Supplemental Specifications - Section 900

of the

Standard Specifications for Road and Bridge Construction

January 1, 2015

Subsection 901.01 (pg. 918), 5-14-18; Add the following sentence as the second paragraph of the subsection:

Provide hydraulic cement, selected from the Department’s QPL, which conforms to the following for the kind and type specified or allowed:

- Portland cement ................................................ AASHTO M 85
- Portland blast-furnace slag cement (Type IS) AASHTO M 240
- Portland Pozzolan cement (Type IP) .............. AASHTO M 240
- Portland limestone cement (Type IL) ............ AASHTO M 240

The maximum allowable equivalent alkalies is 0.60% for all cements and blended cements used in concrete riding surfaces with aggregates meeting the requirements of 903.24. This includes Class CP, A Paving, and DS concrete mixtures.

Subsection 901.01 (pg. 918), 5-13-19; Hydraulic Cement; Revise 1st paragraph:

Provide hydraulic cement, selected from the Department’s QPL Producer List that conforms to the following for the kind and type specified or allowed:

Subsection 903.01 - Table 903.01-1 (pg. 920), 5-18-15; Replace Note (1) with the following:

“(1) If the fine aggregate is manufactured from crushed stone and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 5%.”
Subsection 903.01 (pg. 920), 5-13-19; Fine Aggregate for Concrete; Revise No. 3:

3. Process fine aggregate, manufactured from limestone or dolomite, from material that has been scalped to remove quarry fines and that has a percentage of wear, as determined in accordance with AASHTO T 96, of not greater than 40. The fine aggregate, when subjected to five cycles of Sodium Soundness test, AASHTO T 104, shall have a weighted loss of not more than 10%. Provide fine aggregate meeting the quality requirements in 903.25.

Subsection 903.01 - Table 903.01-1, Table 903.01-2 (pg. 921), 5-15-17; replace Tables 903.01-1 and 903.01-2 with the following Tables:

Table 903.01-1: Limits of Deleterious Substances in Fine Aggregate for Concrete

<table>
<thead>
<tr>
<th>Substance</th>
<th>Maximum Permissible Limits Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay Lumps</td>
<td>0.5</td>
</tr>
<tr>
<td>Coal and Lignite</td>
<td>0.5</td>
</tr>
<tr>
<td>Material Passing the No. 200 Sieve (1)(3)</td>
<td>3.0</td>
</tr>
<tr>
<td>Other deleterious substances (such as shale, alkali, mica, coated/grains, soft and flaky particles) (1)(2)</td>
<td>3.0</td>
</tr>
</tbody>
</table>

(1) If the fine aggregate is manufactured from crushed stone and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 10%.

(2) Determine other organic impurities according to AASHTO T 267.

(3) If the fine aggregate is manufactured from crushed gravel and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 3.5%.

Table 903.01-2: Gradation Requirements for Fine Aggregate

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Total Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>95-100</td>
</tr>
<tr>
<td>No. 16</td>
<td>50-90</td>
</tr>
<tr>
<td>No. 50</td>
<td>5-35</td>
</tr>
<tr>
<td>No. 100</td>
<td>0-20</td>
</tr>
<tr>
<td>No. 200 (1)</td>
<td>0-3</td>
</tr>
</tbody>
</table>

(1) If the fine aggregate is manufactured from crushed stone and if material finer than the No. 200 sieve consists of the dust of fracture, essentially free from clay or shale, this limit may be increased to 10%.
Subsection 903.02 (pg. 921), 5-13-19; Fine Aggregate for Mortar; Revise 1st paragraph:

Provide mortar sand that conforms to AASHTO M 45, meets the quality requirements in 903.25, and that is uniformly graded from coarse to fine within the limits specified in Table 903.02-1.

Subsection 903.03 (pg. 922-923) 11-16-15; Coarse Aggregate for Concrete, modify the 4th and 5th paragraphs, update Table 903.03-1: Coarse Aggregate Sizes to the following:

“Coarse aggregate in Portland cement concrete bridge decks and overlays on interstates and four or more lane highways consisting of Size No. 57 shall meet 903.24.

The coarse aggregates for travel lanes and bridge decks shall be crushed and consist of stone, slag, gravel, quartzite, gneiss, or combination thereof with an absorption of plus 4 material not to exceed 5%. Do not use uncrushed gravel, pea gravel, or any other uncrushed particles. Crushed gravel, if used, shall consist of siliceous washed particles after processing, of which at least 70% by count of the material retained on the No. 4 sieve contains a minimum of two fractured faces. One face shall be fractured for the approximate average diameter or thickness of the particle.”

<table>
<thead>
<tr>
<th>Application</th>
<th>Coarse Aggregate Size (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural concrete</td>
<td>No. 57</td>
</tr>
<tr>
<td>Self-Consolidating concrete</td>
<td>Maximum-No.67</td>
</tr>
<tr>
<td>Prestressed concrete</td>
<td>No. 57 or 67</td>
</tr>
<tr>
<td>Precast concrete</td>
<td>Any size fraction</td>
</tr>
<tr>
<td>Concrete curbing placed by machine-extrusion methods</td>
<td>No. 7, 57, 67, or 78</td>
</tr>
<tr>
<td>Cement treated permeable base</td>
<td>No. 57</td>
</tr>
</tbody>
</table>

(1) Gradation shall conform to 903.22.

Aggregate shall meet the quality requirements specified below.

Subsection 903.03 (pg. 922) 5-15-17; Coarse Aggregate for Concrete, add the following as the 4th paragraph:

“Coarse aggregate in two-lift composite pavements shall consist of Size No. 467 in the lower lift, graded as specified in 903.22. Coarse aggregate in the upper lift shall be Size No. 57 or 67 graded as specified in 903.22 and shall meet 903.24 riding surface requirements.”
Subsection 903.03 (pg. 923), 5-13-19; Coarse Aggregate for Concrete: Revise 6th paragraph and Table 903.03-1:

For other uses of concrete, provide coarse aggregate of the sizes specified in Table 903.03-1, or as otherwise shown or directed. If proposing to use a coarse aggregate size not specified in Table 903-03.1 or shown on the plans, submit a written request to Regional Materials and Tests explaining the necessity for the change.

Table 903.03-1: Coarse Aggregate Sizes

<table>
<thead>
<tr>
<th>Application</th>
<th>Coarse Aggregate Size (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural concrete</td>
<td>No. 57</td>
</tr>
<tr>
<td>Self-Consolidating Concrete</td>
<td>Maximum No. 67</td>
</tr>
<tr>
<td>Prestressed concrete</td>
<td>No. 57 or 67</td>
</tr>
<tr>
<td>Precast concrete</td>
<td>Any size fraction</td>
</tr>
<tr>
<td>Concrete for Bridge Repair</td>
<td>No. 7, 57, 67, or 78</td>
</tr>
<tr>
<td>Concrete curbing placed by machine-</td>
<td>No. 7, 57, 67, or 78</td>
</tr>
<tr>
<td>extrusion methods</td>
<td></td>
</tr>
<tr>
<td>Cement treated permeable base (2)</td>
<td>No. 57</td>
</tr>
</tbody>
</table>

(1) Gradation shall conform to 903.22.
(2) Aggregate shall meet the quality requirements specified below.

Subsection 903.03-2 (pg. 924) 5-15-17; Revise Table 903.03-2: Limits of Deleterious Substances in Coarse Aggregate for Concrete, update Material passing No. 200 Sieve and Footnote 2:

Table 903.03-2: Limits of Deleterious Substances in Coarse Aggregate for Concrete

<table>
<thead>
<tr>
<th>Substance</th>
<th>Maximum Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soft or non-durable fragments (fragments that are structurally weak such</td>
<td>3</td>
</tr>
<tr>
<td>as shale, soft sandstone, limonite concretions, gypsum, weathered schist,</td>
<td></td>
</tr>
<tr>
<td>or cemented gravel), and organic impurities as determined by AASHTO T 267</td>
<td></td>
</tr>
<tr>
<td>Coal and lignite (1)</td>
<td>1</td>
</tr>
<tr>
<td>Clay lumps (1)</td>
<td>0.25</td>
</tr>
<tr>
<td>Material passing the No. 200 sieve (1)(2)</td>
<td>1.5</td>
</tr>
<tr>
<td>Thin or elongated pieces (length greater than 5 times average thickness)</td>
<td>10</td>
</tr>
<tr>
<td>Other local deleterious substances (1)</td>
<td>1</td>
</tr>
</tbody>
</table>

(1) The sum of the percentages of these materials (i.e., soft or non-durable fragments, coal and lignite, clay lumps, material passing the No. 200 sieve, and other local deleterious substances) shall not exceed 5.0.
(2) For crushed aggregate, if all the material finer than the No. 200 sieve, as determined in accordance with AASHTO T 11, consists of the dust of fracture, essentially free of clay or shale, this limit may be increased to 2.0.
Subsection 903.03 B (pg. 924), 5-13-19; **Soundness**; Revise subsection:

B. **Soundness Quality Requirements**

When the coarse aggregate is subjected to five alternations of the sodium sulfate soundness test in accordance with AASHTO T 104, the weighted percentage of loss shall not exceed 9. The Engineer may accept coarse aggregate failing to meet this requirement if it can be shown by evidence satisfactory to the Engineer that concrete of comparable proportions made from the same source has been exposed to weathering under conditions similar to those occurring at the site of the structure for a period of at least 10 years without appreciable disintegration.

The option regarding alternate freeze-thaw tests for soundness is waived.

The percentage of wear as determined in accordance with AASHTO T 96 shall not exceed 40. The coarse aggregate shall meet the quality requirements in 903.25.

Subsection 903.04 (pg.925), 5-13-19; **Aggregate for Lean Concrete Base**; Remove entire subsection:

Provide crushed limestone, crushed slag, or crushed or uncrushed gravel meeting the requirements of 903.05 for Type B, Grading D. The aggregate may be a “crusher or pit run” or may be sized into two or more sizes. If the material is “crusher or pit run,” use methods that will prevent segregation during stockpiling and handling.

Subsection 903.05 – Aggregate for Mineral Aggregate Base and Surface Courses (pg. 925) 5-15-17; add reference to subsection 903.05 C. in the second paragraph of subsection A.:

“903.05 Aggregate for Mineral Aggregate Base and Surface Courses

Provide crushed stone, crushed slag, crushed or uncrushed gravel, or crushed or uncrushed chert that may be blended with crushed recycled concrete or screened reclaimed asphalt pavement (RAP), together with material such as manufactured sand or other fine materials that are either naturally contained or added as needed to conform to these Specifications.

Provide aggregate of Types A and B, as specified below.

A. **Type A Aggregate**

Provide hard, durable particles or fragments of stone, slag, gravel, or chert, and other finely divided mineral matter.

The Contractor may use recycled concrete aggregate per 903.05 C. or reclaimed asphalt pavement, at a maximum rate of 25% by weight, for Type A aggregate, provided the combined aggregate blend meets all the requirements specified below. Crush and screen the recycled concrete and asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the recycled stockpiles free of bricks, steel, wood, and all other deleterious materials.”
Subsection 903.05 A (pg. 925-926), 5-13-19; Type A Aggregate; Revise Nos. 1, 2, & 3, & Remove Table 903.05-01:

1. Crushed Stone. Provide stone free of silt and clay and having a coarse aggregate portion (retained on the No. 4 sieve) that conforms to the quality requirements specified in Table 903.05-1.903.25.

Table 903.05-1: Quality Requirements for Type A Aggregate

<table>
<thead>
<tr>
<th>Aggregate Property</th>
<th>Test Method</th>
<th>Maximum Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Wear</td>
<td>AASHTO T-96</td>
<td>50</td>
</tr>
<tr>
<td>Sodium Sulfate Soundness Loss (5 cycles)</td>
<td>AASHTO T-104</td>
<td>15</td>
</tr>
</tbody>
</table>

2. Crushed Slag. Provide material that:
   a. Is free of silt and clay,
   b. Meets the quality requirements in Table 903.05-1903.25,
   c. Is reasonably uniform in density, and
   d. Has a dry-rodded weight of at least 70 pounds per cubic foot.

3. Gravel and Chert. Screen gravel and chert. All oversize material may be crushed and fed uniformly back over the screen. The coarse aggregate portion shall conform to the quality requirements specified in Table 903.05-1903.25. The portion of the material passing the No. 40 sieve shall be non-plastic, or shall have a liquid limit of not greater than 30 and a plasticity index of not more than eight.

Subsection 903.05 – Aggregate for Mineral Aggregate Base and Surface Courses (pg. 925-926) 5-15-17; add reference to subsection 903.05 C. in the second paragraph of subsection B.:

“For Provide crushed or uncrushed gravel, crushed or uncrushed chert, crushed stone or crushed slag, and other finely divided particles. The Contractor may use recycled concrete aggregate per 903.05 C. or reclaimed asphalt pavement, at a maximum rate of 30% by weight, for Type B aggregate, provided the combined aggregate blend meets all the requirements specified below. Crush and screen recycled concrete and asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the recycled stockpiles free of bricks, steel, wood, and all other deleterious materials.”

Subsection 903.05 – B. Type B Aggregate (pg. 927), 5-18-15; Replace the 1st paragraph of subsection 3. With the following:

“3. Do not use material having clay content greater than 12%, as determined by hydrometer analysis performed in accordance with AASHTO T 88. Material may be used having a clay content exceeding 12% if a plasticity index-fines product does not exceed 3 when calculated by the following formula”
Subsection 903.05 B (pg. 927), 5-13-19; Type B Aggregate; Revise 3rd paragraph:

Provide Type B aggregate meeting the same quality requirements as specified in 903.05.A for Type A aggregate, with the following exceptions:

1. The sodium sulfate soundness loss shall not exceed 20. The aggregate shall meet the quality requirements in 903.25 for Mineral Aggregate Base – Type B.

2. Screen Type B aggregate. Oversize materials may be wasted or crushed and returned over the screen and uniformly blended with the other material.

3. Do not use material having a clay content greater than 12%, as determined by hydrometer analysis performed in accordance with AASHTO T 88. The Contractor may use material having a clay content not exceeding 12% if a plasticity index-fines product does not exceed 3 when calculated by the following formula:

\[
\text{% Passing No. 40 sieve} \times \text{P. I. of Minus No. 40 Material} \over 100
\]

Subsection 903.05 – Aggregate for Mineral Aggregate Base and Surface Courses (pg. 928) 5-15-17; add section C to the bottom:

C. Reclaimed Concrete Aggregate. Provide material comprised of concrete reclaimed from the demolition of a concrete structure or pavement. Reclaimed Concrete Aggregate may only be used as a mineral aggregate base course, subbase or shoulder course. The material shall be free of any materials classified as Solid or Hazardous Waste, especially asbestos, lead and mercury, with test results submitted by the contractor to the Project Supervisor. These test results shall be certified and notarized. The percentage of wear as determined in accordance with AASHTO T 96 shall not exceed 50. Deleterious substances shall be kept to a minimum, and may not be higher than the amounts listed on Table 903.05-3.

| Material                        | Maximum Permissible Limits
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick</td>
<td>5</td>
</tr>
<tr>
<td>Bituminous Concrete Materials</td>
<td>5</td>
</tr>
<tr>
<td>Weathered Rock</td>
<td>2</td>
</tr>
<tr>
<td>Wood</td>
<td>0.1</td>
</tr>
<tr>
<td>Metals</td>
<td>0.1</td>
</tr>
</tbody>
</table>

The gradations of the coarse and fine fractions of aggregate shall be such that, when combined in proper proportions, the resultant mixture will fall within the grading specified in Table 903.05-4.
Table 903.05-4: RCA Grading Tolerances

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Total Percent Passing per Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½ inch</td>
<td>100</td>
</tr>
<tr>
<td>1 inch</td>
<td>85-100</td>
</tr>
<tr>
<td>¾ inch</td>
<td>60-95</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>50-80</td>
</tr>
<tr>
<td>No. 4</td>
<td>40-65</td>
</tr>
<tr>
<td>No. 16</td>
<td>20-40</td>
</tr>
<tr>
<td>No. 100</td>
<td>5-18</td>
</tr>
</tbody>
</table>

Subsection 903.05 C (pg. 928), 5-13-19; **Reclaimed Concrete Aggregate**: Revise 1st paragraph:

C. Reclaimed Concrete Aggregate

Provide material comprised of concrete reclaimed from the demolition of a concrete structure or pavement. Reclaimed Concrete Aggregate may only be used as a mineral aggregate base course, subbase or shoulder course. The material shall be free of any materials classified as Solid or Hazardous Waste, especially asbestos, lead and mercury, with test results submitted by the contractor to the Project Supervisor. These test results shall be certified and notarized. The aggregate shall meet the quality requirements in 903.25, percentage of wear as determined in accordance with AASHTO T 96 shall not exceed 50. Deleterious substances shall be kept to a minimum, and may not be higher than the amounts listed on Table 903.05-3.

Subsection 903.06 A (pg. 929), 5-13-19; **Coarse Aggregate (retained on a No. 4 sieve)**; Revise 1st paragraph:

Provide crushed stone, crushed granite, crushed gravel, crushed slag, or a combination of these materials. This material shall conform to the quality requirements of ASTM D692 and the quality requirements of 903.25,c– except that the sodium sulfate soundness loss shall not exceed 9%, and the aggregate shall contain no more than 5% soft or nondurable particles.

Subsection 903.06 B (pg.929), 5-13-19; **Fine Aggregate (passing a No. 4 sieve)**; Revise 1st paragraph:

Provide limestone fines, natural sand, sand manufactured from stone, gravel, or slag, or combinations of these materials, consisting of hard, tough grains free from injurious amounts of deleterious substances. When subjected to five cycles of the sodium sulfate soundness test, the material shall have a weighted loss of not more than 12% The fine aggregate shall meet the quality requirements in 903.25. Do not use fine aggregate or screenings containing calcium sulfate (CaSO4/gypsum) if more than 5% of the material passing the No. 8 sieve is chemically composed of sulfur trioxide (SO3).
Subsection 903.06 - C. Combined Aggregate Grading (pg. 930) 11-16-15; add the following sentence at the end of the first paragraph:

“For mixtures including recycled asphalt pavement, RAP, and/or recycled asphalt shingles, RAS, stockpiles will not be considered as contributing to the required minimum of three stockpile sizes.”

Subsection 903.11 - Aggregate for Asphaltic Concrete Surface Coarses (Hot Mix) (pg. 934) 11-16-15; add the following sentence at the end of the first paragraph:

“For mixtures including recycled asphalt pavement, RAP, and/or recycled asphalt shingles, RAS, stockpiles will not be considered as contributing to the required minimum of three stockpile sizes.”

Subsection 903.11 (pg. 934) 11-16-15; A. Coarse Aggregate (retained on a No. 4 sieve), revise the 1st paragraph and subsection 3:

“Provide aggregate, consisting of crushed stone, crushed slag, crushed gravel, crushed granite, crushed quartzite, crushed gneiss, or natural combinations of these materials.

3. Combined aggregate shall consist of siliceous particles processed from washed material, of which at least 70% by count of the material retained on the No. 4 sieve shall have a minimum of two fractured faces, one of which must be fractured for the approximate average diameter or thickness of the particle. Do not add pea gravel or uncrushed particles. The absorption of the crushed aggregate retained on the No. 4 sieve shall not exceed 5% when tested in accordance with AASHTO T 85.”

Subsection 903.11 A (pg. 934), 5-13-19; Coarse Aggregate (retained on a No. 4 sieve); Revise paragraph and No. 1:

Provide aggregate, consisting of crushed stone, crushed slag, crushed gravel, crushed granite, crushed quartzite, crushed gneiss, or natural combinations of these materials. The coarse aggregate shall meet the quality physical requirements of ASTM D692, with the following exceptions and additions:

1. Sodium sulfate soundness loss shall not exceed 9%. The aggregate shall meet the quality requirements in 903.25.

Subsection 903.11 - A. Coarse Aggregate (retained on a No. 4 sieve) (pg. 934), 5-18-15; revise subsection 2. as follows:

“2. Material retained on the No. 4 sieve shall contain a maximum of 10% elongated pieces (length greater than five times the average thickness)”
Subsection 903.11 B (pg. 935), 5-13-19; Fine Aggregate (passing a No. 4 sieve); Revise No. 2:

2. When subjected to five cycles of sodium sulfate soundness test, the fine aggregate shall have a weighted loss of not more than 12%. Fine aggregate shall meet the quality requirements in 903.25.

Subsection 903.11 C. Combined Aggregate Grading (pg. 936) 10-8-18; Table 903.11-2 Revise Table to add TLE information:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Total Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grading D</td>
</tr>
<tr>
<td>3/4 inch</td>
<td>--</td>
</tr>
<tr>
<td>5/8 inch</td>
<td>100</td>
</tr>
<tr>
<td>1/2 inch</td>
<td>95-100</td>
</tr>
<tr>
<td>3/8 inch</td>
<td>80-93</td>
</tr>
<tr>
<td>No. 4</td>
<td>54-76</td>
</tr>
<tr>
<td>No. 8</td>
<td>35-57</td>
</tr>
<tr>
<td>No. 30</td>
<td>17-29</td>
</tr>
<tr>
<td>No. 50</td>
<td>10-18</td>
</tr>
<tr>
<td>No. 100</td>
<td>3-10</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-6.5</td>
</tr>
</tbody>
</table>

Subsection 903.11 C. 2. (pg. 937) Grading E, add TLE to the title:

“Grading E and TLE. When using Grading E as a surface for traffic lanes, 50% to 80% of the mineral aggregate shall be composed of crushed limestone, and the remaining 50% to 20% shall be natural sand, slag sand, sand manufactured from gravel or other approved non-skid aggregates, or any combination of these materials, with the following exceptions:

The sand percentage on the Job Mix Formula (JMF) shall range from 20% to 50%. However, if needed to meet or improve the specified design criteria, the Contractor may alter the limestone and sand percentage by 5% from the percentage shown on the original JMF. If altering the aggregate percentages shown on the original JMF, submit a revision of the original design showing the altered percentages of aggregate.
b. When using Grading E for surfacing of shoulders or other non-traffic lane construction, the mineral aggregate may be composed entirely of limestone, including Size No. 10 (screenings) and manufactured sand, but in no case shall the mineral aggregate for this construction consist of less than 50% limestone.

c. Recycled Asphalt Pavement (RAP) milled from Department or other State Highway Agency projects shall be assumed to contain 75% non-skid material.”

Subsection 903.11 C.3. (pg. 938), 6-27-16; revise the 1st paragraph of subsection C.3 to the following:

“3. Grading OGFC. A minimum of 75% of the aggregate shall meet the requirements specified in 903.24 for Surface Mixtures (Non-Skid Aggregates). The coarse aggregate shall have at least 90% crushed aggregate with two fractured faces and 100% with one fractured face as determined in accordance with ASTM D5821. The coarse aggregate shall have a LA Abrasion value of less than 40% and a maximum absorption of 3.0%.”

Subsection 903.11 (pg. 938), 12-2-16; Add the following to C. as subsection 5.:

“5. Grading C, CS, CW. The mixture shall meet all requirements of 903.06. When using Grading C, CS, or CW as a final riding surface for traffic lanes and the design ADT is greater than 1000, a minimum of 75% of the aggregate shall meet the requirements specified in 903.24 for Surface Mixtures (Polish-Resistant Aggregate) for the appropriate levels.”

Subsection 903.12 (pg. 938) 11-16-15; A. Aggregate for Slurry Seal, revise the 1st paragraph a A. as shown; delete the 2nd paragraph:

“The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in 903.24), meeting the requirements of ASTM D692, except the gradation shall be as specified in Table 903.12-1. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 45.

Subsection 903.12 A (pg. 938), 5-13-19; Aggregate for Slurry Seal; Revise 1st paragraph:

The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in 903.24), meeting the requirements of ASTM D692, except the gradation shall be as specified in Table 903.12-1. The aggregate shall meet the quality requirements in 903.25. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 45.

Subsection 903.12 (pg. 939) 11-16-15; B. Aggregate for Micro-Surface: modify the first paragraph, delete the second paragraph:

“The aggregate shall be crushed slag, crushed granite, or crushed stone (crushed stone as specified in 903.24) meeting the gradation limits specified in Table 903.12-2 and the physical properties of ASTM D692, except the percent of fractured pieces shall be 100. The aggregate
shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 65. Polish-resistant aggregates will not be required for leveling courses, provided they will be covered with riding surface mixtures.

Subsection 903.12 B (pg. 939), 5-13-19; Aggregate for Micro-surface: Revise 1st paragraph:

The aggregate shall be crushed slag, crushed-granite, or crushed stone (crushed stone as specified in 903.24) meeting the gradation limits specified in Table 903.12-2 and the physical properties of ASTM D692, except the percent of fractured pieces shall be 100. The aggregate shall have a minimum sand equivalent, as determined in accordance with AASHTO T 176, of 65. Polish-resistant aggregates will not be required for leveling courses, provided they will be covered with riding surface mixtures.

Subsection 903.12 (pg. 939) 5-15-17; B. Aggregate for Micro-Surface: Add the following as the 2nd paragraph:

“If blending aggregates from more than one source, use automated proportioning and blending equipment which has individual bins for each aggregate source used to produce a stockpile meeting the job mix formula gradation. Proportion and blending equipment shall be calibrated at the beginning of production. All aggregate sources shall meet the requirements of Table 903.24-1. Do not blend aggregates with a front end loader. Proportion the aggregate to produce a uniform gradation meeting the requirements specified in Table 903.12-2. The contractor shall provide a Type A laboratory as defined by 106.06 capable of verifying gradation at the location where blending occurs.”

Subsection 903.13 (pg. 940), 12-2-16; modify the last sentence of the 1st paragraph:

“Provide aggregate consisting of crushed stone, crushed slag, or crushed gravel, meeting the quality requirements of ASTM D692, except that at least 50% by count of crushed gravel aggregates shall have at least one fractured face. Crushed slag aggregate retained on the No. 4 sieve shall contain no more than 20% by weight of glassy particles. Provide aggregates meeting the requirements of 903.24 except, if ADT is less than 1000.”

Subsection 903.13 (pg. 940), 5-13-19; Aggregate for Bituminous Seal Coat; Revise 1st paragraph:

Provide aggregate consisting of crushed stone, crushed slag, or crushed gravel, meeting the quality physical requirements of ASTM D692, except that at least 50% by count of crushed gravel aggregates shall have at least one fractured face. The aggregate shall meet the quality requirements of 903.25. Crushed slag aggregate retained on the No. 4 sieve shall contain no more than 20% by weight of glassy particles. Provide aggregates meeting the requirements of 903.24 except, if ADT is less than 1000.
Subsection 903.15 (pg. 941), 5-15-17; revise the 3rd paragraph:

“The Contractor may use recycled concrete aggregate per 903.05 C. or reclaimed asphalt pavement (RAP), at a maximum rate of 25% by weight; provided the combined aggregate blend meets all the requirements specified above. If blending, crush and screen the recycled concrete and/or asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the reclaimed asphalt pavement stockpiles free of bricks, steel, wood, and all other deleterious materials. The virgin and reclaimed pavement blend shall meet the quality requirements specified in Table 903.05-1.”

Subsection 903.15 (pg.941), 5-13-19; Aggregate for Aggregate-Cement Base Course; Revise 3rd paragraph:

The Contractor may use recycled concrete aggregate per 903.05C or reclaimed asphalt pavement (RAP) may be used, at a maximum rate of 25% by weight, provided the combined aggregate blend meets all the requirements specified above. If blending, crush and screen the recycled concrete and/or asphalt to produce a uniform stockpile before blending it with the virgin material. Keep the reclaimed asphalt pavement stockpiles free of bricks, steel, wood, and all other deleterious materials. The virgin and reclaimed pavement blend shall meet the quality requirements specified in 903.25 Table 903.05-1.

Subsection 903.17 (pg. 941), 5-13-19; Aggregate for Underdrains; Revise 1st paragraph:

Provide crushed stone, crushed slag, or washed gravel meeting the quality-physical requirements of ASTM D692, the quality requirements of 903.25, and the gradation requirements specified for Size 6, 7, 8, 57, or 78 in 903.22.

Subsection 903.18 (pg. 942), 5-13-19; Aggregate for Sand-Asphalt Surface Course; Remove entire subsection:

903.18 Aggregate for Sand-Asphalt Surface Course

Provide aggregate, consisting of natural sand, crushed siliceous material, or a combination of these materials, meeting the quality requirements of ASTM D1073. For natural sand, the percentage of material finer than the No. 200 sieve shall not exceed 5.

The natural sand or combination of these materials shall meet the gradation requirements specified in Table 903.18-1.

| Table 903.18-1: Gradation Requirements for Aggregate for Sand-Asphalt Surface Course |
|----------------------------------|----------------------------------|
| Sieve Size | Total Percent Passing-by-Weight |
| No. 4 | 100 |
| No. 8 | 95-100 |
| No. 30 | 50-80 |
| No. 50 | 30-60 |
| No. 100 | 8-25 |
| No. 200 | 2-10 |
Subsection 903.19 (pg. 942-943), 5-13-19; Lightweight Aggregates for Structural Concrete; Revise Subsection:

Provide lightweight aggregate conforming to AASHTO M 195, with the following additions:

1. Produce the lightweight aggregate by fusing raw shale, slate, or clay in a rotary kiln, to yield particles having a wear of not more than 40% when tested in accordance with AASHTO T 96.

2. The lightweight coarse aggregate shall conform to the gradation requirements for size 3/4 inch to No. 4, as shown in Table 1 of AASHTO M 195.

3. The absorption of the coarse aggregate shall not exceed 10% when tested in accordance with AASHTO T 85, aggregate shall meet the quality requirements in 903.25.

4. When the coarse aggregate is subjected to five alterations of the sodium sulfate soundness test in accordance with AASHTO T 104, the weighted percentage of loss shall not be more than 9.

5. Concrete with approximately 6% air content made from the aggregate shall have a minimum durability factor of 90% when tested in accordance with AASHTO T 161.

6. Use material listed on the Department’s QPL.

Subsection 903.24 (pg. 946), 5-18-15; Modify the 1st paragraph to the following:

“Provide coarse aggregate consisting of crushed gravel, crushed granite, crushed slag, crushed quartzite, crushed gneiss, or crushed sandstone. Other crushed aggregate may be used provided it has the chemical, physical, and performance characteristics specified in Table 903.24-1.”
Subsection 903.25 (pg. 947), 5-13-19; **Aggregate Quality Requirements**: Add new Subsection.

### Table 903.25-1: Fine Aggregate Quality Requirements

<table>
<thead>
<tr>
<th>Application</th>
<th>Sodium Sulfate Soundness Loss AASHTO T 104, %max</th>
<th>L A Abrasion AASHTO T 96, %max</th>
<th>Absorption AASHTO T 84, %max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (903.01)</td>
<td>10</td>
<td>40 (1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Mortar (903.02)</td>
<td>10</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Hot Mix Asphalt Mix Base and Leveling Courses (903.06)</td>
<td>12</td>
<td>40 (1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Hot Mix Asphalt Surface Courses (903.11)</td>
<td>12</td>
<td>40 (1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Slurry Seal (903.12)</td>
<td>12</td>
<td>40 (1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Microsurface (903.12)</td>
<td>12</td>
<td>40 (1)</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(1) Applicable for fine aggregate manufactured from limestone or dolomite.

### Table 903.25-2: Coarse Aggregate Quality Requirements

<table>
<thead>
<tr>
<th>Application</th>
<th>Sodium Sulfate Soundness Loss AASHTO T 104, %max</th>
<th>L A Abrasion AASHTO T 96, %max</th>
<th>Absorption AASHTO T 84, %max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete (903.03)</td>
<td>9</td>
<td>40</td>
<td>5</td>
</tr>
<tr>
<td>Mineral Aggregate Base – Type A (903.05)</td>
<td>15</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>Mineral Aggregate Base – Type B (903.05)</td>
<td>20</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>Reclaimed Concrete Aggregate (903.05)</td>
<td>N/A</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>Hot Mix Asphalt Mix Base and Leveling Courses (903.06)</td>
<td>9</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Hot Mix Asphalt Surface Courses (903.11)</td>
<td>9</td>
<td>40</td>
<td>5 (1)</td>
</tr>
<tr>
<td>Bituminous Seal Coat (903.13)</td>
<td>12</td>
<td>40</td>
<td>N/A</td>
</tr>
<tr>
<td>Double Bituminous Surface Treatment (903.14)</td>
<td>12</td>
<td>40</td>
<td>N/A</td>
</tr>
<tr>
<td>Aggregate Cement Base Course (903.15)</td>
<td>15</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>Underdrains (903.17)</td>
<td>12</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>Lightweight Concrete (903.19)</td>
<td>9</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Machined Riprap (709.02)</td>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Graded Solid Rock (203.02)</td>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Solid Rock Fill (205.04)</td>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Masonry Stone (921.07)</td>
<td>12</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

(1) Maximum absorption for OGFC is 3.0%
Subsection 904.01 (pg. 948-950), 5-13-19; Asphalt Cements: Combined supplemental specifications from 5-15, 11-15, 6-16, 12-16, and 11-17; Replace entire subsection with the following:

904.01 Asphalt Cements

Only obtain asphalt cement for use on Department projects from Certified Asphalt Cement Suppliers that have an approved Quality Control Plan in accordance with the Department’s Standard Operating Procedures.

Asphalt cement shall conform to AASHTO M 320 and Department procedures. Direct Tension testing is not required.

Instead of PG 64-22, the Contractor may use asphalt cement graded to PG 67-22. PG 67-22 shall conform to the requirements of AASHTO M 320 when the applicable tests are conducted at 67 °C and -12 °C, and the dynamic shear of the rolling thin film, pressure aged vessel sample is tested at 26.5 °C.

To modify the asphalt, properly blend one or more modifier(s) consisting of styrene butadiene (SB), styrene butadiene styrene (SBS), or styrene butadiene rubber (SBR), or Ground Tire Rubber (GTR) to a PG 64-22 or PG 67-22 base asphalt.

GTR used to modify asphalt shall meet the requirements of 921.17. Blending of GTR into asphalt cement shall occur only at the asphalt terminal.

Polyphosphoric acid may be used as a modified not exceeding 0.5% by weight of asphalt binder and may only be used when the primary modifier is one of the styrene-based products listed above.

In addition to the above, asphalt cement modified with GTR shall meet the following requirement. The temperature difference determined by the Separation Test shall not exceed 15 °F. The separation test shall consist of taking the difference in softening point, as determined by the Ring and Ball Test (AASHTO T53), between the top and bottom thirds of a specimen prepared per ASTM D7173.

In addition to the above requirements, the asphalt cements shall meet the requirements specified in Table 904.01-1.
Table 904.01-1: Requirements for Asphalt Cement

<table>
<thead>
<tr>
<th>Property*</th>
<th>PG 64-22, PG 67-22</th>
<th>PG 70-22</th>
<th>PG 76-22</th>
<th>PG 82-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-recoverable creep compliance at 3.2 kPa, Jnr(3.2), kPa^-1 at 64°C, Max</td>
<td>4.5</td>
<td>1.0</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>% Difference in Non-Recoverable Creep Compliance, Jnr(diff) at 64°C, %, Max</td>
<td>75</td>
<td>75**</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

* Tested in accordance with AASHTO T350.
** Shall be waived if Jnr(3.2) is equal to or less than 0.5

PG76-22 and PG82-22 grade asphalts shall meet the requirements for Indication of Elastic response as defined in Appendix X1 of AASHTO M332. PG70-22 grade asphalts shall have a minimum percent recovery at 3.2 kPa of 29%.

Furnish a certification to the Engineer on each project stating that the asphalt cement provided meets the Department’s specification. Ensure that quality control and compliance testing are completed in accordance with the asphalt supplier’s approved quality control plan and Department procedures. Identify on the certification, the type(s) of modifier used.

In addition, the asphalt cement supplier shall provide a temperature-viscosity curve for PG 64-22 and PG 67-22 asphalt cements with a recommended mixing temperature range. In order to develop a temperature-viscosity curve, it may be necessary to run the viscosity test at a higher temperature, based on the softening point of the modified asphalt cement.

Subsection 904.01 (pg. 949), 5-13-19; Asphalt Cements; Revise paragraph below Table 904.01-1:

PG76-22 and PG82-22 grade asphalts shall meet the requirements for Indication of Elastic response as defined in Appendix X1 of AASHTO M332 AASHTO R92. PG70-22 grade asphalts shall have a minimum percent recovery at 3.2 kPa of 29%.

Subsection 904.03 (pg. 951) 11-16-15; Emulsified Asphalts, Add “TTT-3” to 904.03-1 with the following requirements:

| Saybolt-Furol Viscosity @ 77 °F, seconds | 10-100 |
| Particle Charge                        | Positive |
| Sieve Test, %                         | 0.1 Max |
| Residue by Distillation[1]             |        |
| Residue, %                            | 50 Min  |
| Demulsibility, %                      | 65 Min  |
| Penetration                            | 40-90   |
1-Distill at 350°F

Subsection 904.03 (pg. 954), 12-2-16; Revise Table 904.03-1(c) to remove TTT-1, TTT-2, and TTT-3:

<table>
<thead>
<tr>
<th>Practices</th>
<th>AASHTO Test Method</th>
<th>CRS-2P</th>
<th>RS-2</th>
<th>RS-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saybolt-Furol Viscosity @ 77 °F, seconds</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>20-100</td>
</tr>
<tr>
<td>Saybolt-Furol Viscosity @ 122 °F, seconds</td>
<td>T59</td>
<td>100-400</td>
<td>75-400</td>
<td>n/a</td>
</tr>
<tr>
<td>Storage Stability Test, 24-h, %</td>
<td>T59</td>
<td>1 Max</td>
<td>1 Max</td>
<td>1 Max</td>
</tr>
<tr>
<td>5-day Settlement, %</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Particle Charge</td>
<td>T59</td>
<td>Positive</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Sieve Test, %</td>
<td>T59</td>
<td>0.1 Max</td>
<td>0.1 Max</td>
<td>0.1 Max</td>
</tr>
<tr>
<td>Residue by Evaporation</td>
<td>T59</td>
<td>Distillation</td>
<td>Distillation</td>
<td></td>
</tr>
<tr>
<td>Residue, %</td>
<td>T59</td>
<td>65 Min</td>
<td>63 Min</td>
<td>55 Min</td>
</tr>
<tr>
<td>Demulsibility, %</td>
<td>T59</td>
<td>40 Min</td>
<td>60 Min</td>
<td>60 Min</td>
</tr>
<tr>
<td>Distillate, %</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Oil Test, %</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Stone Coating</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Float Test, seconds</td>
<td>T50</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
### Table 904.03-1(c): Test Requirements for Emulsified Asphalt

<table>
<thead>
<tr>
<th>Practices</th>
<th>AASHTO Test Method</th>
<th>CRS-2P</th>
<th>RS-2</th>
<th>RS-1</th>
<th>TTT-1</th>
<th>TTT-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saybolt-Furol Viscosity @ 77 °F, seconds</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>20-100</td>
<td>20-100</td>
<td>10-100</td>
</tr>
<tr>
<td>Saybolt-Furol Viscosity @ 122 °F, seconds</td>
<td>T59</td>
<td>100-400</td>
<td>75-400</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Storage Stability Test, 24-h, %</td>
<td>T59</td>
<td>1 Max</td>
<td>1 Max</td>
<td>1 Max</td>
<td>1 Max</td>
<td>1 Max</td>
</tr>
<tr>
<td>5-day Settlement, %</td>
<td>T59</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Particle Charge</td>
<td>T59</td>
<td>Positive</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>Positive</td>
</tr>
</tbody>
</table>

**Subsection 904.03 (pg. 954), 5-18-15:** Replace with the following:

**Subsection 904.03, Table 904.03-1(c). Modify** as follows for TTT-1, TTT-2:
### Practices

<table>
<thead>
<tr>
<th>Test Method</th>
<th>CRS-2P</th>
<th>RS-2</th>
<th>RS-1</th>
<th>TTT-1</th>
<th>TTT-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Test, %</td>
<td>T59 0.1 Max</td>
<td>0.1 Max</td>
<td>0.1 Max</td>
<td>0.1 Max</td>
<td>0.1 Max</td>
</tr>
<tr>
<td>Residue by T59</td>
<td>Evaporation Distillation</td>
<td>Distillation</td>
<td>Distillation</td>
<td>Distillation (1)</td>
<td></td>
</tr>
<tr>
<td>Residue, %</td>
<td>T59 65 Min</td>
<td>63 Min</td>
<td>55 Min</td>
<td>50 Min</td>
<td>50 Min</td>
</tr>
<tr>
<td>Demulsibility, %</td>
<td>T59 40 Min</td>
<td>60 Min</td>
<td>60 Min</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Distillate, %</td>
<td>T59 n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Oil Test, %</td>
<td>T59 n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Stone Coating</td>
<td>T59 n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Float Test, seconds</td>
<td>T50 n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Penetration</td>
<td>T49 75-175</td>
<td>100-200</td>
<td>100-200</td>
<td>0-20</td>
<td>40-90</td>
</tr>
<tr>
<td>Elastic Recovery, %</td>
<td>T301 50 Min</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Ductility @ 77 ºF, cm</td>
<td>T51 40 Min</td>
<td>40 Min</td>
<td>40 Min</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Ductility @ 40 ºF, cm</td>
<td>T51 n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>R&amp;B Softening Point, ºF</td>
<td>T53 125 Min</td>
<td>n/a</td>
<td>n/a</td>
<td>60-75</td>
<td>n/a</td>
</tr>
<tr>
<td>Original G*/sind @ 82 ºC</td>
<td>T315 n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>1.0 Min</td>
<td>n/a</td>
</tr>
</tbody>
</table>

(1) Distill at 350 ºF  
(2) Straight-sided mold, 20-cm elongation, 5min hold, 25 ºC

**Subsection 905.01** (pg. 956) 5-14-18, Revise subsection, add part C. Polypropylene Foam Type:

**“905.01 Preformed Joint Fillers (Non-Extruding and Resilient Types)**

Provide preformed joint fillers as shown on the Plans. When designated, punch holes in preformed joint filler to admit the dowels.
Furnish the filler for each joint in a single piece for the full depth and width required for the joint unless otherwise directed by the Engineer. If the Engineer approves the use of more than one piece for a joint, fasten the abutting ends securely, and hold to shape by stapling or using other positive means of fastening satisfactory to the Engineer.

**A. Bituminous Type**

Provide bituminous type preformed joint fillers conforming to AASHTO M 213.

**B. Non-Bituminous Types**

Provide non-bituminous types of preformed joint filler conforming to AASHTO M 153, Type I, II, or III, as specified.

**C. Polypropylene Foam Type**

Provide semi-rigid, closed-cell, polypropylene foam, preformed expansion joint filler conforming to ASTM D8139.

**Subsection 908.04 (pg. 968), 5-18-15, High Strength Bolts, A. Specifications; Add the following to the first paragraph:**

“Unless otherwise shown on the Plans, mechanically galvanize all bolts, nuts and washers in accordance with ASTM B695 Class 50.”

**Subsection 908.04 (pg. 968), 12-2-16, High Strength Bolts, A. Specifications; revise the first paragraph:**

“Unless otherwise shown on the Plans, all bolts, nuts and washers shall be coated with acceptable coating in accordance with ASTM F3125 for the respective grade.”

**Subsection 908.04 (pg. 968) 12-2-16; revise A. Specifications, 1.:**

“A. Specifications: 1. Bolts. ASTM F3125, Grade 325 and Grade 490 - High Strength Bolts for Structural Joints”

**Subsection 908.04 (pg. 970) 12-2-16; Revise C. Testing, 3. Assemblies, subsection f., update Table 908-04-2:**

C. Testing, 3. Assemblies, f. Table 908.04-2 The minimum rotation, from a snug tight condition (10% of the specified proof load), shall be as specified in Table 908.04-2.
Table 908.04-2: Rotation from Snug Tight Condition

<table>
<thead>
<tr>
<th>Bolt Length</th>
<th>Minimum Rotation from Snug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to and including 4 diameters</td>
<td>240 degrees (2/3 turn)</td>
</tr>
<tr>
<td>Over 4 diameters, but not exceeding 8 diameters</td>
<td>360 degrees (1 turn)</td>
</tr>
<tr>
<td>Over 8 diameters</td>
<td>480 degrees (1-1/3 turn)</td>
</tr>
</tbody>
</table>

(Note: These values differ from those shown in ASTM F3125.)

Subsection 908.07 (pg. 973), 5-14-18; Add the following as the last sentence in the subsection:

“Furnish the Engineer a certification from the manufacturer identifying each heat number and certifying that the requirements from AASHTO M 105 and the above additions have been met.”

Subsection 909.02 (pg. 977), 12-2-16; Remove the 4th paragraph referencing a tolerance of 5% from B. Steel Posts and Braces.

Subsection 909.02 (pg. 980-981), 12-2-16; Remove the word minimum from Table 909.02-1:

Table 909.02-1: Post and Braces

<table>
<thead>
<tr>
<th>Application</th>
<th>Material</th>
<th>ASTM Specification</th>
<th>Nominal Diameter (inches)</th>
<th>Outside Diameter (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Posts</td>
<td>Galvanized steel pipe</td>
<td>F1083</td>
<td>1.5</td>
<td>1.900</td>
</tr>
<tr>
<td></td>
<td>Aluminum alloy standard (ANSI Schedule 40) pipe</td>
<td>B429, Alloy 6063, Temper T6</td>
<td>1.5</td>
<td>1.900</td>
</tr>
<tr>
<td></td>
<td>Triple coated steel pipe with a 0.120-inch wall thickness</td>
<td>F1043, Group I-C</td>
<td>1.5</td>
<td>1.900</td>
</tr>
<tr>
<td>Application</td>
<td>Material</td>
<td>ASTM Specification</td>
<td>Nominal Diameter (inches)</td>
<td>Outside Diameter (inches)</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------------------</td>
<td>--------------------</td>
<td>---------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>End, Corner, and Pull Posts</td>
<td>Galvanized standard steel pipe</td>
<td>F1083</td>
<td>2.0</td>
<td>2.375</td>
</tr>
<tr>
<td></td>
<td>Aluminum alloy standard (ANSI Schedule 40) pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B429, Alloy 6063, Temper T6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Triple coated steel pipe with a 0.130-inch wall thickness</td>
<td>F1043, Group I-C</td>
<td>2.0</td>
<td>2.375</td>
</tr>
<tr>
<td>End and Corner Braces</td>
<td>Galvanized standard steel pipe</td>
<td>F1083</td>
<td>1.25</td>
<td>1.660</td>
</tr>
<tr>
<td></td>
<td>Aluminum alloy standard (ANSI Schedule 40) pipe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>B429, Alloy 6063, Temper T6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(for corner posts: B241)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Triple coated steel pipe with a 0.111-inch wall thickness</td>
<td>F1043, Group I-C</td>
<td>1.25</td>
<td>1.660</td>
</tr>
</tbody>
</table>

**Subsection 909.03** (pg. 983), 12-2-16; Remove the last paragraph of the subsection.

**Subsection 912.05** (pg. 1001), 6-27-16; Add subsection 912.05 – Brick Paving Units:

“**912.05 Brick Paving Units**

Provide brick of the kind and grade specified."
A. Masonry Brick

1. Sidewalk: ASTM C902, Class SX, Type 1
2. Crosswalks and Roadway: ASTM C1272, Type R

B. Concrete Brick and Truncated Dome Concrete Brick

Provide brick conforming to ASTM C936

C. Truncated Dome Brick

Provide brick conforming to ASTM C902, Class SX, Type 1

Subsection 914.08 (pg. 1006), 5-13-19; Precast, Concrete Box Sections; Revise 1st paragraph:

For culverts, storm drains, and sewers, provide precast reinforced concrete box sections conforming to ASTM C1577. Manufacture all precast concrete box sections in accordance with the Department’s procedure on the Manufacture and Acceptance of Precast Drainage Structures, Noise Wall Panels, and Retaining Wall Panels – Standard Operating Procedure 5-3.

Subsection 915.02 (pg. 1007), 6-27-16; modify the description of 915.03, remove zinc coated, iron from 915.02 A. update the first paragraph of 915.02 A., Remove subsection B. Aluminum Coated Steel Pipe, Revise C. to become B., revise D to become C, Remove 1st and 2nd paragraphs of D now C, revise E to become D, update 915.03 to match index title:

“SECTION 915 – METALLIC PIPE

915.01 Ductile Iron or Cast Iron Pipe ................................................................. 1007
915.02 Corrugated Metal Pipe Culverts, Pipe Arches, and Underdrains......................... 1007
915.03 Polymer Pre-coated, Corrugated Steel Pipe, Culverts, and Underdrains.... 1008

915.01 Ductile Iron or Cast Iron Pipe
Provide ductile iron pipe conforming to ASTM A716 for the specified diameters and strength classes. Unless otherwise specified, either smooth, corrugated, or ribbed pipe may be furnished. For pipe diameters in excess of 48 inches, conform to ANSI Standard for Cast Iron Pit Cast Pipe, or as otherwise specified in the Contract, for the specified diameter and strength class. Provide cast iron drain pipe conforming to ASTM A74. Unless otherwise specified, provide ductile iron pressure pipe for water lines or sewer construction conforming to the requirements of ASTM A377 for the diameters and working pressures specified.

915.02 Corrugated Metal Pipe Culverts, Pipe Arches, and Underdrains
A. Corrugated Steel Pipe, Pipe Arches, and Underdrains
Provide corrugated steel pipe, pipe arches, or underdrains, including special sections, such as elbows and flared ends, that conform to AASHTO M 36, aluminum-coated Type 2 meeting AASHTO M274. Special Sections shall be the same thickness as the pipe, arch, or underdrain to which they are joined. Furnish shop-formed elliptical pipe and shop-strutted pipe only where shown on the Plans.
B. Corrugated Aluminum Pipe, Pipe Arches, and Underdrains
When using corrugated aluminum pipe, pipe arches, or underdrains, conform to the applicable requirements of AASHTO M 196. Use special sections, such as elbows and flared end sections that conform to the applicable requirements of AASHTO M 196 and that are of the same gauge as the conduit to which they are joined.

C. Structural Plate Corrugated Steel and Aluminum Structures
Corrugated aluminum alloy structural plate for pipe, pipe arches, and arches shall conform to the requirements of AASHTO M 219.

D. Bituminous Coating
When material supplied for any of the items specified above are to be bituminous-coated, ensure that the metal to be coated is free of grease, dirt, and other contaminants. Bituminous coating and paving shall conform to the requirements of AASHTO M 190. Apply the coating in accordance with the manufacturer’s recommended procedures and as directed by the Department.”

915.03 Polymer Pre-coated, Corrugated Steel Pipe, Culverts and Underdrains
Provide polymer pre-coated corrugated steel pipe conforming to AASHTO M 245, Grade 250/250, unless otherwise specified.”

Subsection 916.05 E. (pg. 1012); 12-2-16, Add sentence to first paragraph:
“Fabricators must be AISC certified as specified in 602.04 A.4.”

Subsection 917.02.A.6. (pg. 1023), 6-27-16; Revise the following:
“6. Anchor Bolts. Use anchor rods of high strength steel meeting the requirements of ASTM F 1554, Grade to be determined by design. Fit each anchor bolt with a hex nut and lock-washer.”

Subsection 918.01 (pg. 1033-1035), 5-14-18; Revise the 1st paragraph and 3rd paragraph of A. General, Revise Table 918.01-1, Table 918.01-2, Table 918.01-4, Table 918.01-5, Revise the last paragraph of B. Seed Groups, Revise Table 918.01-6 Temporary Seeding:

A. General
Provide seed meeting the rules and requirements of the Tennessee Department of Agriculture Chapter 0080-05-06.

Pack grass seed in new bags or bags that are sound and not mended.

The vendor shall notify the Department before making shipments to allow the Department to arrange for inspection and testing of stock.

The vendor shall furnish the Department a certified laboratory report from a Society of Commercial Seed Technologists accredited commercial seed laboratory or from a State seed laboratory showing the analysis of the seed to be furnished. The report from an accredited commercial seed laboratory shall be signed by a Registered Member of the Society of Commercial Seed Technologists. The Department may take samples of the seed to check against the certified
laboratory report. Sampling and testing will be in accordance with the requirements of the Tennessee Department of Agriculture.

Use commercial grade 10-10-10 fertilizer or equivalent.

**B. Seed Groups**

When a seed group is used, provide mixtures meeting the requirements specified in Tables 918.01-1 through 918.01-5, unless otherwise specified.

**Table 918.01-1: Group A (February 1-July 1)**

<table>
<thead>
<tr>
<th>Kind of Seed</th>
<th>Quantity, Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky 31 Fescue</td>
<td>80</td>
</tr>
<tr>
<td>Korean Lespedeza</td>
<td>15</td>
</tr>
<tr>
<td>Annual Rye Grass</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table 918.01-2: Group B (June 1-August 15)**

<table>
<thead>
<tr>
<th>Kind of Seed</th>
<th>Quantity, Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky 31 Fescue</td>
<td>5575</td>
</tr>
<tr>
<td>Korean Lespedeza</td>
<td>15</td>
</tr>
<tr>
<td>German Millet</td>
<td>10</td>
</tr>
</tbody>
</table>

**Table 918.01-3: Group B1 (April 15 - August 15)**

<table>
<thead>
<tr>
<th>Kind of Seed</th>
<th>Quantity, Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bermudagrass (hulled)</td>
<td>70</td>
</tr>
<tr>
<td>Annual Lespedeza</td>
<td>30</td>
</tr>
</tbody>
</table>

**Table 918.01-4: Group C (August 1-December 1)**

<table>
<thead>
<tr>
<th>Kind of Seed</th>
<th>Quantity, Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kentucky 31 Fescue</td>
<td>70</td>
</tr>
<tr>
<td>Annual Rye Grass</td>
<td>20</td>
</tr>
<tr>
<td>White Clover</td>
<td>10</td>
</tr>
</tbody>
</table>

**Table 918.01-5: Group C1 (February 1-December 1)**

<table>
<thead>
<tr>
<th>Kind of Seed</th>
<th>Quantity, Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown Vetch</td>
<td>25</td>
</tr>
<tr>
<td>Kentucky 31 Fescue</td>
<td>70</td>
</tr>
<tr>
<td>Annual Rye Grass</td>
<td>5</td>
</tr>
</tbody>
</table>

Uniformly mix seed when forming Groups. Do not mix Group seed until each type seed that is used to form the Group has been tested separately and meets DOA requirements for purity and germination.
C. Over-Seeding

Groups A, B, and C, when sown on slopes 3:1 and steeper, shall be over seeded with Sericea Lespedeza at the rate of 15 pounds per acre. When over-seeding is performed between February 1 and July 1, use Scarified Sericea Lespedeza with an additional 2 pounds per acre of Weeping Lovegrass. Between July 1 and December, use unhulled Sericea Lespedeza. Only use Group C1 when shown on the Plans.

D. Temporary Seeding

For temporary seeding, use seed groups and approved varieties as specified in Table 918.01-6.

Table 918.01-6: Temporary Seeding

<table>
<thead>
<tr>
<th>Seed Group (Season)</th>
<th>Kind of Seed</th>
<th>Percent by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group D (January 1 – May 1)</td>
<td>ItAnnual Rye Grass</td>
<td>33-1/3%</td>
</tr>
<tr>
<td></td>
<td>Korean Lespedeza</td>
<td>33-1/3%</td>
</tr>
<tr>
<td></td>
<td>Spring Oats</td>
<td>33-1/3%</td>
</tr>
<tr>
<td>Group E (May 1 – July 15)</td>
<td>Sorghum-Sudan Crosses (1)</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>StGerman Millet (2)</td>
<td>100%</td>
</tr>
<tr>
<td>Group F</td>
<td>BCereal Rye</td>
<td>66-2/3%</td>
</tr>
<tr>
<td>July 15 – January 1</td>
<td>ItAnnual Rye Grass</td>
<td>33-1/3%</td>
</tr>
</tbody>
</table>

Subsection 918.04 (pg. 1036), 12-2-16; add as a 2nd paragraph:

“For small quantities less than 100 units of seeding or sod, bagged pelleted or agricultural limestone meeting the Department of Agriculture Tennessee Liming Materials Act may be utilized.”

Subsection 918.04 (pg. 1036), 5-13-19; Agricultural Limestone; Revise 1st and 2nd paragraphs:

Provide agricultural limestone, containing at least 85% of calcium carbonate and magnesium carbonate combined, and that is crushed so that at least 85% will pass the No. 10 sieve and 50% will pass a No. 40 sieve.

For small quantities less than 100 units of seeding or sod, bagged pelleted or agricultural limestone meeting the Department of Agriculture Tennessee Liming Materials Act may be utilized.

Subsection 921 (pg. 1049), 11-6-17, Section 921 – Miscellaneous Materials, add Ground Tire Rubber to the Index:

“921.17 Ground Tire Rubber ………………………………………………..1060”
Subsection 921.01 (pg. 1049), 5-18-15, Water; Replace subsection with the following:

“For mixing concrete, use water that is reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable matter, and other substances injurious to the finished product. Water provided by a municipal utility may be used without testing.

All other water shall have quality results submitted in accordance with the frequency listed in Table 921.01-01. All water quality results shall adhere to Table 921.01-2.

Table 921.01-1 Testing Frequency for Mixing Water

<table>
<thead>
<tr>
<th>Water Source</th>
<th>Testing Frequency(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal</td>
<td>NA</td>
</tr>
<tr>
<td>Non-Municipal</td>
<td>Every 3 months; tested annually after 4 consecutive passing tests</td>
</tr>
</tbody>
</table>

(1) The frequency may vary at the discretion of the Department.

Table 921.01-2 Quality Requirements for Mixing Water

<table>
<thead>
<tr>
<th>Maximum Concentration in Mixing Water</th>
<th>Limits</th>
<th>ASTM Test Method (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Ion Content, ppm</td>
<td>500</td>
<td>C114</td>
</tr>
<tr>
<td>Alkalies as (NaO2 + 0.658 K2O), ppm</td>
<td>600</td>
<td>C114</td>
</tr>
<tr>
<td>Sulfates as SO4, ppm</td>
<td>3000</td>
<td>C114</td>
</tr>
<tr>
<td>Total Solids by mass, ppm</td>
<td>50000</td>
<td>C1603</td>
</tr>
<tr>
<td>pH</td>
<td>4.5-8.5</td>
<td>(2)</td>
</tr>
<tr>
<td>Resistivity, Minimum, kohm-cm</td>
<td>0.500</td>
<td>D1125</td>
</tr>
<tr>
<td>Soluble Carbon Dioxide, ppm</td>
<td>600</td>
<td>D513</td>
</tr>
<tr>
<td>Calcium and Magnesium, ppm</td>
<td>400</td>
<td>D511</td>
</tr>
<tr>
<td>Iron, ppm</td>
<td>20</td>
<td>(2)</td>
</tr>
<tr>
<td>Phosphate, ppm</td>
<td>100</td>
<td>D4327</td>
</tr>
</tbody>
</table>

(1) Other methods (EPA or those used by water testing companies) are generally acceptable.
(2) No ASTM method available.

Subsection 921 (pg. 1049) 10-8-18, Miscellaneous Materials, Remove 921.03 Sodium Chloride from the Content list:

921.01 Water ................................................................. 1052
921.02 Calcium Chloride .................................................. 1053
921.04 Lime ................................................................. 1053
921.05 Select Material for Soil-Cement Base .................. 1054
921.06 Chemical Additives .............................................. 1054
921.07 Masonry Stone .................................................... 1056
921.08 Waterstops ........................................................ 1056
921.09 Grout ............................................................... 1059
921.10 Precast Manholes and Catch Basins ..................... 1059
921.11 Manhole Steps .................................................... 1059
921.12 Geotextile and Geosynthetic Material ................. 1060
Subsection 921.01 (pg. 1049), 5-14-18, Water; Remove Resistivity, Soluble Carbon Dioxide, Calcium and Magnesium, Iron, and Phosphate from Table 921.01-2 Quality Requirements for Mixing Water:

Table 921.01-2 Quality Requirements for Mixing Water

<table>
<thead>
<tr>
<th>Maximum Concentration in Mixing Water</th>
<th>Limits</th>
<th>ASTM Test Method (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chloride Ion Content, ppm</td>
<td>500</td>
<td>C114</td>
</tr>
<tr>
<td>Alkalies as (NaO2 + 0.658 K2O), ppm</td>
<td>600</td>
<td>C114</td>
</tr>
<tr>
<td>Sulfates as SO4, ppm</td>
<td>3000</td>
<td>C114</td>
</tr>
<tr>
<td>Total Solids by mass, ppm</td>
<td>50000</td>
<td>C1603</td>
</tr>
<tr>
<td>pH</td>
<td>4.5-8.5</td>
<td>(2)</td>
</tr>
</tbody>
</table>

(1) Other methods (EPA or those used by water testing companies) are generally acceptable.
(2) No ASTM method available.

Subsection 921.03 (pg. 1050) 10-8-18, Miscellaneous Materials, Remove subsection 921.03 Sodium Chloride:

Subsection 921.06 (pg.1051) 11-16-15; B. Bituminous Additives - 1. Anti-Stripping Additive, replace the ASTM C977 reference with AASHTO M 303.

“Use hydrated lime conforming to AASHTO M 303 or other heat-stable asphalt anti-stripping additive containing no ingredient harmful to the bituminous material or the workmen and that does not appreciably alter the specified characteristics of the bituminous material when added in the recommended proportions.”

Subsection 921.06 B. Bituminous Additives (pg.1052) 10-10-16; revise the 3rd paragraph to the following:

“When using an anti-stripping additive other than hydrated lime, use a dosage rate of 0.3%, unless either gravel is used as a coarse aggregate or test results indicate moisture susceptibility, in which case mix at a dosage rate of 0.5%.

Subsection 921.06 B. 2. (pg. 1052) 11-6-17; B. Bituminous Additives, 2. Silicone Additives, Remove description and add the following sentence:
“2. Silicone Additives. The amount of silicone added to asphalt cement shall not exceed 2 oz. of silicone per 5500 gallons asphalt cement.”

Subsection 921.07 (pg. 1053), 5-13-19; Masonry Stone; Revise 2nd paragraph:

When the crushed aggregate is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than 12. Masonry stone shall meet the quality requirements in 903.25.

Subsection 921.10 (pg. 1056), 5-13-19; Precast Manholes and Catch Basins; Revise 1st paragraph:

Provide precast manholes and catch basins that conform to ASTM C478 and that are made in accordance with the Department’s procedure for the Manufacture and Acceptance of Precast Drainage Structures, Noise Wall Panels, and Retaining Wall Panels Standard Operating Procedure 5-3.

Subsection 921.15 (pg. 1060), 5-13-19; Fly Ash; Revise 3rd paragraph:

Obtain fly ash from an approved source as shown on the Department’s QPL Producer List.

Subsection 921.15 (pg. 1060), 5-13-19; Fly Ash; Revise Table 921.15-1:

<table>
<thead>
<tr>
<th>Property</th>
<th>Fly Ash Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Chemical Requirements: Uniformity Requirements</td>
<td>F  C</td>
</tr>
<tr>
<td>The loss on ignition of individual samples shall not vary from the average established by the 10 preceding tests, or by all preceding tests if the number is less than 10, by more than: Loss on ignition, max variation, percentage points from average</td>
<td>1.0 1.0</td>
</tr>
<tr>
<td>B. Physical Requirements: Pozzolanic Activity Index</td>
<td></td>
</tr>
<tr>
<td>With Portland cement, at 7 days, min, % of control</td>
<td>60  60</td>
</tr>
<tr>
<td>With Portland cement, at 28 days, min, % of control</td>
<td>75  75</td>
</tr>
</tbody>
</table>

Subsection 921.16 (pg. 1060), 5-13-19; Ground Granulated Blast Furnace Slag; Revise 2nd paragraph:

Obtain ground granulated blast furnace slag from an approved source as shown on the Department’s QPL Producer List.
Subsection 921.17 (pg. 1060) 11-6-17; Ground Tire Rubber, add the following subsection:

“921.17 Ground Tire Rubber

Provide Class 30-1 Ground Tire Rubber (GTR) as defined by ASTM D5630 except for as noted in table 921.17-1. The material shall also be certified to meet the requirements of Table 921.17-01. Include certification of the GTR with the bill of lading for the modified asphalt cement.

Table 921.17-1: Requirements for Ground Tire Rubber

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Gravity</td>
<td>1.15 +/- 0.05</td>
</tr>
<tr>
<td>Moisture Content</td>
<td>0.75% Max</td>
</tr>
<tr>
<td>Ferrous Metal Content</td>
<td>0.01% Max</td>
</tr>
<tr>
<td>Fiber Content</td>
<td>0.5% Max</td>
</tr>
<tr>
<td>Ash (ASTM E1131)</td>
<td>10% Max</td>
</tr>
</tbody>
</table>