

**SECTION 321216 ASPHALT PAVING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Hot-mix asphalt paving.
  - 2. Hot-mix asphalt paving overlay.
  - 3. Asphalt surface treatments.
  - 4. Pavement-marking paint.
- B. Related Sections include the following:
  - 1. Division 01 Section, "Construction Waste Management"
  - 2. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
  - 3. Site Wide Materials Management Plan Dated November 2018

1.3 SUBMITTALS

- A. Shop Drawings: Indicate technical data, tested physical and performance properties, pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- B. Job Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners and other information specified.
- D. Material Certificates: Certificates signed by manufacturers certifying that each material complies with specified requirements.
- E. Installer Qualifications: Engage an experienced installer who has complete hot-mix asphalt paving similar in material, design and extent to that indicated for this Project and with a record of successful in-service performance.

Firm shall be registered and approved paving mix manufacturer with authorities having jurisdiction or with the DOT of the state in which the project is located.

- F. Asphalt-Paving Publication: Comply with AI's "The Asphalt Handbook," except where more stringent requirements are indicated.
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements related to asphalt paving, including but not limited to, the following:
  - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
  - 2. Review condition of substrate and preparatory work performed by other trades.
  - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
  - 4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel and equipment required to execute the Work without delays.
  - 5. Review inspection and testing requirements, governing regulations and proposed installation procedures.
  - 6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

#### 1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is occurring, imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Prime Coat: Minimum surface temperature of 60 deg F
  - 2. Tack Coat: Minimum surface temperature of 60 deg F.
  - 3. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  - 4. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

## PART 2 - PRODUCTS

### 2.1 BASE COURSE

- A. All hot-mix asphalt shall be constructed on a dense graded aggregate base course as shown on the plans.

Dense Graded Aggregate shall meet the following gradation requirements:

<u>Sieve Size</u>	<u>Percent Passing</u>
1-1/2"	100
3/4"	55 – 90
No. 4	25 - 50
No. 50	5 - 20
No. 200	3 - 10

### 2.2 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactory in previous installations.
- B. Coarse Aggregate: Sound, angular crushed stone, crushed gravel, complying with ASTM D 692
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone, gravel or combinations thereof, complying with ASTM D 1073.
1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

### 2.3 ASPHALT MATERIALS

All asphalt materials shall conform to the requirements of the 2019 NJDOT Standard Specifications for Road and Bridge Construction

- A. Asphalt Cement: ASTM D 3381 for viscosity-graded material.
- B. Prime Coat: Asphalt emulsion prime conforming to NJDOT requirements.
- C. Tack Coat: ASTM D 977; emulsified asphalt for ASTM D 2397, cationic emulsified asphalt, slow setting, factory diluted water, of suitable grade and consistency for application.
- D. Water: Potable.

### 2.4 AUXILIARY MATERIALS

- A. Asphalt Paving (Geotextile) Fabric – Petromat Style 4599 by Propex, Inc.
- B. Sand: ASTM D 1073, Grade Nos. 2 or 3.
- C. Pavement-Marking Paint: Alkyd-resin type, ready-mixed, complying with FS TT-P-115, Type I, or AASHTO M 248, Type N.
  - 1. Color: As indicated on plans and details or as directed by the Owner.
- D. Glass Beads: AASHTO M 247.
- E. Bituminous Asphalt Paving

## 2.5 MIXES

- A. Hot-Mix Asphalt: Provide dense, hot laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in ACI's "Mix Design Methods for Asphalt Concrete and Other hot-mix Types"; and complying with the following requirements:
  - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
  - 2. Base Course: Hot Mix Asphalt 19 M 64
  - 3. Surface Course: Hot Mix Asphalt 12.5 M 64

## PART 3 – EXECUTION

### 3.1 CONSTRUCTION WASTE MANAGEMENT

- A. The contractor, subcontractors, and their personnel shall follow the procedures and practices for waste separation, collection and transport as defined in the contractor's "Waste Management Plan" as required by Division 01 Section "Construction Waste Management."

### 3.2 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- C. Notify Architect and Owner in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been properly corrected.

### 3.3 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade to the satisfaction of the Architect and Owner.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix

asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

### 3.4 MILLING OF PAVEMENT

- A. Mill Hot Mix Asphalt Pavement to the specified depth, profile and cross slope. Operate Milling machine to produce milled material that passes a 3-inch sieve. Use automatic grade controls to control the line and grade of the milling machine. Use either string line or ski reference system. Replace teeth in the milling drum that become dislodged, broken or unevenly worn. Perform milling operation, including removal of the milled material, in a manner that prevents dust and other particulate matter from escaping into the air.

Ensure that the milled area is free from gouges, continuous grooves, ridges, and delaminated areas and has a uniform texture consisting of discontinuous longitudinal striations. Ensure that the striations do not deviate more than 1 inch in 200 feet from a line parallel to the center of the traveled way and do not exceed 3/8 inch in depth. Check at least every 25 feet to ensure that the depth of milling is within 1/4 inch of the indicated depth.

Mill HMA to the depth specified without damaging the underlying HMA. If the HMA below the specified milling level becomes dislodged or delaminated, remove and replace.

When profile milling, ensure that the cutting depth is sufficient to remove ruts and corrugations and to scarify the remaining surface.

Using a mechanical sweeper, clean the milled area before opening to traffic and before subsequent construction or resurfacing.

If the milled area is opened to traffic, ensure that the water can drain from the surface and does not become trapped. If the longitudinal edge height of the milled surface exceeds 2 inches, slope the edge to provide a smooth transition from the milled surface to the remaining pavement. At transverse edges of milled areas, provide a smooth transition from the milled surface to the remaining pavement.

### 3.5 RESURFACING OF PAVEMENT

- A. Resurfacing will be performed on existing pavements by milling the existing pavement surface to a depth that will provide a minimum overlay as designated on the construction documents. Upon completion of the milling operations the surface must be prepared as indicated under the section entitled Milling of Pavement and/or Surface Preparation prior to application of tack and prime coat. The HMA will then be installed over the prepared surface in accordance with the section entitled Hot Mix Asphalt Placing.

### 3.6 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
  - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
  - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

### 3.7 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated the hot-mix asphalt base course must remain in place for a minimum of two (2) months, or as directed by the Owner, prior to placement of the asphalt surface course.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of 250 deg F.
  - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

### 3.8 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints by bulkhead method or saved vertical face method as described in AI's "The Asphalt Handbook."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.9 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt and recalling to required elevations. Correct laydown and rolling operations to comply with requirements. Unless modified by the engineer, complete breakdown rolling in less than 40 minutes to the required density.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  1. Average Density: 96 percent of reference laboratory density according to ASTM D 1559, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.10 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Base Course: Plus or minus 1/2 inch
  - 2. Surface Course: Plus 1/4 inch no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  - 1. Base Course: 1/4 inch.
  - 2. Surface Course: 1/8 inch.
  - 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

### 3.11 DRIVING SURFACE PLACEMENT

- A. Preparation of Subgrade: Unsatisfactory drainage and subgrade conditions shall be corrected prior to placement by scarifying, reshaping, and recompacting, or by replacing or importing subgrade/subbase.
- B. Transport: Tarps shall be used to cover 100% of the load's exposed surface from the time of loading until immediately before placement.
- C. Placement: DGA placement should be placed in a single pass. Material shall be placed in a single 6-8 inch loose lift. This lift is to be compacted with a vibratory roller. If freezing temperatures or precipitation are forecast that may cause the material to freeze, or prevent the material from drying out, placement shall be postponed at the direction of the owner or aggregate supplier.
- D. Compaction: After placement, the material shall be compacted using a ten-ton vibratory roller. DGA shall be compacted to a minimum 95% of the dry-mass (dry-weight) density according to ASTM D698, Procedure C, Standard as determined by pre-sampling.

### 3.12 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect and Owner.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Use thermoplastic paint and local standards for all striping, chevrons, and other markings within the public right-of-way.
  - 1. Basis of Design: Sherwin-Williams Smart Mark Alkyd Thermoplastic Pavement Marking, or approved equal
    - a. Comply with AASHTO M249.
    - b. Extrude at 120-mil thickness and heat fuse.
    - c. Provide glass traffic beads complying with AASHTO M247 Type 1.



d. Color: White, unless otherwise indicated.

E. On-Site Striping

1. Basis of Design for on-site striping not otherwise indicated: Zoneline Traffic and Zone Marking Paint as manufactured by PPG Architectural Finishes, Inc., Pittsburgh, PA. or approved equal.
2. Apply two coats of undiluted Traffic and Zone Marking Paint in accordance with manufacturer's recommendations.

F. Pavement marking colors: Three standard colors of traffic and zone paint shall be used: WHITE, YELLOW and Handicap BLUE.

1. Use WHITE to define the parking stalls.
2. Use YELLOW to define traffic islands and loading/service areas (including the chevrons).
3. Use WHITE for direction-of-travel arrows and associated lettering. Lettering size as indicated; 1'-6" minimum height.
4. Use BLUE for the aisle aligned with the pedestrian ramp between handicap parking stalls.
5. Use BLUE for barrier-free parking stall designation.
6. Use YELLOW for dashed lane and/or centerline markings.
7. Use YELLOW for exposed face of concrete curb at drop-off zones, no-parking zones and where indicated.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Contractor must will engage a qualified testing agency to perform tests and inspections.

1. Testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979.

1. Reference laboratory density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726 or by nuclear method described below.
  - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 15 cores taken for the entire project site.
  - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. The Contractor shall be responsible to replace and compact hot-mix asphalt where core tests

were taken.

- F. The Contractor is responsible to remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements at no additional cost.

#### 3.14 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow milled materials to accumulate on-site.

#### 3.15 TRAFFIC AND LANE MARKING

- A. Clearing: Sweep and clean surface to eliminate loose material, sand, silt and dust to the satisfaction of the Owner, Testing Agency and Architect.
- B. Striping: Use traffic lane-marking paint as specified on the site plan and in accordance with the local requirements.

Do not apply traffic and lane marking paint to wet pavement surfaces or until layout and placement have been verified by the Owner and Architect.

- C. Apply paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide 12 to 15 mil's dry thickness.

END OF SECTION 321216