

## ATTACHMENT A (ADD 2)

**10-1.36 (Alternate A) RUBBERIZED ASPHALT CONCRETE (TYPE G):** Rubberized asphalt concrete (Type G) shall consist of furnishing and mixing gap graded aggregate and asphalt-rubber binder and spreading and compacting the mixture. Type G rubberized asphalt concrete shall conform, except as otherwise provided, to the provisions for Type A asphalt concrete in Section 39, "Asphalt Concrete," of the Standard Specifications and these special provisions.

Aggregate shall be Type A conforming to the grading for the ½" maximum, gap grading.

**A. GENERAL** Asphalt binder shall be PG 64-16 conforming to the provisions in Section 92, "Asphalts," of the Standard Specifications.

The Contractor shall submit in writing a job mix formula (asphalt mix design) to the Engineer for approval a minimum of five (5) working days before producing rubberized asphalt concrete. The job mix formula will be prepared by at the Contractor's expense by a materials testing laboratory approved by the Engineer. The job mix formula will provide sufficient test data to establish to the satisfaction of the Engineer that the mix design conforms to all the requirements of this section "10-1.21 RUBBERIZED ASPHALT CONCRETE (TYPE G)"

The Contractor shall coordinate with their supplier to produce a trial run of rubber asphalt of between 100 and 300 tons of material at least one full working day prior to the first full day of rubber asphalt production. This trial run shall be produced in the same field conditions, asphalt plant and manner as the balance of the rubber AC for the project. The Contractor (& supplier) will demonstrate to the satisfaction of the Engineer that their equipment and operation will enable the Contractor to produce rubber asphalt that meets all the requirements of the project specifications during full production.

This trial run material shall be placed on the project in a location approved by the Engineer and compacted in the same manner and with the same equipment that will be used to compact the rubber asphalt concrete for the remainder of the project. The Contractor will demonstrate to the satisfaction of the Engineer that their equipment and operation will enable the Contractor to achieve the specified compaction during full production.

The Engineer may require more than one trial run if in the opinion of the Engineer, the previous trial run did not achieve satisfactory results or no longer represents the Contractor's operations during full production.

During the blending, mixing and production of asphalt rubber binder supplier shall have a minimum of 4 full time field personnel on site dedicated strictly to the rubber asphalt mixing, testing and blending operations *in addition* to all the other plant personnel normally used by the supplier for asphalt production and related operations.

The Contractor shall meet with the County staff at least two weeks prior to the first asphalt rubber binder production on the project. The Contractor shall have a responsible representative from the rubber producer attend this meeting to review their operation.

Aggregate for Type G rubberized asphalt concrete shall be of such quality that the optimum

amount of asphalt-rubber binder to be mixed with the aggregate, as determined by the job mix formula in conformance with the requirements in California Test 367 (as amended below), shall be a minimum of 7.0 percent by mass of dry aggregate and a maximum of 9.0 percent by mass of dry aggregate. Aggregates which result in an optimum asphalt-rubber binder content of less than 7.0 percent or more than 9.0 percent by mass of dry aggregate shall not be used. The job mix formula will determine the exact amount of asphalt-rubber binder to be mixed with the aggregate in conformance with the requirements in California Test 367, except as follows:

1. The specific gravity used in California Test 367, Section "B. Voids Content of Specimen," will be determined using California Test 308, Method A.
2. California Test 367, Section "C. Optimum Bitumen Content," is revised as follows:
  - a. Plot asphalt-rubber binder content versus void content for each specimen on Form TL-306 (Figure 3), and connect adjacent points with straight lines.
  - b. From Figure 3 select the theoretical asphalt-rubber binder content that has 4.0 percent voids.
  - c. Record the asphalt-rubber binder content in Step 2 as the Optimum Bitumen Content (OBC).
  - d. To establish a recommended range, use the Optimum Bitumen Content (OBC) as the high value and 0.3 percent less as the low value. Notwithstanding, the recommended range shall not extend below 7.0 percent nor shall the high value to establish the recommended range be above 9.0 percent. If the OBC is 7.0 percent, then there shall be no recommended range, and 7.0 percent shall be the recommended value.
3. Laboratory mixing and compaction shall be in conformance with the requirements of California Test 304, except that the mixing temperature of the aggregate shall be between 300°F and 325°F. The compaction temperature of the combined mixture shall be between 290°F and 300°F.

The rubberized asphalt concrete mixture, composed of the aggregate proposed for use and the optimum amount of asphalt-rubber binder as determined in conformance with the requirements in California Test 367 modified above, shall conform to the following quality requirements:

<b>RUBBERIZED ASPHALT CONCRETE MIXTURE</b>		
Test Parameter	California Test	Requirement
Stabilometer Value, Minimum	304 and 366	23
Voids in Mineral Aggregate, Percent, Minimum	See Note	18

Note: Voids in mineral aggregate test shall be determined as described in Asphalt Institute Mix Design Methods for Asphalt Concrete (MS-2)

The Engineer will select the exact amount of asphalt-rubber to be mixed with the aggregate based on the test results and the job mix formula's Optimum Bitumen Content (OBC) recommendation.

The Contractor shall furnish a Certificate of Compliance to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications for each material used in asphalt-rubber binder and the asphalt-rubber binder mixture. The Certificate of Compliance shall certify that the material conforms to the provisions in these special provisions. When requested by the Engineer, the Contractor shall submit samples with the Certificate of Compliance. The Contractor shall provide the Engineer a Material Safety Data Sheet (MSDS) for each of the constituent components of the asphalt-rubber binder, for the completed mixture of asphalt-rubber binder and for the Type G rubberized asphalt concrete.

The Contractor shall provide a Certificate of Compliance for each truck load of crumb rubber modifier (CRM), asphalt binder, and asphalt modifier delivered to the project. The Quality Control Program used by the manufacturer of each ingredient shall include a sampling and testing frequency as shown below:

1. CRM shall be tested, except for the grading requirement, at least once for every 250 tons of production, with a minimum of once for each project.
2. Asphalt binder shall be tested at least once for every 600 tons of production with a minimum of once for each project.
3. Asphalt modifier shall be tested at least once for every 50 tons of production with a minimum of once for each project.
4. A copy of the laboratory test results for the test parameters specified in these special provisions for CRM, asphalt binder, and asphalt modifier shall be submitted to the Engineer with the Certificate of Compliance for each truck load of individual material delivered to the project.

Certified volume or weight slips shall be delivered to the Engineer for the materials supplied.

The manufacturer's Quality Control Program described above will be provided at no expense to the Engineer and may be observed by the Engineer's representatives at any time.

## B. ASPHALT MODIFIER

The asphalt modifier shall be a resinous, high flash point, aromatic hydrocarbon compound and shall conform to the following requirements:

<b>ASPHALT MODIFIER</b>		
<b>Test Parameter</b>	<b>ASTM Designation</b>	<b>Requirement</b>
Viscosity, m <sup>2</sup> /s (x10 <sup>-6</sup> ) at 100°C	D 445	X∇3*
Flash Point, CL O C, °C	D 92	207 min.
<b>Molecular Analysis:</b>		
Asphaltenes, percent by mass	D 2007	0.1 Max

Aromatics, percent by mass	D 2007	55 min.
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\* The symbol AX@ is the viscosity of the asphalt modifier the Contractor proposes to furnish. The value AX@ which the Contractor proposes shall be between the limits 19 and 36 and shall be submitted in writing to the Engineer. A proposed change, requested by the Contractor, in the value AX@ shall require a new asphalt-rubber binder design.

The asphalt modifier shall be proportionately added to the asphalt binder at the production site where the asphalt-rubber binder is blended and reacted. Asphalt modifier shall be added in an amount of 2.5 percent to 6.0 percent by mass of the asphalt binder based on the recommendation of the asphalt-rubber binder supplier. The asphalt binder shall be at a temperature of not less than 374°F or more than 439°F when the asphalt modifier is added. If the asphalt modifier is combined with the asphalt binder, before being blended with the CRM, the combined asphalt binder and asphalt modifier shall be mixed by circulation for a period of not less than 20 minutes. Premixing of asphalt modifier and asphalt binder will not be required when the ingredients of the asphalt-rubber binder are proportioned and mixed simultaneously. Asphalt modifier and asphalt binder shall be measured for proportioning with meters conforming to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications.

### C. CRUMB RUBBER MODIFIER (CRM)

Crumb rubber modifier (CRM) shall be 100% California Rubber and shall consist of a combination of scrap tire CRM and high natural CRM. The scrap tire CRM shall consist of ground or granulated rubber derived from a combination of automobile tires, truck tires or tire buffings. The high natural CRM shall consist of ground or granulated rubber derived from materials that utilize high natural rubber sources.

Steel and fiber separation may be accomplished by any method. Cryogenic separation, if utilized, shall be performed separately from and prior to grinding or granulating.

CRM shall be ground or granulated at ambient temperature. Cryogenically produced CRM particles which can pass through the grinder or granulator without being ground or granulated respectively shall not be used.

CRM shall not contain more than 0.01-percent wire (by mass of CRM) and shall be free of other contaminants, except fabric. Fabric shall not exceed 0.05-percent by mass of CRM. The test and method for determining the percent by mass of wire and fabric is available at the Transportation Laboratory, Pavement Branch, Telephone 916-227-7300, and will be furnished to interested persons upon request. A Certificate of Compliance certifying these percentages shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The length of an individual CRM particle shall not exceed 4.75 mm (0.19-inches).

The CRM shall be sufficiently dry so that the CRM will be free flowing and not produce foaming when combined with the blended asphalt binder and asphalt modifier mixture. Calcium carbonate or talc may be added at a maximum amount of 3 percent by mass of CRM to prevent CRM particles from sticking together. The CRM shall have a specific gravity between 1.1 and

1.2 as determined by California Test 208. Scrap tire CRM and high natural CRM shall be delivered to the production site in separate bags and shall be sampled and tested separately. CRM material shall conform to the following requirements of ASTM Designation: D 297:

<b>SCRAP TIRE CRUMB RUBBER MODIFIER</b>		
	<b>Percent</b>	
<b>Test Parameter</b>	<b>Min.</b>	<b>Max.</b>
Acetone Extract	6.0	16.0
Ash Content	-	8.0
Carbon Black Content	28.0	38.0
Rubber Hydrocarbon	42.0	65.0
Natural Rubber Content	22.0	39.0

<b>HIGH NATURAL CRUMB RUBBER MODIFIER</b>		
	<b>Percent</b>	
<b>Test Parameter</b>	<b>Min.</b>	<b>Max.</b>
Acetone Extract	4.0	16.0
Rubber Hydrocarbon	50.0	-
Natural Rubber Content	40.0	48.0

The CRM for asphalt-rubber binder shall conform to the gradations specified below when tested in conformance with the requirements in ASTM Designation: C 136, except as follows:

1. Split or quarter 0.22lbs  $\nabla$  0.01lbs from the CRM sample and dry to a constant mass at a temperature of not less than 135°F or more than 145°F and record the dry sample mass. Place the CRM sample and 0.01lbs of talc in a 0.13gal jar. Seal the jar, then shake it by hand for a minimum of one minute to mix the CRM and the talc. Continue shaking or open the jar and stir until particle agglomerates and clumps are broken and the talc is uniformly mixed.
2. Place one rubber ball on each sieve. Each ball shall have a mass of 0.02lbs  $\nabla$  0.01lbs, have a diameter of 1-inch  $\nabla$  0.02-inches, and shall have a Shore Durometer "A" hardness of 50  $\nabla$  5 in conformance with the requirements in ASTM Designation: D 2240. After sieving the combined material for 10 minutes  $\nabla$  1 minute, disassemble the sieves. Material adhering to the bottom of a sieve shall be brushed into the next finer sieve. Weigh and record the mass of the material retained on the No. 8 sieve and leave this material (do not discard) on the scale or balance. Observed fabric balls shall remain on the scale or balance and shall be placed together on the side of the scale or balance to prevent the fabric balls from being

covered or disturbed when placing the material from finer sieves onto the scale or balance. The material retained on the next finer sieve (No.10 sieve) shall be added to the scale or balance. Weigh and record that mass as the accumulative mass retained on that sieve (No.10 sieve). Continue weighing and recording the accumulated masses retained on the remaining sieves until the accumulated mass retained in the pan has been determined. Prior to discarding the CRM sample, separately weigh and record the total mass of fabric balls in the sample.

3. Determine the mass of material passing the No.200 sieve (or mass retained in the pan) by subtracting the accumulated mass retained on the No.200 sieve from the accumulated mass retained in the pan. If the material passing the No.200 sieve (or mass retained in the pan) has a mass of 0.01lbs or less, cross out the recorded number for the accumulated mass retained in the pan and copy the number recorded for the accumulated mass retained on the No.200 sieve and record that number (next to the crossed out number) as the accumulated mass retained in the pan. If the material passing the No.200 sieve (or mass retained in the pan) has a mass greater than 0.01lbs, cross out the recorded number for the accumulated mass retained in the pan, subtract 0.01lbs from that number and record the difference next to the crossed out number. The adjustment to the accumulated mass retained in the pan is made to account for the 0.01lbs of talc added to the sample. For calculation purposes, the adjusted total sample mass is the same as the adjusted accumulated mass retained in the pan. Determine the percent passing based on the adjusted total sample mass and record to the nearest 0.1 percent.

<b>CRM GRADATIONS</b>		
<b>Sieve Size</b>	<b>Scrap Tire CRM Percent Passing</b>	<b>High Natural CRM Percent Passing</b>
No.8	100	100
No.10	98-100	100
No.16	45-75	95-100
No.30	2-20	35-85
No.50	0-6	10-30
No.100	0-2	0-4
No.200	0	0-1

#### **D. ASPHALT-RUBBER BINDER**

Asphalt-rubber binder shall consist of a mixture of asphalt binder, asphalt modifier, and crumb rubber modifier.

At least 2 weeks before the binder's intended use, the Contractor shall furnish the Engineer 4 one-liter or 4 one-quart cans filled with the asphalt-rubber binder proposed for use on the project. The Contractor shall supply the Engineer, for approval, a binder formulation and samples of the materials to be used in the asphalt-rubber binder at least 2 weeks before construction is scheduled to begin. The binder formulations shall consist of the following information:

1. Asphalt binder and Modifiers:
  - a. Source and grade of asphalt binder.
  - b. Source and identification (or type) of modifiers used.
  - c. Percentage of asphalt modifier by mass of asphalt binder.
  - d. Percentage of the combined blend of asphalt binder and asphalt modifier by total mass of asphalt-rubber binder to be used.
  - e. Laboratory test results for test parameters shown in these special provisions.
  
2. Crumb Rubber Modifier (CRM):
  - a. Source and identification (or type) of scrap tire and high natural CRM.
  - b. Percentage of scrap tire and high natural CRM by total mass of the asphalt-rubber blend.
  - c. If CRM from more than one source is used, the above information will be required for each CRM source used.
  - d. Laboratory test results for test parameters shown in these special provisions.
  
3. Asphalt-Rubber Binder:
  - a. Laboratory test results of the proposed blend for test parameters shown in these special provisions.
  - b. The minimum reaction time and temperature.

The method and equipment for combining asphalt binder, asphalt modifier, and CRM shall be so designed and accessible that the Engineer can readily determine the percentages by mass for each material being incorporated into the mixture.

The proportions of the materials, by total mass of asphalt-rubber binder, shall be 80 percent  $\nabla$  2 percent combined asphalt binder and asphalt modifier, and 20 percent  $\nabla$  2 percent CRM. However, the minimum amount of CRM shall not be less than 18.0 percent. Lower values which are rounded up shall not be allowed. The CRM shall be combined at the production site and shall contain 75 percent  $\nabla$  2 percent scrap tire CRM and 25 percent  $\nabla$  2 percent high natural CRM, by mass.

The asphalt binder and asphalt modifier shall be combined into a blended mixture that is chemically compatible with the crumb rubber modifier to be used. The blended mixture is considered to be chemically compatible when it meets the provisions for asphalt-rubber binder (after reacting) found in these special provisions.

The blended asphalt binder and asphalt modifier mixture, and the CRM shall be combined and mixed together at the production site in a blender unit to produce a homogeneous mixture.

The temperature of the blended asphalt binder and asphalt modifier mixture shall be not less than 374°F nor more than 439°F when the CRM is added. The combined materials shall be reacted for a minimum of 45 minutes after incorporation of the CRM at a temperature of not less than 374°F nor more than 424°F. The temperature shall not be higher than 43°F below the actual flash point of the asphalt-rubber binder.

After reacting, the asphalt-rubber binder shall conform to the following requirements:

ASPHALT-RUBBER BINDER			
	ASTM Test	Requirement	
Test Parameter	Method	Min.	Max.
Cone Penetration @ 25°C, 1/10 mm	D 217	25	70
Resilience @ 25°C, Percent rebound	D 3407	18	C
Field Softening Point, °C	D 36	52	74
Viscosity @ 190°C, Pa s (x10 <sup>-3</sup> )	See Note	1500	4000

NOTE: The viscosity test shall be conducted using a hand held Haake Viscometer Model VT-02 with Rotor 1, 24 mm in depth x 53 mm in height, or equivalent, as determined by the Engineer. The accuracy of the viscometer shall be verified by comparing the viscosity results obtained with the hand held viscometer to 3 separate calibration fluids of known viscosities ranging from 1000 to 5000 Pa s (x10<sup>-3</sup>). The viscometer will be considered accurate if the values obtained are within 300 Pa s (x10<sup>-3</sup>) of the known viscosity. The known viscosity value shall be based on the fluid manufacturers standard test temperature or the test temperature versus viscosity correlation table provided by the fluid manufacturer. Viscometers used on the project shall be verified to be accurate. The test method for determining the viscosity of asphalt-rubber binder using a hand held viscometer is available at the Transportation Laboratory, Pavement Branch, Telephone (916) 227-7300. The accuracy verification results shall be provided to the Engineer and shall be certified by a Certificate of Compliance. The Certificate of Compliance shall be furnished to the Engineer in conformance with the provisions in Section 6-1.07, "Certificates of Compliance," of the Standard Specifications.

The Contractor shall provide a Haake Viscometer, or equivalent, at the production site during combining of asphalt-rubber binder materials. The Contractor shall take viscosity readings of asphalt-rubber binder from samples taken from the feed line connecting the storage and reaction tank to the asphalt concrete plant. Readings shall be taken at least every hour with not less than one reading for each batch of asphalt-rubber binder. The Contractor shall log these results, including time and asphalt-rubber binder temperature, and a copy of the log shall be submitted to the Engineer on a daily basis. As determined by the Engineer, the Contractor shall either notify the Engineer at least 15 minutes prior to each test or provide the Engineer a schedule of testing times.

The reacted asphalt-rubber binder shall be maintained at a temperature of not less than 374°F nor more than 424°F.

If any of the material in a batch of asphalt-rubber binder is not used within 4 hours after the 45-minute reaction period, heating of the material shall be discontinued. Any time the asphalt-rubber binder cools below 374°F and is reheated shall be considered a reheat cycle. The total number of reheat cycles shall not exceed 2. The material shall be uniformly reheated to a temperature of not less than 374°F nor more than 424°F prior to use. Additional scrap tire CRM may be added to the reheated binder and reacted for a minimum of 45 minutes. The cumulative amount of additional scrap tire CRM shall not exceed 10 percent of the total binder mass.

Reheated asphalt-rubber binder shall conform to the provisions for asphalt-rubber binder.

## **E. EQUIPMENT FOR PRODUCTION OF ASPHALT-RUBBER BINDER**

The Contractor shall utilize the following equipment for production of asphalt-rubber binder:

1. An asphalt-heating tank equipped to heat and maintain the blended asphalt binder and asphalt modifier mixture at the necessary temperature before blending with the CRM. This unit shall be equipped with a thermostatic heat control device and a temperature reading device and shall be accurate to within  $\pm 37^{\circ}\text{F}$  and shall be of the recording type.
2. A mechanical mixer for the complete, homogeneous blending of asphalt binder, asphalt modifier, and CRM. Asphalt binder and asphalt modifier shall be introduced into the mixer through meters conforming to the provisions in Section 9-1.01, "Measurement of Quantities," of the Standard Specifications. The blending system shall be capable of varying the rate of delivery of asphalt binder and asphalt modifier proportionate with the delivery of CRM. During the proportioning and blending of the liquid ingredients, the temperature of asphalt binder and the asphalt modifier shall not vary more than  $\pm 57^{\circ}\text{F}$ . The asphalt binder feed, the asphalt modifier feed, and CRM feed shall be equipped with devices by which the rate of feed can be determined during the proportioning operation. Meters used for proportioning individual ingredients shall be equipped with rate-of-flow indicators to show the rates of delivery and resettable totalizers so that the total amounts of liquid ingredients introduced into the mixture can be determined. The liquid and dry ingredients shall be fed directly into the mixer at a uniform and controlled rate. The rate of feed to the mixer shall not exceed that which will permit complete mixing of the materials. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected by a reduction in the volume of material or by other adjustments. Mixing shall continue until a homogeneous mixture of uniformly distributed and properly blended asphalt-rubber binder of unchanging appearance and consistency is produced. The Contractor shall provide a safe sampling device capable of delivering a representative sample of the completed asphalt-rubber binder of sufficient size to permit the required tests.
3. An asphalt-rubber binder storage tank equipped with a heating system furnished with a temperature reading device to maintain the proper temperature of the asphalt-rubber binder and an internal mixing unit capable of maintaining a homogeneous mixture of asphalt binder, asphalt modifier, and CRM.

The equipment shall be approved by the Engineer prior to use.

## **F. AGGREGATE**

The aggregate for Type G rubberized asphalt concrete shall conform to the following grading and shall meet the quality provisions specified for Type A asphalt concrete in Section 39-2.02, "Aggregate," of the Standard Specifications, except as follows:

1. California Test 211, Los Angeles Rattler loss at 500 revolutions shall be 20 percent maximum, and loss at 100 revolutions shall be 5 percent maximum.
2. California Test 205, Section D, definition of a crushed particle is revised as follows: "A particle having 2 or more fresh mechanically fractured faces shall be considered a crushed

particle."

3. The swell and moisture vapor susceptibility requirements shall not apply.

The symbol "X" in the following table is the gradation which the Contractor proposes to furnish for the specific sieve.

Aggregate Grading Requirements			
Percentage Passing			
2@- maximum			
Sieve Size	Limits of Proposed Gradation	Operating Range	Contract Compliance
3/4@	C	100	100
1/2@	C	90-100	90-100
3/8@	83-87	X∇5	X∇7
No.4	33-37	X∇5	X∇7
No.8	18-22	X∇4	X∇5
No.30	8-12	X∇4	X∇5
No.200	C	2-7	0-8

## G. PROPORTIONING, SPREADING AND COMPACTING

When batch type asphalt concrete plants are used to produce rubberized asphalt concrete Type G, the asphalt-rubber binder and mineral aggregate shall be proportioned by mass.

When continuous mixing type asphalt concrete plants are used to produce Type G rubberized asphalt concrete, the asphalt-rubber binder shall be proportioned by an asphalt meter of the mass flow, Coriolis effect type. The meter shall have been Type-approved by the Division of Measurement Standards prior to the start of production. The meter shall be calibrated in conformance with the requirements in California Test 109. The meter shall be interfaced with the existing continuous mixing plant controller in use on the asphalt concrete plant.

Type G rubberized asphalt concrete shall be placed only when the atmospheric and pavement surface temperatures are 60°F or above.

Compaction and spreading shall conform to the requirements of Section 10-1.16, AAsphalt Concrete@ of these special provisions and the following:

Upon time of delivery to the work site, the temperature of Rubberized Asphalt Concrete (Type G) shall be 310°F minimum to 340°F maximum. Atmospheric temperatures shall be 55°F and rising.

The Contractor shall cover the loads of Type G rubberized asphalt concrete with tarpaulins. The Tarpaulins shall completely cover the exposed Type G rubberized asphalt concrete until the Type G rubberized asphalt concrete has been completely transferred into the asphalt concrete paver hopper or deposited on the roadbed.

The Contractor shall use a minimum of three rollers: two for breakdown, and one for finish work. These rollers shall conform to the requirements for breakdown rollers as specified in Section 39-6.03 ACompaction@ of the Standard Specifications, except that vibratory rollers using vibratory mode shall be used for initial breakdown rolling. Backup rollers shall be supplied at all paving sites.

Breakdown compaction shall be completed before the temperature in the mat drops below 290°F.

Section 39-6.03, "Compacting," of the Standard Specifications is amended by deleting the fifth and the seventh through tenth paragraphs and adding the following before the eleventh paragraph:

Rubberized Asphalt concrete shall be compacted to a relative compaction of not less than 92 percent based on percentage of Rice gravity ASTM 2041-91.

Relative compaction shall be based on comparison to the maximum theoretical asphalt concrete density (Rice gravity) using test method ASTM 2041-91. In place asphalt concrete densities will be determined using cores taken from the pavement using California Tests 304 and 308. Lot and test site selection will be determined by the Engineer.

Any lot of asphalt concrete that has relative compaction of less than 92.0 percent shall be removed and replaced by the Contractor at no cost to the agency. If requested in writing by the Contractor, a lot with a relative compaction of 89.5 percent or greater may be accepted on the basis of a reduced payment.

The Engineer will provide monitoring of the compaction process using a nuclear density gauge. If any lot tested indicates a relative compaction below 92.0 percent, the Contractor will be advised that he is not attaining the desired relative compaction and that his materials or his procedures, or both, need adjustment.

Section 39-8.02, APayment,@ of the Standard Specifications is amended by adding the following after the first paragraph:

Asphalt concrete in a lot that is accepted on the basis of reduced payment will be paid for at the contract prices for the items of asphalt concrete involved multiplied by the following factors:

Relative Compaction	Percent Reduction	Relative Compaction	Percent Reduction
92.0	0.0	90.7	39.0
91.9	3.0	90.6	42.0
91.8	6.0	90.5	45.0
91.7	9.0	90.4	48.0
91.6	12.0	90.3	51.0
91.5	15.0	90.2	54.0
91.4	18.0	90.1	57.0
91.3	21.0	90.0	60.0
91.2	24.0	89.9	63.0
91.1	27.0	89.8	66.0
91.0	30.0	89.7	69.0
90.9	33.0	89.6	72.0
90.8	36.0	89.5	75.0

Traffic shall not be allowed on Type G asphalt concrete until finish rolling is complete and the temperature of the mat has dropped below 149EF. Deviations from this requirement may be allowed by the Engineer at intersections, commercial driveways or other isolated areas, if sand, or other approved material, is uniformly spread over the new pavement to prevent tire pickup or flushing.

Sand shall be spread on the surface of Type G rubberized asphalt concrete at a rate of 1.0 lb/yd<sup>2</sup> to 2.0 lb/yd<sup>2</sup>. The exact rate will be determined by the Engineer. When ordered by the Engineer excess sand shall be removed from the pavement surface by sweeping. Sand shall be free from clay or organic material. Sand shall conform to the fine aggregate grading provisions in Section 90-3.03, "Fine Aggregate Grading," of the Standard Specifications.

Full compensation for furnishing and spreading sand, or other approved material, on the rubberized asphalt concrete surface and for sweeping and removing excess material from the pavement surface shall be considered as included in the contract price paid per ton for rubberized asphalt concrete (Type G) and no separate payment will be made therefor.

**H. PAYMENT:** The contract price paid per ton for Rubberized Asphalt Concrete (Type G) shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in placing the Rubberized Asphalt Concrete

(Type G), complete in place as shown on the plans, as specified in these Special Provisions, and as directed by the Engineer.