

**SPECIFICATIONS FOR RUBBER POLYMERIZED MEMBRANE
SURFACE TREATMENT WITH AGGREGATE COVER**

“RPM SURFACE TREATMENT”

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 hot paving grade asphalt and ground rubber followed immediately with a cover material.

1.0 BASE MATERIALS

1.1 Asphalt Cement

Asphalt cement 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.

1.2 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.

1.3 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
2.00 mm, (#10)	100
1.18 mm, (#16)	90 – 100
0.60 mm, (#30)	25 – 75
0.18 mm, (#80)	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 length of the individual rubber particles shall not exceed 3mm (1/8”). The rubber shall be accepted by certification from the rubber supplier.

1.4 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 30. 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:

<u>Sieve Size</u>	<u>Passing – Nominal Size</u> <u>9.5 mm, (3/8")</u>
15.8 mm, (5/8")	100%
12.5 mm, (1/2")	100%
9.5 mm, (3/8")	85 – 100%
4.75 mm, (#4)	0 – 25%
2.36 mm, (#8)	0 – 5%
0.30 mm, (#50)	0 – 2 %
0.075 mm, (#200)	0 – 2%

1.5 Materials Testing

A minimum of 60 days prior to construction the Agency or contractor (if RPM supplier is acting as a sub-contractor) shall send a representative sample of the asphalt cement and the aggregate proposed for use to the RPM supplier for testing. Testing for stripping and asphalt content to determine and assure that appropriate characteristics are achieved when blended with the granulated rubber will be performed.

2.0 **CRUMB RUBBER POLYMERIZED MEMBRANE**

2.1 Mixing and Reaction

The percent of rubber shall be 10% +/- 2% as indicated by the mixture design for specific project requirements by weight of total mixture, that is, by total weight of asphalt cement, plus granulated rubber. The exact granulated rubber content shall be determined by the mix design submitted by the RPM supplier and based on laboratory testing.

The temperature of the asphalt shall be between 154°C and 204°C, (310°F and 400°F), at the time of addition of the granulated reclaimed rubber. The asphalt and rubber shall be combined and mixed together in a blender unit and reacted in the distributor for a period of time as required by the mix design. The temperature of the asphalt RPM mixture shall be above 163°C, (325°F), during the reaction period.

2.1 Delays

When a job delay occurs after full reaction, the RPM may be allowed to cool. The RPM shall be re-heated slowly just prior to application, but not to a temperature exceeding 191°C, (375°F). An additional quantity of granulated rubber or additive not exceeding 2% by volume of the hot RPM mixture may be added after re-heating.

3.0 EQUIPMENT

3.1 Mechanical Blender

A mechanical blender for proper proportioning and thorough mixing of the asphalt-cement and granulated rubber is required. This unit shall be equipped with: an asphalt totaling meter (liters or gallons); a flow rate meter (liters per minute or gallons per minute); a positive displacement auger to feed the rubber properly to mixing chamber at the specified rate; and a static motionless mixer. Blender will have a separate asphalt cement 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 awarding authority if requested.

3.2 Distributor Truck

On projects exceeding 31.8 metric tons, (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 218 C, (425F); 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 RPM at a viscosity of 30 – 2000 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 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 removal 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 meter with a tolerance of plus or minus 0.2 liters per square meter, (0.05 gal. /sq. yd). 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.

3.3 Hauling Equipment

Trucks for hauling cover material shall be rear discharge conveyor-fed or “live bottom” truck equipped with a device to look onto the hitch at the rear of the chip spreader to prevent aggregate spillage.

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

3.4 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 1.2 to 4.9 meters, (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 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 4.5 metric tons, (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.

3.5 Pneumatic-Tired Roller

There shall be at least two self-propelled, multiple wheel, pneumatic-tired rollers which shall weigh between 6.5 and 10.9 metric tons, (7 and 12 tons), each roller shall have a total compacting width of at least 1.4 meters, (56 inches), have a minimum tire pressure of 414 kPa, (60 psi), and be equipped with a watering system.

3.6 Steel-Wheel Roller

One self-propelled, 2-axle (tandem) steel-wheel roller shall be used and shall weigh between 7.3 and 10.9 metric tons, (8 and 12 tons), and be equipped with scrapers, wetting pads and watering system. Combination pneumatic and steel drum-type rollers are acceptable, as one unit only.

4.0 **CONSTRUCTION PROCEDURES**

4.1 Preparation

Potholes, other areas of pavement failure, and major depressions in the existing pavement surface shall be repaired by the owner with asphalt concrete. A leveling course shall be placed on planed, milled or existing surface by the owner, if required.

Immediately prior to application of the RPM, the surface shall be thoroughly cleaned by sweeping. Contractor shall be responsible for covering all utility irons just prior to application and uncovering after aggregate is spread.

4.2 Seasonal and Weather Limitations

RPM 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 10 C, (50 F), and rising. No water shall be present on the road surface.

4.3 Application

The RPM shall be applied at a temperature of 150 C to 200 C (302 F to 392 F), at a rate of 1.4 – 1.8 liters / square meter (0.30 – 0.40 gal / square yard). Exact rate to be determined by the aggregate gradation, traffic quantity and speed 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 10.2 to 15.2 centimeters, (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.

4.4 Aggregate Application

The application of aggregate shall follow as close as possible behind the application of the hot RPM which shall not be spread further in advance of the aggregate spread that can be immediately covered. Construction equipment or other vehicles shall not drive on the uncovered RPM. The hot pre-coated aggregate shall be spread uniformly by a self-propelled spreader at a rate of spread directed by the Agency, generally between 13.6 and 16.3 kilograms per square meter, (25 and 30 pounds per square yard). Any deficient areas shall be covered with additional material.

4.5 Rolling

A minimum of three rollers shall be used for aggregate compaction into the hot RPM. Two of the rollers must be pneumatic-tired and the third must be steel-wheel. At some project locations or when production rates dictate, one less roller may be utilized as determined by the Agency and RPM supplier.

Rolling shall commence immediately following spread of aggregate. There shall be at least three coverages by the pneumatic tired rollers to embed the aggregate particles firmly in the RPM. A 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 to limit sticking of the RPM and aggregate to the rollers.

4.6 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.

5.0 **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

5.1 RPM

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

5.2 Other Work

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

BID FORM

BID ITEM: 10% Asphalt-Rubber Surface Treatment applied to town prepared roadways in accordance with the attached specifications.

Price per Square Yard \$ _____

Bidder: _____

Phone: _____

Address: _____

Fax: _____

Signature: _____

Printed Name & Title: _____

Date: _____

**REFERENCE LIST
STONE SEAL &
10% ASPHALT-RUBBER SURFACE TREATMENTS**

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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Contract Amount: