March 1, 2016

Asphalt Binder and Additives

Delete Subsection 401.2.1.1, Binder and Additives, General of the Standard Specification in its entirety and replace it with the following:

401.2.1.1 Performance Graded (PG) Binder

Use PG 64-22 or PG 76-22 binder as required by the contract that conforms to all of the requirements of AASHTO M 320. Do not use any combination of "air blown" asphalt binders. Ensure that the asphalt binder supplier lists all types of modifiers and additives used in the production of their PG binders including source of Re-Refined Engine Oil Bottoms (REOB), polymers, ground tire rubber (GTR), polyphosphoric acid (PPA), silicone, and liquid anti-stripping agent (LASA) in their Quality Control Plans. Ensure that additives used for compaction aides or anti-strips such as silicones, WMA additives, and LASA products are listed on the Bill of Lading (BOL). Use PG asphalt binders and modifiers that are heat and storage stable. Thoroughly blend the composite materials at the asphalt terminal before being loaded into the transport vehicle. Asphalt terminals that either supply or produce PG binders must be able to store multiple tanker loads of PG and certify that their products meet AASHTO M 320 prior to transferring or shipping on the BOL and that all modifiers and additives are compatible. Ensure that all PG binders adhere to *SCDOT Qualified Products Policy No. 37-38*. Only use PG 64-22 and PG 76-22 binder from sources listed on the most recent edition of *SCDOT Qualified Product List 37*.

401.2.1.1.1 Modified Performance Graded Binder

When specified, use modified binder consisting of a neat binder modified with a polymer or other modifier producing a binder complying with the requirements of a PG 76-22 as specified in AASHTO M 320 with the addition of the Multiple Stress Creep Recovery (MSCR) test using AASHTO T 350. Ensure acceptable elastomeric polymer is used by using Non-recoverable Creep Compliance values plotted against Percent Recovery based on figure X1.1 found in AASHTO M 332 using RTFO aged material. Ensure that the MSCR test is performed at 64°C using the Very Heavy Traffic "V" Grade requirement in AASHTO M 332. Use elastomer polymer or modifier consisting of a styrene-butadiene (SB), styrene-butadiene-styrene (SBS), styrene-butadiene-rubber (SBR), or ground tire rubber (GTR). Polyphosphoric Acid (PPA) may also be added to the binder, but must not exceed 0.5% by weight of the asphalt binder. Varying blends of SB, SBS, SBR, GTR (7% min.), and PPA (0.5% max.) may be used, at the discretion of the AME, provided the end product meets all specified requirements for the PG 76-22. Perform the storage stability separation test ASTM D7173 to ensure the asphalt binder is homogenous. Ensure that all storage tanks on the asphalt plant site are clearly marked to prevent cross contamination of different PG binders.

401.2.1.1.1.1 Ground Tire Rubber (GTR) in Performance Graded Binder

Ensure that the Ground Tire Rubber (GTR) is <u>terminally</u> (no exceptions) blended with the neat asphalt to create a homogenous and storage stable PG 76-22 that meets all criteria as stated in 401.2.1.1.1, with the exception of Solubility requirement (AASHTO T 44). Blending the GTR modified binder at the asphalt plant during asphalt mixture production will not be permitted. Use a 2.0mm gap setting when using the DSR in accordance to AASHTO T 315 and AASHTO T 350. GTR materials must be free from excessive moisture when received from the tire recycling facility and stored in a dry location at the terminal to prevent blending issues with the binder modification process. A letter of compliance from the tire recycling facility will be required by the AME and the asphalt terminal stating that the GTR blend will meet this specification. The GTR must be free of loose metal particles, other foreign contaminating materials, with exception of embedded metal particles in the rubber. Mineral powder may be added to reduce sticking and caking of the GTR particles. Stabilizing or compatibility additive(s) can be used to achieve better particle distribution. Any additives used for this purpose must not be detrimental to the performance of the asphalt binder or mixture performance and must be accepted by the AME in the supplier's QC plan. Ensure that the GTR supplier provides certificates of compliance with each shipment certifying that all requirements of this specification are complied with for each production lot number and the end product is homogenous and shows no signs of separation or coagulation. In the event that the terminal changes supply sources of GTR type of grind

(ambient or cryogenic), or particle size, the asphalt terminal must perform a complete binder analysis on their revised product, and also provide a split sample to the SCDOT to ensure specification compliance.

Provide all sources of GTR and grind type in the asphalt terminal's QC plan. SCDOT may obtain samples of the GTR particles, base binder, or the finished GTR modified asphalt binder to ensure specification compliance at any time.

Physical Test	Test Procedure	Specification
Sampling of the GTR	ASTM E105 ASTM E122	In accordance to random sampling procedures
GTR Supply	ASTM D5603	Ambient or Cryogenic Grind
Dosage of GTR	Per COA & Supplier's QC Plan	Minimum of 7.0% by weight of the PG 64-22 base asphalt binder
GTR Specific Gravity	ASTM D5603	1.06 – 1.20
GTR Particle Distribution	ASTM D5644	30 Mesh Maximum of 2.0% Retained
GTR Metal Content	ASTM D5603	Maximum 0.01%
GTR Fiber Content	ASTM D5603	Maximum 0.50%
GTR Moisture Content	ASTM D1509	Maximum 0.75%
Mineral Filler –Talcum Powder (Optional)	ASTM M17	Maximum of 4.0%
Stabilizing Additives (Optional)	-	Maximum of 4.5% by wt. of GTR

Chemical Test	Test Procedure	Specification
Acetone Extract	ASTM D297	Maximum 25.0%
Rubber Hydrocarbon Content		40.0 – 60.0 %
Ash Content		Maximum 8.0 %
Carbon Black Content		20.0 – 40.0 %
Natural Rubber		16.0 – 45.0 %

401.2.1.1.1.2 Ground Tire Rubber in Open Graded Friction Course Mixtures

Stabilizing fibers and fiber supply systems at the asphalt plant may not be necessary when the GTR binder is used as required by section 409.2.3 and 409.4.3 of the Standard Specifications. Perform the SC-T-90 drain-down procedure at 350°F when conducting the asphalt mix design, or otherwise directed by the AME. In the event that drain-down values are found to be excessive, then stabilizing fibers may be necessary as directed by the AME. No additional compensation will be paid for the fibers in the OGFC mixture.

401.2.1.1.1.3 Asphalt Plant Storage Requirements When Using Ground Tire Rubber

Use a dedicated storage tank for "terminal blended GTR asphalt binder" at the asphalt plant. This tank must be capable of providing continuous mixing, as well as recirculation of the GTR asphalt binder as needed. Ensure that this tank is heated and capable of maintaining the temperature of the homogeneous blend of asphalt binder and GTR at 300°F to 350°F. Ensure that GTR modified binders are not mixed with other modified PG 76-22 binder without permission of the AME.