DIVISION 900 - MATERIALS

SECTION 901 - AGGREGATES

901.04 BROKEN STONE

THE FIFTH THROUGH SEVENTH LINES IN THE TABLE IN THE FIRST PARAGRAPH ARE CHANGED TO:

Absorption in cold water	
No. 8 and larger	1.8
No. 89 and 9	1.8

901.05 WASHED GRAVEL

THE THIRD THROUGH FIFTH LINES IN THE TABLE FOLLOWING THE FIRST PARAGRAPH ARE CHANGED TO:

Absorption in cold water	
No. 8 and larger	1.8 maximum
No. 89 and 9	1.8 maximum

901.08 DENSE-GRADED AGGREGATE

C. Production from Mixture with RAP.

6.

THE SECOND SENTENCE IS CHANGED TO:

When AASHTO T 310 (Direct Transmission Method, nuclear gauge method for measuring density and moisture content) is used to perform Compaction Acceptance Testing (Subsection 301.05, Subpart 2), a representative sample of five tests for each 5,000 square yards lot will be taken.

901.12 AGGREGATES FOR PORTLAND CEMENT CONCRETE, MORTAR, AND GROUT

A. Coarse Aggregate.

THE FIRST SENTENCE OF THE FIRST PARAGRAPH IS CHANGED TO:

Coarse aggregate shall be broken stone or washed gravel conforming to Subsection 901.04 or 901.05 respectively except that carbonate rock shall not be used for concrete surface courses or bridge decks.

B. Fine Aggregate.

THE SIXTH LINE IN THE TABLE FOLLOWING THE FIRST PARAGRAPH IS CHANGED TO:

No. 30	25 - 65

SECTION 902 - BEAM GUIDE RAIL

902.02 POSTS AND SPACERS

THE ENTIRE SUBSECTION TEXT IS CHANGED TO:

Suppliers for obtaining recycled/synthetic routed spacers will be identified in the Standard Input. According to the provisions of 105.04, the Working Drawing submission shall provide evidence that the spacers that are to be used do satisfy the above criteria. Steel spacers shall conform to AASHTO M 270 Grade 36 and shall be galvanized according to AASHTO M 111. Steel pipe spacers shall be schedule 40 galvanized pipe.

Wood timber spacers and posts shall conform to Subsection 918.01.

Steel posts shall be structural steel that conforms to AASHTO M 270 Grade 36 and shall be galvanized according to AASHTO M 111.

To verify suppliers for obtaining recycled/synthetic routed spacers (Polymer & Composite Blockouts), the Contractor is advised to study the "Bureau of Material's Approved List" on the following NJDOT website:

http://www.state.nj.us/transportation/eng/technology/materials

SECTION 903 – HOT MIX ASPHALT

903.01 COMPOSITION OF MIXTURES

For this Project, the 25 percent or less RAP requirements shall govern.

903.02 FORMULA FOR JOB MIX

THE FOLLOWING IS ADDED TO THE FIRST PARAGRAPH:

Unless otherwise approved by the Engineer, only one source of supply for hot mix asphalt surface course may be used on the project.

903.03 SAMPLING AND TESTING

(a) Drum Mix Plants

THE FOLLOWING IS ADDED TO THE FIRST PARAGRAPH:

When a lot is necessarily less than 350 tons, no samples shall be taken. When a lot is greater than 350 tons, a minimum of 2 samples shall be taken.

(b) Fully Automated Batch Plants

THE FOLLOWING IS ADDED TO THE FIRST PARAGRAPH:

When a lot is necessarily less than 350 tons, no samples shall be taken. When a lot is greater than 350 tons, a minimum of 2 samples shall be taken.

THE FOLLOWING IS ADDED AFTER THE SECOND PARAGRAPH:

If reclaimed asphalt pavement is added to the system prior to the hot bins, sampling and acceptance testing will be performed in accordance with the requirements for manual batch plants.

THE FOLLOWING IS ADDED TO THIS SECTION:

903.03a SAMPLING TESTING (ALTERNATE)

Any independent testing agency and/or laboratory performing the services necessary for sampling, testing and/or analysis by this alternate method, shall be accredited by the AASHTO accreditation program.

Along with the test results submitted to the Engineer, the laboratory shall also submit the testing worksheets showing the test methods used, including the calculations. All results will be compared to the job mix formula for the project. Adjustment calculations will be submitted to the Engineer.

The technician who performs the acceptance testing for the testing agency and/or laboratory, shall be certified by the Society Asphalt Technologists for New Jersey, Inc. As an asphalt plant technologist, Level 1.

All testing agencies and/or laboratories must be in possession of a certificate of accreditation from the AASHTO Accreditation Program in order to provide the required services for sampling, testing and/or analysis by this alternate method. The Certificate of Accreditation (on www.nist.gov/amrl) shall be for, at least, the following test methods:

AASHTO T30 – MECHANICAL ANALYSIS OF EXTRACTED AGGREGATE.

AASHTO T164 – QUANTITATIVE EXTRACTION OF BITUMEN FROM BITUMINOUS PAVING MIXTURES OR AASHTO T308 – DETERMINING THE ASPHALT BINDER CONTENT OF HOT MIX ASPHALT (HMA) BY THE IGNITION METHOD.

AASHTO T166 – BULK SPECIFIC GRAVITY OF BITUMINOUS.

(D) Conformance to Job Mix Formula

Conformance to job mix formula shall be determined on the basis of the average of five 8 –inch diameter drilled cores taken from random locations in a lot. A lot should be a maximum of 10,000 square yards in area and will apply to all projects whether the project payment quantities for hot mix asphalt surface course, hot mix asphalt intermediate course or hot mix asphalt base course are measured on a square yard or ton basis.

When a drill fails to procure a whole core, the drill shall be moved a distance of not more than 5 feet and an alternate core obtained. When a project involves the improvement of several individual streets, or several sections of the same street, the lot shall be determined by the area of each street, and if less than the required lot area, the next street or section paved shall be added to complete the approximate area of the lot. All lots shall be approximately equal in size. The number of lots for the project shall be based on the next higher whole number derived by dividing the total pavement square yardage by 10,000.

Where more than one job mix formula is used for a mixture, the Contractor shall supply the Engineer with a record of the location of mixture placement on the project by job mix formula. This shall be supplied to the Engineer daily.

A minimum of 5 cores shall be taken from the hot mix asphalt surface course, hot mix asphalt intermediate course or hot mix asphalt base course from each project.

The average of the test results for the five samples of a lot shall conform to the job mix formula within the applicable tolerances of Table 903-2a. Payment for any lot, which does not comply with these requirements, shall be reduced in accordance with Table 903-06. The Engineer may order removal of any lot subject to the maximum reduction. Reductions for non-conformance of range and stability requirements shall not apply if this drilled core alternate method is used to determine conformance to job mix formula.

Table 903-02 is replaced by the following when the alternate Subsection 903-03a method of sampling and testing is used.

TABLE 903-2a TOLERANCE FROM JOB MIX FORMULA FOR AVERAGE OF FIVE SAMPLES

GRADATION SIEVE SIZE ALL PLANTS	MIX NO.	1-2	1-4HD	1-4	1-5	1-5HD
		TOLERANCE PERCENTAGE (PLUS OR MINUS)				
No. 8		5.5	5.0	5.0	5.0	5.0
No. 200		1.6	1.6	1.6	1.6	1.6
Asphalt		0.55	0.55	0.55	0.55	0.55

SECTION 904 – BITUMINOUS MATERIALS

904.01 ASPHALT BINDER

THE FIRST SENTENCE OF THE FIRST PARAGRAPH IS CHANGED TO:

Asphalt binder shall conform to AASHTO M320, "Performance-Graded Asphalt Binder".

904.06 TEMPERATURE-VOLUME CORRECTION FACTORS

SUBSECTION IS CHANGED TO:

Temperature-volume correction factors that shall be used to convert the volume of bituminous materials, measured at the temperature at the point of use, to the volume at 60 °F are found in the following tables:

Table 904-1 Temperature-Volume Correction Factors for Bituminous Materials

Asphalt Binder, All Grades.
Cut-Back Asphalt, Grades RC-800, RC-3000, MC-800, and MC-3000.
Inverted Emulsified Asphalt, Grade IEMC-800.

http://www.state.nj.us/transportation/cpm/BaselineDocuments/

SECTION 905 - CONCRETE ADMIXTURES AND CURING MATERIALS

905.02 CHEMICAL ADMIXTURES.

THE FOLLOWING IS ADDED TO THIS SUBSECTION:

Corrosion inhibitor products that are to be used in the fabrication of concrete items shall be as follows:

Calcium Nitrite Based as produced by
W.R. Grace & Company
2133 85th Street
North Bergen, NJ 07047
Telephone: 201-869-5220

Calcium Nitrite Based as produced by
The Euclid Chemical Company
5 Joanna Court
East Brunswick, NJ 08816
Telephone: 732-390-9770

Calcium Nitrite Based as produced by
Master Builders Inc.
798 Welsh Road
Huntingdon Valley, PA 19006
Telephone: 215-938-7501

Calcium Nitrite Based as produced by
SIKA Corporation
201 Polito Avenue
Lyndhurst, NJ 07071
Telephone: 800 - 933 - SIKA (7452)

Calcium Nitrite Based as produced by
Great Eastern Technologies, LLC
"Chem Strong CI"
515 Route 528
P. O. Box 3015
Lakewood, NJ 08701
Telephone: 888 - 452 – 9348

THE FOLLOWING SUBSECTION IS ADDED:

905.06 DETECTABLE WARNING SURFACES

Materials for Detectable Warning Surfaces shall be safety red and appear uniform in color after curing. The surface coating material shall be an abrasion, UV and chemical resistant and shall be capable of adhering to existing or new portland cement concrete surfaces. The minimum final dry coat thickness shall be 40 mils.

The cured coating shall exhibit the following minimum coefficients of friction when tested according to ASTM D 1894.

Static coefficient of friction	**Dynamic coefficient of friction**
Dry 0.95 – 0.99	Dry 0.91 – 0.95
Wet 1.39 – 1.42	Wet 1.27 – 1.36

The Detectable Warning Surfaces shall be installed according to the manufacturer's recommendations.

SECTION 908 – JOINT MATERIALS

908.02 JOINT SEALERS

THE FIRST PARAGRAPH IS CHANGED TO:

Hot-poured joint sealer for joints and cracks in both HMA and portland cement concrete surface course shall be sealant conforming to Subsections 908.06, 908.07, and ASTM D 6690 as follows:

1. Type II Sealant shall be used when sealing cracks in HMA.
2. Type IV Sealant shall be used when sealing joints and cracks in Portland cement concrete pavements and HMA saw and seal applications.

908.03 PREFORMED ELASTOMERIC JOINT SEALER (COMPRESSION TYPE)

A. Requirements.

THE SECOND SENTENCE IS CHANGED TO:

The material shall conform to the physical properties specified in Table 1 of ASTM D 3542 and as modified herein. The Compression-Deflection properties specified in Table 1 of ASTM 3542 shall be replaced with NJDOT Test Method J-2 as provided within these Specifications. The requirement for Pressure Deflection shall be 3.5 psi.

THE FIRST SENTENCE OF THE FIFTH PARAGRAPH IS CHANGED TO:

The width to height ratio of the compression sealer shall never be less than 90%.

908.05 STRIP SEAL EXPANSION DAM

B. Glandular Type Strip Seal.

1. Scope.

THE FIRST SENTENCE IS CHANGED TO:

This specification covers the material requirements for glandular type strip seal deck joint systems consisting of an extruded neoprene rubber gland seal mechanically locked in the cavities of two parallel steel rail sections.

3. Metal Components and Adhesive.

THE FIRST AND SECOND SENTENCES ARE CHANGED TO:

Steel rail sections shall conform to AASHTO M 270 Grade 36 or 50. Steel for plates, shapes and other structural steel used in the deck joint system shall conform to AASHTO M 270 Grade 36 or 50.

THE FOLLOWING NEW SUBSECTION IS ADDED:

908.08 POLYMERIZED JOINT ADHESIVE

Polymerized joint adhesive shall be hot-applied asphaltic joint adhesive/sealer and shall conform to the physical properties in Table 908-6 below.

Table 908-6 Tests for Identification

Property	ASTM Test Procedure	Physical Requirements
Cone Penetration, 77°F	D 5329	60-100
Flow, 140°F	D 5329	5 mm maximum
Resilience, 77°F	D 5329	30% minimum
Ductility, 77°F	D 113	30 cm minimum
Ductility, 39.2°F	D 113	30 cm minimum
Tensile Adhesion, 77°F	D 5329	500% minimum
Softening Point	D 36	77°C minimum
Asphalt Compatibility	D 5329	Pass

The polymerized joint adhesive shall have a viscosity at the recommended pour temperature to allow for proper application of the material. The manufacturer of the joint adhesive shall provide documentation of recommended pour temperature and safe heating temperature for the material and shall submit certifications of compliance according to Subsection 106.04. Test results shall be attached to the certification.

SECTION 909 – LANDSCAPING MATERIALS

909.09 TOPSOIL STABILIZATION MATTING

THE FOLLOWING IS ADDED TO THIS SUBSECTION:

The topsoil stabilization matting at the southwest corner of the bridge shall be Tensar TM-3000 turf reinforcement mat or equal approved by the Engineer. Installation shall comply with the fabricator's best recommended procedures and practices.

909.10 TOPSOIL

A. Unacceptable topsoil sources.

ITEM 1. IS CHANGED TO:

1. Soils having less than 4.1 pH value, or greater than 8.0 pH value.

SECTION 910 - MASONRY UNITS

910.07 GRANITE FACING FOR PIER SHAFTS

THE LAST SENTENCE OF THE LAST PARAGRAPH IS CHANGED TO:

The number of cores to be furnished for such tests shall be six.

SECTION 912 - PAINTS, COATINGS, AND MARKINGS

912.10 PAVEMENTS STRIPES OR MARKINGS

C. Thermoplastic

2. For white, the composition of the mixture shall be as follows:

Component	Percent by weight
Resin/Binder	22-26 percent
Glass Beads (pre-mix)	30 percent minimum
White Pigment	10 percent minimum
Calcium Carbonate and Inert Fillers (shall not contain silica other than as glass beads)	34-38 percent

3. Only yellow non-lead formulas shall be used, the composition of the mixture shall be as follows:

Component	Percent by weight
Resin/Binder	22-26 percent
Glass Beads (pre-mix)	30 percent minimum
Yellow Pigment	2 percent minimum
Calcium Carbonate and Inert Fillers (shall not contain silica other than as glass beads)	42-46 percent

The yellow material's combined totals of lead, cadmium, mercury, and hexavalent chromium shall not exceed 100 parts per million.

The thermoplastic manufacturer shall certify, according to Subsection 106.04, that the material will meet the requirements specified.

912.12 REMOVABLE PAVEMENT MARKING TAPE AND REMOVABLE BLACK LINE MASKING TAPE

THE SUBSECTION HEADING AND SUBPART A IS CHANGED TO:

912.12 REMOVABLE WET WEATHER PAVEMENT MARKING TAPE AND REMOVABLE BLACK LINE MASKING TAPE

A. **Removable Wet Weather Pavement Marking Tape.** The removable wet weather pavement marking tape shall consist of polymeric, conformable backing materials with a retroreflective surface designed to provide retroreflectivity in wet conditions. The underside of the tape shall be precoated with a pressure sensitive adhesive which bonds the tape to the roadway surface so as to be able to withstand traffic immediately after installation. Primers shall be used to promote tape adhesion to the pavement only in accordance with the tape manufacturers recommendations.

Daylight color of the white tape shall be no darker than color No. 37778 of FED-STD-595B. Daylight color of the yellow tape shall conform to the FHWA color tolerance chart for highway yellow.

THE THIRD PARAGRAPH IS CHANGED TO:

When measured with a LTL-2000 Retrometer, the tape shall have initial, minimum retroflectance values conforming to:

Dry Condition – ASTM E 1710
Entrance Angle = 88.76°

Observation Angle	Specific Luminance	
	White	Yellow
(Degrees)	(Millicandelas per square foot per footcandle)	(Millicandelas per square foot per footcandle)
1.05	750	450

Note: The angular aperture of both the photoreceptor and the light projector shall be six minutes of arc. The reference axis shall be taken perpendicular to the test sample.

Continuous Wet Condition – ASTM E 2176
Entrance Angle = 88.76°

Observation Angle	Specific Luminance	
	White	Yellow
(Degrees)	(Millicandelas per square foot per footcandle)	(Millicandelas per square foot per footcandle)
1.05	750	350

Note: Specific luminance is measured in millicandelas per square foot per foot-candles.

The removable tape shall be capable of being removed manually, intact or in large pieces, at temperatures above 40 °F without the use of solvents, burning, grinding, or blasting. Only tape that has previously received the approval of the Department Bureau of Materials shall be used. Certification of Compliance shall be furnished according to Subsection 106.04.

912.13 INORGANIC ZINC COATING SYSTEM

THE FOLLOWING IS ADDED:

A complete coating system of an inorganic zinc-rich primer, a high-build epoxy intermediate coat, and a urethane finish coat shall be selected from one of the approved coating systems listed on the following website:

http://www.state.nj.us/transportation/eng/technology/materials

All products for the complete system, including thinners and solvents, shall be from the same manufacturer and shall be from the Qualified Paint List.

Drying time between coats shall be per the manufacturer's recommendations.

The following information shall be submitted for the system selected at least one month before painting is anticipated:

1. A 1-gallon sample for each coat of paint in the system.

2. Infrared curves (0.1 to 0.6 mils) for each coat. Curves for the dry film of the vehicle (binder) of each component and for the mixed paint shall be included.
3. Weight per gallon, at 77 °F, for each coat. Variance shall be within plus or minus 1.8 ounces of the normal weight per gallon of the sample that was approved and placed on the QPL.
4. Viscosity in Krebs Units, at 77 °F, for each coat. Variance shall be within plus or minus 5 Krebs Units, or equivalent units of another viscometer, of the viscosity of the sample that was approved and placed on the QPL.
5. Percent of solids by weight of each coat.
6. Percent of metallic zinc by weight in the dry film of the cured zinc primer coat. This percentage shall be greater than or equal to that of the sample that was approved and placed on the QPL.
7. Percent of metallic zinc by weight in the zinc pigment component.
8. Finish coat color chips for selection of color by the Engineer.
9. The required curing time and dry film thickness for the qualification of the zinc primer for slip-critical connections in conformance with the requirements of AASHTO, Division I, Table 10.32.3C for Class of Surface B. A certified test report with the slip coefficient tested according to AASHTO Division 1, Article 10.32.3.2.3.
10. Technical data sheets, MSDS, and specific application instructions for all coats. In the event of a conflict between the data/instruction sheets and these Specifications, with the approval of the Engineer, the manufacturer's requirements shall govern. Work shall not be allowed to proceed until the information is received and approved.
11. Mixing and thinning directions.
12. Recommended spray nozzles and pressures.

The Contractor shall submit the manufacturer's recommended repair procedures to correct damage such as that caused in handling and shipping, deficient or excessive coating thickness, removal of zinc salts and other contaminants that would be detrimental to succeeding coats, and procedures for surface preparation and painting of rust spots.

The Contractor shall provide the services of a paint or a painting technical representative from the paint manufacturer at the beginning of operations and whenever required during operations.

Each container of paint shall be labeled to show the name of the manufacturer, the trade name designation of the contents, the lot or batch number, the date of manufacture, and the volumetric contents in gallons or the weight of zinc powder in pounds. Each container shall be labeled according to the Code of Federal Regulations for flammables and shall contain all information necessary to comply with NJSA 34:5A-1 New Jersey Worker and Community Right To Know Act.

912.14 EPOXY MASTIC COATING SYSTEM

THE FOLLOWING IS ADDED:

A complete coating system of an aluminum epoxy mastic primer and a urethane finish coat shall be selected from one of the approved coating systems on the following website:

http://www.state.nj.us/transportation/eng/technology/materials

All products for the complete system, including thinners and solvents, shall be from the same manufacturer and shall be from the Qualified Paint List.

Drying time between coats shall be per the manufacturer's recommendations.

The following information shall be submitted for the system selected at least one month before painting is anticipated:

1. A 1-gallon sample for each coat of paint in the system.

2. Infrared curves (0.1 to 0.6 mils) for each coat. Curves for the dry film of the vehicle (binder) of each component and for the mixed paint shall be included.
3. Weight per gallon, at 77 °F, for each coat. Variance shall be within plus or minus of the nominal weight per gallon of the sample that was approved and placed on the QPL.
4. Viscosity in Krebs Units, at 77 °F, for each coat. Variance shall be within plus or minus 5 Krebs Units, or equivalent units of another viscometer, of the viscosity of the sample that was approved and placed on the QPL.
5. Percent of solids by weight of each coat.
6. Finish coat color chips for selection of color by the Engineer.
7. Technical data sheets, MSDS, and specific application instructions for all coats. In the event of a conflict between the data/instruction sheets and these Specifications, with the approval of the Engineer, the manufacturer's requirements shall govern. Work shall not be allowed to proceed until the information is received and approved.
8. Mixing and thinning directions.
9. Recommended spray nozzles and pressures.

The Contractor shall submit the manufacturer's recommended repair procedures to correct damage such as that caused in handling and shipping, deficient or excessive coating thickness, removal of zinc salts and other contaminants that would be detrimental to succeeding coats, and procedures for surface preparation and painting of rust spots.

The Contractor shall provide the services of a paint or a painting technical representative from the paint manufacturer at the beginning of operations and whenever required during operations.

Each container of paint shall be labeled to show the name of the manufacturer, the trade name designation of the contents, the lot or batch number, the date of manufacture, and the volumetric contents in gallons or the weight of zinc powder in pounds. Each container shall be labeled according to the Code of Federal Regulations for flammables and shall contain all information necessary to comply with NJSA 34:5A-1 New Jersey Worker and Community Right To Know Act.

912.15 ORGANIC ZINC COATING SYSTEM

A complete coating system of an organic zinc-rich primer, a high build epoxy intermediate coat, and a urethane finish coat shall be selected from one of the approved coating systems listed on the following website:

http://www.state.nj.us/transportation/eng/technology/materials

Drying time between coats shall be per the manufacturer's recommendations.

The following information shall be submitted for the system selected at least one month before painting is anticipated:

1. A 1-gallon sample for each coat of paint in the system.
2. Infrared curves (0.1 to 0.6 mils) for the zinc primer, intermediate, and finish coats to include curves for the dry film of the vehicle (binder) of each component and for the mixed paint.
3. Weight per gallon, at 77 °F, for the zinc primer, intermediate, and finish coats. Variance shall be within plus or minus of the nominal weight per gallon of the sample that was approved and placed on the QPL.
4. Viscosity in Krebs Units, at 77 °F, for the zinc primer vehicle and the intermediate and finish coat paints. Variance shall be within plus or minus 5 Krebs Units, or equivalent units of another viscometer, of the viscosity of the sample that was approved and placed on the QPL.
5. Percent of solids by weight of the zinc primer vehicle and the intermediate and finish coat paints.
6. Percent of metallic zinc by weight in the dry film of the cured zinc primer coat. This percentage shall be greater than or equal to that of the sample that was approved and placed on the QPL.
7. Percent of metallic zinc by weight in the zinc pigment component.
8. Finish coat color chips for selection of color by the Engineer.

9. The required curing time and dry film thickness for the qualification of the zinc primer for slip-critical connections in conformance with the requirements of AASHTO, Division I, Table 10.32.3C for Class of Surface A. A certified test report with the slip coefficient tested according to AASHTO Division 1 Article 10.32.3.2.2.
10. Technical data sheets, MSDS, and specific application instructions for all coats. In the event of a conflict between the data/instruction sheets and these Specifications, with the approval of the Engineer, the manufacturer's requirements shall govern. Work shall not be allowed to proceed until the information is received and approved.
11. Mixing and thinning directions.
12. Recommended spray nozzles and pressures.

The Contractor shall submit the manufacturer's recommended repair procedures to correct damage such as that caused in handling and shipping, deficient or excessive coating thickness, removal of zinc salts and other contaminants that would be detrimental to succeeding coats and procedures for surface preparation and painting of rust spots.

The Contractor shall provide the services of a paint or a painting technical representative from the paint manufacturer at the beginning of operations and whenever required during operations.

Each container of paint shall be labeled to show the name of the manufacturer, the trade name designation of the contents, the lot or batch number, the date of manufacture, and the volumetric contents in gallons or the weight of zinc powder in pounds. Each container shall be labeled according to the Code of Federal Regulations for flammables and shall contain all information necessary to comply with NJSA 34:5A-1 New Jersey Worker and Community Right To Know Act.

SECTION 913 - PIPE

913.03 DUCTILE IRON WATER PIPE

THE FIRST SENTENCE OF THE FIRST PARAGRAPH IS CHANGED TO:

Ductile iron water pipe shall conform to ANSI/AWWA C151/A21.51.

913.04 CONCRETE PIPE

THE ENTIRE SUBSECTION TEXT IS CHANGED TO:

In the manufacture of concrete pipe, concrete shall be composed of cement, coarse aggregate, fine aggregate, and water. Concrete may include admixtures, fly ash, or GGBFS. The materials shall conform to the following:

Aggregates	901.12
Air-Entraining Admixture	905.01
Chemical Admixture	905.02
Fly Ash	ASTM C 618, Class C or F
GGBFS	919.18
Portland Cement or Blended Hydraulic Cement	919.11
Water	919.15

If fly ash is used to control alkali-silica reactivity, Class F fly ash shall be used.

Reinforced concrete culvert pipe, storm drain, and sewer pipe shall conform to AASHTO M 170, Class III, Wall B, unless otherwise designated. For jacked pipe, reinforced concrete culvert pipe shall conform to AASHTO M 170, Class V, Wall B. Reinforced concrete elliptical culvert, storm drain, and sewer pipe shall conform to AASHTO M 207, Class HE-III, unless otherwise designated.

If required for watertight flexible joints, preformed flexible joint sealants conforming to AASHTO M 198 shall be used.

The manufacturer of the pipe shall notify the Bureau of Materials at least 2 days before shipping pipe to the Project. Pipe will be inspected and approved in the manufacturer's yard. For approval of the concrete pipe, three-point loading shall be performed in the manufacturer's yard at a frequency directed by the Engineer.

913.11 PLASTIC DRAINAGE PIPE

THE SUBSECTION HEADING AND TEXT ARE CHANGED TO:

913.11 HIGH DENSITY POLYETHYLENE (HDPE), PVC DRAINAGE PIPE

Corrugated HDPE drainage pipe shall conform to AASHTO M 252 or AASHTO M 294M. PVC drainage pipe shall conform to ASTM D 2729.

SECTION 914 – PORTLAND CEMENT CONCRETE, MORTOR, AND GROUT

THE TITLE OF THIS SECTION IS CHANGED TO:

SECTION 914 – PORTLAND OR BLENDED HYDRAULIC CEMENT CONCRETE, MORTAR, AND GROUT

914.01COMPOSITION OF PORTLAND CEMENT CONCRETE.

SUBSECTION IS RENAMED AND CHANGED TO:

914.01 COMPOSITION OF PORTLAND OR BLENDED HYDRAULIC CEMENT CONCRETE

Portland cement concrete shall be composed of portland cement or blended hydraulic cement, coarse aggregate, fine aggregate, admixtures, and water. Portland cement concrete except white concrete may include fly ash, Ground Granulated Blast Furnace Slag or Silica Fume. Materials shall conform to the following Subsections:

Aggregates	901.12
Admixtures:	
Air-Entraining	905.01
Chemical	905.02
Mineral	
Fly Ash	919.07
Silica Fume	919.10(b)
Ground Granulated Blast Furnace Slag	919.18
Portland Cement	919.11
Water	919.15

Chemical admixtures conforming to the requirements of Subsection 905.02 may be used in the mix design of structural concrete items.

914.02 PORTLAND CEMENT CONCRETE DESIGN, CONTROL, AND ACCEPTANCE TESTING REQUIREMENTS

THE TITLE OF THIS SUBSECTION IS CHANGED TO:

914.02 PORTLAND OR BLENDED HYDRAULIC CEMENT CONCRETE DESIGN, CONTROL, AND ACCEPTANCE TESTING REQUIREMENTS

B. Proportioning and Verification.

THE SECOND SENTENCE OF THE THIRD PARAGRAPH IS CHANGED TO:

At least six 4 by 8 inch test cylinders shall be prepared from each batch and cured according to AASHTO T 23 or AASHTO T 126.

THE FIRST SENTENCE OF THE TENTH PARAGRAPH IS CHANGED TO:

Classes A and B concrete may be designed to achieve early strength requirements by increasing the Cement content.

C. Acceptance Testing Procedures for Slump and Air Entrainment.

THE FIRST SENTENCE OF THE FOURTH PARAGRAPH IS CHANGED TO:

Following any permitted additions, the drum shall be rotated at the recommended mixing speed for a minimum of 30 revolutions without exceeding 300 total revolutions, the original test results shall be disregarded, and a single test for both slump and air entrainment performed.

D. General Acceptance Testing Requirements for Strength.

THE FOLLOWING IS ADDED AFTER THE SECOND PARAGRAPH:

Concrete test specimens which are to be used for determination of early strengths for form removal, opening to traffic, or otherwise placing the concrete into service shall be cured according to the field curing provisions in AASHTO T-23.

E. Acceptance Testing for Strength for Pay-Adjustment Items.

THE ENTIRE TEXT OF THIS SUBPART IS CHANGED TO:

Concrete Pay Items which are subject to pay adjustment and the base prices are as follows:

DESCRIPTION	UNIT	BASE PRICE
CONCRETE IN SUPERSTRUCTURE, DECK SLABS	CY	$460.00
CONCRETE IN SUPERSTRUCTURE, DECK SLABS, W/ CORR. INHB. ADMIXTURE	CY	$525.00
CONCRETE IN SUPERSTRUCTURE, PARAPETS	LF	$305.00
PRESTRESSED CONCRETE SLAB BEAMS, (TYPE SII-36), 36" X 15"	LF	$125.00
PRESTRESSED CONCRETE SLAB BEAMS, (TYPE SIII-36), 36" X 18"	LF	$130.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BI-36), 36" X 27"	LF	$170.00
PRESTRESSED CONCRETE SLAB BEAMS, (TYPE SIV-36), 36" X 21"	LF	$160.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BII-36), 36" X 33"	LF	$170.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BIII-36), 36" X 39"	LF	$175.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BIV-36), 36" X 42"	LF	$185.00

DESCRIPTION	UNIT	BASE PRICE
PRETENSIONED PRESTRESSED CONCRETE BEAMS, 45"	LF	$155.00
PRETENSIONED PRESTRESSED CONCRETE BEAMS, 54"	LF	$155.00
PRESTRESSED CONCRETE SLAB BEAMS, (TYPE SII-48), 48" X 15"	LF	$160.00
PRESTRESSED CONCRETE SLAB BEAMS, (TYPE SIII-48), 48" X 18"	LF	$135.00
PRETENSIONED PRESTRESSED CONCRETE BEAMS, 63"	LF	$185.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BI-48), 48" X 27"	LF	$215.00
PRESTRESSED CONCRETE SLAB BEAMS, (TYPE SIV-48), 48" X 21"	LF	$215.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BII-48), 48" X 33"	LF	$185.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BIII-48), 48" X 39"	LF	$220.00
PRESTRESSED CONCRETE BOX BEAMS, (TYPE BIV-48), 48" X 42"	LF	$230.00
PRETENSIONED PRESTRESSED CONCRETE BEAMS, 72"	LF	$200.00
PRESTRESSED CONCRETE PILES, DRIVEN	LF	$90.00
CAST-IN-PLACE CONCRETE PILES, DRIVEN, 12" DIAMETER	LF	$30.00
PRECAST CONCRETE PILES, DRIVEN, 12" X 12"	LF	$90.00

The amount of pay-adjustment in dollars is the product of the Pay Item base price times the lot quantity times the percent pay-adjustment (expressed as a decimal) given by Equation 1 or Equation 2.

Equation 1 and Equation 2:

Quality	Pay-adjustment (Percent)	
PD < 50	PPA = 3.0 - 0.3 PD	Equation 1
PD ≥ 50	PPA = 26.0 - 0.76 PD	Equation 2

Where: PPA = Percent Pay-adjustment
PD = Percent Defective (Estimate of percent of lot below the class design strength by the use of Equation 3 and Subsection 914.05, Table 914-5)

Equation 3:

$$Q = (ALS - CDS) / S$$

Where: Q = Quality index for pay-adjustment computations
ALS = Average lot strength in psi
CDS = Class design strength in psi
S = Standard deviation of the strength test results in psi for the lot as computed by Equation 4

Equation 4:

$$S = \sqrt{\frac{\Sigma(Xi - ALS)^2}{N-1}}$$

Where: Σ = Summation
Xi = Individual test result (average strength of a test cylinder pair)
N = Number of test results for the lot

Note: When only a single test result is available, the standard deviation "S" is assumed to equal 200 psi.

There will be no positive pay adjustments to the contract price. Therefore, if the percent defective level is less than or equal to 10%, there will be no pay adjustment. For lots having greater than 10 percent defective, Equations 1 or 2, as appropriate, subtract progressively larger amounts from the contract price.

If, based on the initial series of tests, the lot quality of a pay-adjustment item is estimated to be PD = 50 or greater, or if any individual test value (average of a cylinder pair) falls below the retest limit for non-pay-adjustment concrete in Subsection 914.05, Table 914-4, the Engineer has the option to reevaluate by coring or other suitable means. When this provision is applied to Class P concrete, each beam or pile in the steam bed will be evaluated separately.

If the Department elects not to core, the Contractor may accept the pay-adjustment of (PPA) calculated by Equation 2 or, when approved by the Engineer, may take cores according to Subsection 914.05, Table 914-4 at no cost to the Department. The Contractor must take the cores within 60 days from notification of the option to core. As an aid in making this decision, the Contractor will be permitted to perform nondestructive testing using a method or device approved by the Engineer.

When re-evaluation is accomplished by a method other than coring, the results will be used only to determine what further action is to be taken. If any of the non-core tests results are below the class design strength, the Engineer has the option to core. If this option is waived, the Contractor may elect to core, at no cost to the State and within 60 days after being presented with this option, or to accept the pay-adjustment computed from the initial test cylinder results. If the Contractor elects to core, the coring shall be performed as directed and the Department will test the cores. If none of the non-core test results is below the class design strength, the Engineer may elect either to core or to accept the lot at 100 percent payment.

If, based on the core results, the lot is determined to be at a quality level of PD < 75, the pay-adjustment shall be computed by Equation 1 or Equation 2, as appropriate. If the lot is confirmed to be at a quality level of PD = 75 or greater, the lot is considered to be rejectable and the Engineer may:

1. Require the Contractor to remove and replace the defective lot at no cost to the State,
2. Allow the Contractor to leave the defective lot in place and receive a percent pay-adjustment (PPA) computed by Equation 2, or
3. Allow the Contractor to submit a plan, for approval, for corrective action to be performed at no cost to the State. If the plan for corrective action is not approved, either option 1 or 2 above may be applied.

F. **Acceptance Testing for Strength for Non-Pay-Adjustment Items.**

THE ENTIRE TEXT OF THIS SUBPART IS CHANGED TO:

All concrete items not specifically designated as pay-adjustment items as described in Subsection 914.02, Subpart E are considered to be non-pay-adjustment items, but may be accepted by pay-adjustment under certain circumstances. Such an item is eligible for 100 percent payment (PA = 0) provided the retest limit of Subsection 914.05, Table 914-4 is met. If this requirement is not met, the item will be treated as a pay-adjustment item according to Subsection 914.02, Subpart E, and all pay-adjustment provisions shall apply except that the item bid price will be used instead of an item base price in the computation of the pay-adjustment.

When a pay-adjustment is computed for any of the following items, which are only partially composed of concrete, the amount of pay-adjustment, if any, will be multiplied by the Estimated Percentage of Concrete (expressed as a decimal) as indicated below:

Pay Item of Concrete	**Estimated Percentage**
INLETS, TYPE ___	30
INLETS, TYPE ___, USING EXISTING CASTING	30
INLETS, TYPE B-___	40
INLETS, TYPE B-___, USING EXISTING CASTING	40
INLETS, TYPE ___ MODIFIED	40
INLETS, TYPE ___ MODIFIED, USING EXISTING CASTING	40
INLETS, TYPE ES	50
INLET CASTINGS, TYPE ES	40
MANHOLES	30

MANHOLES, ___ ' DIAMETER	30
MANHOLES, USING EXISTING CASTING	30
MANHOLES, SANITARY SEWER	30
MANHOLES, SANITARY SEWER, USING EXISTING CASTING	30
GRANITE CURB	25
RESET GRANITE CURB	25
BEAM GUIDE RAIL ANCHORAGES	25
CHAIN-LINK FENCE, ___ ' HIGH	25
CHAIN-LINK FENCE, ALUMINUM-COATED STEEL,___ ' HIGH	25
CHAIN-LINK FENCE, PVC-COATED STEEL,___ ' HIGH	25
CHAIN-LINK FARM-TYPE FENCE	25
GATES, CHAIN-LINK FENCE, ___ ' WIDE	25
GATES, CHAIN-LINK FENCE, ALUMINUM-COATED STEEL, ___ ' WIDE	25
GATES, CHAIN-LINK FENCE, PVC-COATED STEEL, ___ ' WIDE	25
GATES, CHAIN-LINK FARM-TYPE FENCE, ___ ' WIDE	25
RESET FENCE	25
TEMPORARY CHAIN-LINK FENCE, ___ ' HIGH	25
GUIDE SIGNS, TYPE GA, BREAKAWAY SUPPORTS	20
GUIDE SIGNS, TYPE GA, NON-BREAKAWAY SUPPORTS	20

The amount of pay-adjustment for pay items not listed above is the product of the unit bid price times the lot quantity times the percent pay-adjustment given by Equation 1.

914.03 MORTAR AND GROUT

THE LAST PARAGRAPH IS CHANGED TO:

Epoxy grout conforming to the requirements of ASTM C 881, Type I; Grade 3; Class B or C may be used as a non-shrink grout.

914.04 SAMPLING AND TESTING METHODS

THE FOLLOWING AASHTO TEST METHOD IS ADDED:

T303	Standard Test Method for Accelerated Detection of Potentially Deleterious Expansion of Mortar Bars Due to Alkali-Silica Reaction.

914.05 Tables

TABLES 914-1, 914-3, AND 914-4 ARE CHANGED TO:

Table 914-1 Requirements for Roadway Concrete Items

	Concrete Class	Slump (inch)	Percent Air Entrainment for Coarse Aggregate Si Numbers				
			357	467	57	67	
Cast-in-Place Items							
Surface Course, Bridge Approach Slabs, Bridge Approach Transition Slabs	B	2±1	5.0±1.5	5.0±1.5	6.0±1.5	6.0±1.5	7.0
Base Course	B	2±1	5.0±1.5	5.0±1.5	6.0±1.5	6.0±1.5	7.0
Inlet and Manhole Walls, Headwalls, Miscellaneous Concrete	B	3±1	----	----	6.0±1.5	6.0±1.5	7.0
Inlet and Manhole Top Slabs, Sidewalks, Driveways, Islands	B	3±1	----	----	6.0±1.5	6.0±1.5	7.0
Slope Gutters, Vertical Curb, Sloping Curb, Barrier Curb and Base	B	4±1	----	----	6.0±1.5	6.0±1.5	7.0
Concrete and White Concrete Vertical, Sloping and Barrier Curb, Concrete and White Concrete Islands	B	4±1	----	----	7.0±2.0	7.0±2.0	8.0
Foundations for:							
Inlets and Manholes	B	3±1	6.5 max	6.5 max	7.5 max	7.5 max	8.5
Electrical Items	B	3±1	----	----	7.5 max	7.5 max	8.5
Signs	B	3±1	----	----	6.0±1.5	6.0±1.5	7.0
Junction Boxes	B	3±1	----	----	7.5 max	7.5 max	8.5

Table 914-1 (Continued)

	Concrete Class	Slump (inch)	Percent Air Entrainment for Coarse Aggregate Si Numbers				
			357	467	57	67	
Cast-in-Place Items (continued)							
Footings for Fence Posts, Guide Rail End Treatment	B	3±1	----	----	7.5 max	7.5 max	8.5
Culverts	A	3±1	----	----	6.0±1.5	6.0±1.5	7.0
Monuments	A	3±1	----	----	7.5 max	7.5 max	8.5
Slope Protection	B	2±1	----	----	6.0±1.5	6.0±1.5	7.0
Precast Items							
Culverts	A	3±1	----	----	6.0±1.5	6.0±1.5	7.0
Inlets and Manholes, Junction Boxes, Headwalls, Reinforced Concrete End Sections (See note 2)	B	3±1	----	----	6.0±1.5	6.0±1.5	7.0
Concrete and White Concrete Barrier Curb	B	3±1	----	----	7.0±2.0	7.0±2.0	8.0

Note 1: According to Subsection 501.03, a Type F water-reducing, high range admixture will be permitted accordi Subsection 914.02, Subparts B and C. When a Type F admixture is used, the table Slump and Air Content valu shall be changed as follows:

Slump: 6 ± 2 inches

Air Content: Increase both the target value and tolerance percentages by 0.5.

Note 2: For the items in this category, the slump may be reduced to zero (dry cast) provided that adequate consolidation, achieved.

Table 914-3 Mix Design Requirements

	Class of Concrete					
	A	**B**	**S**	**P**	**P-1**	**P-2**
Class Design Strength (28 days, psi Note 3)	4600	3700	2000	5500	6000	6500
Verification Strength (28 days, psi Note 3)	5400	4500	--	6000	6500	7000
Maximum Water/Cement Ratio (Note 2)						
lb/lb	0.443	0.488	0.577	Note 1	Note 1	Note 1
gals/bag	5.0	5.5	6.5	Note 1	Note 1	Note 1
Minimum Cement Content						
lb/cy	611	564	658	Note 1	Note 1	Note 1
Bags/cy	6.5	6.0	7.0	Note 1	Note 1	Note 1

Note 1: According to PCI Manual, except as indicated in Note 2.

Note 2: The maximum water/cement ratio for all classes of concrete except for Classes P, P-1 and P-2, when a Type F water-reducing, high range admixture is used according to Tables 914-1 and 914-2, shall be reduced by 0.043 lb/lb (4.5 gals/bag).

Note 3: All concrete test results shall be recorded to the nearest 10 psi..

Note 4: To successfully meet the requirements of this specification, the target production strength must be higher than the Class Design Strength by an amount proportional to the Producer's within-lot standard deviation.

Table 914-4 Lot Sizes, Sampling Rates and Retest Limits

	Class of Concrete					
	A	**B**	**S**	**P**	**P-1**	**P-2**
Lot Size (maximum)	One Day's Production			One Day's Production of a Single Steam Bed		
Pay-Adjustment Items						
Initial Sampling Rate	5/Lot	5/Lot	--	5/Lot	5/Lot	5/Lot
Retest Sampling Rate (minimum)	5/Lot	5/Lot	--	5/Unit or Load Test		
Non-Pay-Adjustment Items						
Initial Sampling Rate	3/Lot	2/Lot	1/Lot	3/Lot	3/Lot	3/Lot
Retest Limit (psi)	4400	3600	2000	5400	5900	6400
Retest Sampling Rate	5/Lot	5/Lot	5/Lot	5/Lot	5/Lot	5/Lot

Note 1: The lot sizes are maximums and, at the option of the Engineer, any lot may be subdivided into two or more smaller lots. When such a subdivision is made, the specified sampling rate applies to each of the smaller lots.

Note 2: An initial strength test result is defined as the average strength of two 4 inch by 8 inch compression test cylinders, cured for 28 days, and tested in the Department Laboratory except for Classes P, P-1, and P-2 cylinders which may be tested at the fabricator's plant under the supervision of the Engineer.

Note 3: A retest result is defined as the strength of an individual test result obtained by coring or other suitable means. If retest is performed by coring, each retest result is defined as the corresponding nominal core strength divided by 0.85.

Note 4: The specified sampling rates shall apply except that no more than one test per truckload or batch of concrete will be required (except for air and slump tests when retempering). It is expected that each structural component will have a representative sample taken. At the option of the Engineer, nonstructural concrete lots consisting of 20 cubic yards or less may be accepted without strength tests.

Note 5: No lot shall include more than one class of concrete nor include concrete of the same class having different specified levels of slump or air entrainment.

Note 6: For prestressed concrete, if more than one bed is used or if more than 80 cubic yards of concrete are used, the production shall be subdivided as equally as possible into two or more lots.

Note 7: Retest limit for non-pay-adjustment roadway and structural items requiring the use of Class B, white concrete, shall be 3000 psi.

SECTION 915 – REINFORCEMENT STEEL

915.01 REINFORCEMENT STEEL FOR STRUCTURES

B. Deformed Bars, Zinc-Coated (Galvanized)

THE FOLLOWING IS ADDED:

All reinforcement shall be hot dip galvanized after fabrication except reinforcement for prestressed beams shall NOT be hot dip galvanized.

915.02 PRESTRESSING REINFORCEMENT

C. Grit Impregnated Epoxy-Coated Prestressing Steel.

THE FIRST SENTENCE IS CHANGED TO:

Grit impregnated epoxy-coated prestressing steel strands shall conform to the requirements of ASTM A 882 and to the criteria specified in 502.06.

915.03 REINFORCEMENT STEEL FOR CONCRETE BASE AND CONCRETE SURFACE COURSES

SUBPART 5 TEXT IS CHANGED TO:

5. **Dowels.** Dowel bars in transverse joints shall be epoxy-coated, Grade 60, plain reinforcement steel conforming to ASTM A 615. If specified, dowel bars shall be fitted with end caps. The end caps shall be non-metallic and designed to prevent the entrance of grout or mortar into the expansion void. End caps shall have a maximum length of 2 1/2 inches and shall allow a minimum of 3/4 inch of movement.

SECTION 916 - SIGN MATERIALS

916.04 RETROREFLECTIVE SHEETING

THE ENTIRE TEXT IS CHANGED TO:

As stated herein, the terms reflective sheeting and retroreflective sheeting are synonymous.

Retroreflective sheeting shall conform to ASTM D 4956 based upon results obtained and reported through testing performed by the National Transportation Product Evaluation Program (NTPEP).
Flourescent retroreflective sheeting shall be selected from the approved products list as provided in the Special Provisions.

1. **General Requirements.**
   - a. **Retroreflectance.** All retroreflective sheeting shall have the minimum coefficient of retroreflection (R_A) in conformance with ASTM D 4956.
   - b. **Color.** The colors of the retroreflective sheeting, except for fluorescent colors shall conform the color requirements of ASTM D 4956.
   - c. **Fluorescent Colors.** The daytime fluorescent color of retroreflective sheeting shall be determined according to ASTM E 991.

     In addition, the color shall be equally distinguishable in daylight and at night under artificial headlight illumination. The color shall have a consistent chromaticity across all signs of the same color. Noticeable deviation from the shades that would affect the required performance shall be a cause for rejection of any sheeting or completed sign at any time before acceptance. For sheeting that is directional, the datum mark (arrow) imprinted on the face of the sheeting shall be the datum mark for test purposes.
   - d. **Product Performance Requirements.** The retroreflective sheeting manufacturer shall meet the following requirements for their products.
     (1) Type III Sheeting – Sheeting shall be required to have a service life span of at least 12 years.
     (2) Types VI, VII, VIII AND IX Sheeting – Sheeting shall be required to have a service life span of at least 10 years.
     (3) The performance requirements shall be such that there is: no loss of retroreflectivity; no loss of colorfastness; no cracking; and no other conditions inherent to the sheeting including inks and overlay film that causes it to be incapable of performing as required.
2. **Certification of Compliance.** The manufacturer shall submit a certification of compliance according to Subsection 106.04 for each lot of sheeting supplied for use on the Project.

916.05 LEGENDS, BORDERS, AND ACCESSORIES

THE FOLLOWING IS ADDED AFTER THE SECOND PARAGRAPH:

All finished signs shall be clear and legible without smudging, blisters, delamination, loose edges or other blemishes.

1. **Type A Demountable.**

THE FIRST AND SECOND PARAGRAPHS ARE CHANGED TO:

The demountable sign letters, digits, arrows, borders, and alphabet accessories shall be reflectorized and shall consist of ASTM D 4956 Type VIII OR IX wide angle prismatic retroreflective sheeting applied to ⅜-inch cutout aluminum plates conforming to ASTM B 209, Alloy 6061-T6 or 5052.

All shields and symbols to be mounted to sign types GO, GOX, and GA on breakaway tubular posts shall consist of ASTM D 4956 Type VIII OR IX wide angle prismatic retroreflective sheeting applied to 3/16-inch cutout aluminum plates conforming to ASTM B 209, Alloy 6061-T6.

2. Type B Direct and Permanently Applied Retroreflective Sheeting Copy.
SUBPART D, E & F ARE DELETED and C IS CHANGED TO:

c. When the background is ASTM D 4956 Type III sheeting, ASTM D 4956 Type III sheeting shall be used for copy.

916.08 FABRICATION

8. Shop Painting and Reflectorization.

a. Application.

THE LAST SENTENCE IN THE THIRD PARAGRAPH IS CHANGED TO:

Sheeting applied to extruded sections shall extend over top edges and down side legs a minimum of 1/16 inch; except that where ASTM D 4956 Type VIII or IX sheeting is used, it shall be cut at the top edges according to the manufacturer's recommendation.

c. Screen Process Printing.
THE THIRD SENTENCE IN THE FIRST PARAGRAPH IS CHANGED TO:

Transparent screen process paint, after application to the retroreflective sheeting and thoroughly dry shall conform to the color requirements ASTM D 4956.

9. Packaging, Storage, and Shipping.
THE FIRST SENTENCE IN THE FIRST PARAGRAPH IS CHANGED TO:

Packaging, storage, and shipping of signs produced using retroreflective sheeting shall be according to the sheeting manufacturer's recommendations.

916.10 BREAKAWAY STEEL "U" POST SIGN SUPPORTS

THE HEADING AND ENTIRE TEXT IS CHANGED TO:

916.10 STEEL "U" POST SIGN SUPPORTS

The steel "U" post sign supports shall conform to ASTM A499. Signs shall be secured to the steel "U" post by means of 18-8 stainless steel 5/16 x 18 UNC hexagonal headed bolts and nuts conforming to ASTM A 320, Grade B8, Class 1. Sign mounting bolts shall extend beyond the end of each nut but not more than ¾ inches when fully tightened.

The steel "U" posts shall be straight and have a smooth finish, free of burrs.

The list of the approved products will be provided by the Bureau of Materials Engineering and Testing.

916.14 FLEXIBLE DELINEATORS

2. Composition.

THE FIRST PARAGRAPH IS CHANGED TO:

For ground mounted flexible delineators, the portion of the delineator above ground shall be one component, or shall be bonded together if it consists of two or more components. The shape of the delineator post where the retroreflective sheeting is applied shall have a cross section that protects the sheeting from abrasion upon impact.

10. Mowability.

THE ENTIRE SUBPART IS DELETED.

11. Sampling Rate

THE SUBPART NUMBER IS CHANGED TO

10. Sampling Rate.

916.17TABLES.

THE ENTIRE SUBSECTION IS DELETED.

SECTION 917 – STRUCTURAL STEEL AND OTHER FERROUS METALS

917.01 BOLTS AND BOLTING MATERIAL

2. Specifications.

THE FOLLOWING IS ADDED:

c. Direct Tension Indicators shall comply with ASTM F 959 and shall be accepted and installed according to Test Method S-3, "Procedure for Identification and Installation of High Strength Bolts with Direct Tension Indicators (DTI's)".

3. Manufacturing.

a. Bolts.

THE FIRST SENTENCE IS CHANGED TO:

Hardness for bolt diameters ¼ inch to 1 ½ inches, inclusive, shall be as noted:

THE FOLLOWING IS ADDED:

When atmospheric corrosion resistant weathering steel is to be used, Type 3 bolts shall be used.

THE FOLLOWING IS ADDED:

d. Direct Tension Indicators (DTI's). When galvanizing of the bolt assembly is required, DTI's shall be mechanically galvanized in accordance with AASHTO M 298, Class 50 (ASTM B 695, Class 50). DTI's to be used for Type 3 bolts shall be epoxy coated with a black color.

4. Testing.

THE FOLLOWING IS ADDED:

g. Direct Tension Indicators (DTI's). DTI's shall be tested according to ASTM F 959.

7. Installation.

THE SUBPART A. IS CHANGED TO:

a. Bolts shall be installed according to the appropriate AASHTO Specifications. Direct Tension Indicators (DTI's) shall be used with high strength bolts to verify the required tension. The provisions of Article 11.5.6.4.7 of Division II of the AASHTO Standard Specifications or of Article 11.5.6.4.7 of the AASHTO LRFD Bridge Construction Specifications shall be followed. If warranted and as directed by the Engineer, the face of the nut shall be smeared with wax before it is installed. The Castral Stick Wax lubricant, beeswax or a water wax emulsion; such as, the MacDermid "Torque 'N Tension Control Fluid" may be used.

THE FOLLOWING IS ADDED AT THE END OF THE SUBSECTION:

Anchor bolts, rock anchors, and hardware shall conform to AASHTO M 270 Grade 36 and shall be galvanized after fabrication, including threading, according to ASTM A 153.

Dowels used to anchor prestressed concrete voided slabs and box beams to abutments and piers shall conform to AASHTO M 270 Grade 36 and shall be galvanized to ASTM A 153. Threading of dowels is not required.

Welded steel shear connectors shall conform to Division II, Section 11 of the AASHTO Standard Specifications for Highway Bridges or Section 11 of the AASHTO LRFD Bridge Construction Specifications.

Stainless steel bolts, nuts, and washers shall conform to ASTM A 320, Class 1, Grade B8 (AISI Type 304).

For overhead and cantilever sign support structures, bolts, nuts and washers for steel to steel chord splices shall conform to AASHTO M 164 and be hot-dip galvanized as per ASTM A 153.

As an alternate, bolts, nuts and washers conforming to AASHTO M 164 may be substituted for bolts, nuts, and washers of the same diameter, length, and thickness conforming to ASTM A 307.

917.03 CASTINGS, MATERIALS AND COMPONENTS FOR DRAINAGE STRUCTURES

THE FIRST PARAGRAPH IS CHANGED TO:

All inlet and manhole castings, grates, extension rings, extension frames and covers shall be capable of withstanding the proof load testing requirements specified in AASHTO M 306 when they are tested as a complete assembled unit and shall conform to the following:

SECTION 919 – MISCELLANEOUS

919.02 BEARING PADS

A. Elastomeric Bearing Pads.

THE FIRST PARAGRAPH IS CHANGED TO:

Elastomeric bearing pads for bridge beams shall conform to Division II, Section 18 of the AASHTO Standard Specifications for Highway Bridges or Section 18 of the AAHSTO LRFD Bridge Construction Specifications.

919.07 FLY ASH

THE FIRST PARAGRAPH IS CHANGED TO:

Fly ash for portland cement concrete shall conform to ASTM C 618, Class C or Class F except that the loss on ignition shall not be more than three percent. Fly ash used to control alkali-silica reactivity shall be Class F. Before each source of fly ash is approved, certified results of tests conducted by a testing agency shall be submitted to and verified by the Department. Accompanying the certification shall be a statement from the supplier listing the source and type of coal, the methods used to burn, collect, and store the fly ash, and the quality control measures employed.

919.11PORTLAND CEMENT

SUBSECTION IS RENAMED AND CHANGED TO:

919.11 PORTLAND OR BLENDED HYDRAULIC CEMENT

Portland cement shall conform to the following:

Masonry Cement	ASTM C 91
Portland Cement, Type I, II, and Type III (see Note 1)	ASTM C 150
White Portland Cement, Type I and III (see Note 2)	ASTM C 150
Blended Hydraulic Cement (see Note 3)	ASTM C 595

Note 1: Type III may be used only for prestressed or precast items.

Note 2: Shall not contain more than 0.55 percent by weight of ferric oxide (Fe_2O_3).

Note 3: Only types IS, I(PM), and I(SM) may be used. Portland cement, may be pre-blended with a maximum of 15 percent fly ash, by weight, or a maximum of 10 % silica fume by weight, or with a maximum of 50% GGBFS by weight. If more than 30% GGBFS is used, a scaling test conforming to ASTM C 672 must be completed on the mix design and the concrete must have a visual rating less than 3 as based on ASTM C672 10.1.5 after 50 cycles.

When blended portland cement is used, no additional mineral admixtures shall be added.

Different brands of cement, the same brand of cement from different mills or different types of cement shall not be mixed.

Suitable means shall be provided for storing and protecting the cement against dampness. Cement which for any reason has become partially set or which contains lumps of caked cement will be rejected. The temperature of the cement at the time of delivery to the mixer shall not exceed 160 °F.

919.07 EPOXY BEDDING AND BONDING COMPOUND

THE ENTIRE SUBSECTION TEXT IS CHANGED TO:

Epoxy bedding and bonding compound shall be a 2-part, non-sag gel, rapid-setting epoxy adhesive conforming to the requirements of ASTM C 881, Type IV, Grade 3, Class B or C. Certifications of compliance shall be furnished according to Subsection 106.04.

919.18 GROUND, GRANULATED BLAST FURNACE SLAG

THE SECOND PARAGRAPH is CHANGED TO:

Ground, granulated blast furnace slag may be used as a replacement for portland cement as specified in Subsection 919.11 up to a maximum replacement level of 50 percent by weight. Replacement of portland cement greater than 30 percent will require a scaling test on the mix design conforming to ASTM C 672 with a visual rating less than 3.

919.19 SAMPLING AND TESTING METHODS

Sampling and testing will be performed according to the following:

THE FOLLOWING IS ADDED:

Mineral Admixtures	8 pounds from each source
Blended Hydraulic Cement	ASTM C 595

THE FOLLOWING NEW SUBSECTION IS ADDED:

919.22 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

CLSM shall conform to the following:

Fine Aggregate	901.12
Chemical Admixtures	905.02
Portland Cement, Type I, II, III	919.11
Water	919.15

CLSM shall consist of a mixture of portland cement, water, fine aggregate and chemical admixtures. Fly ash shall not be permitted in mixes intended for trench backfilling. The CLSM mixture shall be proportioned to provide a backfill material that is self-compacting and capable of being excavated with hand tools at a later date. CLSM shall be proportioned to produce a 28-day compressive strength of 50 to 150 pounds per square inch. An accelerating admixture shall be used to produce a fast setting flowable mixture as required. The CLSM shall have a permeability of $1.7 \times 10^{-3} \pm 0.2 \times 10^{-3}$ centimeters per second according to ASTM D5084 for backfilling of conduits and piping.

At least 45 days prior to the start of any CLSM placement, trial batches of CLSM shall be prepared of the same materials and proportions proposed for use on the project. Each mix design shall be submitted on portland cement concrete mix design forms furnished by the Department, naming the sources of materials and test data.

Department personnel will be present at the time of verification batching to confirm that the proportions and materials batched are according to the proposed mix designs. At least six 6 X 12 inch compression test cylinders shall be prepared for each batch according to ASTM 5971-96 for 28-day strengths except for fast setting mixes, which shall be tested at the specified cure time.

SECTION 920 – SUPERPAVE HOT MIX ASPHALT (HMA)

920.02 Formula for Job Mix

The following is added to the first paragraph:

Unless otherwise approved by the engineer, only one source of supply for Superpave HAM surface course may be used on the project.

920.03 Sampling and Testing

This Subsection is deleted and replaced as follows:

920.03 Sampling and Testing (alternate)

The second paragraph is changed to:

The producer's quality control technician shall be present during periods of mix production for the sole purpose of performing quality control and acceptance testing. The quality control technician shall be certified as an asphalt plant technician, level 2 by the society of asphalt technicians of New Jersey. The quality control technician will perform all required volumetric acceptance testing and quality control composition testing. The test results will be submitted to the engineer on a daily basis along with a certification of compliance.

920.03 Sampling and Testing (alternate) (continued)

The Following Is Added To 920.03:

H. Requirements for laboratory performing quality assurance testing

Any independent testing agency and/or laboratory performing the services necessary for quality assurance sampling, testing and/or analysis shall be accredited by the AASHTO accreditation program.

Along with the test results submitted to the engineer, the laboratory shall also submit the testing worksheets showing the test methods used, including the calculations. All results will be compared to the quality control test results for the project.

The technician who performs the quality assurance testing for the testing agency and/or laboratory shall be certified by the society asphalt technologists of New Jersey, inc. As an asphalt plant technologist, level 2.

All testing agencies and/or laboratories must be in possession of a certificate of accreditation from the AASHTO accreditation program in order to provide the required services. The certificate of accreditation (on www.nist.gov/amrl) shall be for, at least, the following test methods:

AASHTO T30 - mechanical analysis of extracted aggregate.
AASHTO T164 - quantitative extraction of bitumen from bituminous paving mixtures or

AASHTO T308 - determining the asphalt binder content of hot mix asphalt (HMA by the ignition method.
AASHTO T166 - bulk specific gravity of compacted bituminous Mixtures.
AASHTO T209 - maximum specific gravity of bituminous.

I. Quality Assurance Sampling and Testing

For quality assurance purposes the agency may take 8-inch diameter cores from the roadway for confirmation of the quality control composition results. The testing will be performed by an independent testing agency and/or laboratory.

Confirmation of the quality control composition results shall be determined on the basis of the average of five 8-inch diameter drilled cores taken from random locations in a lot. A lot should be a maximum of 10,000 square yards in area and will apply to all projects whether the project payment quantities for hot mix asphalt surface course, hot mix asphalt intermediate course or hot mix asphalt base course are measured on a square yard or ton basis.

When a drill fails to procure a whole core, the drill shall be moved a distance of not more than 5 feet and an alternate core obtained. When a project involves the improvement of several individual streets, or several sections of the same street, the lot shall be determined by the area of each street and if less than the required lot area, the next street or section paved shall be added to complete the approximate area of the lot. All lots shall be approximately equal in size. The number of lots for the project shall be based on the next higher whole number derived by dividing the total pavement square yardage by 10,000.

920.03 Sampling and Testing (alternate) (continued)

The average of the test results for the five samples of a lot shall be compared to the average of the quality control test results representative of the lot. The average quality assurance test results shall be within the applicable tolerances of Table 920-7 as compared to the quality control test results. Payment for any lot, which does not comply, with these requirements shall be reduced in accordance with Table 903-8. The engineer may order removal of any lot subject to the maximum reduction.

TABLE 920-7 TOLERANCE FROM QUALITY CONTROL TEST RESULTS FOR AVERAGE OF FIVE SAMPLES

SIEVE SIZE ALL PLANTS	TOLERANCE PERCENTAGE (Plus or Minus)
No. 8	5.5
No. 200	1.6
Asphalt	0.55

TABLE 920-8 REDUCTION PER LOT DUE TO NONCONFORMANCE OF QUALTIY ASSURANCE TESTING AS COMPARED TO THE QUALITY CONTROL TESTING

DEVIATION OF AVERAGE OF FIVE QUALITY ASSURANCE SAMPLES AS COMPARED TO THE REPRESENTATIVE QUALITY CONTROL SAMPLES BEYOND APPLICABLE TOLERANCES IN TABLE 920-7 (PERCENT OF TOLERANCE ABOVE)	REDUCTION PER LOT
1 TO 50	2%
51 TO 100	5%
OVER 100	**10%**

SECTION 990 - METHODS OF TESTS

THE FOLLOWING TEST METHOD IS ADDED:

B-10 TEST METHOD TO DETERMINE ASPHALT CONTENT FOR MODIFIED OPEN GRADED FRICTION (MOGFC) COURSES BY AGGREGATE SURFACE AREA

A. SCOPE.

This test method is used to determine the percentage of asphalt to be used in MOGFC mixes based on the surface area of the aggregate. This percentage is averaged with asphalt contents determined as per Section 990, NJDOT B-11 to arrive at a design asphalt content for a MOGFC mix design.

B. APPARATUS AND MATERIALS.

1. Ovens capable of maintaining temperatures of 140 ± 5 °F (60 ± 3 °C) and 230 ± 9 °F (110 ± 5 °C).
2. Balance meeting the requirements of AASHTO M 231, Class D.
3. Two metal funnels having minimum dimensions of 3 ½ in. (90 mm) top diameter, 4 ½ in. (115mm) high and ½ in. (13 mm) orifice. The funnels shall have a metal strainer soldered where the base of the cone connects to the top of the spout. The equivalent size of the strainer shall not be larger than No. 10 (2.00 mm) sieve.
4. A 3/8 in. (9.5 mm) sieve and a No. 4 (4.75 mm) sieve.
5. S.A.E. No. 10 lubricating oil.
6. Two rubber stoppers to fit the funnel outlets.
7. Ring stand to support the funnels during testing.

C. PROCEDURE.

OIL RETENTION

1. Through quartering, obtain two samples weighing approximately 105 g representative of the material passing the 3/8 in. (9.5 mm) sieve and retained on the No. 4 (4.75 mm) sieve.
2. Dry the sample in the 230 °F (110 °C) oven to a constant weight and allow to cool to room temperature.
3. Weigh out 100.0 g of the material and place in the metal funnel.
4. Place a stopper in the funnel outlet and fill funnel with S.A.E. No. 10 oil, completely immersing the aggregate.
5. After 5 minutes, remove the stopper and allow the oil to drain for 2 minutes.
6. Place the funnel containing the aggregate in the oven maintained at 140 °F (60 °C) for 15 minutes of additional draining.
7. Remove the sample from the funnel, cool to room temperature, reweigh to the nearest 0.1 g and record.

SPECIFIC GRAVITY

1. Determine the Apparent Specific Gravity of the aggregate passing the 3/8 in. (9.5 mm) sieve and retained on the No. 4 (4.85 mm) sieve according to AASHTO T 85.

D. CALCULATIONS.

1. Calculate the percent oil retained for each sample as follows:

$$R = \frac{B - A}{A} \times 100$$

where:
R = percent oil retained
A = weight of sample before test
B = weight of sample after test

2. Using the average percent oil retained of the two samples, calculate the corrected percent oil retained as follows:

$$R_c = \frac{R \times G_a}{2.65}$$

where:
R_c = corrected percent oil retained
G_a = apparent specific gravity of aggregate
2.65 = constant

3. Using the corrected percent oil retained, determine the surface constant (K_c) from the attached chart.

4. Calculate the design asphalt content as follows:

$$\text{Design Asphalt Content} = \frac{(2.0\ K_c + 4.0) \times 2.65}{G_a}$$

DETERMINATION OF SURFACE CONSTANT K_c

CORR. %OIL	K_c	CORR. %OIL	K_c	CORR. %OIL	K_c	CORR. %OIL	K_c
0.1	0.1	2.6	1.2	5.1	2.2	7.6	3.1
0.2	0.1	2.7	1.2	5.2	2.2	7.7	3.1
0.3	0.2	2.8	1.2	5.3	2.2	7.8	3.2
0.4	0.2	2.9	1.3	5.4	2.3	7.9	3.2
0.5	0.3	3.0	1.3	5.5	2.3	8.0	3.2
0.6	0.3	3.1	1.4	5.6	2.3	8.1	3.3
0.7	0.4	3.2	1.4	5.7	2.4	8.2	3.3
0.8	0.4	3.3	1.4	5.8	2.4	8.3	3.4
0.9	0.4	3.4	1.5	5.9	2.5	8.4	3.4
1.0	0.5	3.5	1.5	6.0	2.5	8.5	3.4
1.1	0.5	3.6	1.6	6.1	2.5	8.6	3.5
1.2	0.6	3.7	1.6	6.2	2.6	8.7	3.5
1.3	0.6	3.8	1.6	6.3	2.6	8.8	3.5
1.4	0.7	3.9	1.7	6.4	2.6	8.9	3.6
1.5	0.7	4.0	1.7	6.5	2.7	9.0	3.6
1.6	0.7	4.1	1.8	6.6	2.7	9.1	3.6
1.7	0.8	4.2	1.8	6.7	2.8	9.2	3.7
1.8	0.8	4.3	1.8	6.8	2.8	9.3	3.7
1.9	0.9	4.4	1.9	6.9	2.8	9.4	3.8
2.0	0.9	4.5	1.9	7.0	2.9	9.5	3.8
2.1	1.0	4.6	2.0	7.1	2.9	9.6	3.8
2.2	1.0	4.7	2.0	7.2	2.9	9.7	3.9
2.3	1.0	4.8	2.0	7.3	3.0	9.8	3.9
2.4	1.1	4.9	2.1	7.4	3.0	9.9	3.9
2.5	1.1	5.0	2.1	7.5	3.1	10.0	4.0

THE FOLLOWING TEST METHOD IS ADDED:

B-11 TEST METHOD TO DETERMINE THE OPTIMUM ASPHALT CONTENT FOR MODIFIED OPEN GRADED FRICTION COURSE (MOGFC) MIXES.

A. SCOPE.

This test method is used to determine gradation and the percentage of asphalt in a MOGFC mixture using polymer modified binder and stabilizing fibers. The gradation is verified to ensure stone-on-stone contact, and the impact resistance of the final job mix formula (JMF) is verified. The optimum asphalt content (AC) is determined from: (1) aggregate surface area, (2) relative Voids in Mineral Aggregate (VMA), and (3) visual drain-down determination of asphalt content. A simple average of these three criteria is used to determine the JMF asphalt content.

B. APPARATUS.

1. Equipment as needed for AASHTO T 19
2. Equipment as needed for Superpave mix design as specified in AASHTO R 35 and T 312.
3. Equipment as needed for Section 990, NJDOT B-10.
4. Ovens capable of maintaining temperatures as specified in this method.
5. Clear, glass (Pyrex) 9" diameter pie pans.
6. L.A. Abrasion Machine conforming to AASHTO T 96.

C. PROCEDURE.

1. **Verification of Stone-On-Stone Contact** - The design gradation is chosen to meet minimum air void requirements and to ensure that the aggregate skeleton exhibits stone-on-stone contact.

   1.1 For the selected JMF gradation determine the unit weight G_{uwca} of the coarse aggregate fraction of the aggregate using the dry rodding technique according to AASHTO T 19. The coarse aggregate fraction is the aggregate from the final JMF retained on the No. 4 sieve. From G_{uwca} calculate voids in coarse aggregate fraction VCA_{drc}.

   1.2 For the selected JMF determine the voids in the coarse aggregate of the mix,(VCA_{mix}).

   1.3 Calculations:

   $$VCA_{drc} = 100\ (G_{sbca}-G_{uwca}) / G_{sbca}$$

   Where:

   VCA_{drc} = the voids in the coarse aggregate fraction of the JMF aggregate skeleton.

   G_{sbca} = the bulk specific gravity of the coarse aggregate fraction as determined by AASHTO T 85.

   G_{uwca} = the unit weight of the coarse aggregate fraction (expressed in kilograms per cubic meter) as determined by AASHTO T 19.

   $$VCA_{mix} = 100 - (P_{ca} x G_{mb} / G_{sbca})$$

   Where:

   VCA_{mix} = the voids in the coarse aggregate fraction of the mix. The coarse aggregate fraction of the aggregate is that portion of the JMF aggregate skeleton not passing the 4.75-millimeter sieve.

   P_{ca} = the percent of the coarse aggregate fraction by weight of total mix.

   G_{mb} = the bulk specific gravity of the mix at the design AC content as determined by Section 3.4.

   G_{sbca} = the bulk specific gravity of the coarse aggregate fraction as determined by AASHTO T 85.

   1.4 For stone-on-stone contact VCA_{mix} must be less than VCA_{drc}

2. **Surface Area Asphalt Content**

   2.1 Determine "surface area" asphalt content according to Section 990, NJDOT B-10.

3. Relative VMA Asphalt Content

Note steps 3.1, 3.2 & 3.3 shall be done using a batch plant or mixing in the laboratory.

3.1 Heat aggregate to 25°F (14°C) above binder producer recommended compaction temperature. Heat molds to 50°F (28°C) above recommended compaction temperature. Heat binder to recommended mixing temperature.

3.2 Mix aggregate with asphalt and fiber at five asphalt contents (one at the estimated JMF asphalt content, one each at + and - 0.5% and one each at + and – 1.0% of the estimated JMF asphalt content). After mixing, return sample to the oven if necessary, and when at the recommended compaction temperature, compact the specimens. Three specimens will be compacted at each asphalt content using a Superpave Gyratory Compactor (50 gyrations).

3.3 When compacted, cool to room temperature before removing from mold.

3.4 Determine the bulk specific gravity, Gmb from each specimen's dry mass (grams) and volume in cubic centimeters. The volume is determined from the diameter of the plug and the height as determined from four equidistant measurements using a caliper accurate to 0.02 cm.

$$G_{mb} = w / (\pi r^2 h / 0.99707)$$

Where:

w = dry mass (measured to a tenth of gram)

π = 3.1416

r = radius in cm (measure to 0.01" or 0.0254 CM)

h = height in cm as determined from 4 equidistant measurements.

0.99707 = density of water @ 25°C (77°F)

3.5 Determine maximum specific gravity, G_{mm}, of each specimen at each asphalt content according to AASHTO T 209.

3.6 From G_{mb}, G_{mm}, and each known asphalt content; calculate volumetric information as follows.

% AC by wt of Total mix = b

Volume of air = % air voids = $V_a = (1 - G_{mb} / G_{mm}) \times 100$

% by Volume of asphalt cement = $V_b = (b \times G_{mb})$

Relative VMA = $V_a + V_b$

Note: The volume of the fiber, absorbed asphalt, and Specific Gravity of asphalt binder are not accounted for in this procedure. This procedure measures "relative VMA".

3.7 Plot asphalt content versus "relative VMA" and select the asphalt content at the lowest point on the curve.

4. Visual Draindown Asphalt Content

4.1 Prepare 1000 gram samples of the uncompacted mix for each of the asphalt contents as detailed in Sections 3.1 and 3.2 above.

4.2 Place each sample into a clean, clear glass (Pyrex) 9 inch pie pans.

4.3 Place samples in oven for one hour at the binder manufacturer's recommended mixing temperature. Remove and let cool for one hour at room temperature.

4.4 Visually observe the amount of liquid asphalt on the bottom of each pan.

4.5 Select AC content where ample bonding is evident, without having excessive drainage as evidenced by an appearance of unconnected pools of asphalt binder around aggregate points of contact.

5. Select Asphalt content for job mix formula (JMF)

5.1 Determine the JMF asphalt content by averaging the results from the three methods (surface area, relative VMA, and draindown).

$$AC_{jmf} = (AC_{sc} + AC_{vma} + AC_{dd}) / 3$$

Where:

AC_{jmf} = the design JMF

AC_{sc} = the asphalt content determined by the surface area in Section 2 above.

AC_{vma} = the asphalt content determined by relative VMA in Section 3 above.
AC_{dd} = the asphalt content determined by draindown in Section 4 above.

6. Verification of Abrasion and Impact Resistance of JMF

6.1 Age at least two JMF specimens (plugs compacted with the same effort used during the design process) for 7 days ± 8 hours in an oven capable of maintaining 140 ± 5°F.

6.2 Utilizing a Los Angeles Machine conforming to AASHTO T 96, without the charge of steel balls, subject the aged samples of known weight (A) to 300 revolutions at 30 to 33 revolutions per minute. After the 300 revolutions reweigh the samples (B).

6.3 Calculate the Percent Loss

$$P_{loss} = 100 \times (A-B) / A$$

Where:

P_{loss} = the loss expressed as percent of aged sample before L.A. Abrasion Machine treatment.
A = the weight of the samples before modified L.A. Abrasion test.
B = the weight of the samples after modified L.A. Abrasion test.

THE FOLLOWING TEST METHOD IS ADDED:

B-12 TEST METHOD TO DETERMINE THE OPTIMUM ASPHALT CONTENT FOR OPEN GRADED FRICTION COURSE (OGFC).

A. SCOPE.

This test method is used to determine the optimum percentage of asphalt in a OGFC mixture. The test method uses a visual draindown analysis to determine optimum asphalt content.

B. APPARATUS.

1. Ovens capable of maintaining temperatures as specified in this method.
2. Clear glass (Pyrex) 9" diameter pie pans.

C. PROCEDURE.

1. Heat aggregate to 275°F. Heat molds to 275°F. Heat binder to recommended mixing temperature.
2. Using 1000 gram batches, mix aggregate with asphalt at a minimum of 3 asphalt contents (one at the estimated job mix formula (JMF) asphalt content and one each at + and - 0.5% of the estimated JMF asphalt content). After mixing, check the temperature to ensure that it is 250 ± 10°F. Cool or reheat as necessary to meet the temperature tolerance.
3. Place each 1000 gram batch into a clean, clear glass (Pyrex) 9 inch pie pans.
4. Place samples in an oven at 255 ± 5°F for one hour. Remove and let cool for one hour at room temperature.
5. Visually observe the amount of liquid asphalt on the bottom of each pan.
6. Select the asphalt content where ample bonding is evident, without having excessive drainage as evidenced by an appearance of unconnected pools of asphalt binder around aggregate points of contact.

TEST METHOD S-2

S-2 PROCEDURE FOR PERFORMING ROTATIONAL-CAPACITY TEST ON BOLTS TOO SHORT TO FIT TENSION CALIBRATOR.

B. PROCEDURE.

THE LAST SIX PARAGRAPHS ARE REMOVED.