amount of the aramid fiber into the HMA or WMA so that the aramid fiber does not become airborne.
- g. "Dosage rate" is the minimum weight of treated aramid per ton of asphalt that is to be continuously fed into HMA/WMA.
- h. "Continuous feeding" is metering and delivering in a constant stream-like manner the dosage rate of treated aramid into the HMA/WMA during the asphalt mixing process at the plant.
- i. "Manufacturer" is the company that produces the aramid fiber from raw materials.
- j. "Supplier" is the company that offers an aramid product.

Materials.

Meet the following Aramid and Treatment material properties.

<u>Aramid Properties</u>	<u>Measure</u>
Material	Para-Aramid Fiber (50-52% by weight)
Form	Filament Yarn
Tensile Strength	> 2.758 (GPa)
Elongation at Break	< 4.4 (%)
Modulus	> 95 (GPa)
Specific Gravity	1.44-1.45 (g/cm ³)
Decomposition Temperature	> 800 (°F)

<u>Treatment Properties</u>	<u>Measure</u>
Treatment Type	Sasobit® Wax (48-50% by weight)
Treatment Melting Temperature	> 175 (°F)

<u>Short Cut Aramid Fiber Bundles</u>	<u>Measure</u>
Length	0.75 +/-0.05 (inch)
Appearance/Handling	Free Flowing Coated Fiber Bundles (visual)

Submittals.

Provide the following from the product supplier at least two weeks prior to asphalt production.

1. Identify the mixing plant and type (Batch or Continuous Drum).
2. Material data sheet for the treated aramid fiber describing aramid fiber and treatment properties, including the type, weight, and flash point of treatment material.
3. A certified QA/QC mixing plan including procedures for continuously feeding the aramid fiber into the asphalt. The fiber supplier must approve the QA/QC mixing plan and provide certification of the QA/QC mixing technician at the asphalt mixing plant who is responsible for continuous feeding of the fiber into the HMA or WMA. The continuous feeding can be accomplished by using either manual or machine operated equipment for the entire fiber mixing process.

Job Mix Formula.

When treated aramid fiber is required as a mixture ingredient, modification to the job mix formula is not required.

Storage Requirements.

Store treated aramid product in a dry environment and do not allow it to be in contact with moisture.

Dosage & Mixing Requirements.

The aramid dosage rate is 2.1 ounces (+/- 5%) per ton of HMA/WMA. This does not include the treatment weight. For uniform disbursement, treated aramid shall be metered and continuously fed in a constant stream-like manner. It shall be mixed with the heated aggregates before injection of the liquid asphalt during the asphalt mixing process at the Batch or Continuous Drum Plant per below.

1. Batch Plant

Feed treated aramid manually, or with machine operated equipment, onto RAP or aggregate belts, or directly into the pug mill or weigh hopper. Standard project HMA/WMA batch mixing times apply. Metering shall be based on batch size (tons) and dosage rate (oz/ton). Feeding shall occur in a constant stream-like manner during the heated aggregate mixing batch time. If necessary, increase the mixing time with heated aggregates to ensure the aramid fibers are uniformly distributed.

2. Continuous Drum Plant

Feed treated aramid manually, or with machine operated equipment, onto the RAP belt or directly into the mixing drum through the RAP Collar. Standard project HMA/WMA asphalt production rates apply. Metering shall be calibrated based on the asphalt production rate (tons/hr), and the dosage rate (oz/ton). Feeding shall occur in a constant stream-like manner. . If necessary, increase the mixing time with heated aggregates to ensure the aramid fibers are uniformly distributed.

Inspection.

Visual inspection shall be performed during the mixing process to verify uniform distribution of aramid fiber.

Fiber Reinforced HMA/WMA Placement.

All construction, mixture and density requirements of the asphalt as detailed in the Standard Specifications shall apply.

Pre-Approved Products, Manufacturers & QA/QC Mixing.

Product: ACE Fiber™

Manufacturer: Surface Tech
Contact: Steve Santa Cruz
(619) 750-1851
steve@surface-tech.com
111 SW 5th Ave., S1940
Portland, Oregon 97204

QA/QC Mixing: CBC Engineers & Associates, Ltd.
Contact: Mitch Hardert, P.E.
(937) 428-6150
mitchhardert@cbceng.com
125 Westpark Rd.
Centerville, Ohio 45459

Acceptance.

Acceptance of the reinforced HMA/WMA will include the following factors:

1. The owner/specifier shall receive from the contractor a Professional Engineer stamped QA/QC report which certifies that the metering and continuous feeding was performed per the Dosage rate and all other requirements of this specification by a certified technician, and that visual inspection was performed during the mixing process to certify that no clumping of aramid fiber or treatment product occurred.
2. All other construction, mixture and density requirements of the asphalt as detailed in the Standard Specifications shall apply.

Basis of Payment.

Each ton of Fiber Reinforced HMA/WMA placed according to this specification will be measured and paid for at the contract unit bid price per ton, and shall include full compensation for furnishing all material labor, tools, equipment, QA/QC mixing and reporting, and incidentals for doing all the work involved in metering and feeding the treated aramid fiber, and placement and compaction of the Fiber Reinforced HMA/WMA.

Pay Item.

Fiber Reinforced HMA or WMA _____TONS _____\$/TON