New Jersey Department of Transportation
1035 Parkway Avenue, PO Box 600, Trenton, New Jersey 08625-0600

Baseline Document Change Announcement

ANNOUNCEMENT: **BDC17S-05**

DATE: **August 08, 2018**

SUBJECT: **Introduction of Bridge Deck Waterproof Surface Course (BDWSC)**
- **Addition of new Section 555, Subsections 902.14, & 902.15 to the *2007 Standard Specifications for Road and Bridge Construction.***

New Section 555, Subsections 902.14, & 902.15 have been added to the 2007 Standard Specifications for Road and Bridge Construction to introduce Specifications for Bridge Deck Waterproof Surface Course (BDWSC). The SMEs have recommended that these Specifications be included in the Standard Specifications for Road and Bridge Construction.

The following revisions have been incorporated into the Standard Inputs (SI 2007).

DIVISION 550 – STRUCTURE REHABILITATION

THE FOLLOWING NEW SECTION IS ADDED:

SECTION 555 - BRIDGE DECK WATERPROOF SURFACE COURSE

555.01 DESCRIPTION

This Section describes the requirements for constructing bridge deck waterproof surface course (BDWSC) and retrofit strip seal joint system.

555.02 MATERIALS

555.02.01 Materials

Provide materials as specified:

Tack Coat PG 64E-22	902.01.01
Bridge Deck Waterproof Surface Course (BDWSC)	902.14
Retrofit Strip Seal Joint System	902.15
Joint Sealer, Hot-Poured	914.02
Polymerized Joint Adhesive	914.03

555.02.02 Equipment

Provide equipment as specified:

Materials Transfer Vehicle (MTV)	1003.01
HMA Paver	1003.03
HMA Compactor	1003.05
Vibratory Drum Compactor	1003.06
Bituminous Material Distributor	1003.07
Sealer Application System	1003.08
Milling Machine	1008.01
Mechanical Sweeper	1008.03
Hot-Air Lance	1008.06
HMA Plant	1009.01
HMA Trucks	1009.02

Provide a thin-lift nuclear density gauge according to ASTM D 2950.

When an MTV is used, install a paver hopper insert with a minimum capacity of 14 tons in the hopper of the HMA paver.

555.03 CONSTRUCTION

555.03.01 BDWSC

A. **Paving Plan.** At least 20 days before the start of placing the BDWSC, submit to the RE for approval a detailed plan of operation as specified in 401.03.03.A. Include in the paving plan a proposed location for the test strip.

B. **Weather Limitations.** Do not place BDWSC if it is precipitating. Do not allow trucks to leave the plant when precipitation is imminent. The Contractor may resume operations when the precipitation has stopped and the surface is free of water.

   Do not pave if the base temperature is below 50 °F.

C. **Test Strip.** At least 14 days prior to the production of BDWSC, construct a test strip of the BDWSC at a location agreed upon with the RE. Ensure that the tack coat has been placed as specified in 555.03.01.D before placing BDWSC. Transport and deliver, spread and grade, and compact as specified in 555.03.01.E, 555.03.01.F, and 555.03.01.G, respectively, and according to the approved paving plan. Construct a test strip of at least 60 tons. While constructing the test strip, record the following information and submit to the RE:

   1. **Ambient Temperature.** Measure ambient temperature at the beginning and end of each days' paving operation.

   2. **Base Temperature.** Measure the surface temperature of the existing base before paving.

   3. **HMA Temperature.** Measure the temperature of the HMA immediately after placement.

   4. **Roller Pattern.** Provide details on the number of rollers, type, and number of passes used on the test strip.

   5. **Nuclear Density Gauge Readings.** Obtain the maximum density from the plant, and input it into the nuclear density gauge. Use the nuclear density gauge to read the bulk density and percent air voids.

   6. **Quality Control Core Density Test Results.** Take 5 randomly selected quality control cores to test for the bulk specific gravity and the maximum specific gravity.

      Use drilling equipment with a water-cooled, diamond-tipped, masonry drill bit that produces 6 inch nominal diameter cores for the full depth of the pavement. Remove the core from the pavement without damaging it. After removing the core, remove all water from the hole. Fill the hole with HMA or cold patching material, and compact the material so that it is 1/4 inch above the surrounding pavement surface.

      Compare the nuclear density gauge readings and the core test results to establish a correlation. Use this correlation as a guide for the continued use of the nuclear density gauge for density control.

If the test strip does not meet requirements, make adjustments and construct a second test strip. If the second test strip does not meet requirements, suspend paving operations until written approval to proceed is received.

Before making adjustments to the paving operations, notify the RE in writing.

D. **Tack Coat.** Clean the surface where the BDWSC is to be placed of foreign and loose material. Immediately before beginning paving operations, ensure that the surface is completely dry. Use propane torches or other methods acceptable to the RE to dry the surface. Only apply tack coat that can be paved over in the same day. Apply tack coat 64E-22 at a rate of 0.25 ± 0.05 gallons per square yard and at a spraying temperature of 325 °F ± 25 °F. Adjust the spraying temperature and application rate to produce a uniform coating with no excess material. Ensure that the tack coat is fully cured prior to placing the BDWSC. To prevent tracking of the tack coat onto the HMA paver and HMA truck tires, spread a small amount of clean dry sand over the tack coat prior to opening to construction equipment traffic. Apply a 1/8 inch thick, uniform coating of polymerized joint adhesive to vertical contact surfaces of curbing, gutters, scuppers, parapets, and other structures before the placing of the BDWSC against them. Apply the polymerized joint adhesive slowly to ensure an even coating thickness.

E. **Transportation and Delivery of HMA.** Transport and deliver BDWSC as specified in 401.03.03.D.

F. **Spreading and Grading.** Ensure that required deck repairs have been completed before placing the BDWSC. Place BDWSC at the lay down temperature recommended by the supplier of the asphalt binder or the supplier of the asphalt modifier if the dry mix modified process is used. Spread and grade BDWSC as specified in 401.03.03.E.

G. **Compacting.** Compact the BDWSC as specified in 401.03.03.F. Operate rollers in static mode only.

H. **Opening to Traffic.** Remove loose material from the traveled way, shoulder, and auxiliary lanes before opening to traffic. Do not allow traffic or construction equipment on the BDWSC until the surface temperature is less than 170 °F.

I. **Air Void Requirements.** Use a thin-lift nuclear density gauge to measure in-place bulk specific gravity. Correct the reading using correction factor developed during the test strip. Calculate the air voids using the maximum specific gravity supplied by the QC technician at the HMA plant. Compact the mixture so that the air voids are a maximum of 3 percent.

J. **Ride Quality Requirements.** The Department may evaluate the surface course placed in the traveled way as specified in 401.03.03.J using the equations in Table 401.03.03-7.

K. **Treatment of Fixed-End Deck Joints.** Verify that the fixed-end joint and the type of header.

1. If there is an existing header repair the end of the deck and header and retrofit the joint with neoprene sealing element using elastomeric or polymer concrete as per manufacturer's requirements.

2. If there is no existing header and joint width is 1 1/2 inch or more, repair the end of the deck, and retrofit the joint with neoprene sealing element using elastomeric or polymer concrete as per manufacturer's requirements.

3. If there is no existing header and the joint width is less than 1 1/2 inch, repair the end of the deck before the BDWSC overlay. After the BDWSC overlay, sawcut 3/4 inches wide by 3/4 inches deep and seal with hot-poured sealer at interface between the end of the deck and the approach roadway.

   Before paving over existing pavement, identify joint locations and maintain references throughout the paving operations. Perform sawcutting between 1 and 5 days after placement of the BDWSC overlay. Ensure that the transverse joints are sawcut from curb to curb.

   After sawcutting, immediately collect the slurry from the sawcut cavity and surrounding pavement surface and dispose of as specified in 201.03.09. Clean sawcuts with a 150 pounds per square inch water blast to remove remaining debris in the sawcut cavity, and then blow sawcuts with a hot-air lance to provide a dry surface. Immediately after blowing, seal the joint with hot-poured joint sealer prepared according to the manufacturer's recommendations. Do not heat joint sealer at the pouring temperature for more than 6 hours and do not reheat. Fill the sawcuts so that after cooling the level of the sealer is not more than 1/4 inch above, or less than 1/8 inch below, the surface. Do not spread sand or other fine material on the sealed joints. Allow joint sealer to cure to prevent pickup before opening to traffic.

555.03.03 Retrofit Strip Seal Joint System

A. **Working Drawings.** Submit working drawings for certification for the retrofit strip seal joint system as per section 105.05. As a minimum, include the following information of the working drawings:

1. Manufacturer's requirements for materials in the joint system.
2. Method of installation including sequence of installation, temperature restrictions, and materials handling requirements.
3. Ensure that the removal and reinstallation of the strip seal can be accomplished from above the joint without full closure of the roadway.
4. Method to be used to ensure that the strip seal does not protrude above the top of the joint.

B **Manufacturer's Representative and Recommendations.** Submit two copies of written installation procedures and material certifications 14 days prior to the first scheduled installation to the RE. Arrange with the manufacturer of the joint system to assign a representative who is completely knowledgeable and competent in all aspects with the joint systems materials and installation procedures.

Ensure that the representative is present during each joint system installation to assure proper construction, material preparation, installation, and curing. The representative is responsible to advise the RE and the Contractor that the correct installation methods are being followed, to train assigned personnel in the correct methods of installation, and to verify proper installation of the joint in writing to the RE.

C. **Weather Limitations.** Follow the manufacturer's instructions regarding weather limitations.

D. **Preparation.** Center the joint installation over the existing expansion joint gap and to the width determined by the manufacturer. Variation in the width of the joint may be necessary to accommodate site conditions.

Sawcut the pavement transversely at the determined width along the joint to a 2 inch minimum depth. To permit the new joint system to be installed, remove all material, including wearing surface, masking or covering material, waterproofing membrane, concrete header, and old joint material between the sawcuts. If it is necessary to remove concrete, use only hand held tools. Remove existing materials without damaging existing sound concrete that is to remain. Use elastomeric or polymer concrete to repair any damage to sound concrete.

Grit blast all joint surfaces, dry and free of dust, dirt, grease, loose materials, and any other matter that will inhibit bonding. Clean the concrete surface to the satisfaction of the manufacturer's representative.

E. **Installation Elastomeric or Polymer Concrete.** Form the joint and install hardware, if necessary. If hardware is installed to mechanically hold the strip seal gland, ensure that it is placed at the proper depth for the joint. Mix and place the elastomeric or polymer concrete according to the manufacturer's recommendations. Open to traffic according to the manufacturer's recommendations.

F. **Installation Strip Seal Gland.** Prepare the surfaces and the strip seal gland. Install the strip seal gland according to the manufacturer's recommendations. Ensure that the strip seal gland is installed to the proper depth and does not protrude above the top of the joint. Open to traffic according to the manufacturer's recommendations.

555.04 MEASUREMENT AND PAYMENT

The Department will measure and make payment for Items as follows:

Item	*Pay Unit*
BRIDGE DECK WATERPROOF SURFACE COURSE	TON
RETROFIT STRIP SEAL JOINT SYSTEM	LINEAR FOOT
TACK COAT 64E-22	GALLON

The Department will measure BRIDGE DECK WATERPROOF SURFACE COURSE by the ton as indicated on the certified weigh tickets, excluding unused material.

The Department will measure TACK COAT 64E-22 by the volume delivered, converted to the number of gallons at 60 °F as calculated by the temperature-volume correction factors specified in 902.01.

The Department will make payment for POLYMERIZED JOINT ADHESIVE as specified in 401.04.

The Department will measure RETROFIT STRIP SEAL JOINT SYSTEM in linear feet from curb to curb along the bridge deck joint.

SECTION 902 – ASPHALT

THE FOLLOWING SUBSECTIONS AND SUBPARTS ARE ADDED:

902.14 BRIDGE DECK WATERPROOF SURFACE COURSE (BDWSC)

902.14.01 Composition of the Mixture

Provide BDWSC mixture that is produced at an HMA plant that is listed on the QPL and meets the requirements specified in 1009.01. Composition of the mixture for BDWSC is coarse aggregate, fine aggregate, and asphalt binder, and may also include mineral filler and crumb rubber. Do not use Reclaimed Asphalt Pavement (RAP), Ground Bituminous Shingle Material, Remediated Petroleum Contaminated Soil Aggregate, or Crushed Recycled Container Glass (CRCG) in BDWSC.

1. Use polymer modified asphalt binder that is specially formulated for meeting the mix performance criteria in this specification. Consult with the asphalt binder supplier to obtain the appropriate material for the specific mix design. Submit a certificate of analysis (COA) showing the PG continuous grading (AASHTO R 29) for the asphalt binder used in the mix design.

   For quality assurance testing of the asphalt binder, the ME may sample the asphalt binder during production of the mix and compare the results with the COA submitted during test strip approval. To analyze the binder the ME will test the binder at the nearest standard PG temperature then compare the results with the COA. If the high ($G^*/\sin\delta$) and low (stiffness and m value) temperature passing test results are within 5 percent of the results from the passing temperature on the COA, then the ME will consider the asphalt binder comparable to the binder used during the test strip.

2. Use coarse aggregate that conforms to 901.05.01 and is classified as argillite, gneiss, granite, quartzite, or trap rock as defined in 901.03.01.

3. Use fine aggregate that is stone sand as specified in 901.05.02 and has an uncompacted void content of at least 45 percent when tested according to AASHTO T 304, Method A. Ensure that the minimum sand equivalent of the fine aggregate is 45 percent when tested according to AASHTO T 176.

4. Ensure that mineral filler, if used, conforms to 901.05.03.

902.14.02 Mix Design

At least 45 days before initial production, submit a JMF for the BDWSC on forms supplied by the Department. Include a statement naming the source of each component and a report confirming the results meet the criteria specified in Table 902.14.02-1 and Table 902.14.02-2.

Table 902.14.02-1 Job Mix Formula Requirements for BDWSC

Sieve Size	Percent Passing[1]	Production Control Tolerances[2]
1/2″	100	± 0.0%
3/8″	80-100	± 4.0%
#4	55-85	± 6.0%
#8	32-42	± 2.0%
#16	20-30	± 2.0%
#30	12-22	± 2.0%
#50	7-16	± 2.0%
#100	3-12	± 2.0%
#200	2.0-6.0	± 1.0%
Asphalt Binder Content (Ignition Oven)[3]	7.0 % minimum	± 0.30%
Lift Thickness	1.5 – 3.0 inch	

1. Aggregate percent passing to be determined based on dry aggregate weight.
2. Production tolerances are for the approved JMF and may not fall outside of the wide band gradation limits.
3. The asphalt binder content may not be lower than the minimum after the production tolerance is applied.

Table 902.14.02-2 Volumetric Requirements for Design and Control of BDWSC					
	Required Density (% of Max Sp. Gr.)	Voids Filled with Asphalt	Voids in Mineral Aggregate	Dust to Binder Ratio	Draindown AASHTO T 305
	N_{des} (50 gyrations)	(VFA)	(VMA)		
Design Requirements	99	90 - 100	≥ 18.0 %	0.3 – 0.9	≤ 0.1 %
Control Requirements	98 - 100	90 - 100	≥ 18.0 %	0.3 – 0.9	≤ 0.1 %

Establish the percentage of dry weight of aggregate passing each required sieve size and an optimum percentage of asphalt binder based upon the weight of the total mix. Determine the optimum percentage of asphalt binder according to AASHTO R 35 and M 323 with an N_{des} of 50 gyrations. Before maximum specific gravity testing or compaction of specimens, condition the mix for 2 hours according to the requirements for conditioning for volumetric mix design in AASHTO R 30, Section 7.1. If the absorption of the combined aggregate is more than 1.5 percent according to AASHTO T 84 and T 85, short term condition the mix for 4 hours according to AASHTO R 30, Section 7.2 prior to compaction of specimens (AASHTO T 312) and determination of maximum specific gravity (AASHTO T 209). Ensure that the JMF is within the master range specified in Table 902.14.02-1.

Ensure that the mixture meets a minimum tensile strength ratio (TSR) of 90 percent when tested according to AASHTO T 283 with the following exceptions:

1. Before compaction, condition the mixture for 2 hours according to AASHTO R 30 Section 7.1.
2. Compact specimens with 40 gyrations according to AASHTO T 312.
3. Extrude specimens as soon as possible without damaging.
4. Use AASHTO T 269 to determine void content.
5. Record the void content of the specimens.
6. If less than 55 percent saturation is achieved, the procedure does not need to be repeated, unless the difference in tensile strength between duplicate specimens is greater than 25 pounds per square inch.
7. If visual stripping is detected, modify or readjust the mix.

For each mix design, submit 3 gyratory specimens and one loose sample corresponding to the composition of the JMF, including the design asphalt content, with the mix design forms. The ME will use these samples for verification of the properties of the job mix formula. Compact the specimens to the design number of gyrations (N_{des}). To be acceptable, all 3 gyratory specimens must comply with the gradation and asphalt content requirements in Table 902.14.02-1 and with the control requirements in Table 902.14.02-2. The ME reserves the right to be present at the time of molding the gyratory specimens.

In addition, submit 6 gyratory specimens and 12 boxes of loose mix to the ME. The ME will use these additional samples for performance testing of the BDWSC mix. Ensure that the additional gyratory specimens are compacted according to AASHTO T 312, are 77 millimeters high, and have a maximum air void content of 3.0 percent. The ME will test the specimens using an Asphalt Pavement Analyzer according to AASHTO T 340 at 64 °C, 100 pounds per square inch hose pressure, and 100 pound wheel load. The ME will use the supplied loose mix to compact 2 samples to a maximum air void content of 3.0 percent for Flexural Beam Fatigue testing. The ME will test the fatigue specimens according to AASHTO T 321 at 15 °C, 10 Hertz loading frequency, and 1,500 micro-strains. The ME will approve the JMF if the average rut depth for the 6 specimens in the Asphalt Pavement Analyzer testing is not more than 3 millimeters in 8,000 loading cycles and the fatigue life, as determined by AASHTO T 321, is not less than 100,000 cycles. If the JMF does not meet the APA and Flexural Beam Fatigue criteria, redesign the BDWSC mix and submit for retesting. The ME will ensure that all submitted specimens are within the target air void content as tested at the Material's Central Lab.

The JMF for the BDWSC mixture is in effect until modification is approved by the ME. If required, the ME may use the 12 boxes of loose BDWSC mix to compact additional gyratory specimens for performance testing and the performance test results may be used for approval of the JMF.

When unsatisfactory results for any specified characteristic of the work make it necessary, the Contractor may establish a new JMF for approval. In such instances, if corrective action is not taken, the ME may require an appropriate adjustment to the JMF.

Should a change in sources be made or a change in the properties of materials occurs, the ME will require that a new JMF be established and approved before production can continue.

902.14.03 Sampling and Testing

A. **General Acceptance Requirements.** The RE or ME may reject and require disposal of any batch or shipment that is rendered unfit for its intended use due to contamination, segregation, improper temperature, lumps of cold material, or incomplete coating of the aggregate. For other than improper temperature, visual inspection of the material by the RE or ME is considered sufficient grounds for such rejection.

Ensure that the temperature of the mix at discharge from the plant or storage silo meets the recommendation of the supplier of the asphalt binder or supplier of the asphalt modifier.

Combine and mix the aggregates and asphalt binder to ensure that at least 95 percent of the coarse aggregate particles are entirely coated with asphalt binder as determined according to AASHTO T 195. If the ME determines that there is an on-going problem with coating, the ME may obtain random samples from 5 trucks and will determine the adequacy of the mixing on the average of particle counts made on these 5 test portions. If the requirement for 95 percent coating is not met on each sample, modify plant operations, as necessary, to obtain the required degree of coating.

B. **Sampling.** Perform sampling as specified in 902.02.04.B.

C. **Quality Control Testing.** Perform quality control testing as specified in 902.02.04.C.

D. **Acceptance Testing and Requirements.** The ME will determine volumetric properties at N_{des} for acceptance from samples taken, compacted, and tested at the HMA plant. The ME will compact HMA to the 50 design gyrations (N_{des}), using equipment according to AASHTO T 312. The ME will determine bulk specific gravity of the compacted sample according to AASHTO T 166. The ME will use the most current QC maximum specific gravity test result in calculating the volumetric properties of the BDWSC.

The ME will determine the dust-to-binder ratio from the composition results as tested by the QC technician.

Ensure that the HMA mixture conforms to the requirements specified in Table 902.14.02-1 and Table 902.14.02-2. If 2 samples in a lot fail to conform to the gradation or volumetric requirements, immediately initiate corrective action.

The ME will test a minimum of 1 sample per lot for moisture, basing moisture determinations on the weight loss of an approximately 1600 gram sample of mixture heated for 1 hour in an oven at 280 ± 5 °F. Ensure that the moisture content of the mixture at discharge from the plant does not exceed 1.0 percent.

E. **Performance Testing.** Provide 6 gyratory specimens that are compacted according to AASHTO T 312 and 12 boxes of loose mix. Compact the 6 gyratory specimens to 77 millimeters high and maximum air void content of 3.0 percent. The ME will test the specimens using an Asphalt Pavement Analyzer according to AASHTO T 340 at 64°C, 100 pound per square inch hose pressure, and 100 pound wheel load. The ME will use the supplied loose mix to determine the maximum specific gravity of the mix according to AASHTO T 209 and to compact 2 samples to a maximum air void content of 3.0 percent for Flexural Beam Fatigue testing. The ME will test the fatigue specimens according to AASHTO T 321 at 15°C, 10 Hertz loading frequency, and 1,500 micro-strains. The ME will ensure that all submitted specimens are within the target air void content as tested at the Material's Central Lab.

Ensure that the first sample is taken in the first lot of production. Thereafter, sample every second lot. The ME may stop production of BDWSC if a sample does not meet the design criteria for performance testing as detailed in Table 902.14.03-1.

Table 902.14.03-1 Performance Testing Requirements for BDWSC

Test	Requirement
APA @ 8,000 loading cycles (AASHTO T 340)	≤ 3 mm
Flexural Fatigue Life (AASHTO T 321)	≥ 100,000 cycles

902.15 RETROFIT STRIP SEAL JOINT SYSTEM

Use a strip seal joint system that builds up the joint using elastomeric or polymer concrete and seals the joint using a strip seal expansion joint. Ensure that the joint system includes a method for securing the strip seal with the elastomeric or polymer concrete.

Ensure that the strip seal joint system is capable of being constructed within the allowable lane closure hours for the project and compatible with installation in an asphalt overlay.

Use strip seal gland that is a neoprene strip seal gland according to 914.04.02.B or a preformed silicon strip seal meeting the criteria in Table 902.15-1.

Table 902.15-1 Requirements for Preformed Silicon Strip Seal

Property	Test Method	Requirement
Durometer (Shore A)	ASTM D 2240	55 ± 5
Tensile (psi)	ASTM D 412	550 minimum
Elongation	ASTM D 412	350% minimum
Tear (die B ppi)	ASTM D 624	80 minimum
Compression Set @ 350 °F, 22 hrs.	ASTM D 395	30% maximum
Operating Temperature Range 1		– 60 °F to + 450 °F
Specific Gravity		1.51
Color		Black

1. The heat age data at temperatures above 300 °F does not apply in this application but in general, tested at 302 °F and 437 °F, no degradation occurs causing functional concern. The operating temperature range indicates the material remains elastomeric in nature at the above temperatures.

Implementation Code R (ROUTINE)

Changes must be implemented in all applicable Department projects scheduled for Final Design Submission at least one month after the date of the BDC announcement. This will allow designers to make necessary plan, specifications, and estimate/proposal changes without requiring the need for an addenda or postponement of advertisement or receipt of bids.

Recommended By:

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