SECTION 32 12 00
BITUMINOUS PAVING

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section specifies providing asphaltic surface, binder and base courses on prepared subgrade or previously constructed base course in conformance with sections, lines and grades shown.

B. Related Work Specified Elsewhere:
   1. Base for pavements: Section 32 10 00.

1.02 SUBMITTALS:

Submit the following for approval in accordance with the General Requirements and with the additional requirements as specified for each:

A. Certification:
   1. For each delivery of asphaltic material, submit certificate stating type and amount of asphalt and results of specified tests.

B. Documentation:
   1. Job-mix formula:
      a. For each mix to be supplied submit job-mix formula based on expected production averages.
      b. In formula establish:
         1) Weight percent of total aggregate and of aggregate finer than each required sieve size.
         2) Weight percent of total mix of asphalt cement.
         3) Temperature of mix when placed.
      c. Maintain job-mix formula once approved.
   2. Weight ticket: For each load of bituminous mixture delivered to the site, submit weight ticket showing the following:
      a. Mix type.
      b. Mix temperature.
      c. Identification of the truck.
      d. Tare weight of truck.
      e. Loaded weight of truck.
      f. Net weight of load.
      g. Time of leaving mix plant.
      h. Signature of the Engineer's plant representative.

1.03 QUALITY ASSURANCE:

A. Codes, Regulations, Reference Standards and Specifications:
   1. Comply with codes and regulations of the jurisdictional authorities.

2. VDOT.
3. AASHTO: M6, M29, M43, M45, M76, M79, M140, M156, M208, T30, T164, T165, T168.
4. ASTM: D2950, D3515.
5. ASTM: D3515. [1]

B. Sources of Supply:
1. Not less than 20 days prior to beginning the work, inform the Engineer of the source of the materials to be used and obtain approval.
2. Once approved, do not change source of supply.
3. Do not construe approval as approval of entire location but as approval only insofar as material continues to meet specified requirements.
4. Maintain quality of material. Material may be sampled and tested by the Engineer as often as the Engineer deems necessary.
5. The Engineer has the right to reject material at the job site by visual inspection pending sampling and testing.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Delivery Trucks:
1. For transporting bituminous, mixtures use trucks which show no leakage of oil or grease, have solid metal dump-type beds which are clean and smooth with tight fitting rear gate to prevent loss of materials in transit.
2. Prior to loading, spray inside surface of truck beds with minimum amount of approved thin oil or mixture of lime and water proportioned 50 gallons of water to 100 pounds of lime necessary to prevent adhesion of the mixture. Do not use kerosene, gasoline or excessive amount of oil.
3. Equip trucks with coverings to protect loads from weather and with suitable insulation to prevent undue heat loss during transit at temperatures below 40F.

B. Weighing of Bituminous Mixtures:
1. Provide approved truck scales having both dial and automatic printer or use public scales.
2. Use scales complying with applicable laws, ordinances and regulations governing use of scales.
3. Have scales tested and sealed by authorized public official as often as directed to ensure their accuracy.
4. At least once a week, check tare weight of each truck with full load of fuel and fitted with its equipment.

1.05 JOB CONDITIONS:

A. Environmental Requirements:
1. Do not place bituminous pavement on wet surfaces.
2. Place bituminous pavement when temperature of air and base exceed 40F.

PART 3 - PRODUCTS

3.01 MATERIALS:

A. Asphalt Cement

B. Cut-Back Asphalt for Prime Coat

C. Emulsified Asphalt for Tack Coat: SS-1, SS-1h, CSS-1, or CSS-1h, diluted one-part water to one-part emulsified asphalt. Prior to dilution, emulsified asphalt to comply with AASHTO M140 or AASHTO M208. Apply at rate of 0.05 to 0.15 gallons per square yard.

D. Aggregate: Coarse and fine aggregate to be free from substantial portions of serpentine or talc materials or carbonate aggregates containing less than 25 percent by weight insoluble residue retained between Size 10 and Size 200 sieves as determined by leaching samples with 6N hydrochloric acid.

1. Coarse aggregate: Crushed stone, AASHTO M79 and AASHTO M76 except for grading. Weight loss not to exceed 15 percent by weight when subjected to five alterations of magnesium sulfate soundness test.
2. Fine aggregate for hot asphaltic concrete: Consisting of one or a combination of the following materials:
   a. Material conforming to AASHTO M6 with the following additional requirements:
      1) When the material is subjected to five alternations of the magnesium sulfate soundness test, weighted loss not exceeding 12 percent by weight; amount of deleterious substances not exceeding following maximum permissible percent limits by weight:
         a) Clay lumps: 0.5.
         b) Coal and lignite: 0.25.
         c) Material passing size 200 sieve: 3.0.
         d) Other deleterious substances, such as shale, alkali, mica, coated grains, soft and flaky particles: 2.0.
   b. Material conforming to specified requirements for No. 10 coarse aggregate in accordance with AASHTO M43.
3. Fine aggregate for sheet asphalt binder: AASHTO M45, with the following additional requirements:

	Sieve Designation	Percentage By Weight Passing Square Mesh Sieves
	8	100
	50	15 - 40
	100	0 - 10
	200	0 - 5

5. Fine aggregate for sheet asphalt surface: AASHTO M29, with the following additional requirements:

	Sieve Designation	Percentage By Weight Passing Square Mesh Sieves
	4	100
	10	95 - 100
	40	55 - 80
	80	15 - 40

6. Mineral filler:

	Sieve Designation	Percentage By Weight Passing Square Mesh Sieves
	30	100
	50	95 - 100
	200	70 - 100

3.02 MIXES:

A. Provide mixes in accordance with ASTM D3515 and as specified.

B. Proportion constituents of job mixes within limits specified in Table 32 12 00-1.

C. Submit mixes as directed for evaluation of job-mix formula, with bulk specific gravity determined in accordance with AASHTO T165.

3.03 TEMPERATURE OF MIXES:

A. Maintain temperature of mixes within plus-or-minus 25F of that given in job-mix formula. Temperature ranges as specified in Table 32 12 00-2.

PART 5 - EXECUTION

5.01 EQUIPMENT:

A. Equipment for Preparing Bituminous Material:
   1. Use bituminous paving material prepared in mixing plant conforming to AASHTO M156.

B. Equipment for Spreading and Finishing Bituminous Material:
   1. Use equipment capable of placing material at widths ranging from eight to twelve feet by increments of one foot and at varying thickness.
   2. Use machines which spread bituminous mixture without tearing surface. Achieve finish that is smooth, true to cross section, uniform in density and texture and free from hollows, corrugations and other irregularities.

C. Equipment for Compacting:
   1. Provide approved equipment capable of compacting materials to specified Marshall density.

5.02 BASE PREPARATION:

A. Prior to placing bituminous mixture, check line, grade and cross section of underlying course. Repair defective areas.

B. Have base approved, prior to placement of surface course.

C. Aggregate and Soil Aggregate Bases:
   1. Apply cut-back asphalt primer at rate of 0.2 to 0.5 gallons per square yard when base is damp but with no standing water.
   2. Allow 24 hours for base to entirely absorb primer. Blot excess primer with just enough sand to prevent pickup under traffic. Sweep loose sand from base before placing base course.

D. Portland Cement Concrete, Bituminous and Brick Pavement Bases:
   1. Apply tack coat using equipment designed for that purpose.
   2. Apply tack coat uniformly to clean dry base at rate of 0.05 to 0.15 gallons per square yard.
   3. Ensure that surface has cured and is satisfactorily tacky before placing mix.

E. Immediately prior to placing mix, apply thin coat of hot asphalt cement to contact surfaces of curbs, gutters, manholes and similar structures.

5.03 PLACING MIX:

A. Place base course mixture in one or more lifts with asphalt paver or spreader to provide nominal compacted thickness as shown. Place surface course mixture with asphalt paver to provide nominal compacted thickness as shown. Minimum lift thickness at least two times maximum particle size. Maximum lift thickness to be that which can be demonstrated to be laid in a single lift and compacted to required uniform density and smoothness. Place material in continuous operation. Correct irregularities before final compaction of mixture.

B. If equipment being used produces tracks, pulling, indented areas or other permanent blemishes in material being spread, remove such equipment from site and substitute other approved spreading and finishing equipment.

C. Do not permit direction of movement of paving equipment to be changed by turning on newly completed base, binder or surface courses.

D. Adjacent to headers, gutters, manholes and similar structures, place surface course so that finished surface is 1/4-inch above edge of structure.

E. When the Engineer considers it impractical to place mix with two machines, one machine will be permitted. Treat joints created by such operation as cold joints.

F. Rake joints to eliminate seams between lane passes.

5.04 COMPACTION:

A. Compact immediately after placing. Initial rolling with steel-wheel tandem roller, steel three-wheel roller, vibratory roller, or pneumatic-tire roller following paver as closely as possible, oriented with drive wheel closest to paver. If intermediate rolling is needed, use pneumatic-tire roller immediately behind initial rolling. Final rolling to eliminate marks from previous rolling. Use vibrating plate compactor or hand tamper to achieve thorough compaction in areas too small for roller. Keep steel wheel rollers wet while rolling.

5.05 COLD JOINTS:

A. Longitudinal: Apply tack coat to cold material before joining new work.

B. Transverse: Place bulkhead full depth of course or cut back minimum of three inches from sloping surface with masonry saw. Apply tack coat to cold material.

5.06 BULKHEADS:

A. Where placement of mix is to be discontinued for such period of time that material will fall below specified street temperature, place suitable bulkhead.

B. Construct cold joint as specified when work is resumed.

5.07 HANDWORK:

A. When approved, perform bituminous paving work by hand in areas inaccessible to machines.

B. Undertake handwork using equipment designed and approved for purpose.

C. Perform handwork so that resulting paving meets specified requirements.

5.08 FIELD QUALITY CONTROL:

A. Allowable Tolerances:
   1. Thickness: Place bituminous pavement to within tolerance of plus-or-minus 1/8 inch of thickness shown.
   2. Surfaces: Construct surfaces to the following tolerances:
      a. Base courses to within plus-or-minus 3/8 inch of elevation shown.
      b. Surface courses to within plus-or-minus 3/16 inch of elevation shown.

c. Surfaces to deviate no more than 1/4 inch in the length of 10-foot steel straightedge, not cumulative.

d. During compacting, screed surface using straightedge as specified in Section 02750. Adjust rolling procedures so that tolerances are met.

3. Densities required:

a. Base courses: 94 percent of Marshall density.

B. Testing:

1. Mixes:

a. During course of the work submit mixes as directed for testing of gradation and bitumen content in accordance with AASHTO T30 and AASHTO T164 on random samples selected in accordance with AASHTO T168.

2. Determine density of base and surface courses by one of the following methods:

a. Test base and surface courses for density and thickness with a nuclear density meter in accordance with ASTM D2950. [2]

1) Compute average thickness of base and surface courses from average density and weight per square yard of paving mixture actually used as follows:

$$t = \frac{W}{0.75\ d}$$

Where:

t = pavement thickness, in inches.

W = average weight of base or surface mixture actually used, pounds per square yard.

d = compacted density of base or surface course as measured by the nuclear device,pounds per cubic foot.

0.75 = constant.

b. Not used.

c. Test base and surface courses for density by taking test cores at designated locations for testing by the Engineer, number of cores not exceeding one core per 500 square yards of bituminous pavements or two cores per shift, whichever is greater.

1) Wherever deficient pavement is discovered take such additional cores as directed.

2) Repair core holes promptly using the same mix that was cored; where cores are taken through both base course and surface course simultaneously, use surface course mix for repair work.

5.09 PROTECTION OF BITUMINOUS PAVEMENT:

A. Obtain approval for use of pavement by public and construction traffic.

B. Do not permit traffic to cross uncompleted longitudinal joints.

5.11 DEFICIENT PAVEMENT:

A. Where directed, replace with new material or repair bituminous pavement that does not meet specified requirements.

TABLE 32 12 00-1 CONSTITUENT PROPORTIONS [3]					
GRADING OF TOTAL AGGREGATE (COARSE, FINE, MINERAL FILLER: AS NECESSARY) AMOUNTS FINER THAN LABORATORY SIEVE (SQUARE OPENING) WEIGHT PERCENT					
SIEVE	SHEET ASPHALT		HOT ASPHALTIC CONCRETE		* JOB-MIX FORMULA TOLERANCE:
	BINDER	SURFACE	BINDER	SURFACE	ALL MIXES
1 inch	- -	- -	100	- -	+7
3/4 inch	- -	- -	90 - 100	- -	+7
1/2 inch	100	- -	- -	100	+7
3/8 inch	85 - 100	- -	60 - 85	85 - 100	+7
No. 4P	35 - 55	100	45 - 65	55 - 80	+7
No. 10	20 - 35	95 - 100	30 - 50	40 - 65	+6
No. 40	- -	55 - 92	10 - 25	10 - 30	+6
No. 80	- -	20 - 60	3 - 15	3 - 15	+4
No. 200	0 - 5	9 - 20	2 - 8	2 - 8	+3
	ASPHALTIC CEMENT, WEIGHT PERCENT OF TOTAL MIXTURE				
	4.0 - 7.0	8.5 - 11.5	5.0 - 8.0	5.0 - 8.0	+0.5
*	Notwithstanding tolerances, supply mixes within specified grading limits.				

TABLE 32 12 00-2 MIX TEMPERATURE RANGES				
	TEMPERATURES, DEGREES F			
MIX	PLANT			STREET
	AGGREGATE	ASPHALT CEMENT	TOTAL MIX	
Sheet Asphalt Binder	250 - 325	250 - 325	250 - 325	250 - 325
Sheet Asphalt Surface	300 - 375	250 - 350	300 - 375	275 - 350
Hot Asphaltic Concrete	250 - 325	250 - 325	250 - 325	250 - 325

END OF SECTION