

Asphalt Rubber Chip Sealing

DRAFT MAINTENANCE SPECIFICATION

March 22, 2007

Description: This work consists of furnishing and applying asphalt rubber binder followed by an application of treated cover aggregate to the surface of the existing pavement. It shall be constructed in accordance with these specifications and close conformity with the lines, grades, thickness, and typical cross section shown on the plans or established by the Engineer.

Material: The chip sealing shall be composed of asphalt rubber binder and cover aggregate as specified below:

- (1) **Asphalt Binder:** The asphalt binder for the asphalt rubber mixture shall be PG 58-28.
- (2) **Rubber:** The granulated rubber shall be a vulcanized rubber product from the ambient temperature processing of scrap, pneumatic tires. The granulated rubber shall meet the following gradation.

Note: The use of rubber of multiple types from multiple sources is acceptable provided that the overall blend of rubber meets the gradation requirements. The length of the individual rubber particles shall not exceed 1/8 in.

<u>Sieve Size</u>	<u>% Passing</u>
#10	100
#16	90 – 100
#30	25 – 75
#80	0 – 20

- (3) **Cover Aggregate:** The cover aggregate shall be crushed quarry stone, free from dust and other contaminants.

The percentage of wear as determined by the Los Angeles Abrasion Test (AASHTO-T96) shall be a maximum of 30. The aggregate shall be pre-heated to a temperature between 200 Degrees F and 300 Degrees F and be pre-coated with 0.6 % (+/- 0.2%) by weight of aggregate of PG 64-28 asphalt binder prior to application.

The gradation of the aggregate shall meet the following limits:

<u>Sieve Size</u>	<u>% Passing – Nominal Size</u> <u>3/8 in</u>
5/8 in	100
1/2 in	100
3/8 in	85 – 100
#4	0 – 25
#8	0 – 5
#50	0 – 2
#200	0 – 2

Note: The Contractor is responsible for locating a suitable location for stockpiling the required aggregate and insuring that stockpiles do not become contaminated. The Contractor will be responsible for clean up at the stockpiles sites.

A minimum of 30 days prior to construction, the Contractor shall send a representative sample of the proposed aggregate to the asphalt rubber supplier for testing. Gradation testing shall be performed to determine the design application rates for the asphalt rubber binder and the cover aggregate. A Coating and Stripping Test (AASHTO T-182) shall be performed by the Contractor to assure compatibility of the asphalt rubber binder with the processed aggregate. A copy of the test results will be provided to the Engineer prior to the start of work.

- (4) **Mixing and Reaction:** For 20% Asphalt Rubber Binder, the percent of granulated rubber shall be 18% (+/- 3%) by weight of the total asphalt rubber binder. The 20% asphalt rubber binder shall meet the requirements of ASTM D6114, Table 1, Type 2. For the 10% Asphalt Rubber Binder, the percent of granulated rubber shall be 10% (+/- 3%) by weight of the total asphalt rubber binder. The exact granulated rubber content shall be the quantity that will yield a final asphalt rubber viscosity of 300 – 700 cP @ 347 degrees F as determined by a Haake-type high range rotational viscometer (utilizing Rotor #1).

The temperature of the asphalt binder shall be 350 – 425 degrees F at the time of the addition of the granulated rubber. The asphalt binder and rubber shall be combined and mixed together in the mechanical blender and reacted for a minimum of one hour. The temperature of the asphalt rubber binder shall be above 325 degrees F during the reaction period.

When a job delay occurs after full reaction, the asphalt rubber binder may be allowed to cool. The asphalt rubber binder shall be re-heated slowly just prior to application, but not to a temperature exceeding 375 degrees F. An additional quantity of granulated rubber, not exceeding 2% by weight of the asphalt rubber binder, may be added after re-heating in order to maintain a 300 – 700 cP viscosity for the 10% granulated rubber mixture. For a 20% granulated mixture, the additional quantity of granulated rubber is not to exceed 3% by volume of the asphalt rubber binder and may be added after re-heating in order to maintain a 1500 – 5000 cP viscosity.

Equipment: The equipment used by the Contractor shall include, but not be limited to the following:

- (1) **Mechanical Blender:** A mechanical blender for proper proportioning and thorough mixing of the asphalt binder and granulated rubber is required. This unit shall be equipped with: asphalt totaling meter (gallons); a flow rate meter (gallons per minute); a positive displacement auger to feed the rubber properly to a mixing chamber at the specified rate; and a static motionless mixer. Blender will have a separate asphalt binder feed pump and finished product pump to maximize production. Blender shall be capable of providing 100% proportional mix at any given time during the blending cycle and documentation from the manufacturer supporting this shall be submitted to the Engineer if requested.
- (2) **Distributor Truck:** On projects exceeding 35 tons of asphalt rubber, at least two pressure-type bituminous distributor trucks in good condition will be required. The distributor shall be equipped with an internal heating device capable of heating the material evenly up to 425 degrees F, an internal mixing unit capable of maintaining a proper mixture of asphalt cement and granulated rubber; have adequate pump capacity to maintain a high rate of circulation in the tank and to spray the asphalt rubber binder at a viscosity of 300 – 2000 cP for the 10% granulated rubber mixture and 5000 cP for the 20% granulated rubber mixture. The distributor shall be equipped with an electronically controlled computerized compensation unit for controlling application rates at various width and speed changes.

The application unit shall have electronic controls and a digital readout installed and operated from inside the cab of the distributor. The distribution bar on the distributor shall be fully circulating. Any distributor that produces a streaked or irregular

distribution of the material shall be promptly repaired or removed from the project. Distributor equipment shall include a tachometer, pressure gauges, volume measuring devices, and a thermometer for reading the temperature of tank contents. Controls for the spray bar shall be located in the truck cab for controlling the width and rate of spray of the product. The spray bar shall be capable of spraying from one foot to 16 feet.

It shall be constructed so that uniform application may be made at the specified rate per square yard.

- (3) **Aggregate Spreader:** The aggregate spreader shall be hydrostatically driven and self propelled. It must be equipped with a hydraulically controlled variable adjustable head that is capable of spreading stone in widths from 4 to 16 feet. The spreader shall be mounted on pneumatic tires, and shall apply the stone on the road surface in a manner that ensures that the tires do not contact the road surface until after the stone has been applied. The unit shall be equipped with an electronic radar type sensor used to measure ground speed and will automatically adjust the stone application rate depending on the width of application and the speed of spreader. It shall have the ability to apply stone on any grade from 0 – 10%. The spreader shall be equipped with an integral hopper with a minimum capacity of 5 tons of stone which shall be filled by trucks in a manner which ensures that the truck tires never come in contact with asphalt treated road surfaces until the stone has been properly applied. To maintain constant stone application, a self-locking truck hitch will permit towing of aggregate trucks without stopping the spreader. It will be capable of maintaining positive engagement over irregular terrain.
- (4) **Pneumatic-Tired Roller:** There shall be at least two self-propelled, multiple wheel, pneumatic-tired rollers which shall weigh between 7 and 12 tons. Each roller shall have a minimum total compacting width of five feet, have a minimum tire pressure of 60 psi, and be equipped with a water system.
- (5) **Steel-Wheel Roller:** One self-propelled, 2-axle (tandem) steel-wheel roller shall be used and shall weigh between 8 and 12 tons. It shall be equipped with scrapers, wetting pads and a watering system. Combination pneumatic and steel drum-type rollers are acceptable, as one unit only.
- (6) **Power Broom/Street Sweeper:** A rotary power broom or street sweeper shall be provided that is capable of cleaning the road

surface prior to spraying bituminous material and to remove loose cover aggregate after treatment as directed by the Engineer.

Construction Methods: The chip seal operation shall proceed in accordance with the requirements of the “Maintenance and Protection of Traffic” and “Prosecution and Progress” specifications.

- (1) **Weather Requirements:** Work will not be done unless the pavement is dry. No work shall be done during rain or foggy periods. No work shall be done if the ambient temperature is below 50 degrees F. Work shall be restricted to the calendar year dates of April 15 – October 15.
- (2) **Road Surface Preparation:** Immediately prior to the application of asphalt rubber binder and cover aggregate the roadway surface shall be cleaned by the Contractor using a mechanical sweeper and any other equipment or means necessary to remove all foreign debris and material (leaves, branches, dirt, sand, garbage, etc...) from the pavement surface. The surface shall also be dry. The prepared roadway surface must meet the approval of the Engineer. All foreign debris and material shall be removed and disposed of by the Contractor.

Following pavement cleaning, the Contractor shall cover all pavement and utility structures including storm drains, manhole covers, water gates and gas gates. The Contractor shall remove and dispose of the covers not prior to the completion of rolling operations yet by the close of the work day.

- (3) **Application of Asphalt Rubber Binder:** The asphalt rubber binder for a 10% granulated rubber mixture shall be applied at a temperature of 300 to 390 degrees F at a rate of 0.30 – 0.40 gallons per square yard. The asphalt rubber binder for a 20% granulated rubber mixture shall be applied at a temperature of 340 to 410 degrees F at a rate of 0.50 to 0.65 gallons per square yard. The actual rate of application within these ranges for a given pavement requires the cover aggregate be embedded at 50% of the stone particle size into the asphalt rubber binder with minimal stone loss following compaction.

Longitudinal and transverse joints shall be constructed to appear neat and uniform without buildup, uncovered areas, or unsightly appearance. Place longitudinal joints on lane lines reasonably true and parallel to centerline. Where any construction joint occurs, the edges shall be broomed back and blended so there are no gaps and

the elevations are the same, and free from ridges and depressions. Longitudinal joints shall be overlapped from 4 to 6 inches.

Note: During application, adequate provisions shall be made to prevent marring and discoloration of adjacent pavements, structures, vehicles, foliage and personal property.

- (4) **Application of Cover Aggregate:** The application of aggregate shall follow as close as possible behind the application of the hot asphalt rubber binder, not to exceed 300 feet. Construction equipment or other vehicles shall not drive on the uncovered asphalt rubber binder. The pre-coated aggregate shall be spread uniformly by a self-propelled spreader at a rate of spread directed by the Engineer, generally between 25 and 30 pounds per square yard for the 10% granulated rubber mixture and 30 to 40 pounds per square yard for the 20% granulated rubber mixture. Any deficient areas shall be covered with additional material.
- (5) **Rolling Operations:** A minimum of three rollers shall be used for aggregate compaction into the asphalt rubber binder. Two of the rollers must be pneumatic-tired and third must be steel-wheel.

Rolling shall commence immediately following the spread of aggregate. There shall be at least three coverages by the pneumatic tired rollers to embed the aggregate particles firmly into the asphalt rubber binder. Coverage shall be as many passes as are necessary to cover the entire width being spread with a pass being one movement of a roller in either direction. Additional coverage of the steel-wheel roller will follow, if used. Water shall be applied to the tires or wheels as required, limiting sticking of the asphalt rubber binder and aggregate to the rollers.

- (6) **Protection of Surface:** No traffic shall be permitted on the chip sealed road surface until after all rolling has been completed and the asphalt rubber binder has set to a degree satisfactory to the Engineer. All traffic shall be held to speeds not exceeding 25 miles per hour. "Loose Stone" signs shall be posted at the beginning limit of the chip seal operation and at every one mile interval. Speed limit signing and other required signing shall meet all Connecticut Department of Transportation and contract requirements. They shall remain in place for a minimum of 24 hours after the chip seal was placed. Signing shall not be removed until the loose aggregate is removed from the roadway and all other contract requirements are fulfilled (i.e. line striping) so that the original posted speed limit can be reinstated.

Note: When the maximum amount of aggregate has been embedded into the asphalt rubber binder and the pavement has cooled, all loose material shall be swept or otherwise removed. This must be done at a time and in a manner, which will not displace any embedded aggregate or damage the new surface.

Method of Measurement: This work will be measured for payment by the number of square yards of “Chip Seal” placed. The specification is presented as a turn-key operation requiring bidders to include all costs associated with this work.

Basis of Payment: The accepted quantity of “Chip Seal” placed shall be paid for at the contract unit price per square yard. The cost of the asphalt rubber binder used shall be included in the cost per square yard. This unit price shall include all materials, equipment, tools, and labor incidental thereto.