

## **SECTION 32 12 00**

### **FLEXIBLE PAVING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

**A. Section Includes:**

1. Bituminous prime coat, if used.
2. Asphalt paving courses including binder course and surface course.
3. Bituminous tack coat.
4. Paint and thermoplastic pavement markings
5. Tennis court, ball court coating system

**B. Related Sections:**

1. 31 22 00 "GRADING" for backfill and compaction of trench excavations prior to paving and for general subgrade preparation.
2. 32 05 00 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS" for graded aggregate base (GAB) construction.

##### **1.2 REFERENCE SPECIFICATIONS AND DOCUMENTS**

**A. Georgia Department of Transportation (GDOT)**

1. Department of Transportation, State of Georgia Standard Specifications, Construction of Roads and Bridges, 2013 Edition. Unless otherwise noted, conform with GDOT Standard Specifications for testing, materials, and methods for bases and hot mix asphalt pavement.
2. GDOT *Special Provision* Sect. 828 applies to hot mix asphalt mixtures and is available at [http://www.dot.ga.gov/PartnerSmart/Business/Source/special\\_provisions/shelf/sp828.pdf](http://www.dot.ga.gov/PartnerSmart/Business/Source/special_provisions/shelf/sp828.pdf).
3. GDOT Test Procedures (GDT), where referenced.

**B. American Society for Testing Materials (ASTM)**

1. ASTM D1557- laboratory compaction characteristics of soil using Modified Effort.
2. ASTM D2726- Bulk specific gravity and density of compacted bituminous mixtures.
3. ASTM D2950- In place density of bituminous concrete by nuclear gage.
4. ASTM D3203- Percent air voids in compacted bituminous paving mixtures.
5. ASTM D3549- Thickness of compacted bituminous paving mixture specimens.
6. ASTM D6938- In place density and water content of soil and aggregate using nuclear gage.

**C. MUTCD: US Department of Transportation, Manual of Uniform Traffic Control Devices for Streets and Highways, 2009 Edition with Revisions 1 and 2- dated May 2012. Unless otherwise shown or specified conform with the MUTCD on all asphalt striping and pavement marking.**

### 1.3 SUBMITTALS

- A. Product data for materials, including but not limited to: traffic paint, thermoplastic markings, prime coat, bituminous tack coat.
- B. Job Mix Formula for all asphalt concrete mixtures which includes the following information:
  - 1. Mixture I.D. Number
  - 2. Source and description and proportions of materials to be used.
  - 3. Percentage of combined mineral aggregates passing each specified sieve.
  - 4. Percentage of asphalt by weight of the total mix
  - 5. Single temperature at which to discharge from the plant.
  - 6. Theoretical specific gravity or Theoretical maximum density (Rice) of the mixture at the designated asphalt content
- C. Copy of pavement warranty and maintenance agreement for review by the Design Professional.

### 1.4 QUALITY ASSURANCE

- A. Testing Services: The Owner will engage a qualified independent testing agency to perform material evaluation tests described in this Section.

### 1.5 SITE CONDITIONS

- A. Store materials only in areas designated for Contractor's use.
- B. Complete all underground work and raise all necessary structures prior to paving operations.
- C. Verify all grades and elevations for conformance with the Drawings before proceeding with work. The Design Professional reserves the right to make minor modifications by reasonable field adjustments prior to completion of subgrade work.
- D. Weather Limitations:
  - 1. Install base course when subgrade is sufficiently stable, not saturated, and when air temperature is above 30° F and rising.
  - 2. Apply prime and tack coats to dry surfaces when: rain is not imminent, temperature is above 40° F, and temperature has not been below 35° F for 12 hours immediately prior to application.
  - 3. Construct Asphalt paving courses in dry weather when subgrade is sufficiently stable and air temperature is above 40° F and rising.

### 1.6 PAVEMENT DESIGN

- A. Pavement sections are shown on the Plans and may include, but are not limited to, the following applications:
  - 1. Asphalt Paving within the Right-of-Way.
  - 2. Heavy Duty Asphalt Paving.
  - 3. Medium Duty Asphalt Paving.
  - 4. Tennis court or other recreational surface paving.
- B. All depths shown or specified are measured after compaction.

## 1.7 WARRANTY

### A. Pavement Warranty:

1. (Sub) Contractor shall provide the Owner with a warranty and maintenance agreement on materials and workmanship for all hot mix asphalt paving work. Warranty and maintenance period shall be for a **2 year** period beginning on the established date of substantial completion on all asphalt paving.
2. All maintenance work under the Pavement Warranty shall be performed within 30 days of notice by the Owner and in accordance with GDOT Standard Specifications.

## PART 2 - PRODUCTS

### 2.1 PRIME COAT- CUTBACK ASPHALT

- A. Medium curing cut back asphalts {MC-30, MC-70, MC-250, MC-800, MC-3000} and rapid curing cutback asphalts {RC-30, RC-70, RC-250, RC-800, RC-3000} material properties in accordance with GDOT Standard Specification 821.

### 2.2 BITUMINOUS TACK COAT

- A. Performance graded asphalt cement: PG 58-22, PG 64-22, or PG 67-22 in accordance with GDOT Standard Specification 820.

### 2.3 SUPERPAVE ASPHALTIC CONCRETE MIXTURES

- A. Asphaltic concrete shall be hot plant mix material and shall comply with requirements for Hot Mix Asphaltic Concrete Mixtures per GDOT *Special Provision* Sect. 828 available at the following address:  
[http://www.dot.ga.gov/PartnerSmart/Business/Source/special\\_provisions/shelf/sp828.pdf](http://www.dot.ga.gov/PartnerSmart/Business/Source/special_provisions/shelf/sp828.pdf).
- B. Asphalt cement: PG 64-22 or PG 67-22, unless otherwise approved by the Design Professional.
- C. Design gradations for pavements typically used as surface (top) courses are:

<b>Sieve Size <sup>1</sup></b>	<b>4.75 mm Superpave <sup>3</sup></b>	<b>9.5 mm Superpave Type I</b>	<b>9.5 mm Superpave Type II</b>	<b>12.5mm Superpave</b>
	Percent Passing			
1-1/2 in (37.5mm)				100
1-in (25.0 mm) sieve				90-100
¾ in (19.0 mm) sieve		100	100	55-89
½ in (12.5 mm) sieve	100	98- 100	98-100	50-70

3/8 in (9.5 mm) sieve	90-100	90-100	90-100	
No. 4 (4.75 mm) sieve	75-95	65-85	55-75	
No. 8 (2.36 mm) sieve	60-65	48-55	42-47	30-36
No. 50 (300 µm) sieve	20-50			
No. 200 (75 µm) sieve	4-12	5.0-7.0	5.0-7.0	4.5 -7.0
Range for Total AC <sup>2</sup>	6.00- 7.50%	5.50 - 7.25%	5.25 - 7.00%	5.00-6.25%

1. Refer to GDOT Special Provision 828 for mixture control tolerances applicable to each sieve and pavement.
2. Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC calculations detailed in GDOT SOP 2.
3. Application of 4.75 mm superpavement is limited to low volume parking lots unless otherwise shown.
4. 9.5 mm superpavement shall be Type II unless otherwise shown.

D. Design gradations for pavements typically used as asphalt binder (subsurface, intermediate, or base) courses are:

<b>Sieve Size <sup>1</sup></b>	<b>12.5 mm Superpave</b>	<b>19 mm Superpave</b>	<b>25 mm Superpave</b>
	Percent Passing		
1-1/2 in (37.5mm)			100
1-in (25.0 mm) sieve	100	100	90-100
¾ in (19.0 mm) sieve	98-100	90-100	55-89
½ in (12.5 mm) sieve	90-100	60-89	50-70
3/8 in (9.5 mm) sieve	70-89	55-75	
No. 8 (2.36 mm) sieve	38-46	32-36	30-36

No. 200 (75 µm) sieve	4.5-7.0	4.0-6.0	3.5-6.0
Range for Total AC <sup>2</sup>	5.00- 6.25%	4.25-5.50%	4.00-5.25%

1. Refer to GDOT Special Provision 828 for mixture control tolerances applicable to each sieve and pavement.
2. Range for % AC is Original Optimum AC (OOAC) at 65 gyrations prior to the Corrected Optimum AC calculations detailed in GDOT SOP 2.

E. Volumetric mix requirements for superpavements, including work within public rights of ways.

Design Parameter	Mix Type(s)	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, (Ndes)	All	96%
% Gmm at the initial number of gyrations, Ni	All	91.5% Max
% voids filled with asphalt (VFA) at Ndes	9.5 mm Type I	Min 72; Max 80
	9.5 mm Type II, 12.5 mm	Min 72; Max 76
	19 mm	Min 71; Max 76
	25 mm	Min 69; Max 76
Fines to effective asphalt binder ration (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)	All	>7.00 µm
Minimum % Voids in Mineral Aggregate (VMA)	25 mm	13.0%
	19 mm	14.0%
	12.5 mm	15.0%
	9.5 mm Type I	16.0%
	9.5 mm Type II	16.0%

F. Volumetric mix requirements for parking facilities only.

Design Parameter	Mix Type(s)	Limits
% of Max. Specific Gravity (Gmm) at design gyrations, (Ndes)	All	96%

% Gmm at the initial number of gyrations, Ni	All	91.5% Max
% voids filled with asphalt (VFA) at Ndes	4.75 mm	Min 60; Max 80
	9.5 mm Type I	Min 72; Max 80
	9.5 mm Type II, 12.5 mm	Min 72; Max 78
	19 mm	Min 71; Max 76
	25 mm	Min 71; Max 76
Design optimum air voids	4.75 mm	4.0 - 7.0
Fines to effective asphalt binder ration (F/Pbe)	9.5 mm Type I	0.6 to 1.4
	All other types	0.8 to 1.6
Minimum Film Thickness (microns)	4.75 mm	> 6.00 µm
	All others	> 7.00 µm
Minimum % Voids in Mineral Aggregate (VMA)	25 mm	13.0%
	19 mm	14.0%
	12.5 mm	15.0%
	9.5 mm Type I	16.0%
	9.5 mm Type II	16.0%

#### 2.4 STRIPING AND MARKINGS (PAVEMENT SURFACES, CURBS)

- A. Unless otherwise noted- parking lines, cross walks, bus lane striping, directional arrows, stop bars, center line markings, curb painting/markings and handicap markings shall be painted when Work is outside public road Right of Ways.
- B. All striping and markings within public road Right of Ways, unless otherwise noted, shall be thermoplastic.
- C. Traffic line paint shall be waterborne and conform with material requirements of Georgia DOT Standard Specification 870.2.02. Where specified, glass beads shall be in accordance with GDOT Standard Section 652.
- D. Thermoplastic markings shall be in accordance with Georgia DOT Standard Specification 653.
- E. Unless otherwise shown on the Plans, color applications are as follows:
  1. White: All auto parking spaces, pedestrian crossings and direction arrows.
  2. Yellow: All bus lanes, general no-parking zones (including along curbs), speed breakers, traffic lane direction dividers, and other cautionary areas.
  3. Light Blue: For highlight/background to WHITE in Handicap Areas.
  4. Red: all fire lane areas as indicated on the drawings shall have the curb facing painted red and provide 4" tall "NO PARKING FIRE LANE" curb stenciling along

painted fire lane restricted area once every twenty (20) feet on center.  
Secure local Fire Marshall written approval of markings prior to installation.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION**

- A. Ensure that subgrade has been finished to line, grade, and cross section shown.
- B. Prepare subgrade in accordance with Division 31 "EARTHWORK". Any subgrade defects, or unsatisfactory conditions, that may adversely affect proper installation of this work shall be reported to the Design Professional and corrected prior to base course or paving course work.

#### **3.2 AGGREGATE BASE**

- A. Place, compact, and maintain aggregate bases in accordance with Division 32 "COMMON WORKS FOR EXTERIOR IMPROVEMENTS".

#### **3.3 PRIME COAT**

- A. Provide prime coats to finished, compacted, and slightly damp soil or base surfaces under the following conditions:
  - 1. Prime where noted on the plans.
  - 2. Prime soil or aggregate bases prior to applying bituminous surface treatments (chip seals).
  - 3. Prime all cement or lime stabilized bases prior to asphalt paving.
  - 4. Prime aggregate bases on which less than 5 inches of total thickness of hot mix asphalt will be placed. Except that prime coats are not required in parking lots and driveways bound by curbs or other features, under paved shoulders, or under non-vehicular areas.
- B. Grade of cut back asphalt shall be as shown on the Plans or as determined by the Architect or Testing Agency. If not shown or specified, provide grade of cut back asphalt in accordance with GDOT Standard Specification 412.3.05 given base material texture {tight, average, or open} and Contractor selected curing rate.
- C. Apply prime coat for optimum penetration at a rate between 0.15 and 0.30 gal/sq-yd.

#### **3.4 TACK COAT**

- A. Apply tack coat of asphalt cement between all layers of successive pavement, including between the binder course and surface course pavements.
- B. Apply tack coat to milled pavement surfaces prior to paving.
- C. Apply tack coat to vertical surfaces of curbs, gutters, transverse and longitudinal construction joints, dig out patches prior to such surfaces being paved.
- D. Limit the amount of tack coat applied to that which can be covered by paving operations that day.

- E. Sweep and clean application surfaces of all loose debris, and allow to dry prior to applying tack coat.
- F. Apply tack coats of asphalt cement at an application temperature of 350 - 400 °F and rates of 0.02 to 0.014 gal/sq-yd for freshly placed asphalt and at a rate of 0.04 to 0.06 gal/sq-yd on other surfaces.
- G. Do not allow traffic on tack coat material. Allow the tack coat to become sufficiently tacky (break) prior to paving.

### 3.5 BINDER COURSE

- A. Construct a hot plant mix asphaltic concrete binder course on prepared base to the line, grade, thicknesses, and tolerances indicated on the Plans and in these specifications.
- B. Uniformly spread and compact.
- C. Layer Thicknesses: Conform with minimum and maximum lift thicknesses as follows (reference GDOT Section 400, Table 5):
  - 1. 25 mm Superpave: 3" to 5"
  - 2. 19 mm Superpave: 1-3/4" to 3"
  - 3. 12.5 mm Superpave: 1-3/8" to 2-1/2"

### 3.6 SURFACE COURSE

- A. Following tack coat break, place hot plant mix asphaltic concrete wearing course by means of a mechanical spreader to the thickness indicated on plans and details and roll evenly in place.
- B. Replace any high, low, or defective areas by saw cut and removal of the affected pavement. Replacement hot plant mix asphaltic concrete shall be immediately compacted to conform to surrounding area and thoroughly bonded thereto.
- C. Uniformly spread and compact.
- D. Layer Thicknesses: Conform with minimum and maximum lift thicknesses as follows:
  - 1. 12.5 mm Superpave: 1-3/8" to 2-1/2"
  - 2. 9.5 mm Superpave Type 2: 1-1/4" to 2"
  - 3. 9.5 mm Superpave Type 1: 7/8" to 1-1/2"
  - 4. 4.75 mm Superpave: 7/8" to 1-1/8"

### 3.7 PLACING ASPHALTIC CONCRETE PAVING

- A. Hot plant mix asphaltic concrete paving shall be placed on prepared surface, spread, and struck. Unless approved otherwise, spread mixture at minimum temperature of 225°F.
- B. Place each course by pavers equipped with automatic screed control such that it can be finished to required grade, cross-section, width, thickness and is uniform in density and texture. Except that, when approved by the Testing Agency or Design Professional, small areas inaccessible to paving machines may be placed by hand. **Paving machine screed extensions may be used with approval of Design Professional only.** Approved Extensions shall provide for consistent lay down density through use of extended auger systems or other approved mechanisms.

- C. Make longitudinal and transverse joints between old and new pavements, or between successive days work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphaltic concrete course. Prior to paving, clean joint contact surfaces and apply tack coat.

### 3.8 ROLLING

- A. Commence rolling when asphaltic concrete mixture will support roller weight without excessive displacement.
- B. Continue rolling until roller marks are no longer visible and asphalt has been uniformly compacted attaining required density and smoothness.
- C. Compact asphaltic concrete mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- D. Do not roll asphalt if mix temperature is less than 175° F unless a lower temperature is supported by the mix design and is otherwise approved by the Design Professional or Testing Agency.

### 3.9 TOLERANCES

- A. Elevation tolerance for asphalt paved surfaces are:
1. General areas  $\pm$  1/4 inch at finish grade unless field adjustments are directed or approved by the Design Professional.
  2. Tennis court  $\pm$  0.05 ft.
- B. Cross slope, thickness, and smoothness tolerances per pavement section layer are as follows:

Layer	Cross Slope	Thickness	Smoothness <sup>1</sup>
Base (Aggregate or treated)	$\pm$ 1.0%	-1/4 in, no max.	1/2 inch
HMA Binder Course	$\pm$ 0.75%	-1/4 in, GDOT max <sup>2</sup>	3/8 inch
HMA Surface Course	$\pm$ 0.5%	-3/8 in, GDOT max <sup>2</sup>	1/4 inch
HMA Tennis Surface Course	$\pm$ 0.3%	-1/8 in, GDOT max <sup>2</sup>	1/8 inch

<sup>1</sup> In any direction within a single plane of asphalt, do not exceed the gap below a 10 foot straightedge resting on high spots.

<sup>2</sup> Refer to Articles on HMA binder and surface courses this section for maximum layer thickness (from GDOT Standard Section 400 Table 5).

### 3.10 PAVEMENT MARKINGS

- A. Approximately two (2) calendar weeks after surface course has been completed, apply parking lines and other pavement markings as shown on the staking plan. Pavement markings includes lines, arrows, handicap designations and all other required pavement painting as detailed.

- B. Apply paint to produce uniform straight edges to widths shown but not less than 4" wide. Uneven lines will not be accepted. Do not apply paint during windy conditions that prevent application in uniform straight edges.
- C. Apply paint to dry and clean surfaces, in accordance with manufactures recommendations but in no cases when air temperature in the shade is less than 40°F.
- D. Apply paint in two uniform coats, by roller, spray or striping machine at manufactures recommended rates not less than fifteen (15) mils.
- E. All work shall be done in accordance with Georgia DOT Standard Specification Section 652 except that application of glass beads are not required.
- F. Protect newly applied paint with cones, drums or other temporary device. Repair any pavement marking damage that occurs until substantial completion of the project.

### 3.11 TESTING- QUALITY ACCEPTANCE

- A. Inspections: Prior to commencement of portions of the work, the Testing Agency and/or Design Professional shall be notified 48 days in advance to verify the following items:
  - 1. Subgrade preparation, stiffness (proofrolling).
  - 2. Subgrade profile, cross slope, and elevation.
  - 3. Grades, elevations, compaction, surface smoothness of base aggregate.
  - 4. Grades, elevations, surface smoothness of asphalt binder course
- B. Additional testing (or retesting) after failing tests shall be paid for by the Contractor.
- C. Minimal testing requirements for Owners Quality Assurance are summarized below. Contractor may elect to collect additional samples and perform additional tests, or prepare additional specimens for testing at its sole discretion in accordance with their own quality control program.

Material or Product	Characteristic /Test Method	Minimum Sample Frequency	Acceptance Criteria	Sampling Point
Aggregate base courses	Gradation; max dry density, optimum moisture by modified proctor, <i>ASTM D1557</i>	1 per source	Gradation within limits.	Stockpile at source
	Compaction <i>GDT 21, 59, ASTM D6938</i>	1 per 500 sq yards, per lift	100% of max dry density, $\pm 2\%$ optimum moisture *	In-place, prior to next lift
Hot asphalt concrete mixes	Compaction <i>GDT 39, 59 ASTM D2950, ASTM D1188, ASTM D3203</i>	1 core per 500 sq-yds per lift, not less than 1 test per paving day.	Percent air voids $\leq 8\%^{**}$	Completed surface after rolling

		Continuous nuclear gage testing during paving.		
	Thickness, by coring.	Binder Courses: 1 per 1000 sq-yds.  Overall Section Including Surface Course: Measured from Compaction samples.	Average of all measurements for a given course or full section $\geq$ specified thickness ***	Completed surface after rolling

\* Unless shown otherwise on the Plans.

\*\* Additionally asphalt mixes shall be applied with uniform density such that within a single day or paving area, the difference between highest and lowest measured air voids does not exceed 4% for new pavement and 5% for resurfacing projects.

\*\*\* Additionally, at any location, the thickness of a given lift shall not be less than within 1/4" of the design thickness.

D. Hot Asphalt Concrete Compaction Testing

1. Density tests are not required when HMA is placed at 90 lbs/sq-yd or less or for courses of 4.75 mm mix.
2. Non conforming work: Remove completed asphalt courses that exceed maximum percentage of air voids (or do not attain minimum compaction percentages) and replace at the direction of the Design Professional or Testing Agency. Statistical testing and pay factors specified in GDOT Standard Specifications are not applicable.

E. Asphalt Cores

1. Repair holes resulting from coring to match existing pavement elevations. Repair holes prior to paving any subsequent courses.
2. 4" diameter cores of binder course shall be taken through base and binder course prior to placing surface course.

F. Correction of Asphalt Thickness Deficiencies

1. In areas where there is a deficiency in the thickness of binder course(s), increase the thickness of wearing course to offset the deficiency.
2. The average thickness of the full asphalt paving section, binder courses + surface course, shall be  $\geq$  the design asphalt section. If tests show a deficiency of -1/4 inch or more in the average thickness of the specimens, provide mitigation acceptable to the Design Professional, Testing Agency, or Owners representation. If directed, place an additional lift of wearing course at the minimum depth as specified in this Section.

3.12 MAINTENANCE OF ASPHALTIC CONCRETE PAVING

- A. Protect completed asphalt surfaces from damage, siltation, and spills throughout construction.
- B. Remove and replace any asphaltic concrete paving if damaged by construction activities. Do not change or alter grade during corrective work, unless approved by the Design Professional.
- C. Saw cut and remove areas of damaged asphaltic concrete paving in neat and straight lines extending the width of a full lane or at least 10 feet in large areas. Corrections by surface patching will not be accepted.

**END OF SECTION**