OPEN-GRADED FRICTION COURSE

Delete Section 409, OPEN-GRADED FRICTION COURSE, of the Standard Specifications in its entirety and replace it with the following:

409.1 Description

This section contains specifications for the materials, equipment, construction, measurement, and payment for an open-graded friction course (OGFC) composed of crushed mineral aggregate, polymer modified binder, warm mix chemical additives, and hydrated lime mixed in an approved asphalt plant. Place the OGFC on a prepared surface and in conformity with the Plans or as otherwise specified by the RCE.

409.2 Materials

409.2.1 General

Use materials meeting the applicable requirements of Subsection 401.2 except as modified in this subsection. Do not use RAP, slag, or marine limestone in the OGFC. PG 76-22 and hydrated lime are required.

409.2.2 Aggregate

Use crushed coarse aggregate having an abrasion loss of not more than 52.0% when tested in accordance with AASHTO T 96 (C Grading). If the aggregate's abrasion loss is greater than 42.0%, but less than or equal to 52.0%, test the Micro-Deval abrasion value of the material in accordance with AASHTO T 327 and ensure it does not exceed a maximum of 15.0% loss. Use Crushed coarse aggregate with two or more freshly mechanically induced fractured faces on at least 90%, based on count, in accordance with AASHTO T 61, and a Sodium Sulfate Soundness loss not greater than 15.0% when subjected to five alterations in accordance with AASHTO T 104. When Fly Ash is used as a mineral filler material in an OGFC design, ensure that it is from a source listed on Qualified Products List 03.

409.2.3 WMA Additives

Use a WMA chemical additive that is listed on Qualified Products List No. 77 and is terminally blended with the Asphalt Binder. The use of stabilizing fibers is not required.

409.2.4 Composition of Mixture

Design WMA job mix formulas in accordance with SC-T-80 and SC-T-88 for OGFC designs. Ensure that all designs are accepted by the Materials and Research Engineer prior to use on SCDOT work. Ensure that mix designs are prepared in a laboratory approved by the Asphalt Materials Manager and by technicians certified as a SCDOT Level 2 Asphalt Job Mix Technician. Ensure a minimum retention coating of 99.5% following SC-T-91. Ensure abrasion resistance (Cantabro) of the OGFC mixture is less than 15.0% using SC-T-127. Ensure that porosity measurements on the mix design specimens are equal to or greater than 13.0% in accordance to SC-T-128.

	12.5mm OGFC	**9.5mm OGFC**
Sieve Designation	**% Passing**	
¾ inch	100.0	100.0
½ inch	85.0 - 100.0	95.0 – 100.0
⅜ inch	55.0 - 75.0	80.0 - 100.0
No. 4	15.0 - 30.0	20.0 - 50.0

No. 8	5.0 - 15.0	5.0 - 20.0
No. 200	0.00 - 4.00	0.00 - 4.00
Range for % Binder	5.50 – 7.00	5.5 – 7.00

Design and set target mix design gradations within the master range above. Field tolerances are not permitted to extend outside of the ranges for each designated sieve.

409.3 Equipment

Provide sufficient equipment to enable prosecution of the work in accordance with the project schedule and completion of the work in the specified time. Ensure that the equipment necessary for the proper construction of the work is on site, in acceptable working condition, and approved by the RCE as to both type and condition before the start of work under this section.

409.4 Construction

409.4.1 Ambient Air Temperature Limitations

Place the OGFC on a clean, dry, properly tacked surface only during favorable weather conditions. Ensure that ambient air temperature during placement of OGFC is 55ºF or above when measured in the shade away from any artificial heat sources. Do not place OGFC when the ambient temperature is below freezing the day prior to ensure proper bond to existing pavement surface.

409.4.2 OGFC Paving Plan

Provide a detailed paving plan to the RCE a minimum of 5 days prior to the pre paving meeting to be held at the RCE's office prior to beginning the project. Alter the paving plan as necessary in order to maintain schedule and to provide consistent OGFC mixture.

409.4.2.1 Hauling – Trucking Operations

Ensure that the paving plan includes a trucking schedule showing exactly how many trucks will be used for each milepost of the project in order for the paving operation to be done in a continuous manner without waiting for the asphalt mixture and to eliminate excess standing idle time with loaded hauling trucks.

409.4.2.2 Mix Delivery Temperature

Ensure that the paving plan includes a mixture temperature range that will be maintained in the haul trucks / MTV prior to load out into the asphalt paver. Produce the OGFC mix in a manner as to not exceed the maximum temperature specified on the Job Mix Formula.

409.4.2.3 Paver Operations

Ensure the paving plan includes desired optimum paver speed in feet per minute to eliminate inconsistent movement (reduce paver stops) of the paving operations, provide a more uniform finished mixture, and ensure the OGFC is properly seated to the underlying surface.

409.4.2.4 Compaction Operations

Provide a list of static rollers that will be used to compact the OGFC mixture. Submit a diagram of the roller pattern to be used for the construction project. Ensure the diagram includes the distance or range in feet where the rollers will be located behind the paver during compacting operations.

409.4.2.5 Production

Produce the OGFC mix not to exceed the maximum temperature stated on the OGFC Job Mix Formula to prevent unnecessary drain-down of the asphalt binder, and no less than 225 ºF. To avoid cross-contamination, do not produce other Department project mixes during OGFC production. Thoroughly clean out plant prior to production to prevent excess buildup of aggregate fines from being discharged thereby affecting consistent paving operations. Ensure all equipment repairs are completed prior to production so that the plant is at peak performance for OGFC production. Ensure that all loads of OGFC produced are monitored for mix temperature prior to leaving the plant according to the paving plan, and trucks are tarped and strapped to minimize heat loss of the OGFC mixture.

409.4.3 Additional Quality Control Testing

Perform drain-down testing using SC-T-90 at least one time during the first day's production, then at least once every 7 production days thereafter. If a drain-down test produces a resulting retention coating of less than 95.0%, conduct drain-down testing at least once every 3 production days thereafter until a result of 95.0% or greater is obtained. If a drain-down test produces a resulting retention coating of less than 90.0%, immediately stop production and contact the Asphalt Materials Manager.

409.4.4 Placement Operations

409.4.4.1 Tack Coat

Use a less tracking hot applied bond coat that is listed on Qualified Products List No 38. Ensure that the tack coat is applied uniformly to create a bonding layer between the existing riding surface and the OGFC. Ensure that the product is placed at a minimum of 0.08 gallons per square yard or as is otherwise deemed necessary by the RCE. A PG 64-22 binder may be applied in lieu of hot applied bond coats. Adjust distributors accordingly to apply hot applied products uniformly, and ensure that all safety precautions are taken prior to production.

409.4.4.2 Placement of OGFC

One half load of OGFC can be sent to the jobsite to preheat the paving equipment (MTV and or paver if necessary) but then discard and dispose of this mixture and do not use it on the mainline paving. The Department will pay for the half load in order to prevent contamination and improve construction of the transverse joint. Ensure that once the half load is discarded, the material is not used in the spread rate calculations. Ensure that the temperature of the mix when placed on the roadway is not less than 225ºF. Do not allow long hauling distances or excessive waiting time to off-load. Unless otherwise permitted by the RCE, place OGFC mix within 90 minutes of loadout-discharge at the plant.

Submit a written explanation for any paver stops that exceed 15 minutes to the RCE prior to the next day's production. More than two paver stops exceeding 30 minutes in the same production day will require stopping operations and determining a path forward to eliminate paver stops. Revision to the paving plan may be necessary to continue operations. Paver stops will not require any special equipment to monitor time or thermal segregation, however they are recommended.

Spread the OGFC at the rate shown on the Plans and promptly roll with an 8 to 10 ton tandem steel-wheel roller conforming to the requirements of Subsection 401.3.11. Cease rolling as soon as the OGFC is properly seated to the underlying surface. Ensure that not more than three passes (total) of the rollers are applied to the OGFC. In the event that aggregate breakdown is observed, make adjustments in the rollers used or to the roller pattern to eliminate the breakdown.

Do not permit non-uniform distribution of binder (flushing) and raveling in the OGFC. Remove areas in the OGFC that are flushed or raveled to the full lane width 50 feet on each side and replace at no additional expense to the Department.

409.5 Measurement

The quantity for the pay item OGFC is measured in a similar manner as HMA courses specified in Subsection 401.5.

409.6 Payment

Payment for OGFC is determined using the contract unit price for the pay item. Payment is full compensation for constructing the OGFC as specified or directed and includes furnishing, mixing, hauling, placing, and compacting OGFC; furnishing and applying tack coat; and all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, the Specifications, and other terms of the Contract. Payment for each item includes all direct and indirect costs and expenses necessary to complete the work. Pay items under this section include the following:

Item No. Pay Item Unit

Item No.	**Item**	**Pay Unit**
4091000	Open Graded Friction Course – 9.5mm	TON
4092000	Open Graded Friction Course – 12.5mm	TON