

SECTION 321216

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.01 CONTRACT PROVISIONS INCORPORATED BY REFERENCE

- A. The General Provisions of the Contract, including the General and Supplementary Conditions and Division 1, apply to the work specified in this Section.

1.02 ITEMS REQUIRED BUT NOT SPECIFIED

- A. If an item or material of this trade is indicated in the Drawings but not specifically listed in this Section, provide such item or material at a standard of quality equal to the standard established for the balance of the Work specified, in accordance with the Engineer's interpretation.

1.03 EXECUTION, CORRELATION AND INTENT

- A. In case of an inconsistency between Drawings and Specifications, or within either Document not clarified by addendum, the better quality or greater quantity of Work shall be provided, in accordance with the Engineer's interpretation.

1.04 SECTION INCLUDES

- A. Bituminous concrete pavement required for this work is indicated on the drawings and includes, but is not necessarily limited to:
 - 1. Roadway pavement
 - 2. Granite curbing
 - 3. Bituminous concrete curbing
 - 4. Concrete Curb
 - 5. Patching
 - 6. Line painting and striping
 - 7. Traffic and street signs

1.05 REFERENCED STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
- B. American Society for Testing and Materials (ASTM):
- C. Commonwealth of Massachusetts Department of Transportation (MDOT):
Standard Specifications for Highways and Bridges
- D. Comply with standards specified in accordance with City of Holyoke Department of Public Works.

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1.06 RELATED WORK DESCRIBED ELSEWHERE

Excavating, Filling & GradingSection 312000

1.07 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the asphaltic concrete paving shall conform to the applicable portions of the following:

1. MDOT specifications Section 460 for HOT MIX ASPHALT PAVEMENT and Section 151 for GRAVEL BORROW, Material Specification M1.03.0 Type b for GRAVEL BORROW and Section 500 for CURB AND EDGING.
2. MDOT specifications Section 860 for REFLECTORIZED PAVEMENT MARKINGS.

B. Paving work, base course etc., shall be done only after excavation and construction work which might injure them has been completed. Damage caused during construction shall be repaired before acceptance. All trenches for utility installation shall be completed and backfilled for a period of 30 days prior to paving over these trenches unless approved by the Engineer.

C. Repair and replace existing paving areas damaged and removed during this Project. Workmanship and materials for such repair and replacement shall match those employed in existing work, except as otherwise noted.

D. Pavement subbase shall not be placed on a muddy or frozen subgrade.

E. Existing pavement under state or local jurisdiction shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification in conformance with applicable codes, standards, and practices.

1.08 SUBMITTALS

Submission of the job-mix formula for the bituminous concrete surface course shall be the responsibility of the Contractor, and it shall be submitted to the Engineer for approval 10 days prior to the pavement construction.

1.09 PRODUCT HANDLING

A. Protection

Use all means necessary to protect bituminous concrete pavement materials before, during and after installation and to protect the installed work and materials of all other trades.

B. Replacements

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer at no additional cost to the Owner.

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C. Dust Control

1. Use all means necessary to prevent the spread of dust during performance of the work of this Section.
2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of other work on the job site.

PART 2 - PRODUCTS

2.01 GRAVEL BASE COURSE

Gravel base and/or sub-base courses for areas beneath new pavement as hereinbefore defined and indicated on the drawings, shall consist of gravel borrow composed of hard durable stone, and coarse sand, free of loam, clay or silt, uniformly graded and containing no stone having any dimension greater than the gradation shown on the plans. When spread and rolled on the prepared surface, it shall form a stable surface. The gradation shall conform to State Specifications, Section M1, sub-section M1.03.0, Type "b", and attention is directed to the selected gravel size limitation. Samples of gravel and results of gradation tests performed by an approved testing laboratory shall be submitted for approval of the Engineer. No stone greater than 4" in any dimension.

2.02 DENSE GRADED CRUSHED STONE

Dense graded crushed stone material shall consist of crusher-run coarse aggregates of crushed stone or gravel and fine aggregates of natural sand or stone screenings informally pre-mixed and placed on the gravel base and conforming to Section 402, Subsection M2.01.7, of the State Specification.

2.03 BITUMINOUS CONCRETE PAVEMENT

- A. All courses of the bituminous concrete paving shall consist of Hot Mix Asphalt, conforming to the requirements of Section 460, Subsection M3.11.00 of MDOT Specifications.
 1. Binder or bottom course paving shall have a maximum aggregate size passing 1 in. sieve, and bitumen content = $5 \frac{1}{2}\% \pm 1/2\%$ by weight.
 2. Top or wearing course paving shall have maximum aggregate size passing 1/2 in. sieve, and bitumen content = $6 \frac{1}{2}\% \pm 1/2\%$ by weight.

Complete job mix formula, listing quantities and pertinent ingredient properties, shall be submitted to and approved by the Engineer at least two weeks before work is scheduled to begin.

- B. Bituminous tack coat shall be applied as required. Bituminous material for tack coat on the existing surface, where required or specified, shall be emulsified asphalt, grade RS-1 conforming to Subsection M3.03.0 of MDOT Specifications.

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2.04 BITUMINOUS CONCRETE CURB

Bituminous concrete curb shall be as detailed on the drawings, conforming to the requirements of Section 501 as specified in the Massachusetts Department of Transportation Specifications Material Specifications M3.12.00.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that bituminous concrete pavement be installed in strict accordance with the original design, all pertinent codes and regulations, and all pertinent portions of the referenced standards.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Engineer.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 EQUIPMENT

A. Compacting Equipment

All equipment for compacting shall be steel-tired power rollers having a minimum weight of 10 tons, except that hand held vibrator compactors may be used in areas not accessible to rollers where specifically approved in advance by the Engineer.

B. Paving Equipment

All equipment for paving shall be spreading, self-propelled asphalt paving machine capable of maintaining line, grade and minimum surface course thickness specified, with laser grading sensors for tolerance accuracy.

3.03 GRADING

- A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 312000, EXCAVATING, FILLING AND GRADING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

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- B. Existing subgrade materials which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.
- C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.
- D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase, subsequent backfill and compaction shall be performed as directed by the Engineer as specified in Section 312000, EXCAVATING, FILLING AND GRADING. Completed subgrade after filling such areas shall be uniformly and properly graded.
- E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.
- F. Materials shall not be stored or stockpiled on subgrade.
- G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.
- H. Prepared subgrade will be inspected by the Engineer. Subgrade shall be approved by the Engineer before installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this section of the specification.

3.04 PLACEMENT OF GRAVEL BASE COURSE

- A. The gravel shall be furnished, hauled, deposited and spread in layers as specified in applicable provisions of Section 40, and 405 of the State Specifications and compacted as specified for the formation of embankments, for sub-base, shoulders etc., and as specified herein.
- B. The gravel shall be spread in layers from self-spreading vehicles, or with power graders of approved types, or by hand upon the prepared subgrade. Gravel shall be spread in layers no more than six (6") inches thick, compacted measure. Compaction requirements shall be to 95% maximum density as determined by ASTM D 1557, Method D. Stone greater than 2 in. shall be excluded from course. The method of compaction proposed by the Contractor shall be approved by the Engineer and the approved method and procedure, once established and providing the required results, shall be used throughout the entire operation. Each lift shall be separately compacted to specified density. Trucks shall not be used for compaction purposes.

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- C. Width of base course shall be greater than or equal to the width of pavement surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.
- D. Width of Base
 - 1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.
 - 2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.
 - 3. Surface irregularities which exceed 1/2 in. measured by means of a 10 ft. long straightedge shall be replaced and properly compacted.
- E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.
- F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.05 PLACEMENT OF BITUMINOUS CONCRETE SURFACING

A. Preparation

Bituminous concrete mixtures shall be laid only when surface is free of foreign matter and when the weather is not foggy or rainy, and further these operations shall be carried on only when the atmospheric temperature is not less than 40 degrees F in the shade. Actual mix delivery temperature shall adhere to Section 460.61. Under no circumstances shall mix temperature exceed 325 degrees F upon arrival at the site. Temperature exceeding 325 degrees F will result in rejection of the entire load.

B. Placement

Bituminous concrete pavements shall be furnished, handled and laid in accordance with Section 460 and Section 701 of the State Specifications, except as herein modified.

- 1. Binder and wearing surface courses for sidewalks may each be applied individually, in single lifts of full thickness indicated on the Drawings.
- 2. All joints at old pavement shall be sawed vertical butt joints and shall be cut back, full depth, to encompass all disturbed pavement areas and underlying cavities associated with the excavation for a minimum distance of one (1) foot beyond each side of the excavation. The vertical face of the joint shall receive a coating of Rapid Setting Type 1 (RS-1) asphalt emulsion a short time before paving commences, as directed by the Engineer.

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3. Adjacent concrete work, curb, etc., shall be protected from stain and damage during entire operation. Damage and stained areas shall be replaced or repaired to equal their original condition.
4. Construction methods shall conform to the Massachusetts Department of Transportation Specifications Section 460, HOT MIX ASPHALT PAVEMENT.
5. Submission of the job-mix formula for the bituminous concrete surface course shall be the responsibility of the Contractor, and it shall be submitted to the Engineer for approval 10 days prior to the pavement construction. Deliveries shall be timed to permit spreading and rolling all material during daylight hours, unless artificial light, satisfactory to the Engineer, is provided. Loads which have been wet by rain or otherwise will not be accepted. Hauling over freshly laid or rolled material will not be permitted.
6. Establishment of grades, grade control, and conformance to finished pavement surface grade tolerances required shall be the responsibility of the Contractor in accordance with the Drawings and Specifications.
7. Placing and rolling of mixture shall be as nearly continuous as possible. Break-down rolling shall begin as soon after placing as mixture will bear the operation without undue displacement. Delays in rolling shall be completed while the mix temperature exceeds 150 degrees F. Rolling shall proceed longitudinally, starting at edge of newly placed material and proceeding toward previously rolled areas. Rolling overlap on successive strips shall be greater than or equal to width of roller rear wheel. Alternate trips of roller shall be of slightly different lengths. Corrections required in surface shall be made by removing or adding materials before rolling is completed. Skin patching of areas where rolling has been completed will not be permitted. Course shall be subjected to diagonal rolling, crossing lines of the first rolling while mixture is hot and in compatible condition. Displacement of mixture or other fault shall be corrected at once by use of rakes and application of fresh mixture or removal of mixture, as required. Rolling of each course shall be continued until roller marks are eliminated. Roller shall pass over unprotected edge of course only when paving is to be discontinued for sufficient time to permit mixture to become cold.
8. Where pavement thickness is greater than two inches (2"), bituminous concrete binder course shall be placed in two-inch (2") lifts. All courses shall be properly compacted prior to placement of subsequent courses. Where pavement thickness is less than two inches (2"), a one and one half-inch (1½") lift of bituminous concrete binder course shall be applied and properly compacted. The trench shall be completed with a final one and one half inch (1½") course of bituminous concrete top mix.
9. In places not accessible to roller, mixture shall be compacted with hand tampers. Hand tampers shall weight at least 50 lb. and shall have a tamping face less than or equal to 100 sq. in. Mechanical tampers capable of equal compaction will be acceptable in areas in which they can be employed effectively.
10. Portions of pavement courses which become mixed with foreign material or are in any way defective shall be removed, replaced with fresh mixture and compacted to density of surrounding areas. Asphaltic material spilled outside lines of finished pavement shall be immediately and completely removed. Such material shall not be employed in the work.
11. Joints shall present same texture, density, and smoothness as other sections of the course. Continuous bond shall be obtained between portions of existing and new

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pavements and between successive placements of new pavement. Any longitudinal or transverse joint which has cooled below 150 degrees F prior to placement of adjacent mix, shall be treated with a coat of tack coat prior to new mix placement. New material at joints shall be thick enough to allow for compaction when rolling. Compaction of pavement, base, and subgrade at joints shall be such that there is no yielding of new pavement relative to existing pavement when subjected to traffic.

12. Contact surfaces of previously constructed pavement (if greater than or equal seven days since binder placed), parking lot overlay areas, manholes, concrete collars and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate which will leave asphaltic residue of 5-7 gal./100 s.y. after evaporation of vehicle. Base surface shall be dry and clean when tack coat is applied. Asphaltic paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be placed before tack coat has dried or dusted over.
13. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 1 ft. of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface. Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.
14. Variations in smoothness of finished surface shall be less than or equal to 1/4 in. when tested with a 10 ft. straight edge, applied both parallel to and at right angles to centerline of paved area. At joints with existing pavement, and at other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed 0.01 feet. At other areas pavement elevation tolerance shall not exceed ± 0.05 ft. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this section.
15. The permanent repair shall be neat, uniform and conform to the existing grade. The permittee shall be responsible for all future maintenance of trenches due to improper repair, up to and including complete replacement of the patch, as deemed necessary by the General Superintendent.

3.06 TRAFFIC STRIPING

- A. Traffic paint materials, equipment, methods of placement, and precautions to be observed as to weather, condition of surface, etc., shall conform to MDOT Specifications for traffic striping first class road work. Striping shall not begin until all asphalt surfaces have cured for a minimum of 14 days.
- B. Striping patterns shall conform to the layout shown on the Drawings. Transverse striping of handicap pathways shall be on 4 in. x 12 in. stripe to space ratio.
- C. Strip width shall be the standard 4 inches except wheelchair symbols which shall be as detailed in the 1978 Manual of Uniform Traffic Control Devices. The wheelchair symbols shall be painted in spaces shown on the drawings.

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3.07 GRANITE CURB AND CONCRETE CURB

- A. Granite curb and concrete curb work shall not be performed during rainy weather or when temperature is less than 35 degrees F.
- B. Installation shall be timed to permit placing curb during daylight hours, unless artificial light satisfactory to the Architect is provided.
- C. The pieces of curb shall be set on wooden blocks and leveled over an adequate length to verify true vertical alignment. The concrete shall then be poured and hand troweled to fill all voids below and in front of the curb as detailed.
- D. Curb shall be tapered to meet existing grade in areas adjacent to handicapped access ramps.
- E. Where curbing joins existing or new bituminous curbing, the bituminous curbing shall be replaced for a distance of 2 feet and shall be tapered to conform to the curb end shape.
- F. Portions of granite that become broken, cracked or chipped shall only be allowed for use if approved by the Architect after a thorough visual inspection.
- G. Joints between pieces of curbing shall be filled with an approved mortar mix in conformance with M4.02.15.

3.08 REMEDIAL MEASURES

Upon direction of the Engineer, cut out, and/or rework all surfaces and subgrade areas which do not meet the requirements of this Section; perform all remedial measures at no additional cost to the Owner.

3.09 SPECIAL CONDITIONS

Work shall be properly coordinated with the work of other trades. Other trades shall be consulted in advance so that proper provisions may be made for installation of their work and so that the work of this Section may be properly finished and connected to the work of other trades.

END OF SECTION 321216

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