

**State of Connecticut**  
**Department of Transportation**

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**SUPPLEMENTAL SPECIFICATIONS**  
**TO**  
***STANDARD SPECIFICATIONS FOR***  
***ROADS, BRIDGES, FACILITIES AND***  
***INCIDENTAL CONSTRUCTION***

***FORM 818***

**2020**

**JANUARY 2021**

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Section or Article	Please make the following Corrections:	Rev. Date
Division I GENERAL REQUIREMENTS AND COVENANTS		
1.01.02	<ol style="list-style-type: none"> <li>1. after the abbreviation for ADSC add “AFBMS—Anti-Friction Bearing Manufacturer’s Association”</li> <li>2. after the abbreviation for AGC add “AGMA—American Gear Manufacturer’s Association”</li> <li>3. after the abbreviation for AMRL add “AMS—Aerospace Material Specification”</li> <li>4. after the abbreviation for AWWA add “BGFMA—Bridge Grid Flooring Manufacturer’s Association”</li> </ol>	July20
1.01.02	<ol style="list-style-type: none"> <li>1. after the abbreviation for AMCA add “AMPP—The Association for Materials Protection and Performance [formerly NACE and SSPC]”</li> <li>2. after the abbreviation for EPA add “ETL—Edison Testing Laboratories”</li> <li>3. after the abbreviation for IAS add “IBC—International Building Code”</li> <li>4. revise the abbreviation for NACE to “NACE—National Association of Corrosion Engineers see AMPP”</li> <li>5. after the abbreviation for NTMA add “NTPEP —National Transportation Product Evaluation ”</li> <li>6. after the abbreviation for RCSA add “RCSC—Research Council on Structural Connections”</li> <li>7. revise the abbreviation for SSPC to “SSPC—The Society for Protective Coatings (formerly The Steel Structures Painting Council) see AMPP” but keep the NOTE</li> </ol>	Jan21
1.01.03	<ol style="list-style-type: none"> <li>1. after the abbreviation for pfmd. add “PQR—procedure qualification record”</li> <li>2. after the abbreviation for surf. add “TBD—to be determined”</li> <li>3. after the abbreviation for W add “WPS—weld procedure specification”</li> </ol>	July20
1.05.12	in the first sentence of the paragraph that begins “Each such payroll shall include...” replace “... and, if applicable, ...” with “... or ...”	July20
1.09.02	<ol style="list-style-type: none"> <li>1. change the first sentence to “These Value Engineering Change Proposal (VECP) provisions apply as encouragement to the Contractor to initiate, develop, and present to the Department for consideration <b>cost-reduction proposals</b> conceived by the Contractor, involving changes to the drawings, designs, specifications or other requirements of the Contract.”</li> <li>2. under the Subarticle “Payment for accepted VECPs,” delete “5. The cost savings from a VECP that is exclusively time reduction shall be calculated as the number of Contract days reduced multiplied by the amount of liquidated damages for 1 day under the Contract.” (VECPs based on time savings only will not be accepted)</li> </ol>	July20
Division I GENERAL REQUIREMENTS AND COVENANTS, GENERAL CLAUSES FOR FACILITIES CONSTRUCTION		
1.20-1.01.02	<ol style="list-style-type: none"> <li>1. after the abbreviation for ADSC add “AFBMS—Anti-Friction Bearing Manufacturer’s Association”</li> <li>2. after the abbreviation for AGC add “AGMA—American Gear Manufacturer’s Association”</li> <li>3. after the abbreviation for AMRL add “AMS—Aerospace Material Specification”</li> <li>4. after the abbreviation for AWWA add “BGFMA—Bridge Grid Flooring Manufacturer’s Association”</li> </ol>	July20



1.20-1.01.02	<ol style="list-style-type: none"> <li>1. after the abbreviation for AMCA add “AMPP—The Association for Materials Protection and Performance [formerly NACE and SSPC]”</li> <li>2. after the abbreviation for EPA add “ETL—Edison Testing Laboratories”</li> <li>3. after the abbreviation for IAS add “IBC—International Building Code”</li> <li>4. revise the abbreviation for NACE to “<del>NACE—National Association of Corrosion Engineers</del> see AMPP”</li> <li>5. after the abbreviation for NTMA add “NTPEP —National Transportation Product Evaluation ”</li> <li>6. after the abbreviation for RCSA add “RCSC—Research Council on Structural Connections”</li> <li>7. revise the abbreviation for SSPC to “<del>SSPC—The Society for Protective Coatings (formerly The Steel Structures Painting Council)</del> see AMPP” but keep the NOTE</li> </ol>	Jan21
1.20-1.01.03	<ol style="list-style-type: none"> <li>1. after the abbreviation for pfmd. add “PQR—procedure qualification record ”</li> <li>2. after the abbreviation for surf. add “TBD—to be determined ”</li> <li>3. 3. after the abbreviation for W add “WPS—weld procedure specification ”</li> </ol>	July20
1.20-1.05.12	in the first sentence of the paragraph that begins “Each such payroll shall include...” replace “... and, if applicable, ...” with “... or ...”	July20
1.20-1.05.19	change “ <b>1.20-1.05.19—Facilities Construction - Field Erector Prequalification</b> ” to “ <b>1.20-1.05.19—Facilities Construction - Field Erector Certification</b> ” and delete “ - Advanced” in the only sentence.	Jan21
1.09.02	<ol style="list-style-type: none"> <li>1. change the first sentence to “These Value Engineering Change Proposal (VECP) provisions apply as encouragement to the Contractor to initiate, develop, and present to the Department for consideration <b>cost-reduction proposals</b> conceived by the Contractor, involving changes to the drawings, designs, specifications or other requirements of the Contract.”</li> <li>2. under the Subarticle “<b>Payment for accepted VECPs</b>,” delete “5. The cost savings from a VECP that is exclusively time reduction shall be calculated as the number of Contract days reduced multiplied by the amount of liquidated damages for 1 day under the Contract.” (VECPs based on time savings only will not be accepted)</li> </ol>	July20
Division II CONSTRUCTION DETAILS		
2.02.03	in the third paragraph of subarticle <b>5. Placement of Embankment Material</b> replace “... slopes steeper than 1:3 ...” with “... slopes <b>1 vertical to 3 horizontal or steeper ...</b> ”	July20
2.06.01	change the first sentence of the only paragraph as follows “...necessary for the construction of drainage ditches and paved leak-offs...”	July20
2.06.04	change subarticle <b>2. Paved Leak-offs and Paved Ditches</b> to “ <b>2. Paved Leak-offs</b> ”	July20
6.01.03	<ol style="list-style-type: none"> <li>1. in the eighth paragraph of subarticle 6.01.03-II-1(g) <b>Stay-In-Place Metal Forms for Bridge Decks</b>, replace “FS No. TT-P-641d, Type II” with “<b>MIL-DTL-24441</b>”</li> <li>2. in the eleventh paragraph of subarticle 6.01.03-II-1(g) <b>Stay-In-Place Metal Forms for Bridge Decks</b>, replace “the Welding subarticle in 6.03” with “<b>1.05.17, Welding.</b>”</li> <li>3. in the fourth sentence of subarticle 6.01.03-II-10(b) <b>Rubbed Finish</b>, replace “stripping” with “<b>striping</b>”</li> </ol>	July20
6.01.05	in <b>Table 6.01.05-2b Permeability Pay Factors</b> , change the heading to read “ <b>Permeability Pay Factors (PCCXXX2 mix classifications only)</b> ”	Jan21
8.13.04	change the only sentence as follows “... will be measured for payment along the top <b>arris line</b> of the curb ...”	July20

8.22.02	<i>change the first sentence as follows “The materials for this work shall meet the requirements of 8.21.02, except the reinforcing steel does not need to be galvanized.”</i>	Jan21
9.21.03	<i>in the last sentence of 6. Curing change “6.01.03-9” to “6.01.03-II-9”</i>	July20
9.70.03	<i>in the first sentence of paragraph 5, insert “the” before “MUTCD”</i>	July20
9.76.03	<i>change the last paragraph to “... in accordance with the ATSSA “Quality Guidelines for Temporary Traffic Control Devices and Features,” shall be ...”</i>	July20
10.00.10	<i>in the first sentence of the second paragraph under 10.00.10-2(b)-1, change “push button” to “pushbutton”</i>	Jan21
10.02.02	<i>in the second line of the list, change “PCC03340” to “PCC04461”</i>	Jan21
10.02.05	<i>in the first sentence, change “PCC03340” to “PCC04461”</i>	Jan21
10.10.02	<i>in the third line of the list, change “PCC03360” to “PCC04461”</i>	Jan21
11.07	<i>Change “push button” to “pushbutton” everywhere it appears</i>	Jan21
11.30.02	<i>in the first paragraph, insert “the” before “MUTCD”</i>	July20
11.30.03	<i>change the second paragraph to “... in accordance with the ATSSA “Quality Guidelines for Temporary Traffic Control Devices and Features.”</i>	July20
11.31.02	<i>in the first paragraph, insert “the” before “MUTCD”</i>	July20
12.12.05	<i>change the second to last paragraph to “... in accordance with the ATSSA “Quality Guidelines for Temporary Traffic Control Devices and Features,” shall be ...”</i>	July20
12.20.03	<i>change the second to last paragraph to “... in accordance with the ATSSA “Quality Guidelines for Temporary Traffic Control Devices and Features,” shall be ...”</i>	July20
<b>Division III MATERIALS SECTION</b>		
M.03.03	<i>in 1. General Requirements: (b), replace “6.01.03-3(a)” with “6.01.03-II-3(a)”</i>	July20
M.03.08	<i>In subarticle 2.iii under 5. (b) Joint Sealer for Structures, delete “48686-0944”</i>	July20
M.15.15-5	<i>In the first sentence, change “PCC03340” to “PCC04461”</i>	Jan21
M.15.15-6	<i>In the first sentence, change “PCC03340” to “PCC04461”</i>	Jan21
M.16.08	<i>Change “push button” to “pushbutton” everywhere it appears</i>	Jan21
<b>LIST OF STANDARD PAY ITEMS, ENGLISH/METRIC CONVERSION CHARTS, INDEX</b>		
N/A	<ol style="list-style-type: none"> <li>delete “4.09, Micro-Milling of Bituminous Concrete (0” to 3”), s.y.”</li> <li>change “4.09, Standard Milling of Bituminous Concrete (Greater Than 4” up to 8”), s.y.” to “4.09, Coarse Milling of Bituminous Concrete (Greater Than 4” Up To 8”), s.y.”</li> <li>change “4.09, Standard Milling of Bituminous Concrete (Greater Than 8”), s.y.” to “4.09, Coarse Milling of Bituminous Concrete (Greater Than 8”), s.y.”</li> <li>delete “8.03, Paved Ditch, s.y.”</li> <li>delete “8.03, Paved Channel, s.y.”</li> <li>delete “8.18, Protective Compound for Bridges, s.y.”</li> </ol>	July20
N/A	<ol style="list-style-type: none"> <li>add “4.07, Rumble Strips – Automated, l.f.”</li> <li>add “4.07, Rumble Strips – Manual, l.f.”</li> <li>add “4.07, Removal of Rumble Strips, l.f.”</li> <li>delete “10.18, Navigation Light, ea.”</li> <li>change “11.07, Pedestrian Push Button and Sign (Type), ea.” to “11.07, Pedestrian Pushbutton and Sign (Type), ea.”</li> <li>delete “11.12, Magnetic Vehicle Detector (Type), ea.”</li> </ol>	Jan21

**SECTION 1.05  
CONTROL OF THE WORK**

*In the list of Articles, add the following:*

**1.05.19—Field Erector Certification**

*After 1.05.18, add the following:*

**1.05.19—Field Erector Certification:** Contractors and subcontractors are required to possess AISC Certified Steel Erector (CSE) Certification with a Bridge Erection Endorsement for the following work:

1. Field erection of steel bridge girders, beams and trusses.
2. Field erection of fabricated steel sign supports (overhead and cantilever).

Contractors and subcontractors are required to possess an AISC Certified Steel Erector (CSE) Certification for Steel-Framed Buildings for the field erection of steel frames on Facilities Construction projects.

After Section 1.20-9.75, add the following New Section 1.20-9.80:

**SECTION 1.20-9.80  
CONSTRUCTION SURVEYING FOR  
FACILITIES CONSTRUCTION**

**1.20-9.80.01—Facilities Construction - Description**

**1.20-9.80.02—Facilities Construction - Materials**

**1.20-9.80.03—Facilities Construction - Construction Methods**

**1.20-9.80.04—Facilities Construction - Method of Measurement**

**1.20-9.80.05—Facilities Construction - Basis of Payment**

**1.20-9.80.01—Facilities Construction - Description:** Work under this item shall consist of furnishing labor, equipment, tools and materials to perform surveying, staking, verification, recording of data and calculations as necessary to construct the Project, from existing layout to acceptance of the work according to the plans. Work under this item shall conform to Section 20-300b-1 to 20-300b-20 inclusive of the Department of Consumer Protection, Regulations of CT State Agencies and as supplemented herein.

**1.20-9.80.02—Facilities Construction - Materials:** Stakes used for control staking shall be a minimum of 1 inch × 1 inch wide and a minimum length of 36 inches. Stakes shall be legibly marked and shall be visible at all times. The stakes shall be durable enough to last for the duration of the Contract. In areas where traditional staking cannot be established, the Contractor may use other materials or methods to mark critical locations, as approved or directed by the Engineer.

**1.20-9.80.03—Facilities Construction - Construction Methods:**

**I Submittals:**

1. The Contractor shall provide technically qualified survey crews experienced in construction surveying. All Project surveying and staking shall be performed by or under the supervision of either a Connecticut Licensed Land Surveyor or a Level III Survey Technician certified by the National Society of Professional Surveyors.

The name, authority, relevant experience, and qualifications of the person with overall responsibility for construction surveying and staking shall be submitted to the Engineer ten (10) days prior to any physical work.

The Contractor shall submit Project Record Drawings as required under 1.20-1.08.14. Project Record Drawings shall be the appropriate scale, reproducible final drawings meeting the accuracy requirements of an "Improvement Location Survey," Class A-2.

2. If using Automated Machine Guidance (AMG) methods, the following information shall also be submitted to the Engineer ten (10) days prior to any physical work:
  - A. A written technology statement that includes:
    - i. The manufacturer, model, and software version of the AMG equipment.
    - ii. Verification that the final 3D data which is provided in the Plans is compatible with the AMG equipment.
  - B. Personnel qualifications:
    - i. The name, authority, relevant experience, and qualifications of the person with overall responsibility for the AMG system.
    - ii. The name, authority, and relevant experience of personnel directly responsible for operating the AMG equipment.
  - C. A Quality Control Plan for mechanical calibration and maintenance of both surveying and AMG controlled construction equipment. Include the frequency and types of checks performed.

**II Equipment Requirements:**

1. The Contractor's survey instruments and supporting equipment shall be capable of achieving the specified tolerances in Table 1.20-9.80-1.
2. All instrumentation used on the Project shall have been serviced and calibrated within six (6) months prior to use on the Project, and then every year thereafter.
3. The Contractor shall obtain the Engineer's concurrence prior to using construction equipment equipped with Global Navigation Satellite System (GNSS) or Robotic Total Station (RTS) controlled by an AMG system in the construction of subgrade, subbase and base course aggregate courses, or other construction operations.
4. Tools and supplies shall be of the type and quality suitable for survey work.
5. Stakes and hubs shall be of a sufficient length to provide a solid set in the ground, with sufficient

surface area above ground for necessary legible and durable markings.

### III General Requirements:

1. The Contractor's Construction Schedule shall include dates and sequences of major surveying activities in accordance with 1.20-1.05.08 for Facilities Construction.
2. The Department will furnish the initial horizontal control points, vertical control points and data for use in establishing control for completion of the work. The Contractor shall recover and preserve the initial reference and control points and shall notify the Engineer of missing control points.
3. The Department will furnish data relating to horizontal and vertical alignments, theoretical slope staking catch points, and other design data. The Contractor is responsible for reformatting and any additional calculations that may be required for the convenient use of the State-furnished data. The Contractor shall provide immediate notification of apparent errors or omissions in the initial staking or in the State-furnished data.
4. The Contractor shall provide survey data and measurements in the format(s) acceptable to the Engineer and submit on a schedule determined by the Engineer. Field data and supporting documentation will become the property of the Department upon completion of the work.
5. Prior to major surveying activities, a survey coordination meeting shall be held, and the following agenda items shall be discussed and coordinated with the Engineer:
  - A. Surveying and staking methods;
  - B. Stake marking;
  - C. Grade control for courses of material;
  - D. Referencing;
  - E. Structure control;
  - F. Field staking data;
  - G. Localization of the GNSS systems to the Department-established control points;
  - H. Protection of existing survey markers; and
  - I. Other procedures and controls necessary for the work.
6. The Contractor shall not start the physical work until the required survey or three-dimensional (3D) verification data for the affected work has been reviewed by the Engineer. Review of the construction survey does not relieve the Contractor of responsibility for correcting errors and omissions discovered during the work and for bearing additional costs associated with the error or omission.
7. The Contractor shall maintain legibility of survey markings for the duration of the Project or until notified by the Engineer.
8. Upon completion of the Project, the Contractor shall remove and dispose of all staking material used on the Project.
9. Should the establishment or re-establishment of property acquisition lines, highway lines, or non-access lines be required, the Contractor shall notify the Engineer at least two (2) weeks in advance of need.
10. The Contractor shall provide and maintain safe facilities for convenient access by Department forces to all survey stakes, control points, batter boards, and references.

### IV Specific Requirements:

1. **Control points:** The Contractor shall
  - A. Relocate initial horizontal and vertical control points in conflict with construction to areas that will not be disturbed by construction operations.
  - B. Furnish the coordinates, elevations, and support documentation for the relocated points before the initial points are disturbed.
  - C. Set durable markers for survey control that uniquely identifies the points.
  - D. Furnish the GNSS localization results at least seven (7) days before beginning construction layout survey work. If necessary, the GNSS localization calibration and associated 3D model shall be broken into two or more zones to maintain the localized relationship between control points and original ground.
2. **Centerline establishment:** The Contractor shall establish or reestablish centerline at roadway design cross-section locations as necessary to construct the work.
3. **Original ground topographic verification:** In areas where the plan existing ground elevation and the actual ground elevation are not within a tolerance of  $\pm 0.25$  feet, the Contractor shall immediately notify the Engineer.
4. **Horizontal Slope Limits and Reference Stakes:** The Contractor shall

- A. At a minimum, set stakes on both sides of centerline at the horizontal slope limit at cross-section intervals.
  - B. When the slope is designed with a roll at the top and toe, two stakes shall be set on each side of the roadway, one to mark the intersection of the normal cut or fill with existing ground and the other to determine the limit of the roll.
- 5. Clearing and Grubbing Limits:** The Contractor shall set clearing and grubbing limits on both sides of centerline.
- 6. Finish-grade stakes:** The Contractor shall
- A. Set finish-grade stakes for grade elevations and horizontal alignment, on centerline and on each shoulder at design roadway cross-section intervals.
  - B. Reset finish-grade stakes as many times as necessary for construction of the roadway.
  - C. When the centerline curve radius is less than or equal to 250 feet, use a maximum spacing between stakes of 25 feet.
  - D. When the centerline curve radius is greater than 250 feet, use a maximum spacing between stakes of 50 feet.
- 7. Structures:** The Contractor shall provide survey and staking data in accordance with the above requirements for Structures as follows:
- A. **Culverts:** Verify and set culvert locations at the inlet, outlet, and inlet basin points according to the plans. If the proposed culvert design does not fit field conditions, notify the Engineer and provide the following:
    - i. Surveyed ground profile along the culvert centerline;
    - ii. Slope catch points at the inlet and outlet.
  - B. **Bridges:** Set adequate horizontal, vertical, reference and Working Points for bridge substructure and superstructure components. Field verify the girders, bridge chord, bridge tangent, or control lines are as specified on the bridge plans. Also establish and reference the centerline of each pier, bent, and abutment.

The Contractor shall establish the center line of bearings for all bridge abutments and piers, by setting offset hubs or reference points, so located and protected to ensure they remain undisturbed until such time as they are no longer needed. The Contractor shall mark the location of anchor bolts to be installed, establish the elevation of bearing surfaces and check bearing plates to ensure installation at their proper elevation. Before the erection of structural steel or concrete beams the Contractor shall verify the locations, both vertically and horizontally, of all bearings and the distances between associated bearings.

The Contractor shall be responsible for conducting all surveys to verify the structural steel profile and alignment are as specified. The Contractor must submit survey and verification in a form acceptable to the Engineer a minimum of 7 days prior to installing the falsework and forms.
  - C. **Retaining walls and Reinforced Soil Slopes:** The Contractor shall set adequate horizontal, vertical, reference and Working Points to perform the work.
- 8. Borrow and Waste sites:** The Contractor shall
- A. Perform field work necessary for initial layout and measurement of borrow or waste sites.
  - B. Establish site limits and clearing limits.
  - C. Measure both original and final ground conditions and submit cross-sections as directed by the Engineer.
- 9. Utility Relocations:** The Contractor shall provide additional reference stakes to assist the Engineer and public utility personnel to accurately identify the proposed locations for utility facilities to be relocated. At least 2 weeks prior to the scheduled relocation of public utilities, the Contractor shall stake out the following features throughout the limits of utility relocations at a maximum spacing of 25 feet, unless directed otherwise by the Engineer:
- A. Edge of road on the side adjacent to the proposed utility relocations.
  - B. Both edges of sidewalks, where shown on the plans.
  - C. Proposed drainage location(s) and invert elevation(s) at proposed utility locations.
  - D. Finished grade where existing utility facilities will be reset or relocated.
- 10. Regulated Areas:** The Contractor shall install and maintain reference stakes at 25 foot spacing, or as directed by the Engineer, along the permitted permanent or temporary regulated impacted areas depicted in the permit applications. Each stake shall be legibly marked identifying the baseline station and offset, and the feature it represents.

**11. Pavement Markings:** Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and a representative of the Engineer shall establish and document pavement marking control points from the existing markings within the limits of the proposed pavement markings or pavement marking grooves. These control points shall be used to reestablish the positions of the lanes, the beginnings and endings of tapers, channelization lines for on- and off-ramps, lane-use arrows, stop bars, driveways, private drives, road entrances, and any lane transitions in the Project area, including all line striping grooving. The Contractor shall use these control points to provide appropriate pre-marking prior to the installation of final markings, including grooves.

The Contractor shall provide and maintain reference stakes or markings immediately off the edge of pavement, at 100 foot intervals and at any point where there is a change in pavement markings. If the Contractor proposes an alternative method to establish and document pavement marking control points, it must be approved by the Engineer.

For roadways where the existing pavement markings need to be reestablished or pavement marking grooves are to be installed on non-limited access roadways, the markings shall be adjusted as directed by the Engineer. These adjustments are to provide wider shoulders to accommodate pedestrian and bicycle traffic while maintaining through travel lane widths of no less than 11 feet.

Unless otherwise noted in the Project documents, lane and shoulder widths for commonly encountered half sections shall be established as shown in the table below:

Centerline to curb or edge of road	Lane width	Shoulder width
12 to 16 feet	11 feet	Remaining Pavement
17 to 20 feet	12 feet	Remaining Pavement

**For Projects that only consist of removal and replacement of pavement markings, the requirement for a licensed land surveyor to supervise the staking is waived.**

**12. Miscellaneous survey and staking:** The Contractor shall survey and stake other work such as guiderail, curb and gutter, turf establishment, regulated areas, watercourses and excavation limits for structures. When staking increments are not specified, the Contractor shall propose increments for the Engineer’s review. The Contractor shall maintain or replace these stakes until the Engineer approves their removal.

**Table 1.20-9.80-1  
Construction Survey Staking Tolerances<sup>1</sup>**

Staking Phase	Horizontal	Vertical
Control points set from existing control points. <sup>2</sup>	±0.03 feet	±0.01 feet × √N
Centerline points including all points of curvature and references.	±0.06 feet	±0.03 feet
Slope-stake and slope-stake references. <sup>3</sup>	±0.25 feet	±0.25 feet
Culverts, ditches, and minor drainage structures stakes.	±0.25 feet	±0.06 feet
Retaining walls stakes.	±0.06 feet	±0.03 feet
Bridge substructures and superstructure stakes. <sup>4</sup>	±0.03 feet	±0.03 feet
Pavement markings stakes. <sup>5</sup>	±0.50 feet	N/A
Curb and gutter stakes.	±0.06 feet	±0.03 feet
Working Points. <sup>4</sup>	±0.03 feet	N/A
Clearing and grubbing limit stakes.	±1.00 feet	N/A
Roadway subgrade finish stakes.	±0.16 feet	±0.03 feet
Roadway finish grade stakes.	±0.16 feet	±0.03 feet

<sup>1</sup> At statistical 95% confidence level. Tolerances are relative to existing control points.

<sup>2</sup> N is the number of instrument setups.

<sup>3</sup> Take the cross-sections normal to the centerline ±1 degree.

<sup>4</sup> Bridge control is established as a local network and the tolerances are relative to that network.

<sup>5</sup> This tolerance also applies to alternative methods of establishing and documenting pavement marking control points from the existing markings, such as GPS recording.

- 13. For Facilities Construction:** Existing survey is not guaranteed. The Contractor shall:
- A. Investigate and verify the existence and location of underground utilities and other elements affecting the contract work before beginning site work.
  - B. Furnish information that is necessary to adjust, move or relocate existing structures, utility poles, lines, services, or other utility appurtenances affected by construction. Coordinate with authorities performing work and/ or having jurisdiction.
  - C. Verify layout information shown on the plans, in relation to the control points and existing benchmarks before proceeding to layout the Project work. Notify the Engineer if discrepancies are discovered. Preserve and protect permanent benchmarks and control points during construction operations. Do not change or relocate benchmarks or control points without the Engineer’s prior written approval. Promptly report lost or destroyed control points, or the need to relocate permanent benchmarks or control points because of necessary changes in grades or locations. Promptly replace lost or destroyed benchmarks and control points. Base replacements on the original survey control points.
  - D. Establish and maintain a minimum of (2) permanent benchmarks on the Project Site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark. Record benchmark locations, with horizontal and vertical data, on Project Record Documents. Provide temporary reference points sufficient to locate the work where the actual location or elevation of layout points cannot be marked. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
  - E. Work from lines and levels established by the control survey. Establish benchmarks and control points to set lines and levels at each area of construction as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale plans to determine dimensions. Advise entities engaged in construction activities, of marked lines and levels provided for their use. As construction proceeds, check every major element for line, level and plumb.
  - F. Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means. The Contractor shall identify and document by survey the extent, elevation, and location of all foundations and capped utilities to be left in place and backfilled. Appropriate scaled marked up drawings shall be furnished to the Engineer PRIOR to backfilling.
  - G. Locate and lay out control lines and levels for structures, building foundations, column grids and locations, floor levels including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from (2) or more locations.
  - H. Maintain a surveyor's log of control and other survey work. Make this log available to the Engineer for reference. Record deviations from required lines and levels, and advise the Engineer when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted by the Engineer and not corrected. Record the location of utilities at the time of installation in the log as well as on the As-Built drawings for permanent record. The recording Land Surveyor shall place its registration seal and accuracy statement regarding location of exterior underground utility lines on the utility plans of As-Built drawings.

**1.20-9.80.04—Facilities Construction - Method of Measurement:** Construction Surveying, being paid on a lump sum basis, will not be measured for payment. Prior to beginning the work, the Contractor shall submit a proposed schedule of values for review and concurrence by the Engineer.

**1.20-9.80.05—Facilities Construction - Basis of Payment:** Construction Surveying will be paid for at the Contract lump sum price for "Construction Surveying," based on completed portions of the work. This price shall include all labor, submittals, maintenance, materials, tools, equipment, removal of materials and all work incidental thereto.

Pay Item	Pay Unit
Construction Surveying	l.s.



**SECTION 4.06**  
**BITUMINOUS CONCRETE**

*After “Job Mix Formula (JMF)” in Article 4.06.01 add the following:*

Leveling Course: A thin lift of HMA placed at an average consistent thickness, usually about an inch, as indicated on the plans to correct minor variations in the contour of the existing pavement surface.

*After “Warm Mix Asphalt (WMA) Technology” in Article 4.06.01 add the following*

Wedge Course: A lift or multiple lifts of HMA placed at a varying thickness as indicated on the plans to increase or decrease the cross slope of the existing pavement surface.

*Replace 4.06.03-6 with the following:*

**6. Spreading and Finishing of Mixture:** Prior to the placement of the mixture, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance.

Immediately before placing a bituminous concrete lift, a uniform coating of tack coat shall be applied to all existing underlying pavement surfaces and on the exposed surface of a wedge joint. Such surfaces shall be clean and dry. Sweeping or other means acceptable to the Engineer shall be used.

The mixture shall not be placed whenever the surface is wet or frozen.

Tack Coat Application: The tack coat shall be applied by a pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gal./s.y. for a non-milled surface and an application rate of 0.05 to 0.07 gal./s.y. for a milled surface. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall be heated to  $160^{\circ}\text{F} \pm 10^{\circ}\text{F}$  and shall not be further diluted.

Tack coat shall be allowed sufficient time to break prior to any paving equipment or haul vehicles driving on it.

The Contractor may request to omit the tack coat application between bituminous concrete layers that have not been exposed to traffic and are placed during the same work shift. Requests to omit tack coat application on the upper and lower surfaces of a wedge joint will not be considered.

Placement: The mixture shall be placed and compacted to provide a smooth, dense surface with a uniform texture and no segregation at the specified thickness and dimensions indicated in the plans and specifications.

When unforeseen weather conditions prevent further placement of the mixture, the Engineer is not obligated to accept or place the bituminous concrete mixture that is in transit from the Plant.

In advance of paving, traffic control requirements shall be set up, maintained throughout placement, and shall not be removed until all associated work is completed, including quality control, sampling for density testing, and inspection activities.

The mixture temperature will be verified using three infrared thermometers supplied by the Contractor and acceptable to the Engineer. The placement temperature range shall be listed in the Quality Control Plan (QCP) for placement and shall meet the requirements of Table M.04.03-4. Any HMA material that falls outside the specified temperature range as measured by two of the three thermometers may be rejected.

The Contractor shall inspect the newly placed pavement for defects in mixture or placement before rolling is started. Any deviation from standard crown or section shall be immediately remedied by placing additional mixture or removing surplus mixture. Such defects shall be corrected to the satisfaction of the Engineer.

Where it is impracticable due to physical limitations to operate the paving equipment, the Engineer may permit the use of other methods or equipment. Where hand spreading is permitted, the mixture shall be placed by means of suitable shovels and other tools, and in a uniformly loose layer at a thickness that will result in a completed pavement meeting the designed grade and elevation.

Placement Tolerances: Each lift of bituminous concrete placed at a specified thickness shall meet the following requirements for thickness and area. Any pavement exceeding these limits shall be subject to an adjustment or removal. Lift tolerances will not relieve the Contractor from meeting the final designed grade. Lifts of specified non-uniform thickness, i.e. wedge course, shall not be subject to thickness and

area adjustments.

- a) Thickness: Where the average thickness of the lift exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the Engineer will calculate the thickness adjustment in accordance with 4.06.04.

**TABLE 4.06-3: Thickness Tolerances**

Mixture Designation	Lift Tolerance
S1	+/- 3/8 inch
S0.25, S0.375, S0.5	+/- 1/4 inch

Where the thickness of the lift of mixture is less than that shown on the plans beyond the tolerances shown in Table 4.06-3, the Contractor, with the approval of the Engineer, shall take corrective action in accordance with this Section.

- b) Area: Where the width of the lift exceeds that shown on the plans by more than the specified thickness, the Engineer will calculate the area adjustment in 4.06.04.
- c) Delivered Weight of Mixture: When the delivery ticket shows that the truck exceeds the allowable gross weight for the vehicle type, the Engineer will calculate the weight adjustment in accordance with 4.06.04.

**Transverse Joints:** All transverse joints shall be formed by saw-cutting to expose the full thickness of the lift. Tack coat shall be applied to the sawn face immediately prior to additional mixture being placed.

**Compaction:** The Contractor shall compact the mixture to meet the density requirements as stated in 4.06.04 for any lift placed with a thickness of 1 1/2 inches or greater, and eliminate all roller marks without displacement, shoving, cracking, or aggregate breakage. This shall include wedge courses when the wedge thickness is 1 1/2 inches or greater within a single paver pass.

When placing a lift with a specified thickness less than 1 1/2 inches the Contractor shall provide a minimum rolling pattern as determined by the development of a compaction curve. This shall include wedge courses when the wedge or any portion of the wedge thickness is less than 1 1/2 inches within a single paver pass. The procedure to be used shall be documented in the Contractor's QCP for placement and demonstrated on the first day of placement.

The use of the vibratory system on concrete structures is prohibited. When approved by the Engineer, the Contractor may operate a roller using an oscillatory system at the lowest frequency setting.

If the Engineer determines that the use of compaction equipment in the dynamic mode may damage highway components, utilities or adjacent property, the Contractor shall provide alternate compaction equipment.

Rollers operating in the dynamic mode shall be shut off when changing directions.

These allowances will not relieve the Contractor from meeting pavement compaction requirements.

**Surface Requirements:**

Each lift of the surface course shall not vary more than 1/4 inch from a Contractor-supplied 10 foot straightedge. For all other lifts of bituminous concrete, the tolerance shall be 3/8 inch. Such tolerance will apply to all paved areas.

Any surface that exceeds these tolerances shall be corrected by the Contractor at its own expense.

*Replace "Method II – Butt Joint" under Subarticle 4.06.03-7 with the following:*

**Method II - Butt Joint:**

When adjoining passes are placed, the Contractor shall use the end gate to create a near vertical edge (refer to Figure 4.06-2). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). During placement of multiple lifts, the longitudinal joint shall be constructed in such a manner that it is located at least 6 inch from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. The end gate on the paver should be set so there is an overlap onto the cold side of the joint.

When using this method, the Contractor must complete full width "curb to curb" paving when the vertical edge exposed to traffic would be greater than one inch, unless otherwise allowed by the Engineer.

*Replace paragraphs 10, 11 and 12 under Subarticle 4.06.03-8 with the following:*

Approval of any QCP does not relieve the Contractor of its responsibility to comply with the Project specifications. The Contractor may propose modifications to the QCPs as work progresses and must document the changes in writing prior to resuming operations. These modifications include changes in quality control procedures, equipment, or personnel.

QCP for Production: Refer to M.04.03-1.

QCP for Placement: The Standard QCP, Project Summary Sheet, and Extended Season Paving Plan shall conform to the format provided on the [Advisory Team web page](#).

*Replace Subarticle 4.06.03-9 with the following:*

**9. Temperature and Seasonal Requirements:** Paving, including placement of temporary pavements, shall be divided into 2 seasons, “In-Season” and “Extended-Season.” In-Season paving occurs from May 1 to October 14, and Extended Season paving occurs from October 15 to April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

- Mixtures shall not be placed when the air or subbase temperature is less than 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor must submit an Extended Season Paving Plan for the Project that addresses minimum delivered mix temperature and meets the requirements of Table M.04.03-4. The Plan shall also include if WMA, PMA, or other additives are being used; maximum paver speed; enhanced rolling patterns; and the method to balance mixture delivery and placement operations. Paving during Extended Season shall not commence until the Engineer has approved the plan.

*Replace paragraphs 1 and 2 under Subarticle 4.06.03-10 with the following:*

**10. Field Density:** The Contractor shall obtain cores in accordance with AASHTO R 67 for the determination of mat and longitudinal joint density of bituminous concrete pavements. The Contractor’s representative obtaining samples must be a certified NETTCP HMA Paving Inspector, NETTCP HMA Plant Technician, or has successfully completed the HMA Field Sampling Course administered by The Connecticut Advanced Pavement Laboratory (CAP Lab). Within three (3) calendar days of placement, mat and joint cores shall be extracted on each lift with a specified thickness of 1 1/2 inches or more. That time frame may be extended to a maximum of five (5) days due to inclement weather, State holidays or other access restrictions beyond the control of the Contractor. Joint cores shall not be extracted on HMA S1.0 lifts.

The Contractor shall extract cores from random locations determined by the Engineer in accordance with ASTM D3665. Six (6) inch diameter cores shall be extracted for all mixes. The Contractor shall coordinate with the Engineer to witness the extraction, labeling of cores, and filling of the core holes.

*Replace the last sentence in Subarticle 4.06.04-2(b)i with the following:*

Additionally, any subplot with a density result below 87% is subject to evaluation under 1.06.04.

*Replace the last sentence in Subarticle 4.06.04-2(b)ii with the following:*

Additionally, any subplot with a density result below 87% is subject to evaluation under 1.06.04.

*Replace the last sentence in Subarticle 4.06.04-2(b)iii with the following:*

Additionally, any subplot with a density result below 87% is subject to evaluation under 1.06.04.

After Section 4.06, add the following New Section 4.07:

**SECTION 4.07  
RUMBLE STRIPS,  
REMOVAL OF RUMBLE STRIPS**

**4.07.01—Description**

**4.07.02—Materials**

**4.07.03—Construction Methods**

**4.07.04—Method of Measurement**

**4.07.05—Basis of Payment**

**4.07.01—Description:** Work under this item shall consist of installing rumble strips on asphalt highway shoulders where shown on the plans or where directed by the Engineer.

Work under this item shall also consist of removing rumble strips by milling the pavement to a depth of 2 1/4 inches, disposing of pavement millings, sweeping and cleaning, applying tack coat on all surfaces within the milled area, and placing Hot-Mix Asphalt (HMA) or an equivalent Polymer Modified Asphalt (PMA) to match the elevation of the surrounding pavement.

**4.07.02—Materials:** Materials for the removal of rumble strips shall meet the requirements of Section M.04 and shall consist of the following:

1. HMA S0.375 or an equivalent PMA. All HMA or PMA shall be Traffic Level 2 unless indicated otherwise on the plans.
2. Material for Tack Coat.

**4.07.03—Construction Methods:**

I. Installation of Rumble Strips:

The Contractor shall pre-mark the location of the edge of the cut, and the beginning and ending points of the sections, prior to the installation of the rumble strips. The Engineer will review and approve the locations.

The Contractor shall arrange for a technical representative, from the company which produces the milling machine to be used on the Project, who will be required to be on Site at the beginning of the operation in order to ensure results that meet the requirements of the Contract to the satisfaction of the Engineer.

Rumble strips shall not be installed on bridge decks, in acceleration and deceleration lanes, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

- a. **Automated (Wide Shoulders):** The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is greater than or equal to 4 feet. Where there are no obstructions, the equipment shall be used in sections where the shoulder width from the edge line is a minimum of 3 feet. The equipment shall consist of a rotary type cutting head with a maximum outside diameter of 24 inches and shall be a minimum of 16 inches long. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The cutting head(s) shall be on independent suspension from that of the power unit to allow the tool to self-align with the slope of the shoulder or any irregularities in the shoulder surface. The equipment shall include suitable provisions for the application of water to prevent dust. The Contractor shall use a machine capable of creating the finished pattern at a minimum output of 60 rumble strips per minute.
- b. **Manual (Narrow Shoulders):** The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is between 3 feet and 4 feet. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The equipment shall include suitable provisions for the application of water to prevent dust.
- c. **Finished Cut (Automated or Manual):** The rumble strips shall have finished dimensions of 7 inches (+/- 1/2 inch) wide in the direction of travel and shall be 16 inches (+/- 1/2 inch) long measured perpendicular to the direction of travel. The depressions shall have a concave circular shape with a minimum 1/2 inch depth at center (maximum allowable depth is 5/8 inch measured to a valley). The rumble strips shall be placed in relation to the roadway according

to the patterns shown in the plans or in Figure 4.07-1. Alignment of the edge of the cut shall be checked and verified by the Engineer.

The cutting tool shall be equipped with guides to provide consistent alignment of each cut in relation to the roadway.

The Contractor shall pick up any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Article 1.10.03.

The work area shall be returned to a debris-free state prior to re-opening to traffic.

The Contractor shall provide all traffic control as specified in the item "Maintenance and Protection of Traffic" included elsewhere in the Contract.

## II. Removal of Rumble Strips:

Equipment for this work shall include the following:

1. Milling machine: A milling machine designed and built for milling flexible pavements. It shall be self-propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing bituminous concrete pavement.  
The rotary drum of the machine shall use carbide or diamond-tipped tools. A tooth spacing of 8 mm is preferred, but up to 15 mm will be allowed. The forward speed of the milling machine shall be a maximum of 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.  
The machine shall be equipped with an integral pickup and conveying device to immediately remove milled material from the surface of the roadway and discharge the millings into a truck in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation. When milling smaller areas or areas where it is impractical to use the above described equipment, the Contractor may be permitted to use a lesser-equipped milling machine, if approved by the Engineer. It shall be capable of milling a minimum width of 20 inches to completely remove the existing rumble strip. A wider milling width may be used in cases where two rumble strips are located near and parallel to each other, as may occur in a median area.
2. 10-foot straight edge.
3. Sweeper: A sweeper, equipped with a water tank, capable of remove millings and loose debris from the surface. Other sweeping or vacuum type equipment may be provided in lieu of the sweeper where acceptable by the Engineer. A hand broom may be used for smaller areas when approved by the Engineer.
4. Air compressor: An air compressor capable of producing 100 psi oil free compressed air for cleaning the milled pavement surface.
5. Hot air lance: A hot air lance that can deliver 100 psi oil free heated air to clean and dry the pavement surface. The compressed air emitted from the tip of the lance shall achieve a temperature of at least 1500°F.
6. Paving and compaction equipment: Paving and compaction equipment meeting the requirements of Section 4.06. It is expected that much of the placement will require hand work or a mixture of equipment and hand tools to achieve the required results. Smaller compaction equipment, including vibratory plate compactors, will be allowed by the Engineer to achieve the required results. At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04.
7. Portable lighting equipment: If the work is performed at night a truck-towed light tower and driver shall be provided for use by the Engineer for all marking, installation, and inspection of the patches.
8. Tack Coat Distributor: A minimum 150-gallon capacity tank that is trailer mounted or self-propelled and capable of applying tack coat meeting the requirements of Section 4.06.

The Contractor shall mark the location of the beginning and ending points of the sections for milling and paving, prior to the removal of the rumble strips. The Engineer will review and approve the limits of removal.

The width of milling shall be as specified on the Plans or other specifications. If no other width specification exists, the minimum width of milling for freeway shoulders shall be 20 inches, and for all other rumble strips the minimum width of milling shall be 14 inches in order to completely remove

the existing rumble strip to the satisfaction of the Engineer. If there are two rumble strips located near and parallel to one another, as may occur in median areas, and if they both can be removed by a single pass of a wider milling machine without adversely affecting drainage, safety, or quality of results, then a wider milling machine may be used. In this case the length measured for payment will be the sum of the lengths of the two individual rumble strips. Milling widths wider than specified above may be used with the written permission of the Engineer.

The depth of removal shall be 2 1/4 inches. The Engineer may alter the milling depth, either up or down, based on deterioration or scabbing discovered as work is in progress. This adjustment will not exceed 1/2 inch. It is expected that the milling depth of 2 1/4 inches is appropriate for most cases. The milled surface shall be swept clean (by hand if necessary). Once all millings are removed by sweeping, the milled areas shall be allowed to dry. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of a hot air lance as specified above. When the milled area is dry to the satisfaction of the Engineer, it shall be blown clean of any residual dust or debris using compressed air.

Once deemed clean and dry by the Engineer, the entire milled area, including the sides/walls of the milled area, shall receive an application of tack coat as specified above and in Section 4.06.

After the tack coat has had sufficient time to cure or break, HMA S0.375 (Traffic Level 2) or an equivalent PMA shall be placed and compacted to the requirements above and in Section 4.06. The Contractor shall confirm that the surface elevation of the finished patch matches the elevation of the surrounding pavement surface to within 1/4 inch using the 10-foot straightedge. The Contractor shall confirm that all patch material placed is uniform in appearance without segregation.

The Contractor shall resurface the milled area prior to opening the roadway to traffic. The milled area shall be swept, cleaned, tacked, and repaved in the same work shift.

Precautions shall be taken to avoid damage to the existing roadway materials that are to remain in place. If damage occurs, it must be repaired by the Contractor at no additional cost to the State. The methods employed in performing the work and all equipment, tools, machinery and plant used in handling material and executing any part of the work shall be subject to the approval of the Engineer before the work is started; and whenever found unsatisfactory, it shall be changed and improved as required by the Engineer.

The Contractor shall remove and dispose of any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Article 1.10.03.

**4.07.04—Method of Measurement:** The work for installing and removing rumble strips will be measured for payment by the actual number of linear feet of rumble strips installed or removed, as applicable. Removal distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not previously installed.

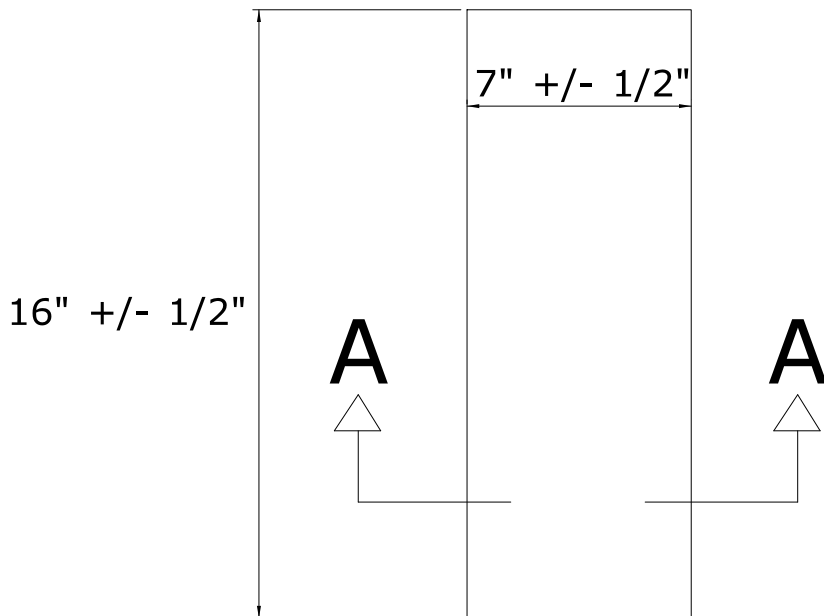
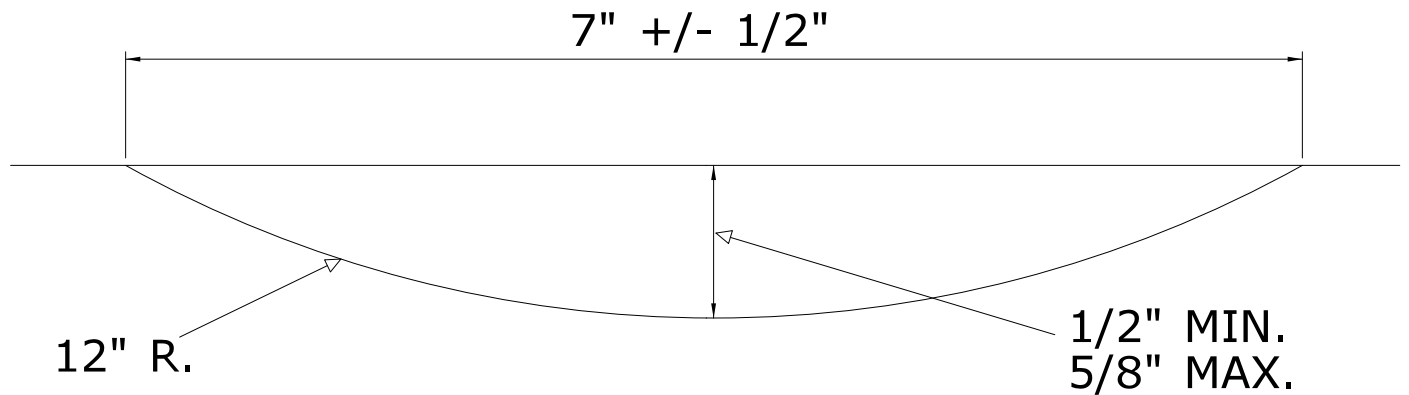
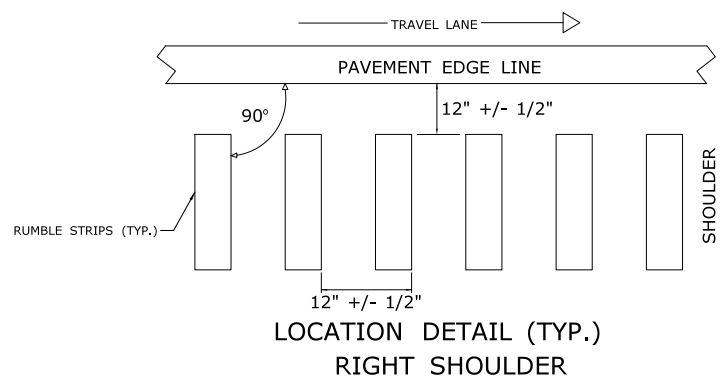
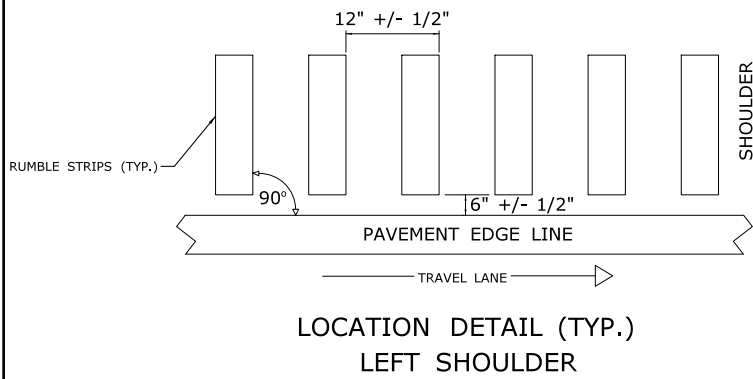
If two rumble strips are near one another and are removed by a single milling machine pass, the length measured for payment will be the sum of the lengths of the two rumble strips.

**4.07.05—Basis of Payment:** The work for installing rumble strips will be paid for at the Contract unit price per linear foot for "Rumble Strips –Automated" or "Rumble Strips–Manual." The price shall include furnishing all equipment, tools, labor, a technical representative and work incidental thereto and also disposal of any waste material resulting from the operation. The Contractor will not be paid under the item "Rumble Strips - Manual" if the field conditions allow for the use of the "Rumble Strips - Automated" item, even if the manual method was used.

The work for removing rumble strips will be paid for at the Contract unit price per linear foot for "Removal of Rumble Strips." The price shall include the removal of the existing rumble strips by milling, sweeping, cleaning, and drying of the milled area, furnishing all materials, application of tack coat, placement and compaction of the HMA or PMA, and equipment, tools, labor, and work incidental thereto, as well as removal and disposal of any waste material resulting from the operation.

Pay Item	Pay Unit
Rumble Strips–Automated	l.f.
Rumble Strips–Manual	l.f.
Removal of Rumble Strips	l.f.

**Figure 4.07-1: DETAILS AND SECTIONS OF RUMBLE STRIPS**

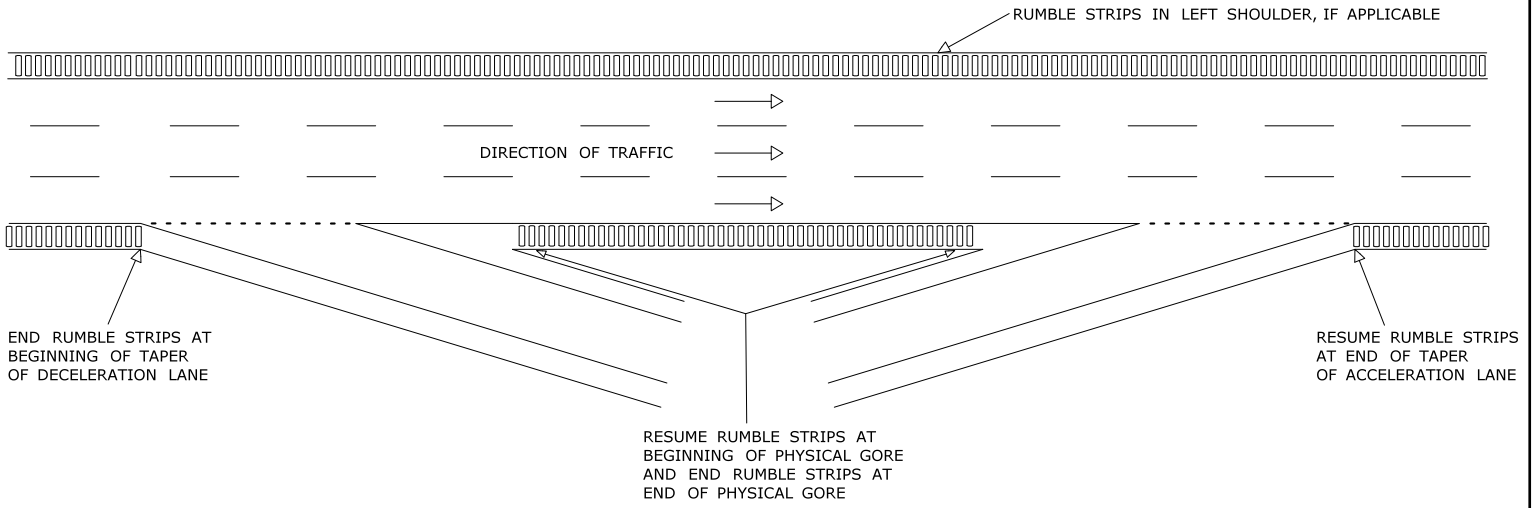


**NOTES:**

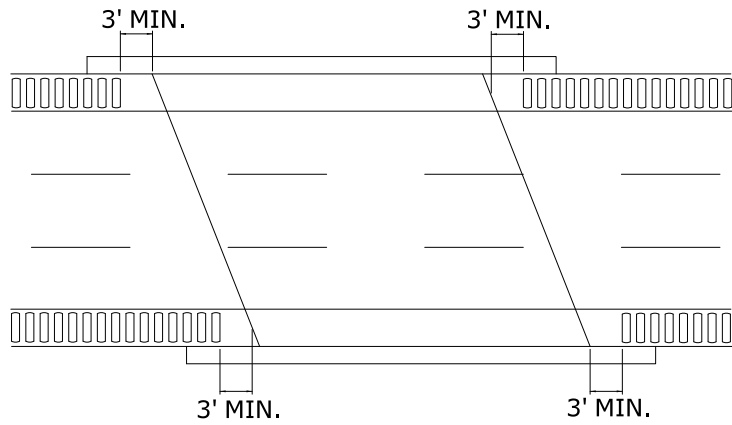
RUMBLE STRIP ALIGNMENT SHALL GENERALLY BE STRAIGHT AND OFFSET APPROXIMATELY 6" IN THE LEFT SHOULDER AND 12" IN THE RIGHT SHOULDER FROM THE OUTER EDGE OF THE EDGE LINE, AND SHALL BE AT LEAST 12" FROM THE LONGITUDINAL JOINT IN COMPOSITE PAVEMENTS. THIS OFFSET MAY BE ADJUSTED TO ACCOMMODATE VARIATIONS IN THE EDGE LINE AND THE SHOULDER WIDTH.

**PLAN DETAIL**

# Figure 4.07-2: TYPICAL TREATMENTS FOR INSTALLING RUMBLE STRIPS

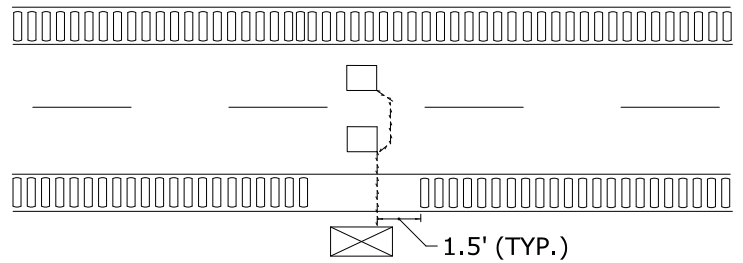


TYPICAL TREATMENT FOR RAMPS

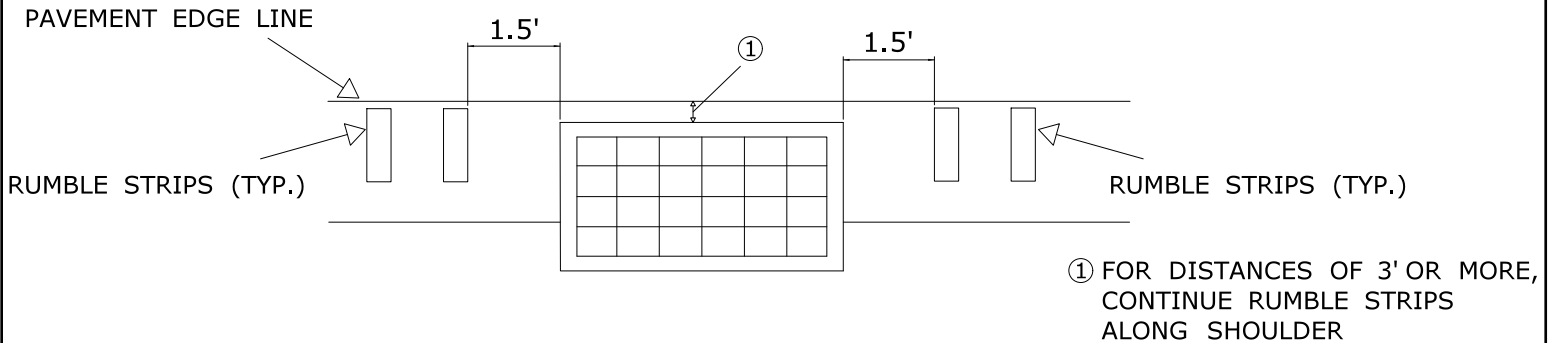


TYPICAL TREATMENT FOR BRIDGES

NOTE: REVISE DISTANCE FROM EXPANSION JOINT AS NEEDED FOR NARROW SHOULDERS APPROACHING BRIDGES



TYPICAL TREATMENT FOR LOOP DETECTOR SAWCUT LOCATIONS



TYPICAL TREATMENT FOR OBSTRUCTIONS (I.E. CATCH BASINS OR MANHOLES)



**SECTION 4.09  
MILLING,  
REMOVAL OF EXISTING WEARING SURFACE**

*Replace Section 4.09 in its entirety with the following:*

**SECTION 4.09  
MILLING,  
REMOVAL OF EXISTING WEARING SURFACE**

**4.09.01—Description:** This work shall consist of the milling, removal, and disposal of existing bituminous concrete pavement. It shall also include the complete removal and disposal of the existing bituminous concrete wearing surface, membrane waterproofing and bond breaker covering the reinforced concrete bridge deck(s) as shown on the plans or as ordered by the Engineer. The types of milling shall include the following:

1. **Coarse** Milling shall be used for the removal of bituminous concrete in excess of 4 inch depth.
2. Fine Milling shall be used to remove bituminous concrete from 0 to 4 inches. It may also be used to remove bituminous concrete greater than 4 inches in limited areas or where required.
3. Removal of Existing Wearing Surface shall be used where shown on the plans.

**4.09.03—Construction Methods:**

**A. Milling:**

**1. General:** The Contractor shall remove the bituminous concrete material using the milling type specified on the Plans. The pavement surface shall be removed to the line, grade, and existing or typical cross-section shown on the plans or as directed by the Engineer.

The bituminous concrete material shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the Contract.

Any milled surface, or portion thereof, that is exposed to traffic shall be paved within 14 calendar days unless otherwise stated in the Contract.

**2. Equipment:** The equipment for milling the pavement surface shall be designed and built for milling bituminous concrete pavements. It shall be self-propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing bituminous concrete pavement.

The milling machine shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including string line, **mobile reference beam** (20 feet minimum), or mobile string line (30 feet minimum). The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Engineer.

The rotary drum of the milling machine shall have carbide or diamond-tipped teeth with the following maximum spacing and minimum milling depth:

Milling Type	Maximum Tooth Spacing*	Minimum Depth Capability (single pass)
<b>Coarse</b> Milling	15 mm	<b>4 inches</b>
Fine Milling	8 mm	<b>4 inches</b>

\* Industry standard **units**

The forward speed of any milling machine shall be limited to no more than 45 feet/minute.

The teeth on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture, as outlined in 4.09.03-C, Surface Tolerance.

**3. Protection:** Protection shall be provided around **visible** existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that falls into inlet openings or inlet grates shall be removed at the Contractor's expense.

**B. Removal of Existing Wearing Surface:** The bituminous concrete wearing surface, membrane waterproofing and bond breaker shall be removed from the structure(s) using means acceptable to the Engineer to completely expose the concrete bridge deck(s).

Prior to removal of bituminous concrete wearing surface, the Contractor shall field verify the depth of the existing bituminous concrete by obtaining depth measurements (maximum 4 inch diameter holes) at intervals no greater than 25 feet apart in each lane. Depth verification holes shall be filled with bituminous material **and compacted** if the removal of wearing surface operation will not be completed within 5 days.

The existing bituminous concrete wearing surface and membrane waterproofing shall be removed in their entireties to the limits shown on the plans. The removal operations shall not begin until the Contractor is prepared to perform the permanent patching or repair to the underlying concrete within 5 working days. If this is in conflict with "Prosecution and Progress," "Maintenance and Protection of Traffic," or other Contract requirements, the more stringent specification shall apply.

Methods for removal of existing wearing surfaces **shall be** fine milling and shall include as many passes or amount of effort required to completely expose the concrete deck(s). Any membrane not completely removed by the milling process shall be removed by scarifying or other means as approved by the Engineer.

Alternate methods for the removal of a bituminous concrete surface may be submitted to the Engineer for review. Demonstration of the alternate removal methods may be required prior to consideration.

The existing bituminous concrete wearing surface, membrane waterproofing, bond breaker, and any other products being removed shall be disposed of offsite by the Contractor unless otherwise noted in the Contract or as directed by the Engineer.

If membrane waterproofing, as specified elsewhere in the Contract, is to be re-installed on the existing deck(s), the surface profile following removal shall be suitable for such reinstallation. The profile of the cleaned concrete surface shall meet the membrane waterproofing manufacturer's recommendations, and have no gouges greater than 1/2 inch in depth. Any deficiencies that could, in the Engineer's opinion, cause failure of, or puncture the new membrane shall be removed as part of this work.

**C. Surface Tolerance:**

**1. General:** The surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections, that are a result of defective equipment, improper use of equipment, poor workmanship, or inadequate field verification. Any unsatisfactory surfaces caused by the removal operations are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer prior to opening the surface to traffic.

Any raised structures shall be delineated with traffic control devices, as directed by the Engineer.

**2. Tolerances:** All milling types shall provide a satisfactory riding surface with a uniform textured appearance. The Contractor shall perform random spot-checks at a minimum of 5 locations per working shift with a Contractor-supplied 10 foot straight edge to verify the surface tolerances listed below. Random spot-checks (minimum of 5 checks per shift) shall occur at a maximum of 250 feet per pass of the milling machine and shall be performed with the Engineer present. The following tolerances shall apply:

(a) **Coarse Milling:** The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed 3/8 inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 3/8 inch.

(b) **Fine Milling:** The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed 1/4 inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 1/4 inch.

Where a surface delamination between bituminous concrete layers or a surface delamination of bituminous concrete on Portland cement concrete causes a non-uniform texture to occur, the depth of milling shall be adjusted in small increments to a maximum of +/- 1/2 inch to eliminate the condition. When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all bituminous concrete pavement shall be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Engineer.

Any unsatisfactory surfaces produced by the milling operation are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

#### **D. Transitions:**

**1. Construction Joints:** No transverse vertical face shall be left exposed to traffic. No longitudinal vertical face greater than 1 inch shall be left exposed to traffic. Any other vertical face created by milling shall have a bituminous concrete taper constructed to the temporary transition requirements as described below.

**2. Roadway Structures:** Roadway structures shall not have a vertical face of greater than 1 inch exposed to traffic as a result of milling. All roadway structure edges and bituminous concrete tapers shall be clearly marked with fluorescent paint. The paint shall be maintained throughout the exposure to traffic.

All structures within the roadway that are exposed to traffic and greater than 1 inch above the milled surface shall receive a transition meeting the following requirements:

- (a) For roadways with a posted speed limit of 35 mph or less:
- (i) Round structures with an exposed vertical face between 1 inch and 2.5 inches shall be transitioned with a hard rubber tapered protection ring designed for that purpose of the appropriate inside diameter designed specifically to protect roadway structures. Bituminous concrete tapers at a minimum 12 to 1 (12:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.
  - (ii) Round structures with an exposed vertical face greater than 2.5 inches shall receive a transition of bituminous concrete formed at a minimum 12 to 1 (12:1) taper in all directions.
  - (iii) All rectangular structures shall receive a transition of bituminous concrete formed at a minimum 12 to 1 (12:1) taper in all directions.
- (b) For roadways with a posted speed limit of 40, 45 or 50 mph: All structures shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions of travel. Direction of travel shall include both the leading and trailing sides of a structure. The minimum taper shall be 12 to 1 (12:1) in all other directions.
- (c) For roadways with a posted speed limit of greater than 50 mph: All structures shall receive a transition of bituminous concrete formed at a minimum 36 to 1 (36:1) taper in the direction of travel. Direction of travel shall include both the leading and trailing sides of a structure. The minimum taper shall be 12 to 1 (12:1) in all other directions.

**3. Temporary Transitions:** If any vertical face is formed in an area exposed to traffic, a temporary paved transition shall be established according to the requirements shown on the plans or in accordance with 4.06.03-5, "**Transitions for Roadway Surface.**" If a milling machine is used to form a temporary transition, the length of the temporary transition shall be in accordance with 4.06.03-5, the requirements shown on the plans, or shall be as directed by the Engineer. A clean vertical face shall be established by saw cutting at all final termini limits of the Project.

**4. Milling for Permanent Pavement Transitions:** When called for on the plans, milling a tapered "keyway" to transition the top course of a bituminous concrete overlay to an existing

pavement shall be performed as specified elsewhere in the Contract.

**E. Sweeping:** Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a sweeper truck. The sweeper truck shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck shall operate at a speed that allows for the maximum pickup of millings from the roadway surface. Other sweeping equipment may be provided in lieu of the sweeper where acceptable by the Engineer.

Any milled area that will not be exposed to live traffic for a minimum of 48 hours prior to paving shall require a vacuum sweeper truck in addition to, or in lieu of, mechanical sweeping. The vacuum sweeper truck shall have sufficient power and capacity to completely remove all millings from the roadway surface including any fine particles within the texture of the milled surface. Vacuum sweeper truck hose attachments shall be used to clean around pavement structures or areas that cannot be reached effectively by the main vacuum. Compressed air may be used in lieu of vacuum attachments if approved by the Engineer.

**4.09.04—Method of Measurement:**

Milling of bituminous concrete will be measured for payment by the number of square yards of area from which the particular type of milling has been completed and the work accepted. Deductions will not be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

The removal of wearing surface will be measured for payment by the number of square yards of bituminous concrete wearing surface removed to expose the underlying concrete deck(s). No area deductions will be made for scuppers, joints, and any similar areas.

There will be no measurement for marking roadway structures, transitions for roadway structures and sweeping of any surface that has been milled.

**4.09.05—Basis of Payment:** Milling work will be paid for at the Contract unit price per square yard for “Fine Milling of Bituminous Concrete (0” to 4”),” “Coarse Milling of Bituminous Concrete (Greater Than 4” Up To 8”),” and “Coarse Milling of Bituminous Concrete (Greater Than 8”).” This price shall include all equipment, tools, labor, and materials incidental thereto. **No additional payments will be made for multiple passes with the milling machine(s).**

Work for the removal of wearing surface will be paid for at the Contract unit price per square yard for “Removal of Existing Wearing Surface,” complete and accepted, which price shall include the field verification, removal of wearing surface, removal of membrane waterproofing and bond breaker, saw cutting, and all equipment, tools and labor. No additional payments will be made for multiple passes with the milling machine(s) to remove the wearing surface.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and doing handwork to remove bituminous concrete around catch basin inlets, bridge scuppers, manholes, utility valve boxes, median barriers, parapets, joints and any similar structures; repairing surface defects as a result of Contractor negligence; providing protection to underground utilities from the vibration of the milling operation; removal of any temporary milled transition; removal and disposal of millings; sweeping and all associated work.

Milling for Pavement Transitions, where identified on the plans, will be paid under a separate item specified elsewhere.

Installation of traffic control devices shall be included under the costs for “Maintenance and Protection of Traffic,” payment for the devices will be under the applicable items.

Pay Item	Pay Unit
Fine Milling of Bituminous Concrete (0” to 4”)	s.y.
Coarse Milling of Bituminous Concrete (Greater Than 4” Up To 8”)	s.y.
Coarse Milling of Bituminous Concrete (Greater Than 8”)	s.y.
Removal of Existing Wearing Surface	s.y.

**SECTION 6.03**  
**STRUCTURAL STEEL**

*Replace Subarticle 6.03.03-4(b) with the following:*

- (b) **Camber:** All members shall be cambered prior to heat curving and painting. Rolled beams shall be either heat or cold cambered by methods approved by the Engineer. Cold cambering shall not be performed on fracture critical rolled sections, such as beams spaced more than 12 feet on center. For beams with excessive camber requirements (more than 1 1/2 inches per 20 feet of length), cold cambering is prohibited. Plate girders shall be cambered by cutting the web to the prescribed shape with allowances for shrinkage due to cutting, welding, and heat curving. The fabricator is responsible to determine what allowances should be made. Rolled, plate-rolled, or fabricated sections shall be cambered to the total amount shown on the plans and within the camber deviation tolerances permitted for welded beams and girders, as indicated in the ANSI/AASHTO/AWS D1.5 Bridge Welding Code. The Contractor must submit to the Engineer for approval, a cambering procedure that includes a plan for corrective action if the actual camber is not within tolerance.

SECTION 8.03  
PAVED DITCHES, PAVED APRONS AND  
PAVED CHANNELS

Replace Section 8.03 in its entirety with the following:

SECTION 8.03  
PAVED APRONS

- 8.03.01—Description
- 8.03.02—Materials
- 8.03.03—Construction Methods
- 8.03.04—Method of Measurement
- 8.03.05—Basis of Payment

**8.03.01—Description:** The work under this item includes placing and compacting of a bituminous concrete course on a pre-excavated foundation forming paved aprons in accordance with the line, grade, compacted final thickness and typical cross-section shown on the plans.

**8.03.02—Materials:** The materials for this work shall meet the following requirements:  
Bituminous Concrete Curb Mix shall meet the requirements of 4.06 and M.04.01.  
Processed Aggregate Base shall meet the requirements of M.05.01.

**8.03.03—Construction Methods:** The processed aggregate base course shall be placed in a single course, 4 inches compacted thickness, in accordance with 3.04.03. The surface shall be a 2 inch course of bituminous concrete curb mix. The bituminous concrete shall be placed and thoroughly compacted with compaction equipment suitable for small areas.

**8.03.04—Method of Measurement:** The quantity to be measured for **this** item will be the surface area in square yards of paved apron constructed and accepted.  
Formation of Subgrade and Processed Aggregate Base will not be measured for payment.

**8.03.05—Basis of Payment:** This work will be paid for at the Contract unit price per square yard for "Paved Apron." The price shall include all materials, tools, equipment and work incidental thereto.

Pay Item	Pay Unit
Paved Apron	s.y.

**SECTION 8.18  
PROTECTIVE COMPOUND FOR BRIDGES**

*Delete Section 8.18 in its entirety.*

**SECTION 9.24  
CONCRETE DRIVEWAY RAMP**

*Replace Section 9.24 in its entirety with the following:*

**SECTION 9.24  
CONCRETE DRIVEWAY RAMP**

**9.24.01—Description:** This item shall consist of concrete driveway ramps constructed on a granular fill base in accordance with the Contract.

**9.24.02—Materials:** Materials for this work shall meet the following requirements:

- 1. **Portland Cement:** Concrete shall meet the requirements of M.03 for Class PCC03340 Concrete.
- 2. **Granular Fill Base:** Granular fill shall meet the requirements of M.02.01.
- 3. **Reinforcement:** Shall meet the requirements of M.06.01.

**9.24.03—Construction Methods:** Construction methods shall meet the requirements of 9.21.03. The surface shall be finished and marked off as directed by the Engineer.

The Contractor shall protect the driveway ramp from damage until it is opened to traffic. The ramp shall not be opened to traffic until the attainment of a compressive strength of 3,000 psi. Any damage occurring prior to the Department opening the driveway ramp to traffic shall be repaired or replaced at the Contractor's expense.

**9.24.04—Method of Measurement:** This work will be measured for payment as follows:

- 1. **Concrete Driveway Ramp:** This work will be measured for payment by the actual number of cubic yards of completed and accepted concrete driveway ramps.
- 2. **Excavation:** Excavation below the finished grade of each ramp, backfilling and disposal of surplus material will not be measured for payment; but the cost shall be included in the Contract price for Concrete Driveway Ramp.

Excavation above the finished grade of each ramp will be classified and paid for in accordance with 2.02.

- 3. **Granular Fill Base:** This work will not be measured for payment, but the cost shall be included in the Contract price for Concrete Driveway Ramp.
- 4. **Reinforcement:** This material will not be measured for payment, but the cost shall be included in the Contract price for Concrete Driveway Ramp.

**9.24.05—Basis of Payment:** This work will be paid for at the Contract unit price per cubic yard for "Concrete Driveway Ramp," complete in place, which price shall include all excavation as specified above, backfill, disposal of surplus materials, and all materials, equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Concrete Driveway Ramp	c.y.



**SECTION 9.71  
MAINTENANCE AND PROTECTION OF TRAFFIC**

*Replace Section 9.71 in its entirety with the following:*

**SECTION 9.71  
MAINTENANCE AND PROTECTION OF TRAFFIC**

**9.71.01—Description:** Unless other provisions are made on the plans or in the special provisions of the Contract, the Contractor shall keep the roadway under construction open to traffic for the full length of the Project and shall provide a sufficient number of travel lanes and pedestrian passways to move that traffic ordinarily using the roadway. The travel lanes and pedestrian passways shall be drained and kept reasonably smooth and in suitable condition at all times in order to provide minimum interference to traffic consistent with the proper prosecution of the work.

Suitable ingress and egress shall be provided at all times where required, for all intersecting roads and for all abutting properties having legal access.

When a scheme for maintenance of traffic, which may include detours, is shown on the plans or described in the special provisions of the Contract, this shall govern unless an alternate scheme acceptable to the Engineer is offered by the Contractor at no additional cost. If no scheme is shown on the plans or described in the special provisions of the Contract, and the Contractor wishes to deviate from the provisions of maintaining traffic as described in this Section, the Contractor may submit and the Engineer may approve a schedule showing a proposed sequence of operations and a compatible method of maintaining traffic.

**The Contractor shall provide to the Engineer the name of the person who shall be responsible for installing and maintaining all temporary traffic control devices in work zones on limited access highways. This person shall be certified as a Traffic Control Supervisor by ATSSA. This certification shall be maintained and valid throughout the duration of the Contract.**

**9.71.03—Construction Methods:** The Contractor shall furnish and erect signs legally closing the highway to traffic, as shown on the plans or directed by the Engineer, prior to commencing any work on the Project.

The Contractor shall furnish a sufficient number of signs, barricades, drums, traffic cones and delineators to forewarn traffic of the construction as shown on the traffic control plans contained within or as directed by the Engineer.

The Contractor shall also provide such safety measures, pavement markings, warning devices and signs as deemed necessary to safeguard and guide the traveling public through detours ordered by the Engineer, included in the approved scheme for maintenance of traffic, or as shown on the plans. The Contractor shall erect, maintain, move, adjust, clean, relocate and store these signs, barricades, drums, traffic cones and delineators when, where and as directed by the Engineer, and in accordance with the ATSSA "Quality Guidelines for Temporary Traffic Control Devices and Features."

The use of unauthorized or unapproved signs, barricades, drums, traffic cones or delineators will not be permitted.

All signs in any one signing pattern shall be mounted the same height above the traveled surface. The Contractor shall keep all signs in proper position, clean and legible at all times. Care shall be taken so that weeds, shrubbery, construction materials or equipment, and soil, are not allowed to obscure any sign, light, or barricade. Signs that do not apply to existing conditions shall be removed or adjusted so that the legend is not visible to approaching traffic.

The Contractor, when ordered by the Engineer, shall remove snow and take care of icy conditions on temporary, new and existing sidewalks on any part of the right-of-way within the limits of the Project. Payment for the cost thereof, will be made as extra work.

Snow removal and correction of icy conditions, other than those resulting from the Contractor's operations, on uncompleted contracts under traffic, will remain an obligation of the State or others.

Should the Contractor fail to perform any of the work required under this section, the State may perform or arrange for others to perform such work. In such cases, the State will deduct from money due or to become due the Contractor all expenses connected there with which are found to be greater than the cost to the State had the Contractor performed the specified work.

**9.71.04—Method of Measurement:** This item, being paid on a lump sum basis, will not be measured for payment.

**9.71.05—Basis of Payment:** This work will be paid for at the Contract lump sum price for "Maintenance and Protection of Traffic." This price shall include all costs for labor, **training**, equipment and services involved in the erection, maintenance, moving, adjusting, cleaning, relocating and storing of signs, barricades, drums, traffic cones and delineators furnished by the Contractor, as well as all costs of labor and equipment involved in the maintenance of traffic lanes and detours, except for pavement markings, ordered or included in the approved scheme for maintenance of traffic. **This price shall also include furnishing and services of a trained Traffic Control supervisor for work on limited access highways.**

"Maintenance and Protection of Traffic" does not include the cost of signs, barricades, drums, traffic cones, delineators, or the furnishing and placing of materials such as borrow, gravel, crushed stone, bituminous concrete for patching and pipe. These items will be paid for at **their respective** Contract unit prices, or in the absence of applicable Contract unit prices, as extra work. If the Engineer requires the Contractor to provide facilities in excess of the requirements of the adopted scheme for maintenance and protection of traffic, the Contractor shall perform the required work, and payment for the cost thereof will be made at applicable Contract unit prices, or in the absence of applicable Contract unit prices, as extra work.

Pay Item	Pay Unit
Maintenance and Protection of Traffic	l.s.

**SECTION 9.77  
TRAFFIC CONE**

*Replace Section 9.77 in its entirety with the following:*

**SECTION 9.77  
TRAFFIC CONE**

**9.77.01—Description:** Under this item the Contractor shall furnish all reflectorized orange traffic cones required on the Project to meet the requirements as stated in the item "Maintenance and Protection of Traffic," as shown on the plans and as directed by the Engineer.

The Contractor shall have, available on the Project, a sufficient number of traffic cones to fulfill all the requirements as specified in the Contract and to replace those traffic cones which have become damaged.

**9.77.02—Materials:** Traffic cones shall be constructed of materials to a thickness to withstand impact without damage to cones or to vehicles. The traffic cones shall be of sufficient mass or have bases to which ballast may be added to assure that they will not be blown over or displaced by wind from passing vehicles. Traffic cones used at night shall be reflectorized by utilizing Retroreflective Sheeting in accordance with M.18.09.

The following documentation shall be submitted by the Contractor prior to using traffic cones on the Project:

1. For traffic cones manufactured on or before December 31, 2019 and used for the duration of their normal service life, a copy of the manufacturer’s self-certification that the traffic cones comply with the requirements of the AASHTO Manual for Assessing Safety Hardware (MASH) or the NCHRP Report 350 is required.
2. For traffic cones manufactured after December 31, 2019, a copy of the manufacturer’s self-certification that the traffic cones comply with the requirements of the 2016 edition of the AASHTO MASH is required.

**9.77.04—Method of Measurement:** This item will be measured for payment by the number of traffic cones used on the Project.

**9.77.05—Basis of Payment:** This item will be paid for at the Contract unit price each for "Traffic Cone" used on the Project. Each cone will be paid for once, regardless of the number of times it is used on the Project.

Any traffic cones that are missing, damaged or defaced so that they are not effective, as determined by the Engineer in accordance with ATSSA "Quality Guidelines for Temporary Traffic Control Devices and Features," shall be replaced by the Contractor at no cost to the State.

When the traffic cones are no longer required on the Project they shall remain the property of the Contractor.

Pay Item	Pay Unit
Traffic Cone	ea.

**SECTION 9.78  
TRAFFIC DRUM**

*Replace Section 9.78 in its entirety with the following:*

**SECTION 9.78  
TRAFFIC DRUM**

**9.78.01—Description**

**9.78.02—Materials**

**9.78.03—Construction Methods**

**9.78.04—Method of Measurement**

**9.78.05—Basis of Payment**

**9.78.01—Description:** Under this item the Contractor shall furnish all traffic drums required on the Project to correspond to the traffic patterns, as indicated in the Contract for "Maintenance and Protection of Traffic," as shown on the plans and as directed by the Engineer.

**9.78.02—Materials:** Traffic Drums shall be manufactured plastic or rubber devices designed in accordance with the latest edition of the MUTCD. The design of the device will allow for the installation of barricade warning lights. The device shall be stabilized with the use of sandbags or other approved means.

Retroreflective Sheeting, in accordance with M.18.09, shall be used on traffic drums. Only one type sheeting shall be used on a drum and all drums furnished on a construction project shall be manufactured with the same type retroreflective sheeting.

The following documentation shall be submitted by the Contractor prior to using traffic drums on the Project:

1. For traffic drums manufactured on or before December 31, 2019 and used for the duration of their normal service life, a copy of the manufacturer’s self-certification that the traffic drums comply with the requirements of the AASHTO MASH or the NCHRP Report 350 is required.
2. For traffic drums manufactured after December 31, 2019 and used without attachments, a copy of the manufacturer’s self-certification that the traffic drums comply with the requirements of the 2016 edition of the AASHTO MASH is required.
3. For traffic drums manufactured after December 31, 2019 and used with attachments such as warning lights, a copy of the Federal-Aid Eligibility Letter issued by the FHWA to the manufacturer documenting that the traffic drums with the proposed attachments meet the crash test and evaluation criteria of the 2016 AASHTO MASH is required.

**9.78.03—Construction Methods:**

The Contractor shall have, available on the Project, a sufficient number of traffic drums to fulfill all the requirements, as specified in the Contract, to provide adequate traffic control during periods of unforeseen circumstances or emergencies.

Traffic drums shall be designed and installed in accordance with the plans, the MUTCD latest edition, and as directed by the Engineer.

Any traffic drum that is missing, damaged or defaced so that it is not effective, as determined by the Engineer and in accordance with ATSSA "Quality Guidelines for Temporary Traffic Control Devices and Features," shall be replaced by the Contractor.

When the traffic drums are no longer required on the Project, they shall remain the property of the Contractor.

**9.78.04—Method of Measurement:** This work will be measured for payment by the number of traffic drums used on the Project.

**9.78.05—Basis of Payment:** This item will be paid for at the Contract unit price each for "Traffic Drum" used on the Project. Each drum will be paid for once, regardless of the number of times it is used on the Project.

Pay Item	Pay Unit
Traffic Drum	ea.

**SECTION 9.79**  
**CONSTRUCTION BARRICADE**

*Replace Section 9.79 in its entirety with the following:*

**SECTION 9.79**  
**CONSTRUCTION BARRICADE**

**9.79.01—Description:** Under this item the Contractor shall furnish all construction barricades of the specified type required on the Project to comply with the requirements of NCHRP Report 350 (TL-3), or the AASHTO MASH, and the requirements stated in the item "Maintenance and Protection of Traffic," as shown on the plans and as directed by the Engineer.

**9.79.02—Materials:** Construction barricades shall consist of the following materials:

The frame shall be of polyvinyl chloride pipe meeting the requirements of ASTM D2241 for PVC 1120 or 1220, SDR 21 (pressure rating 200 psi), ASTM D3034, SDR 35 or an approved equal. All straight members shall be the color white.

Wyes, tees and elbows for joint connections shall be polyvinyl chloride of suitable size and strength for the purpose intended.

Joints shall not be glued and a 3/16 inch nylon rope (or equivalent) shall be threaded loosely through the pipe to keep sections from flying if hit by a vehicle.

Face panels used as horizontal members shall be constructed of a suitable plastic material, 0.060 inch high-impact styrene, anodized aluminum of no less than 0.025 inch thickness or a comparable substitute approved by the Engineer.

All hardware shall be in accordance with standard commercial specifications and shall be approved by the Engineer.

Alternate stripes of white and **fluorescent** orange retroreflective sheeting shall be applied to the horizontal members as shown on the plans. Only one type sheeting shall be used on a barricade and all barricades on a construction project shall be constructed with the same type of retroreflective sheeting. Retroreflective sheeting shall meet the requirements of M.18.09.

Construction barricades shall be designed and fabricated so as to prevent them from being blown over or displaced by wind. Construction barricades shall be approved by the Engineer before they are placed into service.

Materials Certificates shall be required confirming compliance with the requirements set forth in the plans and specifications for these barricades.

**The following documentation shall be submitted by the Contractor prior to using barricades on the Project:**

1. **For barricades manufactured on or before December 31, 2019 and used for the duration of their normal service life,** a copy of the **Federal-Aid Eligibility Letter** issued by the FHWA to the manufacturer documenting that the barricades **meet the crash test and evaluation criteria** of the AASHTO MASH or of the NCHRP Report 350 **is required.**
2. **For barricades manufactured after December 31, 2019,** a copy of the **Federal-Aid Eligibility Letter** issued by the FHWA to the manufacturer documenting that the barricades **meet the crash test and evaluation criteria of the 2016 AASHTO MASH is required.**

**9.79.03—Construction Methods:** The Contractor shall furnish a sufficient number of construction barricades required for the traffic patterns for all operations which are being undertaken concurrently. The barricades shall be constructed in a neat and workmanlike manner to the satisfaction of the Engineer.

Ineffective barricades, as determined by the Engineer and in accordance with ATSSA "Quality **Guidelines** for **Temporary** Traffic Control Devices **and Features**," shall be replaced by the Contractor at no cost to the State.

Barricades that are no longer required shall be removed from the Project and shall remain the property of the Contractor.

**9.79.04—Method of Measurement:** This work will be measured for payment by the number of construction barricades used on the Project.

**9.79.05—Basis of Payment:** This item will be paid for at the Contract unit price each for "Construction Barricade" of the type specified and used on the Project. Each barricade will be paid for once, regardless of

the number of times it is used on the Project.

Pay Item

Pay Unit

Construction Barricade (Type)

ea.

**SECTION 9.81  
42 INCH TRAFFIC CONE**

*Replace Section 9.81 in its entirety with the following:*

**SECTION 9.81  
42 INCH TRAFFIC CONE**

**9.81.01—Description:** This item shall consist of furnishing 42-inch retroreflective traffic cones required on the Project to meet the requirements of the traffic control plans, as stated in the item "Maintenance and Protection of Traffic," as shown on the plans or as directed by the Engineer.

The Contractor shall have available on the Project a sufficient number of traffic cones to fulfill all the requirements as specified in the Contract and to replace those which have become damaged.

**9.81.02—Materials:** The traffic cone shall be manufactured of 2 piece construction - cone and stabilizer base. The cone shall be constructed of impact-resistant orange plastic or rubber of a thickness able to withstand impact without damage to cones or vehicles. The bottom of the cone shall be 8 1/2 inch conical diameter tapering to the top of the cone which shall be 3 1/2 inch conical diameter. The design of the device will allow for the installation of a weighted stabilizer base. The stabilizer base shall not be round in shape. It shall have a hole in the middle to allow for quick placement over the cone. The base shall be constructed of impact-resistant black plastic or rubber ballasted to 18 lbs.

Retroreflective stripes shall be fabricated from retroreflective sheeting. All stripes shall be of one type of sheeting. Retroreflective sheeting shall be as specified in M.18.09.

The following documentation shall be submitted by the Contractor prior to using traffic cones on the Project:

1. For traffic cones manufactured on or before December 31, 2019 and used for the duration of their normal service life, a copy of the manufacturer’s self-certification that the traffic cones comply with the requirements of AASHTO MASH or NCHRP Report 350 is required.
2. For traffic cones manufactured after December 31, 2019, a copy of the manufacturer’s self-certification that the traffic cones comply with the requirements of the 2016 edition of the AASHTO MASH is required.

**9.81.03—Construction Methods:** The stabilizer base shall be attached to the traffic cone in accordance with the manufacturer’s instructions. The Contractor shall ensure that the devices are kept clean and bright.

**9.81.04—Method of Measurement:** This item will be measured for payment by the number of traffic cones used on the Project.

**9.81.05—Basis of Payment:** This item will be paid for at the Contract unit price for "42 Inch Traffic Cone" used on the Project. Each cone will be paid for once, regardless of the number of times it is used on the Project.

Any traffic cones that are missing, damaged or defaced so that they are not effective, as determined by the Engineer, and in accordance with ATSSA "Quality Guidelines for Temporary Traffic Control Devices and Features," shall be replaced by the Contractor at no cost to the State.

When the traffic cones are no longer required on the Project, they shall remain the property of the Contractor.

Pay Item	Pay Unit
42 Inch Traffic Cone	ea.

**SECTION 10.18  
NAVIGATION LIGHT**

*Delete Section 10.18 in its entirety.*



**SECTION 11.12  
MAGNETIC VEHICLE DETECTOR**

*Delete Section 11.12 in its entirety.*

**SECTION M.04**  
**BITUMINOUS CONCRETE MATERIALS**

*Replace Subarticle M.04.03-2(a) with the following:*

**2. Acceptance Requirements:**

**(a) General:**

For those mixes with a total estimated project tonnage over 500 tons, a Contractor representative shall obtain a field sample of the material placed at the project site in accordance with AASHTO R 97 or an alternate procedure approved by the Engineer. Sampling from the truck at the Plant in accordance with AASHTO R 97 will be allowed for those mixes with a total estimated project tonnage equal to or less than 500 tons. The Contractor's representative obtaining mix samples must be a certified NETTCP HMA Paving Inspector, NETTCP HMA Plant Technician, or has successfully completed the HMA Field Sampling Course administered by the Connecticut Advanced Pavement Laboratory. Regardless of sampling location, the sample shall be quartered by the Contractor in accordance with AASHTO R 47 and placed in an approved container. For samples obtained at the project site, a Type A Mechanical Splitter shall be used to quarter the sample in accordance with AASHTO R 47. The container shall be sealed with a security tape provided by the Department and labelled to include the project number, date of paving, mix type, lot and subplot numbers and daily tonnage. The minimum weight of each quartered sample shall be 14000 grams. The Contractor shall transport one of the containers to the Departments Central Laboratory in Rocky Hill, retain one of the sealed containers for potential use in dispute resolution and test the remaining samples for acceptance in accordance with past practice.

The Contractor shall submit all acceptance tests results to the Engineer within 24 hours or prior to the next day's production. All acceptance test specimens and supporting documentation must be retained by the Contractor and may be disposed of with the approval of the Engineer. All quality control specimens shall be clearly labeled and separated from the acceptance specimens.

Contractor personnel performing QC and acceptance testing must be present at the facility prior to, during, and until completion of production, and be certified as a NETTCP HMA Plant Technician and be in good standing. Production of material for use on State projects must be suspended by the Contractor if such personnel are not present. Technicians found by the Engineer to be non-compliant with NETTCP policies and procedures or Department policies may be removed by the Engineer from participating in the acceptance testing process for Department projects until their actions can be reviewed.

Verification and dispute resolution testing will be performed by the Engineer in accordance with the Department's QA Program for Materials.

Should the Department be unable to validate the Contractor's acceptance test result(s) for a lot of material, the Engineer will use results from verification testing and re-calculate the pay adjustment for that lot. The Contractor may request to initiate the dispute resolution process in writing within 24 hours of receiving the adjustment and must include supporting documentation or test results to justify the request.

Replace Table M.04.03-1 with the following:

**TABLE M.04.03-1: Curb Mix Acceptance Test Procedures**

Protocol	Reference	Description
1	AASHTO T 30(M)	Mechanical Analysis of Extracted Aggregate
2	AASHTO R 97	Sampling of Bituminous Concrete
3	AASHTO T 308	Binder Content by Ignition Oven Method (adjusted for aggregate correction factor)
4	AASHTO T 209(M) <sup>(2)</sup>	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
5	AASHTO T 312 <sup>(2)</sup>	<sup>(1)</sup> Superpave Gyratory Molds Compacted to N <sub>des</sub>
6	AASHTO T 329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method

Replace Table M.04.03-2 with the following:

**TABLE M.04.03-2:  
Superpave Acceptance Testing Frequency per Type/Level/Plant for Non-PWL Lots**

Daily Quantity Produced in Tons (Lot)	Number of Sub Lots/Tests
0 to 125	0, Unless requested by the Engineer
126 to 500	1
501 to 1,000	2
1,001 to 1,500	3
1,501 or greater	1 per 500 tons or portions thereof

Replace Table M.04.03-3 with the following:

**TABLE M.04.03-3: Superpave Acceptance Testing Procedures**

Protocol	Procedure	Description
1	AASHTO R 97	Sampling of bituminous concrete
2	AASHTO R 47	Reducing samples to testing size
3	AASHTO T 308	Binder content by ignition oven method (adjusted for aggregate correction factor)
4	AASHTO T 30(M)	Gradation of extracted aggregate for bituminous concrete mixture
5	AASHTO T 312	<sup>(1)</sup> Superpave gyratory molds compacted to N <sub>des</sub>
6	AASHTO T 166	<sup>(2)</sup> Bulk specific gravity of bituminous concrete
7	AASHTO R 35	<sup>(2)</sup> Air voids, VMA
8	AASHTO T 209(M)	Maximum specific gravity of bituminous concrete (average of 2 tests)
9	AASHTO T 329	Moisture content of bituminous concrete

**SECTION M.07  
PAINT****M.07.01—General for All Paints and Enamels****M.07.02—Coating Systems for Structural Steel****M.07.03 through M.07.19—Vacant****M.07.20—Waterborne Pavement Marking Paint****M.07.21—Hot-Applied Waterborne Pavement Marking Paint****M.07.22—Epoxy Resin Pavement Markings****M.07.23—Vacant****M.07.24—Preformed Black Line Mask Pavement Marking Tape****M.07.25—Vacant****M.07.30—Glass Beads****M.07.01—General for All Paints and Enamels:**

**1. Paints and enamels** shall consist of pigments of the required fineness and composition, ground in the required vehicle by a suitable grinding machine to the required fineness. All pigments, resins, oils, thinners and driers shall be free from adulterants.

**2. Proportions:** All proportions in formulas are by weight unless otherwise specified.

**3. Fineness:** All pigments, except aluminum, unless otherwise specified, shall be finely ground with 100% passing the No. 200 sieve; with no less than 97% passing the No. 325 sieve.

**4. Curdling, Livering, Leveling:** The paint or enamel shall not liver or curdle. The pigment shall remain in suspension in a satisfactory manner through the expected shelf life specified on the label. The enamel type paints shall level properly and not show brush marks.

**5. Colors:** All paints and enamels shall be matched to the Department's standard shades.

**6. Time of Drying:** All paints or enamels, unless otherwise specified, shall dry to full gloss in not more than 18 hours.

**7. Weight per Gallon:** The weight per gallon of all paints and enamels shall be determined at 77°F.

**8. Shipping:** All paints and enamels shall be shipped in containers plainly marked with the name, net weight and volume of paint or enamel content. The manufacturer's name, address, date and lot number shall be marked on every package.

**9. Samples, Sampling, and Testing:** The manufacturer shall supply a Certified Test Report per lot for any pigment, oil, resin, thinner, drier or paint. When a portion of the lot is delivered, a Material Certificate is required. Upon request by the Engineer, the manufacturer shall submit a sample in accordance with the latest edition of the Materials Testing Manual's "[Minimum Schedule for Acceptance Testing](#)."

Sampling and testing shall be performed in accordance with ASTM, Federal Standards, or by methods established by the Department.

**M.07.02—Coating Systems for Structural Steel:** The coating system used shall be specified in the Contract and shall be selected from the [Northeast Protective Coating Committee's](#) (NEPCOAT's) Specification Criteria for Protective Coatings qualified products list.

Color: The color of the topcoat material shall be as noted on the plans ([AMS-STD-595 Color Number](#)).

Packaging and Labeling of Coating Material: The container shall be designed to store the specific coating material. Each container of coating material shall bear a label that identifies the name of the coating manufacturer, the name of the product, the lot and batch numbers, the date of manufacture and the shelf life expiration date. The label shall also include complete specific instructions for opening the container and for mixing, thinning, and applying the coating material contained therein. If the coating material cannot be positively identified from the label on the container, it shall not be used.

Delivery: Coating material shall be furnished in the manufacturer's original sealed and undamaged container.

Control of Materials: For each coating material, a Materials Certificate shall be submitted in conformance with 1.06.07. The Material Certificate shall indicate compliance with NEPCOAT Acceptance Criteria for Protective Coatings, List A or B.

**M.07.03 through M.07.19—Vacant**

**M.07.20—Waterborne Pavement-Marking Paint:** Pavement-marking paint shall be waterborne paint and shall be white or yellow, depending on its use, for application on bituminous concrete and Portland cement concrete pavement. This paint shall be compatible with the stripe-painting equipment to be used on

the Project. All requirements shall be as specified in M.07.21, except as follows:

1. Total nonvolatile compounds shall not be less than 70% by weight.
2. Pigment shall be 50 to 60% by weight.
3. Drying time for no-pick-up shall be 15 minutes or less when tested in accordance with ASTM D711.
4. The Contractor shall provide a Materials Certificate in accordance with 1.06.07 for each portion of a batch or lot delivered to the Project site.

**M.07.21—Hot-Applied Waterborne Pavement-Marking Paint:** Fast-drying waterborne pavement-marking paint to be applied on bituminous concrete and Portland cement concrete pavements shall be the color specified on the plans. This paint shall be capable of being applied with stripe-painting equipment at an application temperature of 130 to 145°F and shall have good spraying characteristics. The Contractor shall provide a Materials Certificate in accordance with 1.06.07 for each portion of a batch or lot delivered to the Project site.

**General:** Specifications and publications that apply are as follows:

- FS TT-P-1952 - Paint, Traffic and Air Field Marking, Waterborne
- Federal Test Method Standard (FTMS) No.141 - Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing
- **The MUTCD**

**ASTM Standards:**

- D211 - Specifications for Chrome Yellow and Chrome Orange Pigments
- D476 - Classification for Dry Pigmentary for Titanium Dioxide Pigments

**Detailed Requirements, Formulation and Manufacture:** The paint shall be formulated and manufactured from first-grade raw materials and shall be free from defects and imperfections. The materials shall not exhibit settling or jellying after storage in the sealed containers upon receipt. The paint shall provide the proper anchorage, refraction and reflection for the finished glass spheres when applied as specified.

**Composition:** The composition of the paint material shall meet the requirements of any applicable Federal, State or Local regulation for products of this type and shall meet the following requirements:

1. Paint shall not contain more than 0.06% lead when tested in accordance with ASTM D3335
2. Total nonvolatile organic compounds shall be a minimum of 76% by weight
3. Pigment shall be 58 to 63% by weight when tested in accordance with ASTM D3723
4. Resin solids shall be composed of 100% acrylic emulsion polymer
5. Volatile organic compounds shall not exceed 1.25 lb./gal. excluding water when tested in accordance with ASTM D2369
6. Flash Point: Closed-cup flash point shall not be less than 145°F
7. Density: Weight per gallon shall not be less than 12.5 lb./gal. when tested in accordance with ASTM D1475

**Viscosity:** The consistency of the paint shall not be less than 80, nor more than 90 Krebs units when tested in accordance with ASTM D562.

**Flexibility:** The paint shall not show cracking or flaking when tested in accordance with ASTM D522. The panels shall be lightly buffed with steel wool and thoroughly cleaned with solvent before being used for tests.

**Dry Opacity:** Both white and yellow paints shall have a minimum contrast ratio of 0.96 when tested in accordance with ASTM D2805. Contrast ratio shall be determined by applying a wet film thickness of 0.005 inch to a standard hiding-power chart. After drying, the black- and- white-reflectance values shall be determined using a suitable reflectometer and the contrast ratio determined.

**Bleeding:** The paints shall have a minimum bleeding ratio of 0.97 when tested in accordance with FS TT-P-1952.

**Abrasion Resistance:** No less than 210 liters of sand shall be required to remove paint film when tested in accordance with FS TT-P-1952.

**Color:** The paint shall not discolor in sunlight and shall maintain colorfastness throughout its life. Color determination shall be made without beads, after a minimum of 24 hours. **Paint color shall be in accordance with the MUTCD.**

**Glass Bead Adhesion:** The paint with glass beads conforming to M.07.30, applied at the rate of 6.0 lb./gal. of paint, shall require not less than 150 liters of sand to remove paint film and glass beads.

**Scrub Resistance:** The paint shall pass 300 cycles minimum when tested in accordance with ASTM D2486.

**Drying Time:** Drying time to no pick-up shall be 3 minutes or less when tested in accordance with ASTM D711.

**M.07.22—Epoxy Resin Pavement Markings:**

**General Requirements:**

**Identification:** Each container must be labeled with the following information: Name and address of manufacturer, production batch number, date of manufacture, grade name and/or identification number, type of material, number of gallons, Contract number, directions for mixing and application.

**Certification:** The Contractor shall provide a Material Certificate in accordance with 1.06.07 for each portion of a batch or lot delivered to the Site.

**Detailed Requirements:**

(a) **Epoxy Resin Material:** The material shall be composed of epoxy resins and pigments only. The white and the yellow epoxy resin materials shall be composed of approved materials and be lead- and chromium-free.

(b) **Composition:**

WHITE (percent by weight)	YELLOW (percent by weight)
20% ± 2% Titanium Dioxide (ASTM D476 Type III)	
80% ± 2% Epoxy Resins	75% ± 2% Epoxy Resins

(c) **Color:** The white material shall be in accordance with the MUTCD, when the material is placed in a type EH weatherometer for a period of 500 hours and weathered according to ASTM G152. The yellow material shall be in accordance with the MUTCD.

(d) **Adhesion Capabilities:** When the adhesion of the material to Portland cement concrete is tested in accordance with AASHTO T 237, the failure of the system must take place in the concrete.

(e) **Abrasion Resistance:** When the abrasion resistance of the material is tested according to ASTM D4060 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82.

(f) **Hardness:** The Type D durometer hardness of the material shall be not less than 75 nor more than 90 when tested in accordance with ASTM D2240 after the material has cured for 72 hours at 73°F ± 3.5°F.

(g) **Tensile Strength:** The tensile strength of the material, when tested in accordance with ASTM D638, shall not be less than 6,000 psi after 72 hours cure at 73°F ± 3.5°F.

(h) **Compressive Strength:** The compressive strength of the material, when tested in accordance with ASTM D695, shall not be less than 12,000 psi after 72 hours cure at 73°F ± 3.5°F.

(i) **Shelf Life:** The individual components shall not require mixing prior to use when stored for a period of 12 months.

(j) **Glass Beads:** The glass beads shall meet the requirements of M.07.30.

**M.07.23—Vacant**

**M.07.24—Preformed Black-Line Mask Pavement-Marking Tape:**

**General Requirements:** The preformed, patterned black-line mask pavement-marking tape shall consist of a matte black, non-reflective tape in widths or sizes sufficiently large to mask the existing markings which are to be temporarily covered.

The patterned masking tape shall be pre-coated with a pressure sensitive adhesive and shall be capable of being adhered to existing markings, on bituminous concrete pavement or Portland cement concrete in accordance with the manufacturer's instructions without the use of heat, solvents or other additional adhesives, and shall be immediately ready for traffic use after application. The Contractor shall identify equipment necessary for proper application and removal, and make recommendations for application that will assure effective product performance.

The preformed, patterned black-line masking pavement-marking tape shall be suitable for use for 1 year after the date of receipt when stored in accordance with the manufacturer's recommendations.

**Detailed Requirements:**

(a) **Composition:** The non-reflective, patterned black-line mask pavement-marking tape shall not contain metallic foil and shall consist of a mixture of high quality polymeric materials, pigments and

inorganic fillers distributed throughout its base cross-sectional area, with a matte black non-reflective top layer. The patterned surface shall have a minimum of 20% of the surface area raised and coated with non-skid particles. The channels between the raised areas shall be substantially free of particles. The film shall be pre-coated with a pressure sensitive adhesive. A non-metallic medium shall be incorporated to facilitate removal.

- (b) **Skid Resistance:** The surface of the patterned, non-reflective black-line mask pavement-marking tape shall provide an initial average skid resistance value of 60 British Pendulum Number when tested in accordance with ASTM E303.
- (c) **Thickness:** The patterned material, without adhesive, shall have a minimum thickness of 0.065 inch at the thickest portion of the patterned cross-section and a minimum thickness of 0.02 inch at the thinnest portion of the cross-section.
- (d) **Adhesion:** The black-line mask pavement-marking tape shall adhere to the pavement and existing pavement markings under climatic and traffic conditions normally encountered in the construction work zone.
- (e) **Removability:** The black-line mask pavement-marking tape shall be capable of being removed after its intended use without the use of heat, solvents, grinding, sand or water blasting.

**M.07.25—Vacant**

**M.07.30—Glass Beads:** The glass beads shall meet the requirements of AASHTO M 247, Type 1 or 4, depending on application.

**SECTION M.15  
HIGHWAY ILLUMINATION**

*In the list of Articles, change the title of Article M.15.16 as follows:*

| **M.15.16—Vacant**

*Replace Article M.15.16 with the following:*

| **M.15.16—Vacant**



SECTION M.16  
TRAFFIC CONTROL SIGNALS

*In the list of Articles, change the title of Articles M.16.08 and M.16.13 as follows:*

**M.16.08—Pedestrian Pushbutton**  
**M.16.13—Vacant**

*Replace Subarticle M.16.06-9 in its entirety as follows:*

**M.16.06—Traffic Signals:**

**9. Painting:** All surfaces of the signal housing, housing door, visors, inside and out, the back surface of the backplate and all brackets and hardware shall be cleaned and coated with a Primer conforming to FS TT-P-1757. The surfaces shall then be finished with 3 coats of infrared oven baked paint applied by the manufacturer, before assembly.

**First Coat:** The primer shall be iron oxide baking primer and shall meet or exceed the requirements of FS TT-P-664.

**Second Coat:** Shall be light gray exterior baking enamel and shall comply with FS TT-E-489, either No. 16251, No. 16314, or No. 16376 Gray.

**Third Coat:** Shall be exterior baked enamel and shall comply with FS A-A-2962.

The housing, housing door, the back surface of the backplate, and all brackets and hardware shall be painted black by the manufacturer. The color shall be Aerospace Material Specification – Standard 595 (AMS-STD-595) Color No. 17038.

At intersections at Merritt Parkway interchanges, the housing, housing door, the back surface of the backplate, and all brackets and hardware shall be painted black by the manufacturer. The color shall be AMS-STD-595 Color No. 14056.

The outside of the visors shall have a dull black finish that meets FS TT-E-527.

The inside of the visors and front surface of the backplate per the MUTCD shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background. The dull black finish shall meet FS TT-E-527.

*Replace Subarticle M.16.07-C-2 in its entirety with the following:*

**M.16.07—Pedestrian Signal:**

**2. LED:** The optical unit shall consist of multiple LED light sources and a regulated power supply assembled as a sealed unit. The diodes shall be arranged to display a full-hand symbol side by side with a full pedestrian symbol. The optical unit shall fit into a standard pedestrian signal housing so that it may be installed into an existing incandescent pedestrian signal. The LED optical unit shall be capable of maintaining message symbol integrity despite any partial loss of LEDs. The beam color shall match that of the incandescent message: walking symbol - lunar white, hand - Portland orange. The beam pattern and intensity shall meet ITE specifications. The intensity may not degrade by more than 10% per annum. The optical unit shall be warranted by the manufacturer for a period of 5 years.

Electrical Requirements:

- Input Voltage: 89 VAC to 135 VAC
- Wattage: 15 Watts
- Input Impedance at 60 Hz must satisfy all conflict monitor requirements.
- A regulated power supply shall be engineered to protect the LEDs from electrical surges and transient voltages.

*Replace Subarticles M.16.07-E and M.16.07-F with the following:*

**E. Hardware:** All exposed screws and fasteners shall be stainless steel. All internal screws, fasteners and metal parts shall be stainless steel, non-corrosible materials; or cadmium-plated ferrous materials.

**F. Painting:** All surfaces of the signal housing, door, all brackets and hardware, and visors, inside and out, shall be finished with 3 coats of infrared-oven- baked paint applied by the manufacturer before

assembly. All brackets and hardware shall be painted **black** by the manufacturer. The color shall be **AMS-STD-595 Color No. 17038**.

**First Coat:** The primer shall be iron oxide baking primer and shall meet or exceed the requirements of FS TT-P-645.

**Second Coat:** Shall be light gray exterior baking enamel and shall meet the requirements of FS TT-E-489, No. 16251, No. 16314 or No. 16376 gray.

**Third Coat:** Shall be exterior-baking enamel and shall meet the requirements of FS A-A-2962.

The housing, housing door, outside of the visor, and all brackets and hardware shall be painted black by the manufacturer. The color shall be **AMS-STD-595 Color No. 17038**.

At intersections at Merritt Parkway interchanges, the housing, housing door, outside of visor, and all brackets and hardware shall be painted dark green by the manufacturer. The color shall be **AMS-STD-595 Color No. 14056**.

The inside of the visor shall have a dull black finish to minimize light reflection and to increase contrast between the signal indication and its background. The dull black finish shall meet FS TT-E-527.

*In Article M.16.08, replace the "Painting" Subarticle with the following:*

**M.16.08—Pedestrian Pushbutton:**

**Painting:** All surfaces of the unit shall be finished with 3 coats of infrared oven-baked paint **applied by the manufacturer**, before assembly.

**First Coat:** Primer, shall be **iron** oxide baking primer and shall meet **or** exceed performance specification of FS TT-P-664.

**Second Coat:** Gray Enamel, shall be lusterless and shall comply with FS TT-E-527.

**Third Coat:** **Black** Enamel, shall be **BLACK** exterior-baking enamel and shall meet the requirements of FS A-A 2962. The color shall be **AMS-STD-595 Color No. 17038**. **At intersections at Merritt Parkway interchanges, the color shall be AMS-STD-595 Color No. 14062.**

*Replace Article M.16.13 with the following:*

**M.16.13—Vacant**

*In Article M.16.09, replace the "Painting" Subarticle with the following:*

**M.16.09—Controllers:**

**Painting:** All outside surfaces of the cabinet and door shall be finished with 3 coats of infrared oven-baked paint before assembly.

**First Coat:** The primer shall be **iron** oxide baking primer and shall meet or exceed FS TT-P-636.

**Second and Third Coats:** The second and third coats will be aluminum paint meeting the requirements of FS TT-P-320, and Federal Test Method Standard 141. The color shall be **AMS-STD-595 Color No. 17178**.

*Replace the last paragraph in Article M.16.17 with the following:*

**M.16.17—Illuminated Signs:**

A weatherproof housing of the dimensions specified on the plans shall be provided to enclose the fiber optic module assembly with bifurcated output fiber bundles, color filters, light sources and transformers. The sign housing frame shall be manufactured from extruded aluminum, 6061-T6, ASTM B221. This assembly shall be provided with a hinged access door. The hinge shall be stainless steel piano type hinge mounted on the left side of the door. All external hardware shall be stainless steel, internal hardware shall be corrosion resistant. The housing shall have a minimum of four 1 inch diameter drainage holes. The entire front face of the sign shall be protected by a 1/8 inch thick sheet of clear polycarbonate mounted in the door frame. The housing shall be Federal **Black** according to **AMS-STD-595 Color No. 17038** and the aluminum front panel shall be flat black according to **AMS-STD-595 Color No. 37031** unless otherwise specified on the plans. **At intersections at Merritt Parkway interchanges, the housing shall be AMS-STD-595 Color No. 14062.** The complete sign assembly shall not weigh more than 150 pounds.

The legend displayed for an "Overhead Illuminated 'Stop Ahead' Sign" shall consist of letters 12 inches high and approximately 9 inches wide formed by fiber optic bundles spaced approximately 1 1/2 inches apart. The sign shall be supplied completely assembled and ready to be checked out.