SPECIAL NOTE FOR FIBER REINFORCEMENT OF ASPHALT

PART 1 – GENERAL

1.1 DESCRIPTION

This Section includes specifications for furnishing all materials, equipment, labor, and incidentals for mixing aramid fiber reinforcement to hot mix asphalt. Aramid fiber adds reinforcement to the asphalt mixture to improve high temperature rutting and low temperature cracking properties while allowing the mixture to withstand high stress applications.

1.2 DEFINITIONS

1.2.1 HMA - hot mix asphalt.

1.2.2 WMA - warm mix asphalt. HMA that is treated to reduce the mixing and compaction temperature.

1.2.3 Aramid fiber - pure aramid fiber meeting the material properties of this specification, without additive materials.

1.2.4 Fiber reinforced asphalt mixture - hot mix or warm mix asphalt including aramid fibers properly proportioned and distributed, uniformly mixed, and coated with asphalt.

1.2.5 Delivery material(s) - the material(s) combined with the pure aramid fiber to facilitate aramid fiber and HMA/WMA proportioning, uniform mixing with the HMA/WMA, and asphalt coating of the aramid fibers. Delivery material(s) should keep the pure aramid fiber form flying away.

1.2.6 Aramid product - the aramid supplier's mixture of pure aramid fiber and delivery material(s).

1.2.7 Manufacturer - the company that produces the aramid fiber from raw materials.

1.2.8 Supplier - the company that sales the aramid product.

PART 2 – PRODUCT

2.1 MATERIALS

Aramid fiber should comply with **ASTM D8395-23, *Standard Specification for Aramid Fiber for Asphalt Mixtures.***

2.2 SUBMITTALS

Submit the following:

2.2.1 Identification of the HMA/WMA mixing plant.

2.2.2 A certificate of analysis (COA) on the non-treated aramid fiber that ensures that the physical and mechanical properties follow ASTM D8395, Tables 1 and 2

2.2.3 Documents from the aramid product supplier at least three weeks prior to HMA/WMA production:

2.2.3.1 Supplier's specified dosing rate for the aramid product.

2.2.3.2 Certification that the amount of aramid fiber product will be between within the specified tolerance for each ton of hot mix asphalt.

2.2.3.3 Evidence showing how many times, if any, the supplier's fiber product has been successfully produced at the asphalt plant to be used for the project.

2.2.3.4 Proven method of introducing the aramid fibers into the hot mix asphalt which will not cause the aramid fibers to become airborne.

2.3 JOB MIX FORMULA

Aramid fiber typically does not change the job mix formula. Modification to the job mix formula is not required, unless requested by the Engineer.

PART 3 – EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

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

3.1.2 Standard dosage is 2.1 oz. minimum of pure aramid per ton of asphalt mixture. This amount can be increased / specified as needed such as 1.5x (3.15 oz.) or 2x (4.2 oz.) minimum dosage for additional mixture performance with no change to the mix design. The weight applied is for pure aramid fibers only. The weight of any delivery or packaging materials is not considered.

3.1.3 The aramid fiber supplier's representative should be on site during the first day of production mixing. This requirement can be waived if fiber supplier and HMA/WMA producer can supply evidence of supplier's brand of fiber product being successfully produced by the HMA/WMA producer. The fiber supplier's representative may be on site for additional days as requested by the Engineer.

3.1.4 Introduce the aramid fiber with delivery material(s) as follows:

3.1.4.1 Batch Plant - When a batch type plant is used, add the aramid product dosage to aggregate in the weigh hopper or pug mill. This may be done with loose fibers and a fiber metering device or may be done by using manual dosing equipment. If necessary, increase the batch dry mixing time to ensure the aramid fibers are uniformly distributed prior to the injection of asphalt cement into the mixer.

3.1.4.2 Drum Plant - When a continuous or drier-drum type plant is used, add the aramid product at the Recycled Asphalt Pavement (RAP) collar or to the RAP belt in a continuous manner to uniformly disperse with the aggregate. . Use a separate aramid product metering device feed system to proportion by weight of total mix, the required percentage of fiber reinforcement into the mixture. Control the aramid product metering system with a proportioning device to meet the dosing requirements.

NOTE: When a continuous or drier-drum type plant is used for limited production volumes, the addition of the aramid product may be done by using manual measuring tools or equipment at the location listed above. Because this is not an automated process, a written protocol must be supplied by the producer to demonstrate how they will attain the dosage requirement, and documentation must be supplied by the material manufacturer assuring this method will produce the desired uniform aramid fiber distribution.

3.1.5 As determined by the Engineer, mix the aramid fiber with the aggregate longer, if needed, to allow thorough distribution of aramid fibers at the end of the mixing process and to promote asphalt coating of individual strands of aramid fiber. At the start of any fiber mixing, visually observe the reinforced asphalt mixture at the plant and in first three trucks at the point of discharge and prior to delivery to the job site. Observation shall include using a shovel or other tool to inspect the mixture by

allowing it to slightly cool and fall from the shovel's or tool's edge. Further inspection can be performed by allowing the loose mixture to cool and pulling apart to inspect for strands of aramid. Adjust mixing time and temperature if needed to ensure aramid fiber distribution.

3.1.6 When WMA is used, a feeder system will be required for both Drum and Batch plants to ensure correct distribution and coating of the aramid fibers. This requirement maybe waved if the asphalt producer can demonstrate complete melting or dissolving of the delivery material and proper incorporation of the aramid fibers into the mixture.

3.2 ACCEPTANCE

Acceptance of the reinforced asphalt mixture will include the following factors:

3.2.1 Aramid fiber is properly proportioned based on documentation comparing fiber feeding/dosing to HMA/WMA mix production. A report or log of the total amount of aramid fibers applied certified by fiber manufacturer/supplier shall be required daily.

3.2.2 Visual inspection at the end of the mixing process should verify there is no clumping of aramid fiber or aramid delivery product and aramid fibers are uniformly distributed.

3.2.3 All other mixture and density requirement of the asphalt mixture as detailed in the Standard Specifications, current edition, shall apply.

PART 4 - MEASUREMENT AND PAYMENT

The Department will measure the quantity of Fiber Reinforcement for HMA/WMA as ton of asphalt placed with fibers. Each ton of asphalt placed with the aramid fibers according to this special note will be measured and paid for at the contract unit bid price per ton, and shall include full compensation for furnishing all labor, tools, equipment, and incidentals for doing all the work involved in adding the fibers to HMA/WMA.

The specified dosage rate for aramid fibers for this project for Fiber Reinforcement for HMA/WMA is _____ x Minimum Standard Dosage Rate (_____ x 2.1 oz. / ton of HMA/WMA asphalt mix) = _____ oz./ton.

Code	Pay Item Pay	Unit
24785EC	**Fiber Reinforcement for HMA**	**Tons**