

S-6 SUPERPAVE MIX ASPHALT CONCRETE SURFACE COURSE OVERLAY

Revision Date:
1/30/12

S-6.1 General

The **Kansas Department of Transportation (KDOT) 2007 Standard Specifications for State Road and Bridge Construction**, Sections 109, 601, 611 (Class A), 1201, 1202, and 1203 shall govern the asphalt concrete work except as otherwise modified herein. All testing required by this specification including mix design and the field verification of the mix shall be the responsibility of the Contractor. The mix design shall be modified or redesigned whenever a material source changes or a quarry starts producing from a different geological unit or a major change is made to the asphalt plant. This work shall be subsidiary to the other bid items requiring this material/work.

S-6.2 Asphalt Cement Binder

Asphalt cement shall conform to the requirements of AASHTO-MP 1a-04, Performance Graded Asphalt Binder PG 64-22. The grade of asphaltic binder shall not be changed without a laboratory remix redesign. **Each shipment of asphalt to the asphalt plant shall have a bill of lading stating the asphalt cement meets the specifications referenced above. Copies of the bill of lading shall be submitted to the City Engineer.** The cost of asphalt cement binder shall be subsidiary to asphalt concrete bid item. No separate payment will be allowed.

S-6.2.1 Anti-Stripping Agent

All bituminous mixtures shall contain an anti-stripping agent. AD-here® LOF 65-00 LS as manufactured by ARR-MAZ Products, L.P. shall be added to the asphalt cement at the rate of 0.75% by weight of the total added asphalt cement. Other asphalt anti-stripping additives and their application rate may be used when proven equal after testing as specified in Paragraph "Resistance of Compacted Bituminous Mixture to Moisture Induced Damage AASHTO T 283-03" and approved by the City Engineer.

S-6.3 Aggregates General

The total aggregate (coarse aggregate, fine aggregate and material passing the No. 200 sieve) shall contain not less than 85% crushed material for intermediate course and surface course. The Coarse Aggregate Angularity for all coarse aggregate including RAP or FRAP shall be 85% or higher. The Job Mix Formula (JMF) shall be within the control points shown below. It shall be noted that when the gradation of extracted plant produced mix varies appreciably from JMP, the test properties of the mix will be out of specifications.

The contractor may use Reclaimed Asphalt Pavement (RAP) or Fractionated Reclaimed Asphalt Pavement (FRAP) as an aggregate source. FRAP is defined as having two or more stock piles, where RAP is processed into coarse and fine fractions. The fine FRAP stockpile will contain only material passing the ¼ inch screen. The coarse FRAP stockpile will contain milled material retained on the ¼ inch screen and passing the ¾ inch screen. The maximum percentage of RAP is 25% and the maximum combined percentage of FRAP is 40%. FRAP may be comprised of coarse or fine FRAP or combination thereof. Utilize a separate cold feed bin for each stockpile of FRAP used. Do not blend coarse and fine FRAP either in the stockpile or in a cold feed bin. Add RAP or FRAP to mix through the RAP collar. **RAP may NOT be used in surface courses regardless of mix designation. (Use of FRAP is allowed.)** Sources and types of RAP or FRAP must be recorded and submitted to the City Engineer upon request.

The RAP or FRAP used in production shall be similar in composition (extracted gradation and asphalt content) to the source used for design.

The contractor shall submit a copy of current aggregate quality and consensus tests for aggregates used in the mix. The quality test must have been run within 6 months of the date of a mix design submission or a volumetric test report.

S-6.3.1 Aggregate for Asphaltic Concrete Surface Course

The exact gradation shall be determined by the contractor's laboratory.

Sieve size	Percent passing 12.5 mm nominal size Control Points	
19 mm (3/4 inch)	---	100%
12.5 mm (1/2 inch)	90	100%
9.5 mm (3/8 inch)	80	95%
4.75 mm (No. 4)	---	---
2.36 mm (No. 8)	36	48%
1.18 mm (No. 16)	---	---
600 µm (No. 30)	---	---
300 µm (No. 50)	---	---
150 µm (No. 100)	---	---
75 µm (No. 200)	2	8%

Surface mixtures for streets designated as thoroughfares by the City shall contain the following:

Fifteen percent (15%) of the Minus No. 4 sieve material and 15% of the total aggregate shall be chat, crushed sandstone, crushed gravel, crushed steel slag or crushed porphyry (rhyolite, basalt, granite, and Iron Mountain Trap Rock are examples of crushed porphyry).

S-6.3.2 Aggregate for Asphalt Concrete Intermediate or Leveling Course

The exact gradation shall be determined by the contractor's laboratory.

Sieve size	Percent passing 12.5 mm nominal size Control Points	
19 mm (3/4 inch)	---	100%
12.5 mm (1/2 inch)	85	100%
9.5 mm (3/8 inch)	75	90%
4.75 mm (No. 4)	---	---
2.36 mm (No. 8)	34	44%
1.18 mm (No. 16)	---	---
600 µm (No. 30)	---	---
300 µm (No. 50)	---	---
150 µm (No. 100)	---	---
75 µm (No. 200)	2	8%

S-6.4 Superpave Asphaltic Concrete Mix Design Method

The finished mixture shall meet the requirements described below when prepared in accordance with AASHTO T312-04 (using 6-inch nominal size molds) and the volumetric properties of compacted paving mixtures as calculated using Chapter 4 of Superpave Mix Design, Superpave Series No. 2 (sp-2), 3RD Edition 2001 Printing, Published by the Asphalt Institute referred hereafter as "SP-2", unless otherwise specified. Procedure shall be as specified in Chapter 5 and 6 of the SP-2. The theoretical Specific Gravity (Gmm) shall be determined following AASHTO T209-00 (2004) and the Bulk Specific Gravity of the Compacted Asphalt Mixture (Gmb) shall be determined following AASHTO T166-00. The material for the theoretical specific gravity (Gmm) and the material for the Gyratory Compactor specimens (pucks) shall be cured at 140 ± 3° C (285 ± 5° F) for four hours in a closed oven after the mix is produced in the laboratory. Also, the plant-produced mixture shall be tested when the mix is four hours old. The mixture shall be transported to the laboratory in an insulated container and then stored in a laboratory oven at 140 ± 3° C (285 ± 5° F) minimum temperature for the remainder of the curing period. The curing oven shall be the forced air type and may be operated at a temperature not to exceed the maximum temperature at which the mixture may be discharged from the plant as specified in paragraph (Mixing Plants). This procedure shall be used when the water-absorption as determined by ASTM C 127-04 and ASTM C128-04a of any aggregate in the mixture exceeds 1.25%. The mixture shall be compacted at 140 ± 3° C (285 ± 5° F). The theoretical specific gravity (Gmm) shall be performed using the Type E-A 4500ml metal vacuum pycnometer with a clear polymethyl methacrylate PMMA lid. The vacuum shall be applied for 15 minutes to gradually reduce the residual pressure in the vacuum vessel to 28 mm HG. The bulk specific gravity to the Fine Sand Chart shall be determined using the standard Cone Test for Surface Moisture as stated in ASTM C-128-04a unless otherwise directed by the City Engineer. The G_{se} of the RAP or FRAP material shall be used as aggregate G_{sb} in volumetric calculations provided that the asphaltic cement content of the RAP or FRAP fraction is determined through the use of ASTM D6307-05 Standard Test Method for Asphalt Content of Hot Mix Asphalt by the Ignition method. **The AASHTO Specification shall be used when this specification references the AASHTO number.**

S-6.5 Superpave Design and Testing Properties

Required Density (%of theoretical Maximum Specific Gravity (Gmm) Number of Gyration (Average of 2-6 inch specimens)		
N _{initial}		85-91%
N _{design}	Mix Design Only	96%
% Air voids, in compacted mixture 0% RAP	Mix design Only Field	4.0% 3.0-5.0%
% Air voids, in compacted mixture 5-25% RAP or FRAP	Mix design Only Field	3.7% 2.8-4.5%
% Air voids, in compacted mixture 26-40% FRAP	Mix design Only Field	3.4% 2.6-4.1%
VEA% ¹	0% RAP 5-25% RAP/FRAP 26-40% FRAP	10.0% 10.3% 10.6%
The ratio of minus 75µm (No. 200) material to % effective asphalt control (Pbc) based on the weight of the aggregate from extraction test	Mix Design Field (0-25% RAP/FRAP) Field (26-40% FRAP)	0.6-1.2 0.6-1.6 0.5-1.5
¹ VEA% = Volume of effective asphalt (%) which is the numerical difference between VMA and Air Voids.		

When the aggregate absorption is high, the produced mixture will be tender until the asphalt is absorbed into the aggregate. Therefore, it may be beneficial to silo the mixture at the plant for a time before delivering to the project site. This is more important when the truck haul is short.

S-6.6 Resistance of Compacted Bituminous Mixture to Moisture Induced Damage AASHTO T 283-03

The index of retained strength must be greater than 80 percent as determined by AASHTO T 283-03 (using a 4 inch nominal size mold). Specimens shall be conditioned by freezing and thawing. When the index of retained strength is less than 80 the amount of anti strip may have to be adjusted. No additional payment will be made to the Contractor for addition of anti-stripping agent required. The mix shall contain the anti-stripping agent specified in paragraph "Anti-Stripping Agent" and tested by AASHTO T 283.

S-6.7 Method of determining the retained strength of plant-produced mixtures. Sample the plant produced mixture at the plant site in accordance with ASTM D 979 or behind the paver using the procedure specified herein. Transport the mixture to the laboratory and determine the theoretical specific gravity as specified in paragraph "Asphaltic Concrete Mix Design Method". Prepare the specimens for the AASHTO T 283 test using the same four-hour cured material and compact to 7 ± 0.5 percent air voids. Allow the samples to cool and cure overnight at room temperature and proceed with testing by determining the thickness and bulk specific gravity, then separating the specimens into subsets and preconditioning as specified herein. Then proceed with the testing as specified in AASHTO T 283.

S-6.7.1 Test for AASHTO T 283

One set of tests for each mix design from each plant shall be made as the final verification of the plant produced mix design by the contractor's laboratory.

S-6.7.2 One set of tests for each mix produced for City of Merriam shall be taken during the initial production each year and one set of tests for each 5,000 tons produced and fraction thereof. ***For Mill and Overlay projects, the test shall be taken per day at the Merriam project site.*** Any test that fails will require the contractor to adjust the JMF and take additional test at the contractor's expense.

S-6.7.3 One set of tests shall be made and approved by the City Engineer at contractor's expense when any of the material sources change or when requested by the City Engineer.

S-6.8 Contractor's Laboratory

Asphaltic Concrete Mix Design shall be the responsibility of the Contractor's Laboratory. The laboratory shall be a commercial testing laboratory meeting the requirements of ASTM D 3666-05a. The manager of the laboratory shall submit a signed certificate stating that the laboratory has a current certificate stating that the laboratory meets the ASTM D 3666-05a requirements. The laboratory shall have past experience in testing materials and making Superpave Asphaltic Concrete mix designs. The laboratory shall be approved by the City Engineer. The laboratory shall establish the mix design using the criteria specified herein. Certified test results of the mix design and materials shall be submitted 30 days prior to commencing construction for review by the City Engineer. The test results shall include all detailed raw calculations for the composition of the mix design and shall include all specific gravity calculations. The calculations must be legible but not necessarily typed.

S-6.8.1 Verification of the Plant Produced Mix Design by the Contractor's Laboratory

All test properties of the mix shall be verified by sampling and testing the uncompacted mix placed behind the paver. The test shall be performed in accordance with paragraph "Superpave Asphaltic Concrete Mix Design Method" and shall indicate the test properties of the mix shown in paragraph "Superpave Design and Testing Properties". Also, an extraction and gradation test shall be made using the ignition oven. The contractor's laboratory shall adjust the mix design entering the plant to obtain the test properties behind the paver.

S-6.8.2 The properties of the plant produced mix shall be determined using uncompacted mix sampled behind the paver. The properties shall be determined at N_{design} from the average of two 6 inch nominal size samples gyrated to N_{max} .

S-6.8.3 Material for the sample shall be from the following locations

One from each side of the placed bituminous mat and one from the center of the mat. A square, pointed shovel shall be used for taking the sample and for evenly laying material back into the disturbed mat. Care shall be taken not to get foreign material or tack oil into the sample.

S-6.8.4 A test shall be taken at least daily at the City of Merriam project site, or as directed by the City Engineer when the plant has produced a minimum of 200 tons.

S-6.8.4.1 The test shall also consist of one gradation test ASTM C-136-96a of hot bin material for conventional plants, or total aggregate material from the final feed belt for dryer-drum plants.

S-6.8.4.2

NOTE: The result of the gradation test is very important in determining how to adjust the mix. After the gradation or the bitumen content has been adjusted to obtain the properties of the mix, this verified mix design becomes the Job Mix Formula (JMF). The plant settings may have to be adjusted again whenever the gradations of the materials change. When a change is made it shall be reported on the Superpave Asphaltic Concrete Test Report form.

S-6.8.4.3 Gradation and asphalt content of the mix shall be performed using ASTM D-6307-05 Standard Test Methods for Asphalt Content of Hot Mix Asphalt by the Ignition Method and ASTM D 5444-05. The initial temperature setting of the Ignition Oven shall not exceed 525°C (975°F). If RAP or FRAP is used, an additional gradation and asphalt content test shall be performed for the combined RAP or FRAP sampled from the RAP cold feed into the plant.

S-6.8.4.4 Laboratory test results shall be shown on the test report form "Asphaltic Concrete Test" shown at the end of this specification section. Test results shall be received by the contractor and the City Engineer field representatives within approximately 7 hours after the samples are taken. The laboratory shall determine the Percent Voids, VMA, and VEA as soon as possible and evaluate in accordance with paragraph below: **"Corrective action to be taken when Asphaltic Concrete Test indicates the mix is out of specification." Whenever the Percent Voids or VEA is out of specification the laboratory shall contact the Contractor and the City Engineer immediately.** The Contractors testing laboratory shall send the test results directly to the Contractor and the City immediately upon completion of the test. Signed checked copies may be sent later. The Contractors laboratory shall furnish the City's laboratory other items such as the JMF mix gradation, plant setting, the bulk specific gravity of the aggregate G_{sb} and the specific gravity of the asphalt G_{b} . Laboratories shall compare final test

results when the mix is out of specification. The test results shall indicate whether the plant needs adjusting and recommendations shall be provided on correcting the problem.

S-6.8.4.4 The most recent Asphalt Concrete Test that indicates the mixture meets the specifications is the current mix design.

S-6.8.5 Corrective action to be taken when Asphaltic Concrete Test indicates the mix is out of specification.

S-6.8.5.1 Asphaltic Concrete Surface and Asphaltic Concrete Intermediate or Leveling Course

The mix should be adjusted when consecutive tests show the percent voids in the compacted mix are getting close to being the minimum or the maximum field values.

Paving shall stop and the mixture shall be redesigned whenever any of the following occurs:

three consecutive sets of tests show the percent voids in the compacted mix are less than the minimum field value or more than the maximum field value; or two consecutive sets of tests show the percent voids in the compacted mix are less than 0.5 percent below the minimum field value or 0.5 percent greater than the maximum field value.

Also, paving shall stop and the mix shall be redesigned whenever three consecutive sets of tests show the VEA is more than 1.0% greater or 1.0% less than the VEA specified in paragraph S-6.5. Asphaltic Concrete mixtures with a test indicating the VEA is 2% above the value specified in paragraph S-6.5 shall be removed unless directed otherwise by the City Engineer.

S-6.8.6 Pre-Construction test strips

Test strips shall be constructed by the Contractor off city property at the contractor's expense. However, the city shall observe the sampling and testing. The contractor may negotiate the construction of a test strip on the project with the City Engineer. In that event, asphalt not meeting specification shall be removed at contractor's expense. Asphalt meeting specifications will be paid for at unit prices.

S-6.8.6.1 The Contractor's laboratory shall test the final belt gradation if the plant is a dryer-drum plant or the hot bin material if the plant is a conventional plant, and adjust the feeds to insure the plant is producing the gradation of the mix design, before hot mix production begins for the tested strip.

S-6.8.6.2 Test strips shall contain at least 85 tons of asphaltic concrete. A test sample shall be taken behind the paver at 80 tons. The paver shall be set 12 feet wide and at plan depth when the sample is taken. Care shall be taken not to get foreign material or tack oil into the sample.

S-6.8.6.3 If the laboratory test results indicate the mix can be adjusted to meet the properties stated in paragraph "Superpave Design and Testing Properties" project paving may begin. However, this has to be agreed upon by the Contractor's laboratory, the Contractor, and the City Engineer. Otherwise, another test strip shall be constructed. Test strips will not be required on other projects, which use this mix design. However, all materials have to be from the same sources and geological units. Also, the mix has to be produced by the same plant.

S-6.9 Verification testing of the plant produced asphaltic concrete by the city. The City Engineer will take verification tests at random times, at the City's expense.

S-6.10 Mixing Plants

Mixing plants shall meet the requirements of KDOT's latest specification in effect when this project's bids are received by the City, except the mixture discharged from the plant shall not exceed 157.2°C (315°F).

S-6.11 Asphalt mixtures having temperatures less than 250°F, when dumped into the mechanical spreader will be rejected. The installation shall conform to the APWA Section 2200 Minimum Lay-down Temperature Table.

All bituminous mixtures shall be delivered to the paver at a temperature sufficient to allow the material to be placed and compacted to the specified density and surface tolerance.

All delivery trucks shall be totally covered with a water proof tarpaulin at the asphalt plant and shall not be uncovered until they are next in line to unload.

S-6.12 Placing

Asphaltic concrete intermediate and surface courses shall not be placed in compacted lifts greater than 3 inches deep except when otherwise indicated on maintenance project plans. Asphaltic concrete surface course shall not be placed thinner than 2 inches deep. Asphaltic concrete intermediate course used as surface shall not be placed thinner than 2 inches. Interim layers of intermediate course shall not be left uncovered by the subsequent course for more than 5 days, weather permitting. Material trucks hauling materials other than asphaltic concrete or tack coat shall not travel on previously constructed layers of asphaltic intermediate course until the final course of the intermediate is constructed.

S-6.12.1 The Contractor shall schedule and route his hauling operation to minimize hauling over a final course as much as feasible.

S-6.12.2 Bituminous-Materials Spreaders

Bituminous-materials spreaders shall be the self-propelled type equipped with hoppers, tamping, or vibrating devices, distributing screws (augers), adjustable screeds operated either manually or automatically, equipment for heating the screeds and equalizing devices. The spreader shall be capable of spreading hot bituminous mixtures without leaving indented areas, tearing, shoving, or gouging and capable of confining edge of strips to true lines without use of stationary side forms and capable of placing the course to the required thickness. It shall also be capable of producing a finished surface conforming to the smoothness requirements specified. Spreaders shall be designed to operate forward at variable speeds and in reverse at traveling speeds of not less than 100 feet per minute. If an automatic grade control device is used on the spreader for two-lane paving operations, it shall consist of sensing device for control of one end of the screed and a slope-control mechanism for control of the other end of the screed, or a sensing device on each side of the paving machine. Where the paver is used on multiple paving lanes (more than two paving lanes), sensing devices shall be used on each side of the spreader for control of the screed. The slope-control mechanism shall not be used for grade control in multiple paving lane operations.

When the contractor chooses to pave lanes through the project wider than 12 ft. the spreader (paver) shall be equipped with auger extensions.

Through lanes shall be paved before left turn lanes and side street intersections. Through lane pavers shall not stop for other areas to be paved.

S-6.12.3 Special Procedures to Prevent Segregation

The wings of the spreader hopper shall not be emptied (flipped) between truck loads. The depth of the material in the screed auger chamber shall be kept approximately three-fourths (3/4) full - all the way out to the end gate. The augers should be running automatically and the vibrating screed turned on. The hopper conveyor shall always have approximately 6 inches of material covering it and not be allowed to run out of material. Whenever the paver is run empty (conveyor exposed) the area behind the paver should be checked for a segregated spot. If a spot exists the paver should be stopped and the segregated spot repaired before it is rolled.

S-6.12.4 Joints General

Joints between old and new pavements or between successive day's work shall be cut back vertical with a saw. Other joints shall be sawed vertical as directed by the City Engineer. All joints shall be tacked and shall be made carefully to insure continuous bond between old and new sections of the course. All joints shall have the same texture, density, and smoothness as other sections of the course. The tack shall be overlapped onto the previous pavement 1 inch to 2 inches. Contact surfaces of previously constructed pavements, curbs, gutters, manholes, etc. shall be tacked. Surfaces that have become coated with dust, sand, or other objectionable material shall be cleaned by brushing or cut back with an approved power saw, as directed. The surface against which new material is to be placed shall be sprayed with a thin, uniform coat of bituminous material conforming to the requirements of paragraph TACK COAT stated hereinafter. The material shall be applied far enough in advance of placement of the fresh mixture to insure adequate curing. Care shall be taken to prevent damage or contamination of the sprayed surface.

S-6.12.4.1 Edges of previously placed pavement that have cooled and are irregular, honeycombed, poorly compacted, damaged, or otherwise defective unsatisfactory sections shall be cut back to expose a clean, sound surface for the full thickness of the course as directed by the City Engineer.

S-6.12.4.2 Transverse Joints

The roller shall pass over the unprotected end of freshly placed mixture only when placing of the course is discontinued or when delivery of mixture is interrupted to the extent that unrolled material may become cold. In all cases, the edge of the previously placed course shall be cut back to expose an even, vertical surface the full thickness of the course. In continuing placement of the strip, the mechanical spreader shall be positioned on the transverse joint so that sufficient hot mixture will be spread to obtain a joint after rolling which conforms to the required density and smoothness specified herein.

A string line shall be used to set pavement elevations twenty-five feet after a beginning at a transverse joint or twenty-five feet before an ending at a transverse joint.

S-6.12.4.3 Offsetting Joints in Intermediate and Surface Courses

The surface course shall be placed so that longitudinal joints of the surface course will not coincide with joints in the intermediate course by approximately 9 inches. Care shall be taken when possible to offset longitudinal joints in a manner that the final surface course joint is in the center of the pavement or at the location shown on the plans. Transverse joints in the surface course shall be offset by at least two feet from transverse joints in the intermediate course.

S-6.12.4.4 Special Requirements for Placing Paving Lanes Succeeding Initial Lanes

In placing each succeeding lane after the initial lane has been placed and compacted as specified hereafter, the screed endgate of the mechanical paver shall overlap the previously

placed lane slightly and shall be approximately 1.25 times thicker than the existing compacted lane to allow for compaction roll down and produce a smooth compacted joint with the specified density. Mixture placed on the edge of the previously placed lane by the mechanical paver shall be pushed back (tucked) to the edge of the lane being placed by use of a lute (rake). The pushed back material shall form a ridge on the uncompacted lane along the edge of the previously placed lane. The height of the ridge above the uncompacted lane should be approximately equal to the thickness being allowed for roll down during compaction. These procedures shall be used to facilitate getting a smooth joint with density. Excess mixture shall be removed and wasted. Excess material shall not be spread over the uncompacted mat.

S-6.12.5 Steel-Drum Rollers

Steel-drum rollers shall be self-propelled, tandem (two-axle) with both drums the same size, powered by both drums, vibratory types, weighing not less than 20,000 pounds static weight and not less than 150 lb/in of drum. Drums shall be equipped with adjustable scrapers, water tanks, and sprinkling apparatus for keeping the drums wet, thereby preventing the bituminous mixture from sticking to the wheels. Rollers shall be capable of reversing without backlash and free from worn parts. Roller drums with flat and pitted areas or projections that leave marks in the pavement will not be permitted.

S-6.12.6 Heavy Pneumatic-Tired Rollers

Heavy pneumatic-tired rollers shall be self-propelled and shall consist of two axles on which are mounted an odd number of pneumatic-tired wheels. The roller shall have at least nine pneumatic-tired wheels in such manner that the rear group of wheels will not follow in the tracks of the forward group, but spaced to give essentially uniform coverage with each pass. Axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading. Tires shall be smooth, inflated to 90 p.s.i.. Construction of the roller shall be such that each wheel can be loaded to a minimum of 2,300 pounds.

S-6.12.7 Blowers and Brooms

Blowers and brooms shall be power type and suitable for cleaning the surface to be paved. Open faced brooms may only be used when approved by the City Engineer.

S-6.13 Compaction of Mixture

The contractor is responsible for the development of a compaction procedure that will obtain the required density. The following paragraphs describe a procedure that generally obtains density. **The contractor shall determine the exact amount of rolling (coverages needed) to obtain a density meeting paragraph: "Density and Density Test". The ideal density is an average density between 94% and 96%.**

S-6.13.1 General

The surface of the placed material shall be corrected if necessary before compaction begins. Compaction of the mixture shall be accomplished using a minimum of two steel-drum rollers and a pneumatic-tired roller as specified above. Breakdown rolling shall be as close behind the paver as possible. The break down roller shall be a steel-drum and operated in the vibratory mode on the first forward pass and may be operated in vibratory mode on subsequent passes either forward or back. Delays in rolling freshly spread mixture will not be permitted. The pneumatic-tired roller shall be used as an intermediate roller; however, it shall also roll closely behind the break down roller. The pneumatic-tired roller shall always be kept moving in order to keep its tires warm. The second steel-drum roller shall be used as a final finish roller. Rollers shall not travel faster than 3 mph. Steel-drum rollers shall not be used in the vibratory mode except for initial breakdown rolling. When steel-drum rollers are used in the vibratory mode they

shall be operated at maximum frequency and minimum amplitude. Rolling shall be continued until density is obtained in all portions of each course.

The speed of rollers shall be slow enough at all times to avoid displacement of the hot mixture. Displacement of the mixture resulting from reversing the direction of the roller or from any other cause shall be corrected at once by raking or removing and replacing fresh mixture when necessary. Alternate passes of the roller shall be varied slightly in length. During rolling, the wheels of steel-drum rollers and plates of vibro plate compactors shall be moistened to prevent adhesion of the mixture to the drums or plates, but excess water will not be permitted. Tires of heavy pneumatic roller shall be moistened with soapy water when required to prevent mixture from sticking to tires during rolling. Rollers shall not be permitted to stand on finished courses until the courses have thoroughly cooled. The contractor shall supply ample rollers to obtain the specified density. Places inaccessible to rollers shall be thoroughly compacted with hot hand-tampers or vibro plate compactors.

S-6.13.2 Break Down Rolling

Rollers shall be operated as specified above. The unconfined edge or low side edge of the paving lane shall be broken down first. The other edge shall be broken down second and the middle broken down last. **This is considered one coverage.** Steel-drum break down rollers shall not hang over the free edge of the mat or stay back from it even though they are going to back up for the adjoining lane. The entire lane shall be broken down at the same temperature.

S-6.13.2.1 Intermediate Rolling

The rubber tired roller shall be close behind the break down roller after the mat has cooled a few degrees. The rubber tired roller shall roll the same pattern making the same coverage as the breakdown. The rubber tired roller should stay the thickness of the lift from the free edge.

The number of coverages shall be determined by the contractor. This will change with temperature, humidity and thickness of the lift.

S-6.13.2.2 Longitudinal Joint Break Down Rolling of Paving Lanes Succeeding Initial Lanes

The break down roller in the vibratory mode shall lap over the tucked joint approximately six inches (6") on to the previously placed compacted lane.

As part of the break-down rolling and immediately after the break-down roller completes its first passes, the longitudinal joint shall be pinched to ensure compaction with the pneumatic-tired roller. The rubber tired roller shall make at least one complete pass (forward and backward) operated on the hot lane with the outside tire pinching the joint.

After the rubber tired roller rolls the joint, it shall make at least one pass over the rest of the mat and then drop back to its intermediate rolling. The steel drum roller in static mode shall immediately smooth out the rubber tired marks.

S-6.13.2.3 Finish Rolling

Finish rolling should start when the mat has cooled down 20°F to 40°F below the intermediate rolling (This could be approximately 225°F). The steel wheeled roller in static mode shall immediately smooth out the rubber tired marks using the same pattern making the same type coverages as the breakdown roller. Do not roll until cracks appear, let it cool. Finish rolling can continue until the temperature reaches 175°F.

The finish rolling shall continue until the pavement is smooth and has the density specified above.

S-6.14 Sampling/Testing Pavements for Density

Samples of finished pavement shall be obtained by the contractor or the contractor’s laboratory. A minimum of one test (three nuclear gauge testing) shall be taken for each tonnage lot represented by a Superpave Asphaltic Concrete test. Lots larger than 1200 tons shall have one set of (three nuclear gauge testing) for each 1000 tons placed or as directed by the City Engineer. The sampling shall be taken at locations throughout the tonnage lot. The locations shall not be previously marked. The sampling locations shall be marked by the City Engineer after each tonnage lot placement is completed. The testing shall be tested by the contractor’s laboratory to determine conformance to density and thickness. The City Engineer may require the contractor to take more samples at the contractor’s expense if the density is marginal.

S-6.15 Density and Density Test

Density of the compacted mixture of the surface or intermediate course shall be determined by tests made on the compacted course in accordance with the requirements of the previous paragraph: SAMPLING/TESTING PAVEMENTS FOR DENSITY. The density shall be the average of the three cores 92% to 96% of max theoretical specific gravity of the Superpave Asphaltic Concrete test for the lot. No sampling/testing shall be less than 92%.

S-6.16 Weather Limitations

Weather limitations in Section 611.3(b) of the Standard Specifications shall apply except that the following table shall be used.

Asphalt Placement Temperature Limitations			
Paving Course	Compacted Thickness (inches)	Air Temperature (°F)	Road Surface Temp. (°F)
Surface	All	55	60
Subsurface	< 1.5	50	55
Subsurface	≥ 1.5 and < 3	40	45
Subsurface	≥ 3	30	35

S-6.17 Road Surface Preparation

When the bituminous mixture is placed on an existing bituminous surface, the surface shall be cleaned of all foreign material and broomed as necessary to remove dust. Areas shown on the plans or designated by the City Engineer to be patched shall be excavated to a depth directed by the City Engineer, filled with bituminous mixture and compacted. When the contract does not provide for a patching item, an amount two and one-half times the unit price for the bituminous mixture shall be used. The excavation required will not be paid for directly but will be considered subsidiary. In addition to brooming, a high pressure type water truck, capable of washing all fines, dirt, and debris from the surface, may be required prior to overlaying as directed by the City Engineer. Equipment compliance with this specification shall be visual observation by the City Engineer at the commencement of washing operations. Unless specified, no direct payment shall be made for this item, as it shall be considered subsidiary to other bid items.

S-6.18 Tack Coat

Emulsified Asphalt CSS-1h meeting the requirements of Section 1202 of the Standard Specifications shall be used for tack coat. All existing and new asphaltic concrete surfaces shall receive a tack coat not more than six hours prior to placing an asphaltic concrete paving course. Surfaces previously tack coated and not covered with new asphaltic concrete for more than six

hours shall be retacked. The rate of application shall be 0.05 gal./sy to 0.12 gal./sy, or as otherwise directed by the City Engineer. At locations where asphalt is being placed on top of existing concrete pavement, or for night work where temperatures warrant, the emulsified asphalt shall be diluted 10 percent with water versus the normal 50 percent dilution with water. Tack coat shall not be paid for directly but shall be considered subsidiary to other bid items.

S-6.19 Surface Smoothness

The surface course, upon completion of final rolling, shall be smooth and true to grade and cross-section. When a 12-foot straightedge is laid on the surface parallel with the centerline, the surface shall not vary more than 1/8 inch from the straightedge. When the 12-foot straightedge is laid on the surface transverse to the centerline between the crown and edge of pavement, the surface shall not vary more than 1/4 inch from the straightedge. Low or defective areas shall be immediately corrected by cutting out the faulty areas and replacing with fresh hot mixture and compacting the area to conform to the remainder of the pavement. Testing for plan grade conformance and surface smoothness shall be performed by the Contractor in the presence of a representative of the City Engineer. Tests shall be made at intervals as directed by the City Engineer. The City Engineer may direct the contractor to diamond grind areas that are out of tolerance in lieu of above replacement.

S-6.20 Measurement

Measurement shall be in accordance with Section 109.01 of the Standard Specifications and as modified herein after. The asphalt mixture shall be weighed on approved, certified scales at the contractor's expense. Scales shall be inspected and sealed at least annually by an approved calibration laboratory. The City Engineer will verify the weights at random times, at the City's expense.

S-6.21 Payment

Payment will be made at the contract unit price bid per ton for "Asphaltic Concrete Intermediate Course" and "Asphaltic Concrete Surface Course". This shall be considered payment for all items of work specified in this section. No separate payment will be made for testing/sampling, tack coat and asphalt cement.

SUPERPAVE ASPHALTIC CONCRETE TEST (Verified Mix Design)					
Description:					
LAB I.D.:		TIME	TONS		
Sample Date:		Belt			
Sample I.D.:		Hot Mix			
Supplier:					
GRAIN SIZE DATA – ASTM D5444, C136, C117					
Sieve Size	Belt Sample	RAP/FRAP Sample*	Hot-Mix Sample*	Master Grade Limits	Cal. Single Point
19mm (3/4")					
12.5mm (1/2")					
9.5mm (3/8")					
4.75mm (No. 4)					
2.36mm (No. 8)					
1.18mm (No. 16)					
600µm (No 30)					
300µm (No 50)					
15 µm (No 100)					
75µm (No 200)					
EXTRACTION DATA-ASTM D6307					
%AC, total mix basis	Sample	RAP/FRAP	Plant Setting	*from uncompacted mat	
Aggregate Type	%**	Aggregate Type		%**	
**total aggregate basis					
VOLUMETRIC DATA 6" NOMINAL SIZE Gyratory Specimens					
Gyrations (average of 2 specimens) @ 280-290 deg F – AASHTO T312 - 01					
Ndes = 60 Nini = 6					
	Sample*	Specifications			
Mix bulk specific gravity @ Ndes, Gmb		--			
%Voids @ Ndes		3.0-5.0/2.8-4.5/2.6-4.1		AASHTO T T-169 0%/5-25%/26-40% RAP	
%VMA @ Ndes, Gsb basis					
%VEA @ Ndes		9.0-11 9.3-11.3 9.6-11.6		=%VMA-%Voids (0-5% 5-25% 26-40% RAP)	
%Gmm @ Nini		85-91		AASHTO T 166-00	
Ratio (-) 75µm (No. 200) to % Eff Binder		0.6-1.6/0.5-1.5		0-25%/26-40% RAP	
Tensile Strength Ratio, %		80 minimum		AASHTO T 283-03	
Max Theoretical Specific Gravity Gmm		--		AASHTO T 209-99(04)	
Max Theo. Density, pcf		--			
Effective specific gravity Agg. Gse		--			
Bulk Specific Gravity of Total Agg., Gsb		--		ASTM C128, C127	
Specific Gravity of Asphalt, Gb		--			
Shale or shale-like (virgin aggregates only)		1.0% maximum		KT-8	
COMMENTS:					

S-7 METHOD OF MILLING OPERATION

This work will consist of removal of existing surface to the depth and limits shown on the plans or established by the City Engineer. It shall also include the loading and stockpiling, if required, of the milled material.

S-7.1 Milling Operations

The nature and condition of the milling equipment and the manner of performance of the work shall be such that the finished milled surface of the pavement is not torn, gouged, shoveled, broken, oil coated or otherwise injured by the milling operation.

The milling operation shall provide for a windrowing of cuttings, pick up and elevation into dump trucks, and all in a single lane operation. Use of front-end loaders as the primary means of pick-up will not be construed as a single lane operation, nor will side loading of dump trucks be permitted.

All side streets shall have a butt joint of 1" unless otherwise specified. All driveways greater than 1" after milling shall be ramped.

S-7.2 Milling Machine and Equipment

The milling machine to be used in this contract shall be designed and built for cold milling work; shall be self-propelled; and shall have a means of milling the old pavement surface. The drum patterns shall leave a grooved surface finish. The milling machine drum shall have its teeth in a triple turn type pattern. The drum shall be totally enclosed to prevent discharge of any loosened material on adjacent work areas. A dust suppression system must be part of the equipment. Maximum width of milling machine shall be 12'-6"; drum width shall be minimum to maximum. Smaller machines may be used for auxiliary purposes only. A milling machine attached and powered by a unloader capable of a 3 1/2" to 4" deep cut shall be used for asphalt repair work.

The cold milling machine shall have adequate power to force the cutting edge(s) of the drum teeth to the desired depth below the surface of the pavement without cause undue irregularities in the surface of the planned pavement.

The surface shall be milled flush to all curbs, inlets, manholes or other similar obstruction within the paved area.

The contractor shall supply an adequate number of dump trucks and qualified drivers to accept cuttings in a manner set forth above. All milled material shall become property of the contractor and shall be legally disposed of.

S-7.3 Milling on streets (1 1/2" nominal depth Total Width Cut on streets)

Sufficient passes or cuts shall be made at a depth and width as marked in the field. The milling operation shall provide a smooth profile and cross section, that does not require a leveling course prior to the overlay operation. Prior to opening to two-lane traffic, no unevenness within a lane shall exist. The maximum tolerance for Milling (total Width Cut) in a longitudinal direction shall be 1/2" under a 10' straight edge and shall be 3/8" under an 8' straight edge in a transverse direction.

"Milling (Total Width Cut)" shall be paid for at the contract unit price per square yard, for the depth as indicated.

The payment shall include all costs involved in providing labor, equipment, tools, transportation, incidentals, removal, and disposal in a legal manner, and protection of existing underlying asphalt pavement.

Contractor shall notify Merriam Public Works Department at 913-322-5571 of any deep cracks after milling operation. Public Works crew will crack seal after milling prior to installation of overlay pavement.

S-8 SPECIAL CLEANING OF MILLED SURFACES

Revision Date:

1/8/04

S-8.1 Milled surfaces shall be cleaned with a street sweeper immediately prior to applying tack coat. The sweeper shall remain on the project during application of tack. Each lane shall be cleaned to the satisfaction of the City Engineer. Open faced brooms may only be used in conjunction with the sweeper when approved by the City Engineer.

S-8.2 Street Sweeper Brooms

- The sweeper shall have right and left gutter brooms.
- Speed of broom shall be independent of pickup broom speed.
- Gutter brooms shall be adjustable from inside cab for down pressure and wear. Both gutter brooms tilt angle shall be controlled from inside the cab.
- Gutter brooms shall be protected from impact with automatic return to work position.
- Pickup broom shall have hydraulic pickup for transport.
- Pickup broom down pressure shall be manually adjusted.
- Minimum sweep path of 125”.

S-8.3 Pickup brooms adjustments

The pickup broom shall be adjusted to have a heavy sweeping (5” to 7” pattern) (this is the longitudinal contact of the broom with the roadway shall be between 5” and 7”). Each side of the broom shall have the same contact with the roadway.

S-8.4 Additional cleaning may be required using compressed air as directed by the City Engineer.

During the cold planing operation, the Contractor shall remove all cuttings and debris from the street by use of a self-propelled street sweeper with hopper. Recompacted planing materials and all other materials not picked up the street sweeper shall be removed by other means by the Contractor. No material shall remain that would recompact or leave an unsuitable surface for subsequent overlay operations. Open faced brooms shall only be used when approved by the City Engineer.

At all other times the project site shall be kept clean, neat and orderly. The contractor shall keep all streets in a dust free condition. At any time, the City Engineer may require additional sweeping to maintain the required dust free surface. Stockpiling of debris and unsuitable materials beyond normal working hours shall not be permitted. Immediately after construction operations are complete, all equipment, debris and unsuitable materials shall be completely removed from the site in order to minimize the damage to finished work and inconvenience to the public and adjoining property owners.

S-8.5 Payment

Street Sweeping and cleaning shall be not be paid for directly but shall be considered subsidiary to other bid items.

S-9 METHODS OF ASPHALTIC CONCRETE OPERATIONS

S-9.1 Base Replacement

Asphalt base shall be laid at those locations shown on the plans or as specified in the specifications. The base material shall be laid on compacted subgrade. A bituminous paving machine shall be used where applicable to maintain the required grade. Asphaltic base replacement shall consist of removing the existing asphalt along with any rock base or subgrade, recompacting the subgrade and laying an asphaltic concrete base (Intermediate). Compaction shall be as specified in Section 602 of the Standard Specifications. The base repairs shall be performed after the curb work has been completed. All traffic control required for this work as shown on the plans shall be part of the traffic control lump sum bid.

Subbase shall be completely clean, and the surface tack coat applied as specified prior to placing the asphaltic base material. The asphaltic base shall be laid with a bituminous paving machine not to exceed 4" lifts in depth unless sufficient compaction equipment is used and then not to exceed 6" lifts in depth. The base material shall match the asphalt surface. All areas with 1" in depth or greater not replaced within the work day limitations, or as directed by the City Engineer, shall have temporary material placed to allow traffic full access. All temporary materials used shall be removed prior to placing asphaltic base. Placing and removing temporary material shall be subsidiary to other bid items. Asphaltic base material shall be paid for at the contract unit price bid per ton.

S-9.2 Surface Overlay Operation

Base shall be completely clean, and a surface tack coat applied as specified prior to placing the asphaltic surface material. During overlay operations, no reference grade will be established by the City Engineer, except where deemed necessary by the City Engineer to maintain satisfactory grade. A mobile grade line shall be used as the reference guide on all paving operations, except where otherwise directed by the City Engineer. The mobile grade line shall be either a rigid ski, a matching shoe, or a string line on wheels as directed by the City Engineer.

On all curb/guttered streets, the asphaltic overlay shall be laid ½ " (One-half inch) lip above the edge of the gutter. All asphaltic and/or concrete materials remaining within the gutter and require removing shall be subsidiary to other bid items. Where catch basins are located along or are part of the curb, special care shall be taken to keep the asphalt out of the catch basins. Where catch basins have a side opening and no opening in the gutter line, the Contractor shall not fill up or restrict any portion of this side opening with the overlay, but shall wedge the overlay to meet the existing dimensions. Longitudinal joints shall be rolled as directed by the City Engineer, along with providing proper traffic control.

Contractor shall provide a smooth transition from the new overlay to the existing pavement at intersections and driveways, as directed by the City Engineer in the field. The Contractor shall overlay around all radii and curb returns as directed by the City Engineer. Asphaltic surface material shall be paid for at the contract unit price bid per ton.

Although, it is not anticipated, after the milling operation, the contractor shall notify the City Engineer if the underlying pavement shows any evidence of failure. At the discretion of the City

Engineer, the pavement may be excavated to full depth and restored (minus the surface course) by the City of Merriam Public Works Department. Contractor shall cooperate with the City of Merriam Public Works crews for the work.

S-10 WORK DAY LIMITATION AND TRAFFIC ROUTING

Revision Date:
05/20/2004

During the different construction operations, one lane in each direction must be maintained at all times on all four lane thoroughfares. On two lane streets, traffic shall be carried through construction on all operations except during street resurfacing. Adequate signing and flaggers for one way stop and go traffic shall be required on two lane street to carry traffic through construction. Contractor shall propose the sequencing Traffic construction sequence for the required work shall be in accordance with the traffic control in accordance with the latest edition of the MUTCD.

No work shall be permitted on weekends or holidays unless approved by the City Engineer or his representative, or as indicated on the plans.

The closed lane length shall be determined by the amount of repair in a given section as approved by the City Engineer. The time a section shall be closed will be determined by the time limitation given in the plans.

During the deep cutting operation, traffic shall be carried through construction. All deep cut planing and base replacement shall be completed the same day.

The Taping operations shall be performed after the street has been cold planed or patched. The Taping shall be limited to the same time restrictions as the Cold Planing. The taping operations shall be performed in a minimum time of two days prior to the overlay date on the scheduled section of roadway.

At all construction times, a minimum of one lane in each direction shall remain open to traffic at all times. At other streets, the contractor shall provide adequate signing and flaggers for one-way stop and go traffic, to carry traffic through construction during all operations except during the street overlay, when street closing shall be permitted.

No direct payment will be allowed for compliance with the conditions of this section.