

SPECIFICATIONS FOR ASPHALT-RUBBER SURFACE TREATMENT
STRESS ABSORBING MEMBRANE (SAM)

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 asphalt-rubber as a stress absorbing membrane (SAM). This 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.

3.0 MATERIALS

3.1 Base Asphalt Binder:

The base asphalt binder shall have a PG (Performance Grade) of PG58-28. The supplier may substitute PG64-28 where needed to meet the requirements of ASTM D 6114 (type II). The intended PG must be used in the mix design and for the Asphalt-Rubber blending.

3.2 Asphalt-Rubber Binder:

The physical requirements for the Asphalt-Rubber binder shall conform to ASTM D 6114 type II specifications. The minimum percentage of ground rubber shall be 15% by weight of the total Asphalt-Rubber binder.

The reclaimed vulcanized rubber shall be produced primarily from the processing of automobile and truck tires. The rubber shall be produced by the ambient temperature grinding processes only.

The specific gravity of reclaimed vulcanized ground rubber shall be not less than 1.10 and not greater than 1.20.

Rubber for use in Asphalt-Rubber binder shall be free of loose fabric, wire and other contaminants. Up to 4 percent (by weight of rubber) calcium carbonate or talc may be added to prevent caking or sticking of the particles together. The ground rubber shall be sufficiently dry so as to be free flowing and not produce foaming when blended with the hot PG binder.

3.3 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 200°F and 300°F, and be pre-coated with 0.4% to 0.8% (by weight of aggregate) of PG 58-28, PG 64-28 or PG 64-22 asphalt binder prior to application. Aggregate shall meet the following gradation 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 – 4%
#200 (0.075 mm)	0 – 2%

NOTES:

- The Flakiness Index shall be less than 30% (NFP 18-561 Test).

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 total quantity of asphalt binder in tons. 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 total weight in tons and percentage of ground rubber based on total asphalt rubber binder shall be recorded. All data shall be reported to the awarding authority as outlined in Section 4.4, Reporting.
- A dedicated asphalt rubber reaction/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 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 sampled once per lot at the point of manufacture, tested and certified by an AASHTO re:source (formally AMRL) accredited laboratory approved for asphalt rubber binder testing. The laboratory shall certify that the material meets the requirements of ASTM D 6114 type II specifications. A lot shall be defined as each batch produced, but not to exceed the volume of the manufacturer’s dedicated asphalt rubber reaction/storage tank.

In addition to the ASTM D 6114 Type II specification, to ensure adequate blending residence time and superior binder quality, every lot shall be tested under:

Test (on the produced asphalt rubber binder)	Result
AASHTO T315 Original Binder 2mm DSR @ 82:	G*/sin(d) >1.00 kPA

All data shall be reported to the awarding authority as outlined in Section 4.4, Reporting.

4.4 Reporting:

Prior to starting the project, the contractor shall submit a Quality Control Plan from the Asphalt Rubber supplier meeting the requirements of AASHTO R-26 format.

The contractor shall submit a weekly manufacturer’s report for each lot of asphalt rubber produced that includes the following as a minimum:

- Total quantity of asphalt binder in tons
- Tons and percentage of ground rubber based on total asphalt rubber binder
- ASTM D 6114 certified test results
- AASHTO T315 Original Binder 2mm DSR @ 82

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.

The distributor shall be equipped with a continuous mechanical means to ensure that all nozzles are clean at all times. If a continuous mechanical means is not present, then 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 Streets to be Treated:

The Contractor and the Director shall mutually determine the streets which shall receive asphalt-rubber surface treatment. Measurements of streets to be treated shall be made by the Contractor and the Director or his/her Designee, and the Contractor shall prepare a cost estimate for each street prior to beginning work.

6.2 Staging Location

The awarding authority shall provide a staging area for equipment and materials to be used on the project. The Contractor and Director shall mutually review and agree that the location is of adequate size and condition to allow for safe and secure usage for the required operation(s).

The awarding authority shall provide a location for disposal of asphalt/aggregate debris created in the adjustment of utility castings/structures, milling of keyways, and any pre- or post- project sweeping.

6.3 Surface Preparation:

All surface preparations shall be completed by the awarding authority prior to applying the surface treatment unless otherwise noted or bid as separate items.

The awarding authority shall be responsible for removal of all thermoplastic traffic markings, cleaning and flush filling all cracks and joints greater than 1/4" wide. The awarding authority shall place a leveling course on planed, milled or existing surface, if required.

The contractor shall cover all manhole covers, water boxes, gas boxes, catch basins and other such utility structures with plastic or building felt. Reference each for location and uncovering after application.

The contractor shall thoroughly clean the surface by sweeping immediately prior to application of the asphalt-rubber. Prior to sweeping, the awarding authority shall have removed all vegetation and soil that is bound to the roadway surface.

6.4 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. SAM's shall not be applied after September 1 as a final surface.

6.5 Asphalt-Rubber Application:

The asphalt-rubber mixture shall be applied at a temperature of 325°F to 400°F at a rate of 0.50 to 0.65 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.

6.6 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.

6.7 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.

6.8 Sweeping:

When the maximum amount of aggregate has been embedded into the asphalt-rubber and the pavement has cooled, all loose material shall be swept or otherwise removed by the contractor. Contractor shall supply two (2) sweepers for the day of application. This will be done at a time and in a manner, which will not displace any embedded aggregate or damage the asphalt-rubber. The material removed by sweeping shall be disposed of offsite.

Pre-sweeping or post-sweeping at a later date is the responsibility of the awarding authority unless bid as a separate bid item.

6.9 Traffic Control:

Traffic control is the sole responsibility of the awarding authority. Unless otherwise specified, the roadway shall be kept open to traffic at all times, with traffic discontinued on the lane being surface treated. Controlled traffic may be permitted as soon as the final layer is applied and rolled. A recommended maximum speed of 20 mph, should be maintained for a period of two (2) hours.

7.0 PERFORMANCE

The awarding authority will not award this contract unless the Contractor furnished satisfactory evidence of their ability and experience to perform this work, and that they have sufficient capital and equipment to enable them 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 on which they have been the prime contractor, 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 Stress Absorbing Membrane:

Payment for Stress Absorbing Membrane shall be made at the contract unit price per square yards times the number of square yards, measured by the Contractor and the Director or his/her designee, of road surface treated. Price per square yard shall be for complete in place quantities. Upon completion of work, and acceptance by the Director, the Contractor shall submit a payment request to the Director. Payment shall be net thirty (30) days.

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 ADJUSTMENT

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.

ASPHALT-RUBBER SURFACE TREATMENT:

Current Price minus Base Price divide by 235 (Gal. Asphalt in ton) x .8 (Asphalt minus rubber content) x .60 Gal. / SY (application rate) = Adjustment per square yard.

BID FORM

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

Est. Quantity (SY) _____ x Price per Square Yard \$ _____ = \$ _____

OPTION # 1: Contractor shall provide all necessary crack sealing to the roadways prior to the Surface Treatment.

Est. Quantity (SY) _____ x Price per Square Yard \$ _____ = \$ _____

OPTION # 2: Contractor shall provide all necessary HMA shim/leveling to the roadways prior to the Surface Treatment.

Est. Quantity (Tons) _____ x Price per Ton \$ _____ = \$ _____

Bidder: _____ Phone: _____

Address: _____ Fax: _____

Signature: _____

Printed Name & Title: _____

Date: _____

REFERENCE LIST FOR ASPHALT-RUBBER SURFACE TREATMENT

STRESS ABSORBING MEMBRANE – SAM

Please list six similar projects that have been completed as the Prime Contractor:

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:

Contact:

Phone:

Contract Amount:

Owner:

Address:

City, State, Zip:

Contact:

Phone:

Contract Amount:

Owner:

Address:

City, State, Zip:

Contact:

Phone:

Contract Amount: