

STATE

OF

TENNESSEE

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SPECIAL PROVISION

REGARDING

BITUMINOUS PLANT MIX (HOT MIX) OPEN-GRADED FRICTION COURSE

Description: This specification covers the requirements for the placement of an Open Graded Friction Course (OGFC). The work shall consist of the design and construction of an Asphalt Concrete surface in accordance with Sections 407, 411, and 903 of the Specifications. All requirements for the Asphalt Concrete surface (Hot-mix) Grading D in Sections 407, 411, and 903 shall apply to this item except as revised herein.

Material: All OGFC designs shall follow NAPA Publication, “*Design, Construction and Maintenance of Open-Graded Friction Courses*” published in 2002 except where modified here in. The OGFC shall be designed utilizing a Marshall compaction hammer at 50 blows. The contractor shall formulate and submit a job mix formula that satisfies the general design limits in Table-1 Mixture Requirements.

Coarse Aggregate: Coarse aggregates, materials retained above the #4 sieve, shall be virgin and from approved sources and shall meet all the requirements of **Subsection 903.11(a)**. A minimum of 75% of coarse aggregates shall meet the requirements of **Subsection 903.11(c)**. The coarse aggregate shall have at least 90% crushed aggregate with 2 fractured faces and 100% with one fractured face as determined by ASTM D 5821. The coarse aggregate shall have a LA Abrasion value less than 30% and a maximum absorption of 3.0%.

Stabilizing Additive Material: The stabilizing additive shall conform to AASHTO M 325, Section 8. Fiber pellets shall not be used. Slag Wool Fiber or Cellulose Fiber shall be blown into the asphalt plant measured by a flow meter or sensing device that is accurate to within ±10% of the amount required. For Batch Plants, fibers shall be added in to pugmill or weigh hopper. For drum plants, the fiber line shall be placed one foot upstream of the asphalt binder line so that the fibers are captured by the asphalt binder before being exposed to high-velocity gases in the drum. The minimum additive for a slag wool fiber shall be 0.4% and the minimum for a cellulose fiber shall be 0.3%.

Performance Graded Asphalt Cement: The Performance Graded Asphalt Cement shall be of the type specified and shall meet TDOT specification **Subsection 904.01**.

Production: The temperature of the OGFC mix shall not exceed 350° F at any time during production.

Placement: A Material Transfer Device (MTD) capable of unloading a truck or trailer load of hot mix asphalt without moving the truck shall be utilized when placing OGFC. Haul trucks shall be thoroughly coated with a TDOT Qualified Product List(QPL) approved release agent, such that there are no puddles in the truck bed.

Revise Subsection 407.09-Weather Limitations to read as follows:

The OGFC shall be placed only when the pavement surface temperature and the ambient air temperature are a minimum 55° F and rising. OGFC will not be placed during foggy or rainy conditions. The placement of OGFC shall be limited to the period from April 1 to November 1.

Compaction: Compaction of the wearing course shall consist of a minimum of two passes with a steel double drum asphalt roller with minimum weight of 10 tons, before the material temperature has fallen below 185° F. At no time shall the rollers be allowed to remain stationary on the freshly placed asphalt concrete. Rollers shall be equipped with functioning water system and scrapers to prevent adhesion of the fresh mix onto the roller drums. A minimum of two roller units shall be supplied so the compaction will be accomplished promptly following the placement of the material. The breakdown roller should be within 50 feet of the paver. A release agent (added to the water system) may be required to prevent adhesion of the fresh mix to the roller drum and wheels. At no time shall a pneumatic tire roller be used or a steel wheel roller be used in vibratory mode. If the roller begins to break the aggregate, the contractor shall stop rolling immediately. No in place density readings will be required for acceptance.

Method of Measurement: As per **Subsection 411.09**, the accepted quantities of Open Graded Friction Course shall be paid for at the respective contract unit price per ton for Mineral Aggregate and Asphalt Cement. The addition of a stabilizing additive material (fiber) shall be included in the cost of the Asphalt Cement.

Basis of Payment: As per **Subsection 411.10**, the unit price per ton shall include all labor, materials and equipment necessary to complete the work. For bidding purposes, the target binder content of the OGFC shall be 6.0%

Table 1 – Mixture Requirements
Composition by percent weight

Sieve Size	Percent Passing	Production Tolerances
¾ in.	100	-
½ in.	85 – 100	±4.0%
3/8 in.	55 – 75	±4.0%
#4	10 – 25	±4.0%
#8	5 – 10	±3.0%
#30	-	-
#50	-	-
#100	-	-
#200	2 - 4	±2.0%
Asphalt Cement	6.0% Minimum	±0.25%
Air Voids	20% Minimum	
Stabilizing Additive	0.30% or .040%	
VCA_{DRC} > VCA_{MIX}		
Moisture Susceptibility	80% Minimum	
Cantabro Test	Unaged 20% Maximum	
Draindown	<0.3%	

If during production, the OGFC gradation or asphalt content fall outside of the tolerances that are listed in the table, the contractor shall stop production and correct the problem. Then the contractor shall be limited to 100 tons production until gradation and asphalt content are inside the production tolerances listed above. Mixture placed that is out of tolerance, may be required to be removed and replaced at the Contractors expense.

Revise Subsection 407.03-Composition of Mixtures. Section (C) to read as follows:

(C) Job Mix Formula:

1. General:

At least 21 working days prior to the scheduled start of production of any asphalt paving mixture, the Contractor shall submit in writing in duplicate a proposed Job Mix Formula and Laboratory Design. The mix shall be designed according to NAPA Publication, "*Design, Construction and Maintenance of Open-Graded Friction Courses*" published in 2002. Design specimens shall be compacted with 50 blows of a Marshall compaction hammer and the optimum asphalt content and mixture volumetrics shall be determined at that compaction level. If the specification requirements are not met, it will be necessary to make adjustments to the aggregate types and proportions. If requested, the Department will assist the contractor with the design process. In addition the Contractor shall submit to the Engineer for approval an asphalt barge certification with temperature-viscosity curve for each mixture. A sample of each material to be used in the mix shall be delivered to the location designated by the Engineer.

The following information shall be furnished:

- a. The specific project on which the mixture will be used.
- b. The source and description of all materials to be used in the mix.
- c. The gradations and approximate proportions of the raw materials as intended to be combined in the paving mixture.
- d. A single percentage of the combined mineral aggregate passing each specified sieve. The combined aggregate gradation shall be plotted on a gradation chart with sieve sizes raised to the 0.45 power to assure a well graded mix.
- e. The Loss on Ignition (L.O.I.) results on the combined aggregate.
- f. The Bulk Specific Gravity, Apparent Specific Gravity and absorption on the combined mineral aggregate in the paving mixture (AASHTO T 84 and T 85)
- g. The fractured face count (ASTM D 5821) and glassy particle count of the plus No. 4 material, if applicable.
- h. A single percentage of asphalt by weight of total mix intended to be incorporated in the completed mixture.
- i. The dosage rate and source of anti-stripping additive, if required, meeting the requirements of Section 918.09 (B), to be added to the asphalt.
- j. The maximum specific gravity of the asphalt mixture (AASHTO T 209).
- k. A single temperature at which the mixture is intended to be discharged from the plant.
- l. Evidence that the completed mixture will conform to all specified physical requirements established herein.
- m. The tensile strength ratio (TSR) indicating the stripping and moisture susceptibility characteristics of the mix.

- n. In order to identify critical mixes and make appropriate adjustments, the mix design should have the required design properties for the bitumen content range of Optimum Asphalt Cement $\pm 0.25\%$.
- o. The dosage rate and source of stabilizing additive, meeting the requirements of AASHTO M 325, that is sufficient to prevent draindown at plant production temperatures.
- p. Draindown sensitivity results, in accordance with AASHTO T 305 at the anticipated plant production temperature and shall not exceed 0.30%.

The temperature shown on the Job Mix Formula shall be the optimum mixing temperature as shown on the temperature-viscosity curve. The mixing temperature of Polymer or Latex Modified Asphalt mixes shall not exceed 350 degrees F.

The Laboratory Design must be prepared and signed by a Certified Laboratory Technician. To be certified, the technician must have completed the TDOT Mix Design Workshop School conducted by the Department, including the written and lab performance testing.

2. Revision of Job Mix Formula:

The approved job mix formula shall remain in effect until a change is authorized in writing by the Engineer. The Contractor, at any time after construction has started, may request that the job mix formula be revised, providing evidence is shown that the revision is necessary and the revised aggregate gradation will meet all applicable gradation requirements.

A new design will be required for any change in source of materials. All requests for design mix adjustments, redesigns and new design mixes will be submitted in writing to the Engineer for approval.