

SPECIFICATIONS FOR RUBBER POLYMERIZED MEMBRANE SURFACE TREATMENT
RPM SURFACE TREATMENT

1.0 DEFINITIONS

The term Director [Superintendent, etc.] shall mean the Director of Public Works of the awarding authority.

The term Designee shall mean an employee of the awarding authority, designated by the Director.

The term Contractor shall mean a professional company contracted by the awarding authority to perform work under this agreement.

2.0 DESCRIPTION

This specification covers requirements for materials, manufacture and application of crumb rubber polymerized asphalt to be used as a stress absorbing membrane surface treatment. The specification shall consist of an application of a combined reacted mixture of performance graded asphalt and ground rubber followed immediately with a cover material.

3.0 MATERIALS

3.1 Base Asphalt Binder:

The base asphalt binder for the RPM mixture shall be PG 58-28 or PG 64-28 complying with the requirements of appropriate state or local specifications. The grade selected shall be based on laboratory testing by the RPM supplier.

3.2 Anti-Stripping Agent:

If required by the job mix formula to produce appropriate water resistance, an anti-stripping agent that is heat stable and approved for use by the Agency shall be incorporated into the RPM material at the dosage required by the job-mix formula (up to 1.0% by weight of asphalt). It shall be added to the asphalt cement prior to blending with the granulated rubber.

3.3 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: no substitutions will be accepted.

Sieve Size	% Passing
#10 (2.00 mm)	100%
#16 (1.18 mm)	90 – 100%
#30 (0.60 mm)	25 – 100%
#80 (0.18 mm)	0 – 20%

The use of rubber of multiple types from multiple sources is acceptable provided that the overall blend of rubber meets the gradation requirements. The rubber shall be accepted by certification from the rubber supplier.

3.4 Aggregate:

The aggregate shall conform to the requirement of appropriate state or local specifications for crushed stone. Crushed gravel stone will not be permitted. Percentage of wear as determined by the Los Angeles Abrasion Test (AASHTO-T96) shall be a maximum of 35. The aggregate shall be pre-heated to a temperature between 93°C and 149°C, (200°F and 300°F) and be pre-coated with 0.4% – 0.8% (by weight of aggregate) of PG 58-28 or PG 68-28 asphalt cement prior to application. It is recommended that the gradation of the aggregate meet the following limits as tested by AASHTO T27.

Sieve Size	% Passing – Nominal Size
	3/8" (9.5 mm)
5/8" (15.8 mm)	100%
1/2" (12.5 mm)	100%
3/8" (9.5 mm)	85 – 100%
#4 (4.75 mm)	0 – 8%
#8 (2.36 mm)	0 – 6%
#200 (0.075 mm)	0 – 2%

4.0 ASPHALT-RUBBER MIXING AND REACTION

4.1 Mixing and Reaction Equipment:

The method and equipment for combining the ground rubber and PG asphalt binder shall be so designed and accessible that the Engineer can readily determine the percentage of each material being incorporated into the mixture.

Equipment utilized in the production and proportioning of Asphalt-Rubber binder shall include the following as a minimum:

- An asphalt heating tank or heat exchanger with hot oil heat transfer to heat the PG asphalt binder to the necessary temperature before blending with the ground rubber. This unit shall be equipped with a thermostatic heat control device.
- A mechanical blender shall be utilized for proper proportioning and thorough mixing of the PG asphalt binder and ground rubber. This unit shall have a Coriolis type mass flow meter capable of measuring and recording the flow rate and total quantity of asphalt binder in both gallons and weight. The quantity of ground rubber shall be determined by weight utilizing either a hopper equipped with load cells or a feeder equipped with a belt scale. The percentage of ground rubber based on total asphalt rubber binder shall be recorded.
- An asphalt rubber storage tank equipped with a heating system to maintain the proper temperature of the binder and an internal mixing unit capable of maintaining a homogeneous mixture of asphalt and ground rubber.

4.2 Mixing:

The percent of rubber shall be 10% +/- 2% by weight of total mixture, that is, by total weight of asphalt cement, plus granulated rubber.

The temperature of the asphalt binder shall be between 325°F and 400°F at the time of addition of the ground rubber. Ensure that there are no agglomerations of rubber particles in excess of two inches in the least dimension in the mixing chamber.

The Contractor shall document that the proportions are accurate and that the rubber has been uniformly incorporated into the mixture. Ensure that the crumb rubber and asphalt binder are thoroughly mixed. Rubber floating on the surface or agglomerations of rubber particles is evidence of insufficient mixing. Maintain the temperature of the asphalt-rubber binder immediately after mixing between 325°F and 375°F for a minimum of 45 minutes before use.

4.3 Testing and Certification:

The materials shall be tested and certified by an AMRL accredited laboratory meeting the criteria listed below.

Test	Temperature °F / (°C)	Method	Specification ASTM D6114-II
Apparent Viscosity	347 / (175)	ASTM D2196	125-500 cP
Softening Point	-	ASTM D36	Min 105°F (40.6°C)

The contractor shall submit with the bid a Quality Control Plan from the Asphalt Rubber supplier meeting the requirements of AASHTO R-26 format.

5.0 EQUIPMENT

5.1 Distributor Truck:

On projects exceeding 35 tons of liquid 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°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 at a viscosity of 1,500 to 5,000 centipoise; have adequate pressure devices and suitable manifolds to provide constant positive cut-off to prevent dripping from the nozzles. 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 read out installed and operated from the inside of 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 temperature of tank contents. Controls for spray bar shall be located in cab of truck, for controlling width and rate of spray of product. It shall be so

constructed that uniform applications may be made at the specified rate per square yard with a tolerance of plus or minus 0.05 gallon per square yard.

A "bootman" shall accompany the distributor and ride in a position so that all spray bar nozzles are in his full view and readily accessible for unplugging.

5.2 Hauling Equipment:

Tank trucks utilized for the transportation of asphalt rubber shall be equipped with a heating system to maintain the proper temperature of the binder and an internal mixing/agitation unit capable of maintaining a homogeneous mixture of asphalt and ground tire rubber while in transit.

Trucks for hauling cover material shall be rear discharge conveyor-fed or "live bottom" trucks and shall be equipped with a device to lock onto the hitch at the rear of the chip spreader to prevent aggregate spillage.

Sufficient hauling vehicles will be available to ensure continuous operation of the distributor and chip spreader.

5.3 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 4.5 to 18 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 width of application and the speed of chip spreader. It shall have the ability to apply stone on any grade from 0 - 6%. 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 chip spreader. It will be capable of maintaining positive engagement over irregular terrain.

5.4 Pneumatic-Tired Roller:

A minimum of two (2) self-propelled, multiple wheel, pneumatic-tired rollers shall be used, and at least one shall weigh a minimum of 12 tons, and shall have a total compacting width of at least 56 inches.

5.5 Self-Propelled Rotary Pick-up Sweepers:

A minimum of two (2) self-propelled rotary pick-up sweepers shall be used. They shall be designed, maintained, equipped, and operated so that the pavement surface can be swept clean. The rotary sweepers shall be equipped with adjustable down pressure on the sweeper heads and shall be capable of temporarily storing the picked up material from the surface of the pavement for disposal offsite.

6.0 CONSTRUCTION PROCEDURES

6.1 Preparation:

The awarding authority shall crack seal (if needed), repair potholes, other areas of pavement failure, and major depressions in the existing pavement surface. The awarding authority shall place a leveling course on planed, milled or existing surface, if required.

The surface shall be thoroughly cleaned by sweeping immediately prior to application of the asphalt-rubber. (The owner shall have previously completed post-winter clean-up and sweeping of the road surface.)

The contractor shall be responsible for covering all utility irons just prior to application and uncovering after aggregate is spread.

6.2 Seasonal and Weather Limitations:

The asphalt-rubber shall not be applied when weather conditions are unfavorable to obtaining a uniform spread. Construction shall proceed only when the atmospheric temperature is at least 50°F and rising. No water shall be present on the road surface. RPM's shall not be applied after September 15 as a final surface.

6.3 Asphalt-Rubber Application:

The asphalt-rubber mixture shall be applied at a temperature of 325°F to 400°F at a rate of 0.30 to 0.40 gallons per square yard. Exact application rate to be determined by the aggregate gradation, traffic volume and pavement condition.

Longitudinal joints shall be reasonably true to line 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.

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

6.4 Aggregate Application:

The application of aggregate shall follow as close as possible behind the application of the hot asphalt-rubber which shall not be spread further in advance of the aggregate spread than can be immediately covered. Construction equipment or other vehicles shall not drive on the uncovered asphalt-rubber. The hot-precoated aggregate shall be spread uniformly by a self-propelled spreader at a rate of spread directed by the Agency, generally between 30 to 40 pounds per square yard. Any deficient areas shall be covered with additional material.

6.5 Rolling:

A minimum of two (2) pneumatic-tired rollers shall be used for aggregate embedment into the hot asphalt-rubber. Rolling shall commence immediately following spread of aggregate. There shall be at least three coverages by the pneumatic-tired roller to embed the aggregate particles firmly into the asphalt-rubber. 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.

6.6 Sweeping:

When the maximum amount of aggregate has been embedded in to the RPM and the pavement has cooled all loose material shall be swept or otherwise removed. This will be done at a time and in a manner, which will not displace any embedded aggregate or damage the new surface. Pre and post sweeping is the responsibility of the owner unless bid as a separate bid item.

7.0 PERFORMANCE

The awarding authority will not award this contract unless the Contractor furnished satisfactory evidence of his/her ability and experience to perform this work, and that he/she has sufficient capital and equipment to enable him/her to prosecute the work successfully and to complete it within the time named in the contract. The Contractor shall not sublet any portion of this contract, and will own all equipment used to complete such contract. As part of the bid, the Contractor must submit a list of six similar and successfully completed jobs, whose relevance to the proposed job shall be deemed by the awarding authority. The name, address, and telephone number of a contact person involved with each of these projects must be included so they can be investigated prior to the award of the contract. It will be the responsibility of each bidder to visit the job site with the Director. The awarding authority can reject any bid of a contractor who has not visited the work site.

8.0 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

8.1 RPM:

Rubber Polymerized Membrane used as a stress absorbing membrane surface treatment will be measured by the square yard and shall be the actual number of square yards applied. Price per square yard shall be full compensation for all labor, materials and equipment required completing the work in accordance with these specifications.

8.2 Other Work:

Measurement of and payment for other work such as patching, leveling, sweeping and crack sealing shall be bid as separate item(s).

9.0 GUARANTEE

Any material or workmanship found to be defective for up to one (1) year from the date of acceptance by the Director shall be replaced by the Contractor at no cost to the awarding authority. Upon notification of defective material or workmanship, the Contractor shall immediately replace such defective areas.

PRICE ADJUSTEMENT

A fluctuating price will be required for this bid to allow for price adjustments based on the period price of asphalt cement in the awarding authority's state. The price adjustment will be based on the variance in price for the asphalt cement component only from the Base Price to the Period Price. Base price for this bid will be \$_____ per ton of asphalt cement.

"Base Price" = the price of PG binder liquid per ton that exists on the bid opening date, listed above.

"Period Price" = the price of PG binder liquid per ton on the date the stabilization work is performed.

RUBBER POLYMERIZED MEMBRANE SURFACE TREATMENT:

Current Price minus Base Price divide by 235 (Gal. Asphalt in ton) x .9 (Asphalt minus rubber content) x .35 Gal. / SY (application rate) = Adjustment per square yard.

BID FORM

BASE BID: RUBBER POLYMERIZED MEMBRANE SURFACE TREATMENT applied to town prepared roadways in accordance with the attached specifications.

Price per Square Yard \$ _____

OPTION # 1: Contractor shall provide pre- and post- sweeping of the roadways.

Price per Square Yard \$ _____

OPTION # 2: Contractor shall provide all necessary crack sealing to the roadways prior to the Surface Treatment.

Price per Square Yard \$ _____

Bidder: _____ Phone: _____

Address: _____ Fax: _____

Signature: _____

Printed Name & Title: _____

Date: _____

REFERENCE LIST FOR RUBBER POLYMERIZED MEMBRANE SURFACE TREATMENT

RPM SURFACE TREATMENT

Please list six similar projects that have been completed.

Owner:

Address:

City, State, Zip:

Contact:

Phone:

Contract Amount:

Owner:

Address:

City, State, Zip:

Contact:

Phone:

Contract Amount:

Owner:

Address:

City, State, Zip:

Contact:

Phone:

Contract Amount:

Owner:

Address:

City, State, Zip:

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Address:

City, State, Zip:

Contact:

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Contract Amount: