

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Cold milling of existing asphalt pavement.
  - 2. Hot-mix asphalt paving.
  - 3. Hot-mix asphalt overlay.
- B. Related Requirements:
  - 1. Division 02 Section "Structure Demolition" and Division 02 Section "Selective Demolition" for demolition and removal of existing asphalt pavement.
  - 2. Division 31 Section "Earth Moving" for subgrade preparation, fill material, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
  - 3. Division 32 Section "Unit Paving" for bituminous setting bed for pavers.

1.3 UNIT PRICES

- A. Specific work of this section is itemized as Unit Prices on the Bid Form to add or deduct specific units of work to the project. Unit Price descriptions, requirements and units of work are enumerated in Division 01 Section "Unit Prices." Unit Prices are inclusive of all labor, materials, overhead and profit per unit of work indicated.

1.4 DEFINITIONS

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.
- B. PADOT or PennDOT: Pennsylvania Department of Transportation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include technical data and tested physical and performance properties.
  - 2. Paving Schedule: For each paving type indicated, provide a paving schedule that correlates with the job mix designs and the paving types.
  - 3. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.

- a. Demonstrate compliance with PADOT criteria and standards.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer, installer and testing agency.
- B. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
- C. Material Test Reports: For each paving material, by a qualified testing agency.
- D. Field quality-control reports.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer and installer who are thoroughly familiar with the paving system specified and whose paving work conforms to all requirements set forth by PA-DOT (PDT 408).
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.
- C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Municipality and PADOT for asphalt paving work.
- D. Asphalt-Paving Publication: Comply with PennDOT Publication 408 Specifications, unless more stringent requirements are indicated.

#### 1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is 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. When the air temperature falls below 50 deg F, extra precautions shall be taken in drying the aggregate, controlling the temperature of the delivered material, and compacting the mixture.

### PART 2 - PRODUCTS

#### 2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound, angular crushed stone or crushed gravel complying with ASTM D 692-88 and PennDOT Publication 408, Section 703.2.

- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof, complying with ASTM D 1073 and PennDOT Publication 408, Section 703.1.
  - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

## 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22 or PG 58-28 where permitted in PennDot Publication 408, Section 420.
- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material, ASTM D 946 for penetration-graded material and PennDOT Publication 408, Section 702.
- C. Prime Coat: Asphalt emulsion prime coat complying with PennDOT Publication 408, Section 461.
- D. Tack Coat: Emulsified asphalt; ASTM D 977 complying with PennDOT Publication 408, Section 460.
- E. Water: Potable.
- F. Undersealing Asphalt: ASTM D 3141, pumping consistency.

## 2.3 AUXILIARY MATERIALS

- A. Joint Sealant: ASTM D 6690 or AASHTO M 324, Type II or III, hot-applied, single-component, polymer-modified bituminous sealant.

## 2.4 MIXES

- A. General: Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by PADOT and complying with the following requirements:
- B. HEAVY-DUTY PAVING:
  - 1. Superpave HMA Wearing Course – 1-1/2-inch minimum thickness after compaction.
  - 2. Superpave HMA Binder Course – 2-1/2-inch minimum thickness after compaction.
  - 3. Superpave HMA Base Course – 3-inch minimum thickness after compaction.
  - 4. Aggregate Base – 6-inch minimum thickness after compaction, installed over compacted subgrade.
- C. PAVING OVERLAY:
  - 1. Superpave HMA Wearing Course – 1-1/2-inch minimum thickness after compaction.

## 2.5 ASPHALT MATERIAL ESCALATION CLAUSE

- A. General: This clause is applicable only to the asphalt material required for the scope of work defined on this Project and shall apply to the Base Bid, Alternates, and Unit Prices. This provision shall not apply to any other portion of the Work of this Project. The Pennsylvania Asphalt Pavement Association (PAPA) index for Zone 1 on the day Bids are received shall establish the benchmark for any cost adjustment of asphalt materials required for this Project.

- B. Asphalt Material Escalation: Should the cost of asphalt materials required on this Project increase or decrease by more than 5% of the posted PAPA asphalt index per ton of asphalt material, the Contractor or Owner shall be entitled to an adjustment for the cost of asphalt material only. The adjustment shall be calculated using the net increase or decrease (i.e. the value in excess of 5%) at the time the material was provided versus the index at the time Bids were received. Adjustment shall be made by Change Order and shall be based upon the asphalt batch plant's material delivery tickets identifying the actual quantity of material delivered to and incorporated into the Project. No adjustment will be provided for any material for which no ticket is provided. In the case of a credit to the Owner where material tickets are not provided by the Contractor, the quantity shall be measured and verified by the Owner and Architect, and the subsequent credit shall be for the actual total difference in the index without regard to the 5% escalator.

## PART 3 - EXECUTION

### 3.1 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.
1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

### 3.2 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
1. Mill to a depth of 1-1/2 inches.
  2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
  3. Control rate of milling to prevent tearing of existing asphalt course.
  4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
  5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
  6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.
  7. Keep milled pavement surface free of loose material and dust.

### 3.3 REPAIRS

- A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

### 3.4 BASE COURSE PLACEMENT

- A. Crushed aggregate base course shall be compacted to the lines, grade, and thickness as shown on the Drawings. Base course shall be placed in uniform horizontal layers then rolled thoroughly to a hard, even, unyielding surface, compacted to not less than 98 percent of maximum density at optimum moisture. Base course shall not be applied over soft, wet or frozen subgrade.
  1. When the aggregate base course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.
- B. Base course thickness after compacting shall be as shown on the Drawings. Base course shall be placed in uniform horizontal layers then rolled thoroughly to a hard, even, unyielding surface, compacted to not less than 88 percent of theoretical density. Base course shall not be applied over wet or frozen subgrade.
- C. The subgrade shall be prepared in accordance with PDT-408, Section 210, and shall be shaped to true lines and elevations as shown on the Drawings, thoroughly compacted to not less than 95 percent of maximum dry density at optimum moisture. Remove any boulders to a depth of 6" below subgrade. Remove all spongy material, replace with crushed stone fill material and compact solidly. The finished surface shall be uniformly shaped to permit drainage, and any irregularities, dented or depressed areas shall be corrected prior to placing the aggregate base course.
- D. The prepared subgrade shall be protected by the Contractor using all means necessary to prevent rutting and tracking from vehicles and equipment. Where completed subgrade areas are disturbed or damaged by subsequent construction operations or adverse weather, make all repairs or replacements necessary, including re-grading and re-compacting, to the approval of the Architect and at no additional cost to the Owner.
- E. Joining New Pavements to Existing: Saw cut contact area between existing and new pavements so they are smooth and straight before starting paving.
  1. Provide a contact area of the surface layer not less than 18 inches wider than the base, unless otherwise indicated.
  2. Provide horizontal distance between concrete curbs, slant curbs, playground edging, and similar construction to allow room for compaction equipment to be used on all layers.
- F. Joint Sealer: Apply to surfaces at cracks and joints of previously constructed asphalt pavement.
  1. Apply to surface that is clean, dry, free of grease, dust and loose particles; and when air and surface temperatures are above 40 deg F.
  2. Remove all loose stones and chips from the crack/joint before filling.
  3. Do not apply if rain threatens or is predicted within 12 to 14 hours.
  4. Apply two 3/8-inch to 1/2-inch layers of filler, and allow to dry thoroughly between applications; comply with manufacturer's directions.

- G. 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.
- H. Tack Coat: Apply uniformly to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into hot-mixed asphalt pavement, including the vertical surfaces of concrete to be in contact with the hot-mixed asphalt. Distribute 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.
- I. Asphalt Sealer: Apply to surfaces at joints of previously constructed asphalt or Portland cement concrete and at surfaces abutting or projecting into hot-mixed asphalt pavement.
  - 1. Apply asphalt sealer to top surfaces of new hot-mixed asphalt abutting existing asphalt pavement. Apply uniform coat 6 inches wide centered over joint extending 3 inches parallel either side of joint, with neat edges.
  - 2. Apply asphalt sealer to top surfaces of joints formed by hot-mixed asphalt paving and rims of manholes, catch basins, water valves, etc.
  - 3. Apply uniform coat of sand or stone dust to exposed asphalt sealer upon completion.
  - 4. Exercise care in application of asphalt sealer to avoid smearing or staining of adjoining concrete and other surface and appurtenances. Remove and clean damaged surfaces.
  - 5. Allow to dry until at proper condition to receive paving.

### 3.5 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.

### 3.6 PLACING HOT-MIX ASPHALT

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted in accordance with PDT-408 Sections 309 and 409.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 3. 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. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
  2. Complete a section of asphalt base course before placing asphalt surface course.
- 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.

### 3.7 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 using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
  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.

### 3.8 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. Correct laydown and rolling operations to comply with requirements.
- 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: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent or greater than 96 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.

### 3.9 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.
  - 4. ADA accessible areas and building access paths shall be constructed in accordance with ADAAG and ANSI-117.1 requirements.
- C. Drainage: Surfaces shall drain to drains or drainage areas as indicated without the formation of puddles. All areas where drainage does not occur properly or puddles form shall be corrected.

### 3.10 PROTECTION AND CLEANING

- A. Protect adjacent work from splashing of paving materials. Protect paving against traffic until surface has properly cured. Provide temporary barriers, warning lights and other protection as necessary. Remove when no longer required.
- B. All adjacent materials soiled from paving installation shall be cleaned to the satisfaction of the Architect.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified testing agency to perform tests and inspections.
- 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 shall take samples of uncompacted paving mixtures and compacted pavement in accordance with ASTM D979 or AASHTO T 168 and shall confirm compliance with PADOT specifications.
  - 1. Reference maximum theoretical density shall be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041, and compacted in accordance with job-mix specifications.
  - 2. In-place density of compacted pavement shall be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726.
    - a. One core sample will be taken for every 250 sq. yd. or less of installed pavement, with no fewer than three cores taken.

- b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950 and coordinated with ASTM D1188 or ASTM D2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 32 12 16