

SECTION 02740

FLEXIBLE PAVEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Provide asphaltic concrete paving, including pavement sealing and marking and other Work incidental to complete installation, as shown or specified.
2. In earth subgrade areas, over prepared subgrade, aggregate subbase; aggregate base course; asphaltic concrete leveling course; bond coat; asphaltic concrete wearing course; sealer.

B. Related Work Specified In Other Sections:

1. Earthwork, graded to top of subgrade and including stabilization - Division 2.
2. Underground Utility Services - Division 2.
3. Underground Electrical Services - Division 16.

C. Definitions

1. DOT: Department of Transportation.
2. Cold Weather: Average of highest and lowest outdoor air temperature from midnight to midnight of previous 3 calendar days is below 40 degrees F and has not been above 50 degrees F for more than 12 hours in any 24 hour period during previous 72 hours.
3. Hot Weather: Estimated concrete surface moisture evaporation rate exceeds 0.1 pounds per square foot per hour or calculated site evaporation rate exceeds 0.2 pounds per square foot per hour using methods illustrated in ACI 305R.
4. Protection Period: Beginning immediately after concrete placement, time during which formwork may not be removed or concrete is required to be maintained within specific temperature range in order to prevent freezing, excessive evaporation, or to insure necessary strength development.
5. Tolerances: Variation of measurements (quantity, length, elevation, slope, weight) that is allowed from that noted. Plus (+) tolerance increases measurement to which it applies. Minus (-) tolerance decreases measurement to which it applies. Where only 1 signed tolerance is given there is no limit in other direction, however, other measurements or tolerances may govern. When measurement is specified as "maximum," "not more than," "less than," "up to," plus tolerance is +0. When measurement is specified as "minimum," "at least," "greater than," "more than," minus tolerance is -0. Where range in measurement is specified there is no allowed variation beyond range.

1.2 SUBMITTALS

- A. Furnish submittals for items that are identified in this Section by different typeface and bracketed code (e.g., *Item [L]*). Refer to Division 1 General Requirements for definition of codes for types of submittals and administrative requirements governing submittal procedure. Additional submittal requirements pertaining to this Section are specified under this Article.

- B. *Qualifications [Q]*: Submit descriptive data on Testing Agency proposed for use on this Project.
- C. *Mix Report [D]*: Submit mix report for each asphaltic concrete mixture and include proportions of different aggregates and mineral filler, combined aggregate gradation, and recommended asphalt content. Include laboratory tests and curves used to arrive at proposed mix. Submit in sufficient time to allow review and approval before start of field operations.
- D. Certificate: Certification of compliance with specifications and drawings signed by product suppliers.
- E. Schedules: Submit proposed schedule for work and indicate any expected interference with Owner's normal activities. After approval by Owner, deviations shall require written authorization from Owner.

1.3 QUALITY ASSURANCE

- A. Reference Standards
 - 1. Regulatory Requirements: Provide asphalt pavement according to standards referenced in this Section. Should specifications of state or authority having jurisdiction be more stringent, then these shall govern.
 - a. The Registered Design Professional and Owner's Representative shall determine extent of compliance based on intent of Contract Documents.
 - b. Measurement and payment provisions and safety program submittals shall be followed per General, Supplementary, Special Conditions and Division 1 Specification Sections.
 - 2. Manufacturer Qualifications: Qualified manufacturer.
 - a. Manufacturer shall be paving-mix manufacturer registered with and approved by authorities having jurisdiction or NYDOT.
 - 3. Testing Agency Qualifications: Qualified according to ASTM D 3666, "Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials", for testing indicated, as documented according to ASTM E 548, "Standard Guide for General Criteria Used for Evaluating Laboratory Competence".
 - 4. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
 - 5. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 General Requirements.
 - 6. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 General Requirements. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that manufactures hot-mix asphalt.
 - b. Review condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

7. Provide hot mix bituminous cement concrete pavement according to material, testing, workmanship, and other applicable requirements of standard specifications of state or authority having jurisdiction and standards referenced in this Section. Should there be discrepancies between specifications of state or authority and this Section, state or authority shall govern except as noted.
 - a. The Registered Design Professional and Owner's Representative shall determine extent of compliance based on intent of Contract.
 - b. Measurement and payment provisions and safety program submittals shall be followed per General, Supplementary, Special Conditions and Division 1 General Requirements.

B. Reference Specifications

1. Refer to the following for information and criteria in regard to soils and aggregates:
 - a. Geotechnical Data.
 - b. Soils and Aggregates - Division 2.

C. Producer Qualifications

1. Producer of asphaltic concrete mixtures shall be bulk producer, regularly engaged in production of hot-mix, hot-laid asphaltic concrete.

D. Testing

1. Laboratory and field sampling and testing of materials to determine conformance with Specifications, and to provide quality control during construction shall be done by independent, well established and qualified commercial testing agencies. Personnel shall be qualified and shall have had experience on projects equal to complexity of this project. Agency that tests proposed materials shall not be same agency that provides quality control during construction.
2. Owner will retain testing agencies for providing quality control during construction. Contractor shall retain testing agency to test proposed materials and submit qualifications of testing agency and its personnel to Registered Design Professional for approval before retaining agency. Registered Design Professional reserves right to request change in personnel or firm at any time.
3. Each testing agency shall submit duplicate written reports of tests, findings, investigations and recommendations to Contractor and to Registered Design Professional, as soon as each report has been completed, preferably same day, but not more than 1 working day later.

1.4 PROJECT/SITE CONDITIONS

A. Protection

1. Provide barricades, flagmen, warning signs and warning lights to allow movement of traffic. If fire lanes are affected by these operations, secure alternate route for fire trucks.
2. Provide protection for vehicular and pedestrian traffic through and adjacent to these operations.

B. Sequencing, Scheduling

1. Do not install any materials when ground is frozen or covered with snow, ice or water; it is raining.

2. Place various courses when ambient temperatures, taken in shade, are as follows:
 - a. Aggregate Base or Subbase Course. 35 degF or higher.
 - b. Seal Coats. 50 degF or higher and when temperature has not been lower than 35 degF for 12 hours before application.
 - c. Asphaltic Concrete Courses. 40 degF or higher.
 - d. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).
3. Any areas of in-place aggregate subbase or base course that are damaged by freezing, rainfall or other weather conditions shall be brought to condition in compliance with Contract Documents at no cost to Owner.
4. When wearing course placement is deferred over winter, use wearing course mixture for leveling course.
5. Saw cut existing paving to achieve straight-line cut when abutting new paving to existing. Start cut sufficient distance back from existing edge to provide straight line.
6. Match existing elevations of abutting paving unless shown otherwise.

1.5 WARRANTY

- A. Seal Coats: *Guarantee [G]*: seal coat at least 1 year against sticking, oil bleed back, and wearing away.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Subgrade: Improved subgrade compacted to 92 percent of maximum dry density as determined by modified proctor test ASTM D1557.
- B. Aggregate Base: Course per NYDOT Section 300 subbase type 1 (crushed stone or recycled concrete).
- C. Asphalt Materials
 1. Provide asphalt concrete top wearing course per NYSDOT Standard Specifications, Section 400 Hot Mix Asphalt, Type 6F, Top Course.
 2. Provide asphalt concrete binder course per NYSDOT Standard Specifications, Section 400 Hot Mix Asphalt, Type 3 binder course.
 3. Prime Coat: Medium curing cut-back asphalt or asphalt penetrating prime coat consisting of either MC-30 or SS-1h.
 4. Tack Coat: Emulsified asphalt; AASHTO M 140 or AASHTO M 208, SS-1h, CSS-1, or CSS-1h, diluted with 1 part water to 1 part emulsified asphalt.
- D. Herbicide: Commercial chemical for weed control, registered by EPA. Provide in granular, liquid, or wettable powder form.

- E. Joint Sealant: AASHTO M 301, hot-applied, single-component, polymer-modified asphaltic sealant.
- F. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N or F.
 - 1. Color: Match with existing parking at site.

2.2 MIXES

A. Marshall Method Criteria

- 1. Mixes: Comply with the following criteria:

	Marshall Stability (lbs) minimum	Flow (inches) range	VMA* Percent minimum	Air Voids Percent range
Surface and Leveling Courses -	1,800	.09 - .16	14.5	3-5

- 2. Nominal Aggregate Size: As follows:
 - a. Base Course: 1 inch (25 mm).
 - b. Top Course: 1/2 inch (13 mm).
- 3. Emulsified-Asphalt Slurry: ASTM D 3910, “Standard Practices for Design, Testing, and Construction of Slurry Seal”, consisting of emulsified asphalt, fine aggregates, and mineral fillers and as follows:
 - a. Composition: Type 1

B. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes per NYSDOT Section 400 and complying with the following requirements:

- 1. Provide mixes with history of satisfactory performance in geographical project area.
- 2. Base Course: Type 1 per NYSDOT Section 300.
- 3. Top Course: Type 6F per NYSDOT Section 400.

C. Mix Design

- 1. *Mix Design [D]*: Contractor shall provide mixture that conforms to specified requirements listed under Article Marshall Method Criteria.
- 2. The Registered Design Professional reserves right to increase design asphalt content 0.3 percent above recommended content, at no additional cost to Owner.

PART 3 EXECUTION

3.1 PREPARATION

A. Subgrade Preparation

- 1. Fine grade and compact earth subgrades and bring to required elevations and cross-sections. Clean surfaces of existing concrete pavement and remove dirt, loose materials, and soft materials to provide sound, dry surfaces ready to receive paving.
- 2. Before placing any overlying materials, proof roll compacted subgrade with 10-ton rollers. Rework any soft areas or areas unable to support rollers, until reworked subgrade

is acceptable to Registered Design Professional and meets compaction requirements specified in Earthwork – Division 2.

B. Patching

1. 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 (300 mm) into adjacent sound pavement, unless otherwise shown . Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
2. Portland Cement Concrete Pavement: Break cracked slabs and roll to reseat concrete pieces firmly.
 - a. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
 - b. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise shown. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
3. Bond Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at rate of 0.05 to 0.15 gal. per sq. yd. (0.2 to 0.7 Liters per sq. m).
 - a. Allow bond coat to cure undisturbed before applying hot-mix asphalt paving.
 - b. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
4. Patching: Fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
5. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

C. Repairs

1. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt top course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.
 - a. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.
2. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to depth of 1/4 inch (6 mm).
 - a. Clean cracks and joints in existing hot-mix asphalt pavement.
 - b. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
 - c. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

D. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

- E. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- F. Bond Coat: Apply uniformly to surfaces of existing pavement at rate of 0.05 to 0.15 gal. per sq. yd. (0.2 to 0.7 Liter per sq. m).
 - 1. Allow bond 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.

3.2 APPLICATION

A. Hot-Mix Asphalt Placing

- 1. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - a. Place hot-mix asphalt base course in number of lifts and thicknesses shown.
 - b. Place hot-mix asphalt surface course in single lift.
 - c. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - d. Begin applying mix along centerline of crown for crowned sections and on high side of 1-way slopes, unless otherwise shown .
 - e. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- 2. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of lesser width are required.
 - a. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete sections of asphalt base course before placing asphalt surface course.
- 3. 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.

B. Joints

- 1. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 - a. Clean contact surfaces and apply bond coat to joints.
 - b. Offset longitudinal joints, in successive courses, minimum of 6 inches (150 mm).
 - c. Offset transverse joints, in successive courses, minimum of 24 inches (600 mm).
 - d. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
 - e. Compact joints as soon as hot-mix asphalt can bear roller weight without excessive displacement.
 - f. Compact asphalt at joints to density within 2 percent of specified course density.

C. Compaction

1. General: Begin compaction as soon as placed hot-mix paving can bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 - a. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
2. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
3. 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:
 - a. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
 - b. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, "Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures", but not less than 90 percent nor greater than 96 percent.
4. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
5. 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.
6. 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.
7. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
8. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

D. INSTALLATION TOLERANCES

1. Thickness: Compact each course to produce thickness shown within the following tolerances:
2. Base Course: Plus or minus 1/4 inch (13 mm).
3. Top Course: Plus 1/4 inch (6 mm), no minus.
4. Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using 10-foot (3-m) straightedges, applied transversely or longitudinally to paved areas:
5. Base Course: 1/4 inch (6 mm).
6. Top Course: 1/8 inch (3 mm).
7. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

3.3 CONSTRUCTION

A. Asphaltic Seal Coat

1. Seal surfaces of paving and exposed surfaces of asphaltic curbs with 2 applications of seal coat material, installed in accordance with manufacturer's written specifications and further to these Specifications. Clean and seal existing cracks.
2. Power brush areas with caked-on dirt, heavy grease and oil deposits. Chip off grease spots, if required, or burn off with torch and paint burned area with sealer. Brush out cracks with wire brush or sharp tool. Rout out cracks with power router to obtain uniform seals. Clean entire surface with power blower (minimum 5 horsepower unit).
3. Spray with herbicide where vegetation is evident. Paint remaining oil and grease spots with shellac-based paint. Dust painted surfaces with silica sand.
4. Fill cracks 1/4 inch or wider with asphalt (SP 170-180) at 400 degF; overfill and squeegee to form "bandage" about 1/8 inch thick and 2 to 3 inches wide.
 - a. As shown, fill cracks with hot-poured rubberized crack filler at 300 degF. Use double-bottom heating unit.
 - b. Cure crack filler per manufacturer's recommendations. Dust sealed areas with silica sand.
5. Dampen pavement before applying sealer. Apply sealer when pavement and atmospheric temperatures are 50 degF or higher, and rain is not expected before film has dried to rain resistant condition.
6. Apply sealer with machine having carpet drag or squeegee. Squeegee full visible cracks not previously filled. Apply first coat at 0.15 gallon per square yard, and second coat at 0.10 gallon per square yard.
7. Minimum sealing cure periods:
 - a. Between coats -- dry to touch
 - b. For foot traffic -- 4 to 6 hours
 - c. For car traffic -- 24 hours
 - d. For painting -- 1 week
8. Provide protective barricades or other devices during cure period.
9. Schedule work to minimize interference with Owner's normal activities. Normally work when areas are not in use.
 - a. Submit proposed schedule for work and indicate any expected interference with Owner's normal activities. After approval by Owner, deviations shall require written authorization from Owner.

B. PAVEMENT MARKING

1. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Registered Design Professional.
2. Marking-paint manufacturers caution that paint may bleed or tear surface of new asphalt unless asphalt is aged before painting. This aging period may vary from 30 to 90 days. If pavement marking proceeds immediately, consider revising to phased application of thin first coat followed by thicker second coat once asphalt has aged. Verify that two-coat application is recommended by pavement-marking manufacturer.
3. Allow paving to age for 30 days before starting pavement marking.
4. Sweep and clean surface to eliminate loose material and dust.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.
 - 1. Testing agency shall conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.
- C. Site Tests - Asphalt
- D. Thickness: In-place compacted thickness of hot-mix asphalt courses shall be determined according to ASTM D 3549, "Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens".
- E. Surface Smoothness: Finished surface of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances.
- F. In-Place Density: Testing agency shall take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979, "Standard Practice for Sampling Bituminous Paving Mixtures" or AASHTO T 168.
 - 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 according to ASTM D 2041, "Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures", and compacted according to job-mix specifications.
 - 2. In-place density of compacted pavement shall be determined by testing core samples according to ASTM D 1188, "Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens" or ASTM D 2726, "Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures".
 - a. One core sample shall be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than 3 cores taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950, "Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods" and correlated with ASTM D 1188, "Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens", or ASTM D 2726, "Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures".

3.5 RE-INSTALLATION

- A. Where test results or measurements indicate that it does not comply with specified requirements, remove and replace with new asphalt or install additional hot-mix asphalt.

- B. Correct any deficient areas that show evidence of excessive cracking or instability be re-mixing, regrading and recompacting at no additional cost to Owner.

3.6 DISPOSAL

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

END OF SECTION

Revision History	
Date	Rev. No.
A	0
B	0
C	0
D	0
E	0
F	0
02-19-09	0

SK/djo

C:\D\TIMSDATASF\BROOKHAVEN_NATIONAL_LABORATORY\SF070003\200-PROJEXEC\280-SPEC\02740.DOC

THIS PAGE INTENTIONALLY LEFT BLANK