

STATE
 (Rev. 5-18-15)
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 (Rev. 6-27-16)
[\(Rev. 12-2-16\)](#)

OF

TENNESSEE
 January 1, 2015

Supplemental Specifications - Section 900

of the

Standard Specifications for Road and Bridge Construction

January 1, 2015

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 limestone or dolomite~~ 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 903.03 (pg. 922-923) 11-16-15; Coarse Aggregate for Concrete, modify 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 ~~combined~~ absorption of plus 4 material not to exceed 54%. 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. ~~Crushed stone used as a surface aggregate shall meet 903.24.~~”

Table 903.03-1: Coarse Aggregate Sizes

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

⁽¹⁾ Gradation shall conform to **903.22**.

⁽²⁾ Aggregate shall meet the quality requirements specified below.

Subsection 903.05 – B. Type B Aggregate (pg. 927), 5-18-15; Replace 3. With the following: “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 M~~material may be used having a clay content ~~not~~ exceeding 12% if a plasticity index-fines product does not exceed 3 when calculated by the following formula:

Subsection 903.06 (pg. 930) 11-16-15; C. Combined Aggregate Grading, 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; Aggregate for Asphaltic Concrete Surface Coarses (Hot Mix), 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), modify the following:

“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 ~~combined~~ aggregate retained on the No. 4 sieve shall not exceed 5% when tested in accordance with AASHTO T 85.”

Subsection 903.11 (pg. 934), 5-18-15; A. Coarse Aggregate (retained on a No. 4 sieve) Replace with the following:

“2. Material retained on the No. 4 sieve shall contain a maximum of 120% elongated pieces (length greater than five times the average thickness)”

Subsection 903.11 C.3. (pg. 938), 6-27-16; “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 ~~43~~0% and a maximum absorption of 3.0%.”

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

~~“A minimum of 50% of T~~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...

~~Use a pug mill to mix blends of more than one aggregate source. Do not blend aggregates with a front end loader. Proportion the aggregate to produce a uniform gradation meeting the requirements specified in Table 903.12-1.~~

Subsection 903.12 (pg. 939) 11-16-15; B. Aggregate for Micro-Surface: delete as shown:

~~“A minimum of 50% of The aggregate shall be crushed slag...~~

~~Use a pug mill to mix blends of more than one aggregate source. 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.~~

Subsection 903.13 (pg. 940), 12-2-16; Revise the following: “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 903.24 (pg. 946), 5-18-15; Modify the following:

~~“Provide coarse aggregate consisting of crushed gravel, crushed granite, crushed slag, crushed quartzite, or crushed gneiss, or crushed sandstone, meeting the BPN requirements of the table below. The Contractor may use other crushed aggregate provided it has the chemical, physical, and performance characteristics specified in Table 903.24-1. Other crushed aggregate may be used provided it has the chemical, physical, and performance characteristics specified in Table 903.24-1.”~~

Subsection 904.01 (pg. 948) 11-16-15; Asphalt Cements, add the following between the 4th and 5th paragraphs:

“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.”

Subsection 904.01 (pg. 949), 12-2-16; Modify the following in Table 904.01-1:

“Table 904.01-1: Requirements for Asphalt Cement

Property*	<u>PG 64-22, PG 67-22</u>	PG 70-22	PG 76-22	PG 82-22
Ring & Ball Softening Point, degrees F, minimum		128	135	150
Elastic Recovery by means of Durometer, % minimum		45	65	70
<u>Non-recoverable creep compliance at 3.2kPa, Jnr(3.2), kPa¹ at 64°C, Max</u>	<u>4.5</u>	<u>1.0</u>	<u>0.5</u>	<u>0.5</u>
<u>% Difference in Non-Recoverable Creep Compliance, Jnr(diff) at 64°C, %, Max</u>	<u>75</u>	<u>75**</u>	<u>n/a75</u>	<u>n/a75</u>

*_ 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%.”

Subsection 904.01 (pg. 948-950) 5-18-15; Modify the following:

“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 cement high-temperature grade properties, properly blend styrene butadiene (SB), styrene butadiene styrene (SBS), or styrene butadiene rubber (SBR) to a PG 64-22 or PG 67-22 base asphalt.

In addition to the above requirements, the PG 70-22, PG 76-22 and 82-22 asphalt cements shall meet the requirements specified in Table 904.01-1.

Table 904.01-1: Requirements for Asphalt Cement

Property*	<u>PG 64-22, PG 67-22</u>	PG 70-22	PG 76-22	PG 82-22
Ring & Ball Softening Point, degrees F, minimum		128	135	150
Elastic Recovery by means of Ductilometer, % minimum		45	65	70
<u>Non-recoverable creep compliance at 3.2kPa, Jnr(3.2), kPa⁻¹ at 64°C, Max</u>	<u>4.5</u>	<u>1.0</u>	<u>0.5</u>	<u>0.5</u>
<u>% Difference in Non-Recoverable Creep Compliance, Jnr(diff) at 64°C, %, Max</u>	<u>75</u>	<u>75</u>	<u>75</u>	<u>75</u>

* Tested in accordance with AASHTO T350.

All modified grades shall meet the requirements for Indication of Elastic response as defined in Appendix X1 of AASHTO M332.

~~A. Test Procedures~~

~~1. Elastic Recovery by means of a Ductilometer. Test in accordance with AASHTO T 301 at 77°F.~~

~~2. Screen Test. Pour a 1,000 gram sample heated to 275 °F through a No. 10 sieve. Ensure no lumps or particles are retained on the sieve.~~

~~3. Viscometer Test. In addition to the above, all hot mix asphalt mix plants using modified liquid asphalt products shall have a rotational viscometer, meeting ASTM D4402 requirements, with a thermostatically controlled cell. The mix producer shall run a minimum of one test per week on~~

~~samples taken from the Contractor's storage tank. Viscosity values shall be in the ranges specified in Table 904.01-2 when tested at 275 °F.~~

~~Table 904.01-2: Asphalt Cement Viscosity Requirements~~

Property	PG 70-22	PG 76-22	PG 82-22
Viscosity Range (centipoise)	650- 3,000	1,000- 3,000	2,000- 4,000 (+)
(+) Store PG82-22 at proper temperatures to maintain pumpability.			

Materials Certification

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.

~~Where blending or modification occurs after the material has left the storage tanks, the supplier shall conduct a complete series of tests on a sample taken on the first day's production and biweekly thereafter for each grade being produced. Brookfield viscosity and DSR original tests shall be performed daily at the point of blending or modification. The DSR value $G^*/\sin\delta$ shall be ≥ 1.0 kPa at the high PG grade temperature (i.e., 158 °F for PG 70-22).~~

In addition, the asphalt cement supplier/producer 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), 6-27-16; modify the following table:
Table 904.01-1: Requirements for Asphalt Cement

Property	PG64-22	PG 70-22	PG 76-22	PG 82-22
<u>Non-recoverable creep compliance at 3.2kPa, J_{nr}(3.2), kPa⁻¹ at 64°C, Max</u>		<u>4.5</u>	<u>1.0</u>	<u>0.5</u>
<u>% Difference in Non-Recoverable Creep</u>		<u>75</u>	<u>75</u>	<u>n/a75</u>

<u>Compliance,</u> <u>Jnr(diff) at 64°C, %,</u> <u>Max</u>				
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Subsection 904.03 (pg. 951) 11-16-15; Emulsified Asphalts, Add “TTT-3” to 904.03-1 with the following requirements:

<u>Saybolt-Furol Viscosity @ 77 °F,</u> <u>seconds</u>	<u>10-100</u>
<u>Particle Charge</u>	<u>Positive</u>
<u>Sieve Test, %</u>	<u>0.1 Max</u>
<u>Residue by</u>	<u>Distillation⁽¹⁾</u>
<u>Residue, %</u>	<u>50 Min</u>
<u>Demulsibility, %</u>	<u>65 Min</u>
<u>Penetration</u>	<u>40-90</u>

¹-Distill at 350°F

Subsection 904.03 (pg. 954), 12-2-16; Revise the following:

Table 904.03-1(c): Test Requirements for Emulsified Asphalt

Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1	<u>TTT-1</u>	<u>TTT-2</u>	<u>TTT-3</u>
Saybolt-Furol Viscosity @ 77 °F, seconds	T59	n/a	n/a	20-100	<u>20-100</u>	<u>10-100</u>	<u>10-100</u>
Saybolt-Furol Viscosity @ 122 °F, seconds	T59	100-400	75-400	n/a	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>
Storage Stability Test, 24- h, %	T59	1 Max	1 Max	1 Max	<u>1 Max</u>	<u>1 Max</u>	<u>n/a</u>
5-day Settlement, %	T59	n/a	n/a	n/a	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>
Particle Charge	T59	Positive	n/a	n/a	<u>n/a</u>	<u>Positive</u>	<u>Positive</u>
Sieve Test, %	T59	0.1 Max	0.1 Max	0.1 Max	<u>0.1 Max</u>	<u>0.1 Max</u>	<u>0.1 Max</u>
Residue by	T59	<i>Evaporation</i>	Distillation	Distillation	<u>Distillation</u>	<u>Distillation⁽¹⁾</u>	<u>Distillation</u>
Residue, %	T59	65 Min	63 Min	55 Min	<u>50 Min</u>	<u>50 Min</u>	<u>50 Min</u>
Demulsibility, %	T59	40 Min	60 Min	60 Min	<u>n/a</u>	<u>n/a</u>	<u>65 Min</u>
Distillate, %	T59	n/a	n/a	n/a	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>
Oil Test, %	T59	n/a	n/a	n/a	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>
Stone Coating	T59	n/a	n/a	n/a	<u>n/a</u>	<u>n/a</u>	<u>n/a</u>

Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1	TTT-1	TTT-2	TTT-3
Float Test, seconds	T50	n/a	n/a	n/a	n/a	n/a	n/a
Penetration	T49	75-175	100-200	100-200	0-20	40-90	40-90
Elastic Recovery, % ⁽²⁾	T301	50 Min	n/a	n/a	n/a	n/a	n/a
Ductility @ 77 °F, cm	T51	40 Min	40 Min	40 Min	n/a	n/a	n/a
Ductility @ 40 °F, cm	T51	n/a	n/a	n/a	n/a	n/a	n/a
R&B Softening Point, °F	T53	125 Min	n/a	n/a	60-75	n/a	n/a
Original G*/sind @ 82 °C	T315	n/a	n/a	n/a	+0 Min	n/a	n/a

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:

Table 904.03-1(c): Test Requirements for Emulsified Asphalt

Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1	TTT-1	TTT-2
Saybolt-Furol Viscosity @ 77 °F, seconds	T59	n/a	n/a	20-100	20-100 30 mins	10-100 n/a
Saybolt-Furol Viscosity @ 122 °F, seconds	T59	100-400	75-400	n/a	n/a	n/a +5-100
Storage Stability Test, 24- h, %	T59	1 Max	1 Max	1 Max	1 Max	1 Max
5-day Settlement, %	T59	n/a	n/a	n/a	n/a 5 Max	n/a
Particle Charge	T59	Positive	n/a	n/a	n/a	Positive
Sieve Test, %	T59	0.1 Max	0.1 Max	0.1 Max	0.1 Max	0.1 Max
Residue by	T59	<i>Evaporation</i>	Distillation	Distillation	Distillation	Distillation ⁽¹⁾
Residue, %	T59	65 Min	63 Min	55 Min	50 40 Min	50 8 Min
Demulsibility, %	T59	40 Min	60 Min	60 Min	n/a	n/a
Distillate, %	T59	n/a	n/a	n/a	n/a	n/a
Oil Test, %	T59	n/a	n/a	n/a	n/a	n/a
Stone Coating	T59	n/a	n/a	n/a	n/a	n/a
Float Test, seconds	T50	n/a	n/a	n/a	n/a	n/a
Penetration	T49	75-175	100-200	100-200	0-20 5-15	40-90

Practices	AASHTO Test Method	CRS-2P	RS-2	RS-1	TTT-1	TTT-2
Elastic Recovery, % ⁽²⁾	T301	50 Min	n/a	n/a	n/a	n/a
Ductility @ 77 °F, cm	T51	40 Min	40 Min	40 Min	n/a 40 Min	n/a
Ductility @ 40 °F, cm	T51	n/a	n/a	n/a	n/a	n/a
R&B Softening Point, °F	T53	125 Min	n/a	n/a	60-75	n/a
Original G*/sind @ 82 °C	T315	n/a	n/a	n/a	1.0 Min	n/a

⁽¹⁾ Distill at 350 °F
⁽²⁾ Straight-sided mold, 20-cm elongation, 5min hold, 25 °C

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; Add the following to the first paragraph: “Unless otherwise shown on the Plans, ~~mechanically galvanize~~ all bolts, nuts and washers shall be coated with acceptable coating in accordance with ~~ASTM B695 Class 50~~ASTM F3125 for the respective grade.”

Subsection 908.04 (pg. 968) 12-2-16; Modify the following: “A. Specifications: 1. Bolts. ASTM F3125, Grade 325 and Grade 490 ~~ASTM A325~~ High Strength Bolts for Structural Joints”

Subsection 908.04 (pg. 970) 12-2-16; Modify the following: 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

Bolt Length	Minimum Rotation from Snug
Up to and including 4 diameters	240 degrees (2/3 turn)
Over 4 diameters, but not exceeding 8 diameters	360 degrees (1 turn)
Over 8 diameters	480 degrees (1-1/3 turn)

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

Subsection 909.02(pg. 977), 12-2-16; Remove the following paragraph from B. Steel Posts and Braces: ~~“The weights specified for posts and braces are nominal weights, and a plus or minus tolerance of 5% will be allowed.”~~

Subsection 909.02 (pg. 980-981), 12-2-16; Revise the following in Table 909.02-1:

Table 909.02-1: Post and Braces

Application	Material	ASTM Specification	Nominal Diameter (inches)	Outside Diameter (inches)
Line Posts	Galvanized steel pipe	F1083	1.5	1.900
	Aluminum alloy standard (ANSI Schedule 40) pipe	B429, Alloy 6063, Temper T6	1.5	1.900
	Triple coated steel pipe with a 0.120-inch minimum wall thickness	F1043, Group I-C	1.5	1.900

Application	Material	ASTM Specification	Nominal Diameter (inches)	Outside Diameter (inches)
End, Corner, and Pull Posts	Galvanized standard steel pipe	F1083	2.0	2.375
	Aluminum alloy standard (ANSI Schedule 40) pipe	B429, Alloy 6063, Temper T6	2.0	2.375
	Triple coated steel pipe with a 0.130-inch minimum wall thickness	F1043, Group I-C	2.0	2.375
End and Corner Braces	Galvanized standard steel pipe	F1083	1.25	1.660
	Aluminum alloy standard (ANSI Schedule 40) pipe	B429, Alloy 6063, Temper T6 (for corner posts: B241)	1.25	1.660
	Triple coated steel pipe with a 0.111-inch minimum wall thickness	F1043, Group I-C	1.25	1.660

Subsection 909.03 (pg. 983), 12-2-16; Remove the last paragraph: “~~The weights specified for posts and braces are nominal weights, and a plus or minus tolerance of 5% will be allowed.~~”

Subsection 912.05 (pg. 1001), 6-27-16; Add the following Section:

“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 915.02 (pg. 1007), 6-27-16; modify the following:

“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, CorrugatedGalvanized 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. ~~Zinc-Coated-Corrugated-Iron-or~~ Steel Pipe, Pipe Arches, and Underdrains

Provide ~~zinc-coated-(galvanized)~~ corrugated ~~iron-or~~ steel pipe, pipe arches, or underdrains, including special sections, such as elbows and flared ends, that conforming to AASHTO M 36, aluminum-coated Type 2 meeting AASHTO M274. Use special sections, such as elbows and flared end sections that conform to AASHTO M 36 and are of 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. Aluminum Coated Steel Pipe~~

~~Provide aluminum coated steel pipe conforming to AASHTO M 274.~~

~~C.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.

~~D.C. Structural Plate Corrugated Steel and Aluminum Structures~~

~~Provide galvanized corrugated structural plate for pipe, pipe arches, and arches conforming to AASHTO M 167.~~

~~The Contractor may use mechanically galvanized zinc coating meeting ASTM B695 Class 50 as an alternate for hot dipped galvanizing (AASHTO M 232) as applicable to hardware for fabrication of structural plate pipe, pipe arches, and arches.~~

Corrugated aluminum alloy structural plate for pipe, pipe arches, and arches shall conform to the requirements of AASHTO M 219.

DE. 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 Galvanized Steel Pipe, Culverts and Underdrains

Provide polymer pre-coated ~~corrugated galvanized~~ steel pipe conforming to AASHTO M 245, Grade ~~250/25040/40~~, unless otherwise specified.”

Subsection 916.05 E. (pg. 1012); 12-2-16, Add the following to the 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: “Use anchor ~~rodsbolts~~ of high strength steel meeting the requirements of ASTM F 1554, Grade ~~55, and having minimum yield strength of 55,000 psi and a minimum ultimate to be strength of 90,000 psi to be determined by design.~~”

Subsection 918.04 (pg. 1036), 12-2-16; Add the following: “For small quantities less than 100 units of seeding or sod, bagged pelletized or agricultural limestone meeting the Department of Agriculture Tennessee Liming Materials Act may be utilized.”

Subsection 921.01 (pg. 1049), 5-18-15, Water; Replace 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. ~~Test water in accordance with AASHTO T 26. The~~

~~Contractor may use water known to be of potable quality. Water provided by a municipal utility may be used~~ without testing.

~~Where the source of water is relatively shallow, enclose the intake so as to exclude silt, mud, grass, and other foreign materia~~

~~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

<u>Water Source</u>	<u>Testing Frequency⁽¹⁾</u>
<u>Municipal</u>	<u>NA</u>
<u>Non-Municipal</u>	<u>Every 3 months; tested annually after 4 consecutive passing tests</u>

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

Table 921.01-2 Quality Requirements for Mixing Water

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

(1) Other methods (EPA or those used by water testing companies) are generally acceptable.

(2) No ASTM method available.

Subsection 921.06 (pg.1051) 11-16-15; B. Bituminous Additives - 1. Anti-Stripping Additive, modify the following: “Use hydrated lime conforming to AASHTO M 303~~ASTM C977~~ 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 as follows: “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%.~~the percentage of anti-stripping additive used shall range between 0.3% to 0.5% by weight of the asphalt cement.~~”