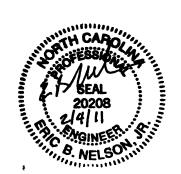
# **Bridge #27 Preservation Special Provisions Structures**

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# **690**BRIDGE #27 PRESERVATION SPECIAL PROVISIONS

# SCOPE OF WORK FOR BRIDGE #27 PRESERVATION

# Location and Description of Bridge

Bridge No. 27 Pasquotank County was built in 1972 and carries US US 158 WB across the Pasquotank River in Elizabeth City, NC. The bridge has an overall length of 888 feet and consists of 20 approach spans of variable length consisting of prestressed concrete girders and a double leaf bascule span 180' long consisting of (2) main steel plate girders, floor beams and stringers with open steel grid deck.

# **Description of Work**

This work shall consist of furnishing all labor, materials and equipment to clean and paint the structural steel of the Bascule Span including all previously painted areas in the counterweight pits and machinery spaces; overlay the concrete deck on the approach spans and the concrete filled sections of grid deck floor using hydro-demolition and latex modified concrete; pavement markings; structural steel repairs to the bascule girders; and maintaining span balance as shown in the contract documents and plans. Contractor shall provide all necessary access; boats, underdeck platforms, scaffolding, ladders, etc.; provide all traffic control (both vehicular and navigational); coordinate all navigation channel work with the US Coast Guard; provide all staging area, material storage, waste disposal, boat storage and boat access; provide environmental controls to limit loss of materials into water and air; jacking equipment, sawing equipment, and chipping equipment; and all else necessary to complete the work.

The contractor shall be responsible for fulfilling all requirements of the NCDOT Standard Specifications for Roads and Structures dated July 2006, except as otherwise specified herein.

### **SECURING OF VESSELS**

(10-12-01)

Secure vessels in accordance with Section 107 of the Standard Specifications and the following provision. When utilizing barges, tugboats or other vessels, take all necessary precautions to ensure that such vessels are securely anchored or moored when not in active operation. Take all necessary measures to ensure that the vessels are operated in a manner that avoids damage to or unnecessary contact with bridges and other highways structures and attachments. If severe weather conditions are anticipated, or should be anticipated through reasonable monitoring of weather forecasts, take additional measure to protect bridges and other highway structures and attachments from extreme conditions. The Contractor is strictly liable for damages to any bridge or other highway structure or attachment caused by a vessel owned or controlled by the Contractor. The Contractor is also liable to third parties for property damages and loss of revenue caused by vessels under the Contractor's control.

# WATERWAY DISRUPTIONS AND COAST GUARD COORDINATION (SPECIAL)

At no time during work will the waterway be closed or narrowed to navigation without prior approval from the Coast Guard. The contractor is required to maintain close and regular contact with the Coast Guard, Sector North Carolina to keep them informed to activities in the waterway with Joseph Edge at (252)-247-4525 or email joseph.m.edge@uscg.mil. Also must contact the 5<sup>th</sup> Coast Guard District with Bill Brazier at (757) 271-1016 or email at Bill.H.Brazier@uscg.mil.

The Contractor shall bear full responsibility for all required coordination with the Coast Guard. Advance coordination with the Coast Guard for any anticipated disruptions to waterway traffic shall begin within 30 days following award of Contract and prior to commencing on-site activities. Approval for scheduled waterway disruptions shall be initiated approximately 45 days in advance, and confirmed no less than 30 days but no more than 45 days, in advance of the first disruption.

# Refer to CFR 33 Parts 1 thru 124 for regulations regarding bridge operation.

The actual waterway disruptions allowed will be fully at the discretion of the Coast Guard. The Department shall not be held responsible for any requirements, stipulations, limitations, etc. related to waterway disruptions as imposed by the Coast Guard which conflict with the requirements of the Contract Documents. Any such conflict shall not be considered cause for delay or additional payment.

All work shall be conducted so that free navigation of the waterway is not unreasonably interfered with and the present navigable depths are not impaired. Timely notice of any and all events that affect navigation shall be given to the District Commander during the work on the moveable span. The channel shall be promptly cleared of all obstructions placed therein or caused by the contractor.

### SUBMITTAL OF WORKING DRAWINGS

(SPECIAL)

## General

Submit working drawings in accordance with Article 105-2 of the *Standard Specifications* and this provision. For this provision, "submittals" refers to only those listed in this provision. The list of submittals contained herein does not represent a complete list of required submittals for the project. Submittals are only necessary for those items as required by the contract. **Make submittals that are not specifically noted in this provision directly to the Resident Engineer**.

To minimize review time, make sure all submittals are complete when initially submitted. The first submittal may be made via email. Provide a contact name and information with each submittal. Direct any questions regarding submittal requirements to the Resident Engineer or State Bridge Management Unit.

### **Addresses and Contacts**

Mr. Rick Nelson, PE
Asst. State Bridge Management Engineer
NC Dept. of Transportation
State Bridge Management Unit
4809 Beryl Drive
Raleigh, NC 27606

Fax: 919.733.2348 Ph: 919.733.4362

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Mr. Aaron Dacey

Coatings & Corrosion Engineer NC Dept. of Transportation Materials & Tests Unit 1563 Mail Service Center Raleigh, NC 27699-1563

Fax: 919.733.8742 Ph: 919.329.4090

Email: adacey@ncdot.gov

Furnish one complete copy of each submittal, including all attachments, to the Resident Engineer. At the same time, submit the number of copies shown below of the same complete submittal directly to the State Bridge Management Unit and the Materials&Tests Unit.

The table below covers "Submittals". The Resident Engineer will receive review comments and drawing markups for these submittals from the State Bridge Management Unit.

Unless otherwise required, submit one set of supporting calculations to the State Bridge Management Unit. Provide additional copies of any submittal as directed by the Engineer.

### **SUBMITTALS**

Submittal	Copies Required by SBMU	Copies Required by Materials&Tests	Contract Reference Requiring Submittal
Bridge Painting Submittals (Under Structure Platforms, Containment, Product Data, Heallth&Safety, QC Plan, etc.)	1 via email, Then 5 hard copies	1 vıa email	Special Provision

### SPAN BALANCE

**SPECIAL (12-15-10)** 

### 1.0 SCOPE

This section is intended to present the requirements associated with span balance during all phases of construction, and includes strain gage balance testing and analysis, balance monitoring throughout construction, and all required weight changes to maintain the balance requirements provided herein.

Strain gages shall be installed and data recorded to evaluate the balance condition of each leaf prior to construction and after all construction work on the moveable leaves has been completed. The Contractor shall, at the direction of the Engineer, make necessary weight adjustments before and after construction, based upon the analysis of the strain gage tests. A final strain gage retest shall be performed after the adjustments are complete to validate the final balance condition of the bridge.

The Contractor shall also develop and maintain a spreadsheet that will calculate the balance condition of the movable leaves throughout the duration of the construction phase. These calculations shall be achieved by tracking all items added to, or subtracted from, each leaf and the change in balance condition resulting from such changes.

### 2.0 CONSTRUCTION BASCULE LEAF BALANCE

# A. Strain Gage Balancing

The Contractor is responsible for determining the balance conditions of the moveable leaves by utilizing the strain gage procedure described below. Strain gage balancing on each leaf shall be performed by the Contractor prior to beginning construction,

after all construction is completed, and after balance adjustments to the span and/or counterweight have been made.

Two bi-axial strain gage rosettes shall be mounted on each shaft S1 (in between gear G1 and the final pinion), configured in such a way as to cancel the effects of bending, so that only torsional strain in each shaft is being measured. Strain in each shaft shall be continuously measured by a data acquisition system. The angle of opening of the bridge shall be simultaneously recorded by the same data acquisition system as the shaft strain.

Prior to performing strain gage measurements, the Contractor shall submit full documentation of the proposed procedure, including instrumentation equipment, strain gage mounting and wiring arrangements, and specific formulas and equations to be utilized for data analysis.

Prior to recording strain, the strain readings shall be zeroed and all static torsional loading shall be relieved from the machinery: all brakes shall be released, and all pinions adjusted such that pinion and rack teeth are not in contact. Feeler gages shall be utilized at each pinion to confirm that teeth are not in contact.

Strain gage measurements shall be taken only on a dry, calm day, with wind loads less than 5 mph, when there is no extraneous equipment, debris, rainwater, ice, snow, or other material on the bridge that would effect the balance of the spans.

Each leaf shall be tested through at least three (3) complete operational cycles and a permanent record of each test shall be maintained.

The Contractor shall submit a report of the results of the balance determination. From the strain data, shaft torque and bridge unbalance, as seen at the tip of the leaves, shall be computed and plotted against the angle of opening from full closed to full open, and from full open to full closed. A plot of Araw@ data strain against the angle of opening shall also be included. Also included in the results presentation shall be a discussion on the peak operating torques as a percentage of the full load motor torque (when they occur and their magnitude) and system friction.

Initial balancing shall establish the existing balance baseline for use in the balance spreadsheet. If the results of the initial balancing determine that the bridge balance is outside of the acceptable balance condition for construction, the Contractor shall coordinate with the Owner the means and methods to bring the bridge into an acceptable balance prior to the start of construction.

Post-construction balancing shall verify the construction balance spreadsheet and determine the adjustments to be made to obtain an acceptable balance condition. Final balancing shall be performed to verify that an acceptable final balance has been obtained after the adjustments.

If the final balancing results indicate that an acceptable final balance condition has not been obtained after the adjustments have been made, the Contractor shall make additional adjustments and repeat the balance testing as required until the desired balance conditions have been achieved.

Additional balance weights shall be furnished by the Contractor.

The testing and all balance calculations shall be performed by a Professional Engineer licensed to practice in the State of North Carolina. The Contractor shall provide evidence of successful strain gage balancing experience on a minimum of five (5) bascule bridges within the previous three years. A complete test procedure, along with the resume of the Engineer conducting the tests, shall be submitted for approval prior to the initial balancing test.

The test procedure shall include the following:

- Test method
- List of equipment
- Sample calculations
- Report format

After the balance tests have been completed, the Contractor shall submit a formal report signed and sealed by the Professional Engineer who conducted the tests. The report shall include the following:

- Introduction
- Test procedure and Equipment
- Method of analyzing recorded data
- Presentation of results
- Conclusions
- Calculations
- Graphical representation of Span Balance vs. Opening Angle

# B. Maintaining Span Balance

Following the initial strain gage balance determination, the Contractor shall develop and maintain a spreadsheet that will determine, throughout the duration of the construction phase, the effect of all weight changes on the initial balance condition. This shall be accomplished by tracking the weight, as well as the lateral and longitudinal center of gravity locations, relative to the trunnion centerline, of all items added to, or subtracted from, each leaf. The spreadsheet will reflect the actual work plan and shall be updated daily. A copy of the spreadsheet shall be submitted to the Engineer for review prior to any work. The working spreadsheet shall be available for review by the Engineer at any time during construction. Weekly summary printouts shall be submitted to the Engineer during construction. Temporary adjustments will be made to maintain an acceptable balance condition at all times. The Contractor shall provide, install and remove temporary balance materials as needed.

When weight adjustments are necessary to maintain the acceptable balance conditions as described below, weight shall be added to or removed from the counterweight and/or bascule leaves in accordance with the approved calculations. The bridge balance conditions shall be adjusted the same day the construction activities result in any alteration of the bridge balance, and prior to any known openings for waterway

traffic. At no time shall any brakes or span locks be released or disengaged, respectively, until bridge balance has been properly restored. Brakes or span locks shall not be used for the sole purpose of maintaining the bridge in the closed position. Instead, proper balance shall be achieved to maintain the bridge in the desired position.

Temporary equipment and tools shall be removed from the bascule spans prior to each bridge opening.

The spreadsheet and all required calculations shall be signed and sealed by a Professional Engineer licensed in the state of North Carolina. A copy of the spreadsheet and all calculations shall be submitted to the Engineer for review and approval prior to the initial balance testing.

# C. Balance Requirements

The balance for each leaf shall be maintained to meet the following requirements:

1. During Construction, Bridge Operation Not Permitted. Bridge is in the Closed Position, with Span Locks Driven.

The movable leaf must be span heavy, with a positive toe reaction between 0 lbs and 10,000 lbs with the bridge in the closed position. The center of gravity must be between -80° and +80° with the leaf in the closed position.

2. During Construction, Bridge Operation Permitted.

The movable leaf must be span heavy in the closed position, with a positive toe reaction between 1,000 lbs and 5,000 lbs with the bridge in the closed position. The center of gravity must be located between -80° and +80° with the span in the closed position.

3. Final Balance Condition of Bridge Following Construction.

The movable leaf must be span heavy in the closed position, with a positive toe reaction between 1,500 lbs and 2,500 lbs with the bridge in the closed position. The center of gravity must be located between  $+10^{\circ}$  and  $+40^{\circ}$  with the span in the closed position.

NOTE: The center of gravity location is measured from the horizontal on the channel side of the trunnion (i.e. an angle of +20° indicates the center of gravity is located on the channel side of the trunnion at an angle of 20° above the horizontal).

# 3. MEASUREMENT AND PAYMENT

There will be no separate measurement and payment for maintaining of the span balance condition. This work is considered an integral part of the overall work, and the costs thereof shall be included in the price bid for *Cleaning and Painting Existing Structure*.

# **CLEANING AND PAINTING EXISTING STRUCTURE**

(SPECIAL)

### **GENERAL**

This work shall consist of furnishing all labor, equipment, and materials to clean and paint the structural steel of the existing Bascule Span. Work includes: removing, containment and disposal of the existing paint system; preparation of the surfaces to be painted; applying the new paint system; and portable lighting and all else as required in the contract documents.

All structural steel of the Bascule Span shall be painted. All machinery and all other areas that have previously been painted shall be painted. The roadway stringers and floor beams in the bascule pit shall also be painted along with exterior faces of the counterweight girders. All machinery, gears and other areas not to be painted shall be protected from blasting and painting. Equipment bearings, seals, and gear faces shall be sealed to keep out blasting medium and paint. The open steel grid floor of the span will not be painted.

The approximate steel area to be painted is 21,183 sq. ft.

Paint on the bridge (regardless of color) contains red lead and other hazardous constituents. All cleaning and surface preparation activities must prevent dispersion of debris into the environment.

Surface area shown is approximate and may vary from the actual quantity to be painted. The Contractor is responsible for determining the actual area to be painted.

### **SPECIALTY ITEMS:**

Work Schedule – Prior to beginning work, the Contractor shall submit his work schedule to the Engineer. Schedule shall be kept up to date, with a copy of the revised schedule being provided to the Engineer in a timely manner.

SSPC QP-2 Certification - The existing paint systems include toxic substances such as red lead oxide, which are considered hazardous if improperly removed. Only contractors who are currently SSPC QP-2, Category A certified, and have successfully completed lead paint removal on similar structures within 18 months prior to this bid, may bid on and perform this work. The Contractor must complete and submit a "Lead Abatement Affidavit" prior to being awarded the contract. This form may be downloaded from:

http://www.ncdot.gov/projects/ncbridges/#stats

Twelve-month Observation Period - The Contractor maintains responsibility for the coating system for a twelve (12) month observation period beginning upon the satisfactory completion of all the work required in the plans or as directed by the Engineer. The Contractor must guarantee the coating system under the payment and performance bond (refer to Article 109-10). To

<sup>&</sup>lt;sup>1</sup> Successfully: Lead abatement work completed in accordance with contract specifications, free of citation from safety or environmental agencies. Lead abatement work shall include but not be limited to: abrasive blasting; waste handling, storage and disposal; worker safety during lead abatement activities (fall protection, PPE, etc.); and containment. This requirement is in addition to the contractor prequalification requirements covered by NCDOT Std. Specification, Section 102-2.

successfully complete the observation period, the coating system must meet the following requirements after twelve (12) months service:

- No visible rust, contamination or application defect is observed in any coated area.
- Painted surfaces have a uniform color and gloss.
- Painted surfaces have an adhesion that meets an ASTM D-3359, 3A rating.

Final acceptance is made only after the paint system meets the above requirements.

Containment Plan - No work begins until the Contractor furnishes the Engineer with a containment plan for surface preparation and coating operations and the Engineer reviews and responds in writing about the acceptability of said plan. Such plan must meet or exceed the requirements of a <u>Class 2A</u> containment in accordance with SSPC Guide 6. Enclosure drawings and loads supported by the structure must be prepared, signed and sealed by a Registered North Carolina Professional Engineer.

In the containment plan describe how debris are contained and collected. Describe the type of tarpaulin and bracing materials and the maximum designed wind load. Describe the dust collection system and how a negative pressure of 0.03 inches of water column is maintained inside the enclosure while blasting operations are being conducted. Describe how the airflow inside the containment structure is designed to meet all applicable OSHA Standards. Describe how water run-off from rain will be routed by or through the enclosure. Describe how wash water will be contained and paint chips separated. Describe what physical containment will be provided during painting application to protect vehicles and areas not to be painted. Include a contingency plan for removal and storage of containment, materials and equipment during natural weather events such as tropical storms and hurricanes.

Wash water Sampling and Disposal Plan - No work begins until the Contractor furnishes the Engineer with a containment plan for surface preparation and coating operations and the Engineer reviews and approves in writing said plan. All wash water shall be collected and sampled prior to disposal. Representative sampling and testing methodology shall conform to 15A NCAC 02B.0103, "Analytical Procedures". Wash water shall be tested for pollutants listed in 15A NCAC 02B.0211 (3), 15A NCAC 02T.0505 (b)(1) and 15A NCAC 2T.0905 (h) (See link below for NCDOT Guidelines for Managing Bridge Wash Water). Depending on the test results, wash water disposal methods shall be described in the disposal plan. Wash water shall be disposed of in accordance with all current state and federal regulations.

# http://www.ncdot.gov/prjects/ncbridges/#stats

Waste Handling of Paint and Abrasives – The Contractor will comply with the Resource Conservation and Recovery Act (RCRA – 40 CFR 261 - 265) and the Occupational Safety and Health Act (OSHA - 29 CFR 1910 - 1926) regulations for employee training, and for the handling, storage, labeling, recordkeeping, reporting, inspections and disposal of all hazardous waste generated during paint removal.

A summary of Generator Requirements is included in the APPENDIX which cites the specific regulations for each Generator category. Quantities of waste by weight and dates of waste generation must be recorded. Waste stored at the project site must be properly labeled.

The North Carolina Department of Environment and Natural Resources (NCDENR) has adopted RCRA as the North Carolina Hazardous Waste Management Rules and is responsible for enforcement. The "Hazardous Waste Compliance Manual for Generators of Hazardous Waste" is published by the Compliance Branch of the Division of Waste Management of NCDENR, and can be found at

# http://www.wastenotnc.org/HWHOME/WEBRules/NCHWRule.html

The Contractor is required to maintain compliance with all federal, state and local regulations. Failure to comply with the regulations could result in fines and loss of qualified status with NCDOT.

Use a company from the below list of approved waste management companies. Immediately after award of the contract, the Contractor arranges for waste containers, testing, transportation and disposal of all waste. No work begins until the Contractor furnishes the Engineer with a written waste disposal plan. Any alternative method for handling waste must be pre-approved by the Engineer.

Southern Logistics, Inc. – 312 Orvil Wright Blvd, Greensboro, NC 27409 (Ph. 336-662-0292) A&D Environmental – PO Box 484, High Point, NC 27261 (Ph. 336-434-7750) Poseidon Environmental Services, Inc. – 837 Boardman-Canfield Rd #209, Youngstown, OH (Ph. 330-726-1560)

All removed paint and spent abrasive media shall be tested for lead following the SW-846 TCLP Method 1311 Extraction, as required in 40 CFR 261, Appendix 11, to determine whether it must be disposed of as hazardous waste. Random sampling using composite samples of at least 20% (minimum of 2 composite samples) of the waste is required for characterization of the waste. A composite sample consists of equal mass samples from 3 to 4 drums. The Contractor shall furnish the Engineer certified test reports showing TCLP results of the paint waste stored on site, with disposal being in accordance with "Flowchart on Lead Waste Identification and Disposal".

(www.wastenotnc.org/hwhome/guidance/guidance.htm).

Until test results are received, all waste shall be stored and labeled as "NCDOT Bridge Paint Removal Waste-Pending Analysis" and include the date generated and contact information for the Division HazMat Manager or Project Engineer. Waste containers shall be stored in a covered and secured storage container. Once test results are received and characterized, waste shall be labeled as either "Hazardous Waste-Pending Disposal" or "Paint Waste-Pending Disposal".

Once the waste has been collected, and the quantity determined, the Contractor prepares the appropriate shipping documents and manifests and presents them to the Engineer. The Engineer will verify the type and quantity of waste and obtain a Provisional EPA ID number from the

NC Hazardous Waste Section North Carolina Department of Environment & Natural Resources 1646 Mail Service Center Raleigh, NC 27699 Phone (919) 508-8400 Fax (919) 715-4061

At the time of shipping the Engineer will sign, date and add the ID number in the appropriate section on the manifest. The maximum on-site storage time for collected waste shall be 90 days. All waste whether hazardous or non-hazardous will require numbered shipping manifests. The cost for waste disposal (including lab and permit application fees) is included in the bid price for this contract. Note NC Hazardous Waste Management Rules (15A NCAC 13A) for more information. Provisional EPA ID numbers may be obtained at this link:

# www.wastenotnc.org/HWHOME/ProvisionalIDRequirements.pdf

Testing labs shall be certified in accordance with North Carolina State Laboratory Public Health Environmental Sciences. List of certified laboratories may be obtained at this link:

 $(\underline{http://slphreporting.ncpublichealth.com/EnvironmentalSciences/Certification/CertifiedLaborator}, \underline{v.asp})$ 

All test results shall be documented on the lab analysis as follows:

- 1. For leachable lead
  - a. Soils/Solid/Liquid-EPA 1311/200.7/6010

All sampling shall be done in presence of the Engineer's representative.

**Equipment Mobilization** - The equipment used in any travel lanes and paved shoulder must be mobile equipment on wheels that has the ability to be moved on/off the roadway in less than 30 minutes. All work conducted in travel lanes must be from truck or trailer supported platforms and all equipment must be self propelled or attached to a tow vehicle at all times.

### SUBLETTING OF CONTRACT:

Only contractors certified to meet SSPC QP-2, Category A, and have successfully completed lead paint removal on similar structures within 18 months prior to this bid are qualified for this work. Work is only sublet by approval of the Engineer.

# **SPECIFICATIONS:**

The North Carolina Department of Transportation (NCDOT) Standard Specifications for Roads and Structures dated July 1, 2006, together with these Special Provisions apply to this project. Surface preparation and painting are performed in accordance with Section 442 except where otherwise noted in these Special Provisions. The Paint materials must meet the applicable materials specifications under Section 1080. Materials approvals are in accordance with 4.0 Materials of this Special Provision.

### 1.0 PREPARATION OF SURFACES:

- 1.1 Power washing with low pressure water Before any other surface preparation are conducted, all surfaces shall be power washed to remove visible deposits of oil, grease, dust, dirt and or other contaminants. All wash water shall meet the requirements of NCDOT Managing Bridge Wash Water specification.
- 1.2 Surface preparation for surfaces behind and immediately adjacent to bridge operational items including electrical conduit, hydraulic hoses and other related areas

- shall be power washed with low pressure water, SP 1 followed by SP 10 with a minimum of 1.5 mil profile.
- 1.3 Blasting is done with mineral abrasives meeting the requirements of Section 1080-15. The profile must be between 1.0 and 3.0 mils when measured on a smooth steel surface. Blasting abrasives used in cleaning operations shall meet the requirements of SSPC AB 1, AB 2 and AB 3.
- 1.4 Before the contractor departs from the work site at the end of the work day, all debris generated during surface preparation are collected in approved containers.
- 1.5 The Contractor cleans a two square foot area at each structure to demonstrate the specified finish and the inspector preserves this area by covering it with tape, plastic or some other suitable means so that it can be retained as a site standard.
- 1.6 Any area of corroded steel (steel which has lost more than 50% of its original thickness) must not be painted until the Engineer observes its condition.
- 1.7 All parts of the bridges not to be painted, and the travelling public, shall be protected from overspray. The Contractor shall submit a plan to protect all parts of bridge that are not required to be painted, in addition to a plan to protect the traveling public and surrounding environment while applying all layers paint to a structure.
- 1.8 Contractor is responsible for protecting all motors, gears, machinery components, electrical conduit, and other areas not to be blast cleaned that are responsible for bridge operations, additionally responsible for replacing any broken hardware, fasteners, lines and or hoses due to contractor performing work. The Engineer will verify proper sealing of all machinery components prior to any blasting or painting.
- 1.9 Surface chloride levels for painting are 7 ug/cm<sup>2</sup> or below.

### 2.0 PAINTING OF STEEL:

Paint System 1 (modified), as specified in these special provisions and Section 442 of NCDOT's Standard Specifications, is to be used for this work. System 1 is an inorganic zinc primer (For this project the IOZ primer shall be replaced with Organic Zinc Primer.) and acrylic topcoats used over blast cleaned surfaces (SP10 – near white) except as noted below:

A. <u>Top Flanges of Girders, Floor Beams and Stringers Under Grid Deck:</u> The top flanges shall be pressure washed (5000 psi min.) to remove latent's, loose paint and other deleterious material. Apply 1 coat (3-5 mils DFT) of Organic Zinc Primer and 2 coats, (5-7 WFT) of an approved Epoxy Aluminum Mastic.

Any area where newly applied paint fails to meet the specifications must be repaired or replaced by the Contractor. The Engineer approves all repair processes before the repair is made. Repaired areas must meet the specifications. The Contractor applies an additional finish coat of paint to areas where the tape adhesion test is conducted.

Do not apply any coating below 40 F or when a temperature of the air or substrate is 40 F or below is predicted during the drying and curing period of the paint. Do not apply any coating above or below the manufacturers recommended application temperatures or during a period when an ambient temperature outside the recommended range is predicted during the drying and

curing period of the paint. During adverse weather, use enclosures that control atmospheric conditions artificially inside within limits suitable for painting during the painting operation and until the paints is cured or until weather conditions permit its exposure in the open.

Should the contractor elect to apply Organic Zinc Primer at or below 50 F the recoat window shall be a minimum of 24 hours or as necessary for the solvent to fully evaporate from the coating.

No application of acrylic coats (intermediate, stripe or top) shall be applied when the air or substrate is below 50 F.

Contractor must insure that chloride, sulfate and nitrate contaminants shall be removed from all steel surfaces prior to painting using an acceptable sample method in accordance with SSPC Guide 15. Levels of contaminants shall be at or below the coating manufacturer's recommendation for each contaminant. In addition if the Contractor elects to remove containment and expose previously coated surfaces; all surfaces shall be power washed with low pressure water prior to the application of each successive remaining coat and demonstrate that chloride, sulfate and nitrate contaminants are below the paint manufacturers recommended limits.

Should the contractor elect to blast and paint to adjacent areas of newly applied layers of coating they shall provide sufficient protection to coatings layers as well as stop each layer twelve (12") inches from the end of each coating layer to provide sufficient coating application

All vertical steel to steel contact areas such as gusset, floor beam or stringer connections shall be sealed with an approved caulking as recommended by the paint manufacturer and approved by the Engineer prior to start of work.

### 3.0 MATERIALS:

All <u>Organic Zinc-Rich</u> coatings <u>submitted for use</u> shall be evaluated for performance through the National Transportation Product Evaluation program (NTPEP) for Structural Steel Coatings as part of a <u>Coating</u> System <u>that appears on one of the North East Protective Coatings Committee's (NEPCOAT) Qualified Products Lists.</u> Submission of products through AASHTO/NTPEP is a continuous process <u>and manufacturers may submit systems at any time.</u> Prior to the start of work, a 1 quart unmixed sample kit (including the zinc dust) of the Organic Zinc Primer shall be sent to the Materials and Tests Unit for verification testing.

Only paint suppliers that have a NCDOT qualified inorganic zinc primer may furnish paints for this project. All paints applied to a structure must be from the same supplier. Before any paints are applied the Contractor provides the Engineer a manufacturer's certification that each batch of paint meets the requirements of the applicable Section 1080 of NCDOT's Standard Specifications.

The inspector randomly collects a one quart sample of each paint product used on the project. Additional samples may be collected as needed to verify compliance to the specifications.

# 3.1 REQUIREMENTS FOR SUITABLE CAULKING

# Submit for approval to the Engineer and Materials & Tests Unit, Chemical Testing Engineer

### A. APPROVAL

- 1. Manufacturer's letter certifying the Caulking Compound supplied to the project will meet or exceed Department expectations and will be adequate for the intended use
- 2. Contractor shall submit for approval necessary paperwork at a minimum of 7 working days prior to Pre-Construction Meeting:
  - Product data sheet
  - MSDS sheet
  - Letter from paint manufacturer stating caulking material is suitable and compatible with the type and brand of paint being used on the project
- 3. Show typical markings on the packaging and any date markings.
- 4. Provide application instructions and temperature limitations.
- 5. State effective product life

### **B. WORK SEQUENCE**

Contractor shall apply suitable caulking in accordance the manufacturer's product data sheet. In no case shall caulking be applied to moist, damp or frost bearing surfaces or if temperature will fall below freezing for more than 48 hours.

Suitable caulking shall be applied to surfaces after application of the primer coat and prior to the intermediate coat.

### C. ACCEPTANCE BY DEPARTMENT

The Engineer of Record & Chemical Testing Engineer will review the manufacturer's submittal for compliance with specification requirements.

# D. FIELD DOCUMENTATION REQUIREMENTS

Accepted suitable caulking products will be accepted if they can be identified in the field by manufacturer name and (in applicable) brand name.

### 4.0 INSPECTION:

Quality Assurance Inspection - The Contractor furnishes all necessary apparatus such as ladders, scaffolds and platforms as required for the inspector to have reasonable and safe access to all parts of the work. The contractor illuminates the surfaces to be inspected to a minimum of 50-foot candles of light.

Contractor must insure that chloride levels on the surfaces prior to each coat of paint are below 7 ug/cm<sup>2</sup> using an acceptable sample method in accordance with SSPC Guide 15. The frequency of testing shall be 2 tests per 5000 square feet after all surface preparation has been completed and immediately prior to painting. Test areas selected shall represent the greatest amount of corrosion in the span as determined by the Engineers' representative..

NOTE- Contractor has the option to expose each layer of paint applied permitting proper curing to outside exposure. Random quality assurance testing of chloride levels will done to assure all layers of paint have acceptable chloride levels prior to the application of the next layer.

If contractor elects to use an approved organic zinc rich primer and is approved in accordance with "4.0 Materials" of this specification, verification of the cure of organic zinc rich primer shall be tested by the following:

ASTM D 3363- 2H ASTM D 4541- 400 PSI

NCDOT reserves the right for ongoing QA (Quality Assurance) inspection to include but not limited to surface contamination testing, adhesion pull testing and DFT readings as necessary to assure quality.

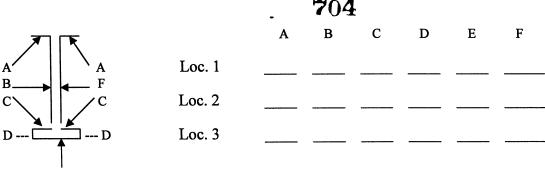
The Contractor informs the Engineer of all scheduled and unannounced inspections from SSPC, OSHA, EPA and/or others that come on site and furnishes the Engineer a copy of all inspection reports.

Inspection Instruments - The Contractor furnishes at least the following calibrated instruments at site and conducts the quality control testing:

Sling Psychrometer - ASTM E-337 – bulb type
Surface Temperature Thermometer
Wind Speed Indicator
Tape Profile Tester – ASTM D-4417 Method C
Surface Condition Standards – SSPC VIS-1 and VIS-3
Wet Film Thickness Gage – ASTM D-4414
Dry Film Thickness Gage – SSPC-PA2 Modified
Solvent Rub Test Kit – ASTM D-4752
Adhesion Test Kit – ASTM D-3359 Method A (Tape Test)
Adhesion Pull test – ASTM D-4541
Surface Contamination Analysis Kit or (Chloride Level Test Kit)

The contractor maintains a daily quality control record in accordance with Section 442-12 and such records must be available at the job site for review by the inspector and be submitted to the Engineer as directed. In addition to the information required on M&T-610, the Contractor shall submit all DFT readings as required on M&T611.

A. The dry film thickness is measured at each spot as indicated on the attached diagram at no less than three random locations along each main girder, floor beam, and stringer. Also dry film thickness is measured at no less than six random spots per span on diaphragms and lateral bracing. Each spot is an average of three to five readings in accordance with SSPC PA-2.



Randomly select one A, one C and one D spot along with B, E and F.

- **B.** Two random adhesion tests (1 test=3 dollies) per span are conducted on interior surfaces in accordance with ASTM D-4541 after the prime coat has been properly cured in accordance with ASTM D-4752 with no less than a 4 resistance rating, and will be touched up by the Contractor. The required minimum average adhesion is 400 psi.
- C. Cure of the intermediate and stripe coats shall be accessed by utilizing the thumb test prior to the application of any successive layers of paint.
- **D.** One random Cut Tape adhesion test per span is conducted in accordance with ASTM D-3359 on interior surface after the finish coat is cured. Repair areas shall be properly tapered and touched up by the Contractor.

### 5.0 SAFETY AND ENVIRONMENTAL COMPLIANCE PLANS:

Personnel access boundaries are delineated for each work site using signs, tape, cones or other approved means. Submit copies of safety and environmental compliance plans that comply with SSPC QP-2 Certification requirements.

### **6.0 ENVIRONMENTAL MONITORING:**

E

Comply with Section 442–13(B) of NCDOT's Standard Specifications.

A "Competent Person<sup>2</sup>" is on site during all surface preparation activities and monitors the effectiveness of containment and dust collection systems. Any visible emissions outside the containment enclosure or pump monitoring results exceeding the level of 30  $\mu$ g/m3 TWA is justification to suspend the work. Before any work begins the Contractor provides a written summary of the responsible person's safety training.

### 7.0 HEALTH AND SAFETY RESPONSIBILITY:

Comply with Section 442-13(C) of NCDOT's Standard Specifications. Insure employee blood sampling test results are less than 50 micrograms per deciliter. Remove employees with a blood sampling test of 50 or more micrograms per deciliter from work activities involving any lead exposure.

<sup>&</sup>lt;sup>2</sup> Competent Person as defined in OSHA 29 CFR 1926.62 is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who have authorization to take prompt corrective measures to eliminate them.

An employee who has been removed with a blood level of 50 micrograms per deciliter or more shall have two consecutive blood sampling tests indicating that the employee's blood lead level is at or below 40 micrograms per deciliter before returning to work activities involving any lead exposure.

# **8.0 STORAGE OF PAINT AND EQUIPMENT:**

The Prime Contractor provides a location for materials, equipment and waste storage. Tarpaulins are spread over all pavements and surfaces underneath equipment utilized for abrasive recycling and other lead handling equipment or containers. All storage of paint, solvents and other materials applied to structures shall be stored in accordance with Section 442 of the Specifications or manufacturers' requirements. The more restrictive requirements will apply.

### 9.0 UTILITIES:

The Contractor protects all utility lines or mains which may be supported on, under, or adjacent to bridge work sites from damage and paint over-spray.

### **10.0 PAYMENT:**

The cost of inspection, surface preparation and repainting the existing structure is included in the lump sum price bid for *Cleaning and Painting Existing Structure*. This price is full compensation for furnishing all inspection equipment, all paint, cleaning abrasives, cleaning solvents and all other materials; preparing and cleaning surfaces to be painted; applying paint in the field; protecting work, traffic and property; and furnishing blast cleaning equipment, paint spraying equipment, brushes, rollers and any other hand or power tools and any other equipment; containment, handling and disposal of debris and wash water, all personal protective equipment, and all personal hygiene requirements.

Pollution Control will be paid for at the contract lump sum price which price will be full compensation for all collection, handling and disposal of debris and wash water, all personal protective equipment, and all personal hygiene requirements, and all equipment, material and labor necessary to fully contain the blast debris; daily collection of the blast debris into specified containers; and any measures necessary to ensure conformance to all safety and environments regulations as directed by the Engineer.

Payment will be made under:

Pay ItemPay UnitCleaning and Painting Existing StructureLump SumPollution ControlLump Sum

# MANAGING BRIDGE WASH WATER

(SPECIAL)

### 1.0 Description

Collect and properly dispose of Bridge Wash Water from bridge decks.

### 2.0 Construction Methods

- (A) Prepare a written Bridge Wash Water management plan in accordance with the Guidelines for Managing Bridge Wash Water available at <a href="http://www.ncdot.org/doh/preconstruct/ps/contracts/letting.html">http://www.ncdot.org/doh/preconstruct/ps/contracts/letting.html</a>. Submit plan and obtain approval from the Engineer prior to beginning of the bridge cleaning operation.
- (B) Prior to final payment, submit a paper copy of all completed records pertaining to disposal of Bridge Wash Water.

# 3.0 Measurement and Payment

Payment for collecting, sampling, testing, pH adjustment, monitoring, handling, discharging, hauling, disposing of the bridge wash water, documentation, record keeping, and obtaining permits if applicable, shall be included in the payment for other items.

## **HYDRO-DEMOLITION OF BRIDGE DECK**

(SPECIAL)

# **Description**

Hydro-demolition shall consist of the removal of the deck surface by means of high pressure water blasting which will remove concrete, asphalt, oil, dirt, concrete laitance and rust from the exposed reinforcing bars by direct impact, pressurization of micro and macro cracks and cavitation produced by jet instability. If reinforcing bars or bridge drainage devices are pulled up or snagged during scarification milling operations, the Contractor shall cease operations and consult with the Engineer to determine what adjustments, if any, need to be made to the roto-milling operations.

The Contractor shall submit for approval prior to beginning work, his Hydro-demolition Management Plan. This plan shall include how the Contractor shall provide for the collection, treatment, and disposal of all run-off water generated by the scarification and hydro-demolition processes. This Water Management Plan shall be prepared in accordance the NCDOT Guidelines for Managing Hydro-demolition Water (a copy of which is included in the Appendix). The contractor shall comply with applicable regulation concerning such water disposal.

### **Equipment**

Use the following surface preparation equipment:

- Hydro-demolition machine, self-propelled with min. 17,000 psi orifice pressure.
- Sawing equipment capable of sawing concrete to the specified depth.
- Scarifying equipment that is a power-operated, mechanical scarifier or grinder capable of removing at least 1/4 inch (6 mm) for each pass.
- Hand-held high velocity (7,500 psi minimum) water-jet equipment capable of removing rust scale from reinforcing steel, or removing small chips of concrete partially loosened by the scarifying or chipping operation, and of removing rehydrated dust left from scarification.

- Power driven hand tools for removal of unsound concrete are required that meet the following requirements:
  - Pneumatic hammers weighing a nominal 35 lb (16 kg) or less.
  - Pneumatic hammer chisel-type bits that do not exceed the diameter of the shaft in width.
- Hand tools such as hammers and chisels for removal of final particles of unsound concrete.
- Vibratory screed for overlays, except as noted herein.

The hydro-demolition machine shall be self-propelled and capable of producing a water-jet through an orifice at a pressure of at least 17,000 PSI. The machine shall move the jet transversely across the area and forward and backward so that the entire deck is covered with the water-jet and operated at a pressure sufficient to remove the unsound concrete.

The machine shall have sufficient means to control and vary the following functions:

- (1) Water pressure.
- (2) Angle and distance of the orifice in relation to the surface to be blasted.
- (3) Limits of transverse and longitudinal movement of the orifice.
- (4) Speed of the orifice in the transverse and longitudinal direction.

The high pressure pump (or pumps) shall be equipped with over-pressurization relief valves and rupture disc systems. All high pressure components shall be rated at full working pressure of the hydro-demolition system. The complete hydro-demolition system must be capable of depressurization from a single point.

The equipment must operate at a noise level of less than 90 decibels at a distance of 50 feet.

### **Construction Methods**

Remove all existing asphalt overlays and all loose, disintegrated, unsound or contaminated concrete from the bridge deck in accordance with the following surface preparation classifications shown below:

Seal all expansion joints subjected to run-off water from the hydro-demolition process with material approved by the Engineer, prior to beginning the Class I Surface Preparation. The expansion joints shall remain sealed until water from the hydro-demolition process no longer passes over them. The contractor shall take all steps necessary to eliminate the flow of water through the expansion joints, and any other locations water could leak from the deck.

All deck drains in the immediate work area and the other sections of the bridge affected by the work being performed in the immediate work area shall be sealed prior to beginning the Deck Scarification. They shall remain sealed until it has been determined that materials from the hydro-demolition and concrete overlay operations can not be discharged through them any longer.

A. <u>Scarifying Bridge Deck:</u> Removal of any asphalt wearing surface <u>from the bridge deck or if</u> <u>applicable, the approach roadway pavement,</u> and scarification of the concrete deck to remove the entire concrete surface of the deck to a uniform depth of 1 inch, but not less than 1/2 inch above the top mat of reinforcing steel.

# Estimated average cover to top mat: 1 ½" +/-3/8"

Remove and dispose of all concrete and asphalt, and thoroughly clean the scarified surface. In areas where reinforcing steel is located in the depth to be scarified, use another method with the Engineer's approval. If reinforcing bars or bridge drainage devices are pulled up or snagged during scarification milling operations, the Contractor shall cease operations and consult with the Engineer to determine what adjustments, if any, need to be made.

- B. Class I Surface Preparation (Partial Depth): Remove by hydro-demolition and by chipping with hand tools all loose, unsound and contaminated deck concrete and in areas where reinforcing steel is exposed by removing deck to an average depth of ½ inch below the top mat of reinforcing steel. Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface. Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.
- C. <u>Class II Surface Preparation (Partial Depth)</u>: Remove by hydro-demolition and by chipping with hand tools all loose, unsound and contaminated deck concrete to an average depth of approximately one-half the deck thickness, but no less than 3/4 inch below the top mat of steel. In areas where the entire perimeter of the reinforcing steel bar is exposed, chip or use hand-held high velocity water-jet equipment to provide a minimum depth of 3/4 inch below the bar. Dispose of the removed concrete, clean, repair or replace rusted or loose reinforcing steel, and thoroughly clean the newly exposed surface.

Care shall be taken not to cut, stretch, or damage any exposed reinforcing steel.

In overhangs, removing concrete areas of less than 0.60 ft<sup>2</sup>/ft length of bridge without overhang support is permitted unless the Engineer directs otherwise. Overhang support is required for areas removed greater than 0.60 ft<sup>2</sup>/ft length of bridge. Submit details of overhang support to the Engineer for approval prior to beginning the work.

D. <u>Class III Surface Preparation (Full Depth)</u>: Remove by hydro-demolition, and chipping with hand tools all loose, unsound and contaminated deck concrete to the full slab depth. Thoroughly clean the routed out areas and dispose of concrete removed and clean, repair, or replace reinforcing bars.

For areas of less than 3 ft<sup>2</sup> suspending forms from existing reinforcing steel using wire ties is permitted. For larger areas, support forms by blocking from the beam flanges, or other approved method.

Overhang support is required for full depth removal adjacent to bridge rails. Submit details of overhang support to the Engineer for approval prior to beginning the work.

E. <u>Under Deck Containment</u>: Under deck containment shall be installed under areas of the bridge deck where Class III surface preparation occurs. The containment shall be installed prior to hydro-demolition in the areas indicated on the plans and in any other areas where blow thru or full depth removal occurs during surface preparation.

Submit for approval detailed plans for under deck containment. Detail how waste, debris, and wastewater are kept from falling below.

F. <u>Class AA Concrete</u>: Fill the Class III surface preparation areas with Class AA or latex modified concrete up to the bottom of the proposed concrete overlay in accordance with the methods described below:

Refill areas where concrete was removed with Class AA concrete up to the bottom of the proposed concrete overlay in accordance with Section 420 of the Standard Specifications. Any of the methods for curing Class AA concrete as stated in the Standard Specifications are permitted except the membrane curing compound method.

Provide a raked finish to the surface of the Class AA concrete to provide a minimum relief of 1/16" and a maximum relief of 1/4". Place the overlay course only after the Class AA concrete has attained 2500 psi (17.2 MPa) as measured by an approved, non-destructive test method.

Refilling the areas from which concrete has been removed with latex modified concrete during the Class III repair is permitted if any of the following conditions are met:

- The reinforcing steel cover is 1½ inches or less for the top mat of steel.
- The area being repaired is less than 1 yd<sup>2</sup>.
- The Engineer directs the fill.

For areas of less than 3 ft<sup>2</sup> suspending forms from existing reinforcing steel using wire ties is permitted. For larger areas, support forms by blocking from the beam flanges, or other approved method.

# **Surface Preparation**

Two trial areas shall be designated by the Engineer to demonstrate that the equipment, personnel, and methods of operation are capable of producing results to the satisfaction of the owner's Engineer. The first trial area shall consist of approximately 50 square feet of sound concrete as determined by the Engineer. The equipment shall be calibrated to remove the sound concrete from the scarified surface to the depth required to achieve the plan overlay thickness. After completion of this test area, the equipment shall be moved to the second area consisting of deteriorated or defective concrete, to determine whether this unsound concrete will be completely removed with the previous calibration and to establish a baseline for requiring the contractor to place under-deck containment in areas subject to full depth removal, before beginning the hydro-demolition process in a span. Should it be determined that not all defective concrete has been removed, the hydro-demolition system shall be recalibrated to remove an additional 1/4 inch of sound concrete, then re-test on deteriorated concrete.

If additional defective concrete is found, the depth of cut will increase in 1/4 inch increments until only sound concrete is found remaining.

When satisfactory results are obtained, the machine parameters shall be used for production removal. The contractor shall make adjustments to the operating parameters, as required, to perform concrete removal as indicated on the drawings and to adjust to the variance in the compressive strength of the concrete.

Hand held water blasting equipment, pneumatic hammers, and hand tools may be substituted for the hydro-demolition unit in areas inaccessible (such as adjacent to the curb) or inconvenient (such as small patch areas).

The Engineer will re-inspect after each removal and require additional removals until compliance with plans and specifications are met.

Regardless of the method of removal, the removal operation shall be stopped if it is determined that sound concrete is being removed. Appropriate recalibration, or change in equipment and methods shall be performed prior to resuming the removal operation.

The Contractor shall take all steps necessary to prevent cutting or otherwise damaging existing steel designated to remain in place. Any such bars damaged (nicks deeper than 20% of the bar diameter) by the Contractor's operation shall be repaired or replaced. Defects in embedded reinforcing steel due to corrosion, which has reduced the cross sectional area of the steel by 25% or greater, shall have new reinforcing steel of similar cross section area lap-spliced to each side of the damaged area. Reinforcing bars shall be Grade 60 and meet the material requirements of Section 1070 of the Standard Specifications. Replacement bars shall be spliced to existing bars using either minimum 30 bar diameter lap splices or approved mechanical connectors.

The Contractor shall support and protect the exposed reinforcing steel, which is left unsupported by the hydro-demolition process, against displacement and damage from loads such as those caused by removal equipment and delivery buggies. All reinforcing steel damaged or dislodged by these operations shall be replaced with bars of the same size at the contractor's expense.

Rebar exposed and cleaned by hydro-demolition shall not require re-cleaning if encased in concrete within seven (7) days. Rebar exposed for more than seven (7) days shall be cleaned by high velocity water jets (4,000 PSI minimum) prior to placement of the new concrete.

When large areas of the deck on composite bridges are removed resulting in the debonding of the main stress carrying longitudinal reinforcing bars, the removal shall be performed in stages to comply with the construction sequence shown on the plans or as directed by the Engineer.

The Contractor shall shield his operations to prevent injury or damage from flying or falling debris. The Contractor shall provide a method of handling expected and unexpected blow-through of the deck where shown on the plans and as directed by the Engineer. This method shall provide for the containment of the runoff water and debris, and the protection of the area under the bridge deck. The Contractor shall be responsible for any injury or damage caused by his operations. The containment shall remain in-place until the latex modified concrete has been cast and reach minimum strength.

The removal area shall be thoroughly cleaned of all dirt, foreign materials and loose concrete to the extent necessary to produce a firm solid surface for adherence of new concrete.

Removal of concrete debris shall be accomplished either by hand or by mechanical means capable of removing wet debris and water all in the same pass and directly follow the hydrodemolition process to prevent the debris from re-setting or re-adhering to the surface of the remaining sound concrete. All concrete debris shall become the property of the Contractor and

shall be legally disposed of at the contractor's expense. The contractor shall be responsible for disposing of all debris generated by the scarification operations.

Any debris which is allowed to re-settle or re-adhere to the surface of the sound concrete shall be carefully removed by the Contractor (at no additional cost), and the Contractor shall exercise care to avoid any damage to the remaining sound concrete or exposed reinforcement. Following the removal of the debris and prior to the placement of the overlay, the entire surface shall be blasted clean with high pressure water to remove any bond-breaking residue, loose material from the concrete surface, and/or rust from the reinforcing steel. This residue shall be collected and disposed of by the contractor. The Contractor will not be permitted to allow material to fall from the deck.

All water used for hydro-demolition shall be potable. The Contractor is responsible for furnishing all of the water required for the project.

Any areas of the prepared surface contaminated by oil or other materials detrimental to good bond as a result of the contractor's operations shall be removed to such depth as may be required at the contractor's expense.

The Contractor shall provide adequate lighting as required to allow for the safe conduct of nighttime removal operation if he elects to do hydro-demolition at night. Submit a lighting plan to the Engineer for approval prior to beginning work.

# Measurement and Payment

<u>Scarifying Bridge Deck</u> will be measured and paid for by the contract unit price per square yard and shall be full compensation for the milling of any existing asphalt wearing surface <u>from the bridge deck or approaches</u>, <u>milling of the entire concrete bridge deck</u>, repairing or replacing any damaged reinforcing steel, and the cleaning and disposal of all waste material generated.

Hydro-demolition of Bridge Deck will be measured and paid for by the contract unit price per square yard and shall be full compensation for Classes I, II, and III deck preparation, removal and disposal of unsound and contaminated concrete, cleaning, repairing or replacing of reinforcing steel, under deck containment, class AA concrete, and for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item
Scarifying Bridge Deck
Hydro-demolition of Bridge Deck

Pay Unit Square Yard Square Yard

# **MANAGING HYDRODEMOLITION WATER**

(SPECIAL)
SPI 4-0:

(6-17-08)

# 1.0 Description

Collect and properly dispose of hydrodemolition water from bridge decks.

### 2.0 Construction Methods

- (A) Prepare a written hydrodemolition water management plan in accordance with the Guidelines for Managing Hydrodemolition Water available at <a href="http://www.ncdot.gov/projects/ncbridges/#stats">http://www.ncdot.gov/projects/ncbridges/#stats</a>. Submit plan and obtain approval from the Engineer prior to beginning of the hydrodemolition operation.
- (B) Prior to final payment, submit a paper copy of all completed records pertaining to disposal of hydrodemolition water.

# 3.0 Measurement and Payment

Payment for collecting, sampling, testing, pH adjustment, monitoring, handling, discharging, hauling, disposing of the hydrodemolition water, documentation, record keeping, and obtaining permits if applicable, shall be included in the payment for other items.

# LATEX MODIFIED CONCRETE

(SPECIAL)

# **Description**

This work consists of furnishing and placing an overlay of latex modified concrete (LMC) over conventional existing concrete or repair concrete on bridge decks and approach pavement. Unless otherwise indicated on the plans, groove the bridge floor in accordance with Article 420-14(B) of the *Standard Specifications*.

### **Materials**

For equipment, proportioning and mixing of modified compositions, see Section 1000-8 of the *Standard Specifications*. Prior to beginning any work, obtain approval for all equipment to be used for deck preparation, mixing, placing, finishing, and curing the latex modified concrete.

For material of modified compositions, see Section 1000-8 of the *Standard Specifications* with the following modifications:

Page 10-11, last paragraph of 1000-8, add the following:

Submit the latex modified concrete mix design, including laboratory compressive strength data for a minimum of six 4-inch by 8-inch cylinders at the appropriate age (7 days for normal setting concrete; 3 hours for very early strength concrete) to the Engineer for review. Include test results for the slump and air content of the laboratory mix. Perform tests in accordance with AASHTO T 22, T 119 and T 152.

# Preparation of Surface

Completely clean all surfaces within the 48 hours prior to placing the overlay unless otherwise approved.

Thoroughly soak the clean surface for at least 12 hours immediately prior to placing the latex modified concrete. After soaking the surface for at least 12 hours, cover it with a layer of white opaque polyethylene film that is at least 4 mils (0.100 mm) thick. Immediately prior to placing the latex modified concrete, remove standing water from the surface.

### Placing and Finishing

Prior to placing modified material, install a bulkhead of easily compressible material at expansion joints to the required grade and profile. Placing material across expansion joints and sawing it later is not permitted.

Place and fasten screed rails in position to ensure finishing the new surface to the required profile. Do not treat screed rails with parting compound to facilitate their removal. Prior to placing the overlay attach a filler block to the bottom of the screed and pass it over the area to be repaired to check the thickness. The filler block thickness shall be equal to the design overlay thickness as shown in the plans. Remove all concrete that the block does not clear.

Separate screed rails or construction dams from the newly placed material by passing a pointing trowel along their inside face. Carefully make this trowel cut for the entire depth and length of rails or dams after the modified composition has sufficiently stiffened and cannot flow back.

Brush a latex cement mixture onto the wetted, prepared surface. Carefully give all vertical and horizontal surfaces a thorough, even coating and do not let the brushed material dry before it is covered with the additional material required for the final grade. Remove all loose aggregate from the latex cement brushed surface prior to latex concrete placement (NOTE: Not required for surfaces prepared with hydro-demolition).

Place the latex modified concrete in one operation.

Provide a minimum overlay thickness as shown in the plans and a final surface that is approximately the same as the original deck surface.

Construction joints other than those shown on the plans will not be permitted unless approved by the Engineer.

When a tight, uniform surface is achieved and before the concrete becomes non-plastic, further finish the surface of the floor by burlap dragging or another acceptable method that produces an acceptable uniform surface texture.

Do not allow more than 15 feet (4.5 m) of exposed latex concrete behind the screed. In the event of a delay of 10 minutes or more, temporarily cover all exposed latex concrete with wet burlap and white opaque polyethylene. As soon as the surface supports burlap without deformations, cover the surface with a single layer of clean, wet burlap.

Do not place the latex modified concrete before the burlap is saturated and approved by the Engineer. Drain excess water from the wet burlap before placement.

Within 1 hour of covering with wet burlap, place a layer of 4 mil (0.100 mm) white opaque polyethylene film on the wet burlap and cure the surface for 48 hours. Then remove the curing material for an additional 96 hours air cure.

As soon as practical, after the concrete has hardened sufficiently, test the finished surface with an approved rolling straightedge that is designed, constructed, and adjusted so that it will accurately indicate or mark all floor areas which deviate from a plane surface by more than 1/8 inch in 10 feet (3 mm in 3 m). Remove all high areas in the hardened surface in excess of 1/8 inch in 10 feet (3 mm in 3 m) with an approved grinding or cutting machine. Where variations are such that the corrections extend below the limits of the top layer of grout, seal the corrected surface with an approved sealing agent if required by the Engineer. If approved by the Engineer, correct low areas in an acceptable manner.

Groove the bridge deck unless otherwise shown in the plans.

## **Limitations of Operations**

The mixer will not be permitted on the bridge deck unless otherwise approved.

No traffic is permitted on the finished latex modified concrete surface until the total specified curing time is completed and until the concrete reaches the minimum specified compressive strength.

Do not place latex modified concrete if the temperature of the concrete surface on which the overlay is to be placed is below 40°F (4°C) or above 85°F (29°C). Measure the surface temperature by placing a thermometer under the insulation against the surface.

Prior to placing latex modified concrete, the Engineer determines the air temperature and wind speed. Do not place latex modified concrete if the ambient air temperature is below 45°F (7°C) or above 85°F (29°C), or if the wind velocity is in excess of 10 mph (16 km/h). If working at night, provide approved lighting. Provide aggregates for use in the latex modified concrete that are free from ice, frost and frozen particles when introduced into the mixer.

Do not place latex modified concrete when the temperature of the latex modified concrete is below 45°F (7°C) or above 85°F (29°C).

If the rate of evaporation of surface moisture from the latex modified concrete exceeds 0.05 pounds per square foot per hour during placement, measures shall be taken to reduce the rate of evaporation. The evaporation rate is calculated using the following formula:

E=
$$(T_c^{2.5}$$
-r $T_a^{2.5})(1+0.4V)(10^{-6})$  where,  
E=Evaporation Rate,  $T_c$ =Concrete Temp ( $^0$ F), r=Relative Humidity (%/100)  
 $T_a$ =Air Temp ( $^0$ F), V=Wind Velocity (mph)

Do not place latex modified concrete if the National Weather Service predicts the air temperature at the site to be below 35°F (2°C) during the next 72 hours. If this predicted air temperature is above 35°F (2°C) but below 50°F (10°C), then use insulation to protect the latex modified concrete for a period of at least 48 hours. Use insulation that meets the requirements of Subarticle 420-7(C) and, if required, place it on the latex modified concrete as soon as initial set permits. When using insulation to protect latex modified concrete during the wet curing period, do not remove the insulation until the ambient air temperature is at least 40°F (4°C) and rising. Leave the latex modified concrete uncovered for the 96 hour air curing period.

Assume all risks connected with the placement of latex modified concrete under cold weather conditions referred to above.

Stop all placement operations during periods of precipitation. Take adequate precautions to protect freshly placed latex modified concrete from sudden or unexpected precipitation. Keep an adequate quantity of protective coverings at the worksite to protect the freshly placed pavement from precipitation.

### Measurement and Payment

Latex Modified Concrete Overlay will be measured and paid for in cubic yards of latex modified concrete satisfactorily placed in the completed deck.

Placing and Finishing Latex Modified Concrete will be paid for at the contract unit price bid per square yard which price will be full compensation for furnishing all labor, materials, tools, equipment and incidentals required to complete the work in accordance with the contract documents.



Grooving Bridge Floors will be measured and paid in accordance with Section 420 of the Standard Specifications.

Payment will be made under:

Pay ItemPay UnitLatex Modified Concrete OverlayCubic YardPlacing and Finishing of Latex Modified Concrete OverlaySquare Yard

# **CONCRETE REPAIRS TO UNDER DECK**

(SPECIAL)

# **Description**

Work includes removal of concrete in spalled areas of the existing under deck areas in reasonably close conformity with the lines, depth, and details shown on the plans, described herein and as established by the Engineer. This work also includes removing all loose materials, removing and disposing of debris, applying repair material, and protecting adjacent areas of the bridge and environment from material leakage. The repair material shall be one of the below described materials unless otherwise noted in the plans or provisions.

The location and extent of repairs shown on the plans described herein are general in nature. The Engineer determines the exact extent of removal in the field based on an evaluation of the condition of the exposed surfaces.

Repair, to the Engineer's satisfaction, any portion of the structure that is damaged from construction operations. No extra payment is provided for these repairs.

# A. Polymer Modified Concrete Repair Material

### **Materials**

Repair material shall be polymer modified cement mortar for vertical or overhead applications and shall be suitable for applications in marine environments. Material shall be approved for use by NCDOT. Submit repair material to the Engineer for review and approval prior to beginning the work. Color of repair material shall be concrete gray.

## **Surface Preparation**

Prior to the application of repair mortar, square up edges in repair areas, thoroughly clean surfaces to be repaired and remove all loose materials. Remove grease, wax, salt, and oil contaminants by scrubbing with an industrial grade detergent or degreasing compound followed by a mechanical cleaning. Remove weak or deteriorated concrete to sound concrete by bush hammering, gritblasting, scarifying, waterblasting, or other approved methods. Remove dirt, dust, laitance and curing compounds by gritblasting, sanding, or etching with 15% hydrochloric acid. Only acid etch if approved and follow it by scrubbing and flushing with copious amounts of clean water. Check the cleaning using moist pH paper. Water cleaning is complete when the paper reads 10 or higher. Follow all mechanical cleaning with vacuum cleaning.

# **Application**

When surface preparation is completed, mix and apply repair mortar in accordance with manufacturer's recommendations. Use aggregate that is washed, kiln-dried, and bagged. Apply bonding agent to all repair areas immediately prior to placing repair mortar.

Repair areas shall be formed unless otherwise approved by the Engineer. Form areas to establish the original neat lines of the member being repaired.

Apply repair mortar to damp surfaces only when approved. In such instances, remove all free water by air-blasting. After applying the repair mortar, remove excessive material and provide a smooth, flush surface.

# **B.** Shotcrete Repair Material

### Shotcrete

**Oualification of Shotcrete Contractor** 

Shotcrete Contractors are not acceptable as a Prime Contractor or Subcontractor unless all of following requirements are met:

The Shotcrete Contractor furnishes proof that his or her company has a minimum of 5 years experience in shotcrete repair work on jobs of similar size and character.

The Shotcrete Contractor furnishes five references who were responsible for supervision of similar projects and testifies to the successful completion of these projects. Include name, address, and telephone number. Prior to starting work, the Contractor's nozzlemen are required to pass a test demonstrating their competence. This test is conducted at the job site and approximates actual working conditions as near as possible. For test requirements, see ACI 506.3R, Chapters 2.5 and 3. Only workmanship demonstration is tested.

### General

When shotcreting, meet all requirements of ACI 506.2, published by the American Concrete Institute, Detroit, Michigan, except as modified by the requirements of this Special Provision.

Prior to beginning any repair work, provide a sufficiently sized temporary work platform at each repair location as required. Design steel members meeting the requirements of the American Institute of Steel Construction Manual. Design timber members in accordance with the "National Design Specification for Stress-Grade Lumber and Its Fastenings" of the National Forest Products Association. Submit the platform structure design for review and approval. Do not install the platform until the design is approved. Do not drill holes into the superstructure. When the platform is removed, remove all anchorages made in the substructure and repair the substructure at no additional cost to the Department.

### Material

Use materials conforming to the requirements of the applicable sections of the Standard Specifications and the following provisions:

Use Type II Cement.

Replace ten percent by weight of the cement with silica fume.

Do not use admixtures without approval.

Produce shotcrete cores with a compressive strength of 5000 psi (34.5 MPa) at 28 days. The provisions of ACI 506.2, Section 1.6.3.3, Paragraph 2, do not apply.

Submit the shotcrete mix design, including the source of the material, to the Engineer for acceptance before using it.

Use size 2S or 2MS fine aggregate unless otherwise approved.

### Finish

Slightly build up and trim the shotcrete surface to the final surface by cutting with the leading edge of a sharp trowel. Use a rubber float to float any imperfections. Limit work on the finished surface to correcting imperfections caused by trowel cutting.

### **Testing**

Each day shotcreting takes place, have each nozzleman shoot one 18" x 18" x 3" (460 mm x 460 mm x 75 mm) Test Panel. Shoot the panel in the same position as the repair work that is being done. The panel demonstrates whether the shotcrete is being properly applied and furnishes cores for testing compressive strength. Drill three 3" (76 mm) diameter cores from each test panel and also drill cores from the repair areas as directed by the Engineer. Do not take cores from repaired areas until the shotcrete has cured for 7 days. Drill a core that penetrates into the existing substructure concrete at least 2 inches (50 mm). These cores are inspected for delaminations and sand pockets and tested for bond strength and/or compressive strength. If a core taken from a repaired area indicates unsatisfactory application or performance of the shotcrete, take additional cores from the applicable repair area(s) for additional evaluation and testing as directed by the Engineer. No extra payment is provided for drilling extra cores. Patch all core holes in the repaired substructure units to the satisfaction of the Engineer.

All material, sample, and core testing is done by the Materials and Tests Unit of North Carolina Department of Transportation.

### **Mixture**

Mix the shotcrete in the proportions of one part of portland cement to four parts of sand, and as directed by the Engineer.

Measure this mixture by volume in the dry loose state. Check batching equipment daily or at the discretion of the Engineer.

# Repair Method and Operations

Prior to starting the repair operation, delineate all surfaces and areas assumed to be deteriorated by visually examining and by sounding the concrete surface with a hammer or

any other alternative approved method. The Engineer is the sole judge in determining the limits of deterioration.

Remove all deteriorated concrete to sound concrete with a 17 lb (7.7 kg) (maximum) pneumatic hammer with points that do not exceed the width of the shank or with hand picks or chisels as directed by the Engineer. Do not cut or remove the existing reinforcing steel. Do not remove more existing concrete than required to expose the surface of the sound concrete. Unless specifically directed by the Engineer, do not remove concrete deeper than 6 inches (150 mm) or deeper than 1 inch (25 mm) below the reinforcing steel.

If sound concrete is encountered before existing reinforcing steel is exposed, prepare and repair the surface without removing any more concrete. However, if the reinforcing steel is wholly or partially exposed, remove the deteriorated and/or sound concrete to a minimum clearance of 1 inch (25 mm) all around the reinforcing steel.

Sandblast all exposed concrete surfaces and existing reinforcing steel in repair areas to remove all debris, loose concrete, loose mortar, rust, scale, etc. Use a wire brush to clean all exposed reinforcing steel surfaces facing away from the sandblast nozzle to remove all dust and loose particles.

All material removed becomes the Contractor's. Use an approved method to dispose of the material.

Restore all repaired members, including chamfered edges, as close as practicable to their original "As Built" dimensions and configuration. Provide a minimum of 2" (50 mm) shotcrete cover over reinforcing steel exposed during repair. Finish the shotcrete by cutting the surface to final grade with the leading edge of a trowel.

Provide welded wire fabric at each repair area larger than 1 ft2 (0.1 m2). Provide a minimum 2" x 2" (50 mm x 50 mm) - 12 gage galvanized welded wire fabric. Rigidly secure the welded wire fabric to existing steel or to 3/16" (4.76 mm) minimum diameter adequately spaced galvanized hook fasteners to prevent sagging. Encase the welded wire fabric in shotcrete to a minimum depth of  $1\frac{1}{2}$  inches (38 mm).

If preferred, use steel or synthetic fiber reinforcement as an alternate to welded wire fabric. Work only with experienced personnel. Always work under the direction of an experienced superintendent. The superintendent is required to show a certified experience record indicating at least 5 years experience on work of similar type. No nozzleman is deemed experienced unless they have worked on several other jobs similar to that specified herein and have passed the required pre-qualification test listed in this Special Provision.

Before applying the shotcrete to the surface, thoroughly clean the surface of all dirt, grease, oil or foreign matter, and remove all loose or weakened material.

Wash the roughened existing concrete surface with fresh potable water and an air blast, or with a "stiff" hose stream of fresh water until all loosened materials and salt water spray are removed. Perform this operation 30 minutes to 1 hour prior to applying the shotcrete.

Maximum time allowed between removal of deteriorated concrete and shotcrete application is 5 days. If the time allowance is exceeded it will be necessary to prepare the surface again using the methods described above before shotcrete can be applied.

Apply shotcrete in layers. The properties of the applied shotcrete determine the proper thickness of each layer or lift.

If a work stoppage longer than 2 hours takes place on any shotcrete layer prior to the time it has been built up to required thickness, thoroughly wash the surface with a fresh water stream and air hose as outlined previously, prior to continuing with the remaining shotcrete course. Do not apply shotcrete to a dry surface.

Have the nozzleman hold the nozzle 3-4 feet (0.9 to 1.2 m) from the surface being covered in a position that ensures the stream of flowing material strikes at approximately right angles to the surface being covered without excessive impact. Have the nozzleman control the water content so it never exceeds  $3\frac{1}{2}$  gallons (13.25 liters) per sack of cement. Direct the nozzlemen to maintain the water at a practicable minimum, dependent on weather conditions, so that the mix properly adheres. Control water content so that it does not become high enough to cause the mix to sag or fall from vertical or inclined surfaces, or to separate in horizontal layers.

Use shooting strips or guide wires that do not entrap rebound sand to bring the finished work to approximate shape. Use guide wires to provide a positive means of checking the total thickness of the shotcrete applied. Remove the guide wires prior to the final finish coat.

Blow or rake off sand that rebounds and does not fall clear of the work, or which collects in pockets in the work, to avoid leaving sand pockets in the shotcrete. Do not reuse rebound material in the work.

Apply shotcrete only when the air temperature is at least 40°F (4°C) and rising, but less than 95°F (35°C). Do not apply shotcrete to frosted surfaces. Maintain shotcrete at a minimum temperature of 40°F (4°C) for 3 days.

### **Testing Shotcrete Surfaces**

Immediately after bringing shotcrete surfaces to final thickness, thoroughly check them for sags, bridging, and other deficiencies. Approximately 3 days after completing the final shotcrete placement, thoroughly test it again with a hammer. At this time, the shotcrete should have sufficient strength for all sound sections to ring sharply. Remove and replace any unsound portions of the work found during this 3 day old inspection period, or at any other time prior to the final inspection of the work. No additional compensation is provided for removal and replacement of concrete during or after the 3 day old inspection.

### Curing

Begin curing as soon as the finished shotcrete surface withstands the curing operation without damage in accordance with Section 3.7 of ACI 506.2.

# **Measurement and Payment**

Concrete Repairs to Under Deck will be measured and paid for at the contract unit price bid per cubic foot and will be full compensation for removal, containment and disposal off-site of unsound concrete including the cost of materials, labor, tools, equipment and incidentals necessary to accomplish removal. Depth will be measured from a place at the original outside concrete face. The Contractor and Engineer will measure repair quantities after removal of unsound concrete and before application of repair material. Such payment will also include the cost of sandblasting, surface cleaning and preparation, cleaning of reinforcing steel, placement of new reinforcing steel and/or dowells, cost of temporary work platform, testing of the soundness of the exposed concrete surface, furnishing and installation of repair mortar material, curing and sampling of concrete, and protection/cleaning of adjacent areas from splatter or leakage.

Payment will be made under:

Pay Item
Concrete Repairs to Under Deck

Pay Unit Cubic Feet

## **ELASTOMERIC CONCRETE**

(1-27-10)

# 1.0 DESCRIPTION

Elastomeric concrete is a mixture of a two-part polymer consisting of polyurethane and/or epoxy and kiln-dried aggregate. Provide an elastomeric concrete and binder system that is preapproved. Use the concrete in the blocked out areas on both sides of the bridge deck joints as indicated on the plans.

### 2.0 MATERIALS

Provide materials that comply with the following minimum requirements at 14 days (or at the end of the specified curing time).

ELASTOMERIC CONCRETE PROPERTIES	TEST METHOD	MINIMUM REQUIREMENT
Compressive Strength, psi (MPa)	ASTM D695	2000 (13.8)
5% Deflection Resilience	ASTM D695	95
Splitting Tensile Strength	ASTM D3967	625 (4.31)
Bond Strength to Concrete, psi (MPa)	ASTM C882 (C882M)	450 (3.10)
Durometer Hardness	ASTM D2240	50

BINDER PROPERTIES
(without aggregate)

TEST METHOD

MINIMUM
REQUIREMENT

Tensile Strength, psi (MPa)

ASTM D638

1000 (6.89)

Ultimate Elongation

ASTM D638

150%

Tear Resistance, lb/in (kN/m)

ASTM D624

200 (34.9)

In addition to the requirements above, the elastomeric concrete must be resistant to water, chemical, UV and ozone exposure and withstand temperature extremes. Elastomeric concrete systems requiring preheated aggregates are not allowed.

# 3.0 PREQUALIFICATION

Manufacturers of elastomeric concrete materials shall submit samples (including aggregate, primer and binder materials) and a Type 4 certification in accordance with article 106-3 (F) of the Standard Specifications for prequalification to:

North Carolina Department of Transportation Materials and Tests Unit 1801 Blue Ridge Road Raleigh, NC 27607

Prequalification will be determined for the system. Individual components will not be evaluated, nor will individual components of previously evaluated systems be deemed prequalified for use.

The submitted binder (a minimum volume of 1 gallon) and corresponding aggregate samples will be evaluated for compliance with the Materials requirements specified above. Systems satisfying all of the Materials requirements will be prequalified for a one year period. Before the end of this period new product samples shall be resubmitted for prequalification evaluation.

If, at any time, any formulation or component modifications are made to a prequalified system that system will no longer be approved for use.

### 4.0 MATERIAL CERTIFICATION AND INSTALLATION

Provide a Type 5 certification in accordance with article 106-3 (F) of the Standard Specifications, verifying that the materials satisfy the above requirements and proof of NCDOT prequalification.

Prior to placing the elastomeric concrete, thoroughly clean and dry all concrete surfaces. Sandblast the concrete surface in the blockout and clear the surface of all loose debris.

Provide a manufacturer's representative at the bridge site during the installation of the elastomeric concrete to ensure that all steps being performed comply with all manufacturer installation requirements including, but not limited to weather conditions (ambient temperature, relative humidity, precipitation, wind, etc), concrete deck surface preparation, binder and aggregate mixing, primer application, elastomeric concrete placement, curing conditions and minimum curing time before joint exposure to traffic.

### 5.0 FIELD SAMPLING

Provide additional production material to allow freshly mixed elastomeric concrete to be sampled for acceptance. A minimum of six 2 inch cube molds and two 3x6 inch cylinders will be taken by the Department for each day's production. Compression, splitting tensile, and durometer hardness testing will be performed by the Department to determine acceptance. Materials failing to meet the requirements listed above are subject to removal and replacement at no cost to the Department.

### 6.0 BASIS OF PAYMENT

No separate payment will be made for elastomeric concrete. The lump sum contract price bid for "Evazote Joint Seals" will be full compensation for furnishing and placing the Elastomeric Concrete.

# **EVAZOTE JOINT SEALS**

(11-5-10)

### **Seals**

Use preformed seals compatible with concrete and resistant to abrasion, oxidation, oils, gasoline, salt and other materials that are spilled on or applied to the surface. Use a resilient, UV stable, preformed, impermeable, flexible, expansion joint seal. The joint seal shall consist of low-density, closed cell, cross-linked polyethylene non-extrudable, foam. The joint seal shall contain no EVA (Ethylene Vinyl Acetate). Cell generation shall be achieved by being physically blown using nitrogen. No chemical blowing agents shall be used in the cell generation process.

Use seals manufactured with grooves 1/8" (3 mm)  $\pm$  wide by 1/8" (3 mm)  $\pm$  deep and spaced between 1/4" (6 mm) and 1/2" (13 mm) apart along the bond surface running the length of the joint. Use seals with a depth that meets the manufacturer's recommendation, but is not less than 70% of the uncompressed width. Provide a seal designed so that, when compressed, the center portion of the top does not extend upward above the original height of the seal by more than 1/4" (6 mm). Provide a seal that has a working range of 30% tension and 60% compression and meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D3575-08, Suffix T	110 – 130 psi (758 – 896 kpa)
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft <sup>2</sup> (< 0.001 kpa)
Elongation at Break	ASTM D3575	180% - 210%
Tear Strength	ASTM D624 (D3575-08, Suffix G)	14 – 20 pli
Density	ASTM D3575-08, Suffix W, Method A	$1.8 - 2.2 \text{ lb/ft}^3$ $(28.8 - 35.2 \text{ kg/m}^3)$
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the evazote seal clearly shop maked. Inspect the evazote seals upon receipt to ensure that the marks are clearly visible before installation.

# **Bonding Adhesive**

Use a two component, 100% solid, modified epoxy adhesive supplied by the joint seal manufacturer that meets the requirements given below.

TEST	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	3000 psi (20.7 MPa) min.
Compressive strength	ASTM D695	7000 psi (48.3 MPa) min.
Hardness	Shore D Scale	75-85 psi (0.51-0.58 MPa)
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% max.
Bond Strength	ASTM C882	2000 psi (13.8 MPa) min.

Use an adhesive that is workable to 40°F (4°C). When installing in ambient air or surface temperatures below 40°F (4°C) or for application on moist, difficult to dry concrete surfaces, use an adhesive specified by the manufacturer of the joint seal.

#### **Elastomeric Concrete**

The elastomeric concrete shall not be placed until the reinforced concrete deck slab has cured for seven full days and reached a minimum strength of 3000 psi (20.7 Mpa).

Prepare the concrete surface within 48 hours prior to placing the elastomeric concrete. Before placing the elastomeric concrete, all concrete surfaces shall be thoroughly cleaned and dry. Sandblast the concrete surface in the blockout and clear the surface of all loose debris. Do not place the elastomeric concrete until the surface preparation is completed and approved.

A manufacturer's representative shall be present when placing elastomeric concrete. Do not place elastomeric concrete if the ambient air or surface temperature is below 45°F (7°C).

Prepare and apply a primer, as per manufacturer's recommendations, to all vertical concrete faces to be in contact with elastomeric concrete, and to areas specified by the manufacturer.

Prepare, batch, and place the elastomeric concrete in accordance with the manufacturer's instructions. Place the elastomeric concrete in the areas specified on the plans while the primer is still tacky and within 2 hours after applying the primer. Trowel the elastomeric concrete to a smooth finish.

### Sawing the Joint

The joint opening shall be initially formed to the width shown on the plans including the blockout for the elastomeric concrete.

The elastomeric concrete shall cure a minimum of 2 days prior to sawing the elastomeric concrete to the final width and depth as specified in the plans.

When sawing the joint to receive the evazote seal, always use a rigid guide to control the saw in the desired direction. To control the saw and to produce a straight line as indicated on the plans, anchor and positively connect a template or a track to the bridge deck. Do not saw the joint by visual means such as a chalk line. Fill the holes used for holding the template or track to the deck with an approved, flowable non-shrink, non-metallic grout.

Saw cut to the desired width and depth in one or two passes of the saw by placing and spacing two metal blades on the saw shaft to the desired width for the joint opening.

The desired depth is the depth of the seal plus 1/4" (6 mm) above the top of the seal plus approximately 1" (25 mm) below the bottom of the seal. An irregular bottom of sawed joint is permitted as indicated on the plans. Grind exposed corners on saw cut edges to a 1/4" (6 mm) chamfer.

Saw cut a straight joint, centered over the formed opening and to the desired width specified in the plans. Prevent any chipping or damage to the sawed edges of the joint.

Remove any staining or deposited material resulting from sawing with a wet blade to the satisfaction of the Engineer.

### Preparation of Sawed Joint for Seal installation

After sawing the joint, the Engineer will thoroughly inspect the sawed joint opening for spalls, popouts, cracks, etc. All necessary repairs will be made by the Contractor prior to blast cleaning and installing the seal.

Clean the joints by sandblasting with clean dry sand immediately before placing the bonding agent. Sandblast the joint opening to provide a firm, clean joint surface free of curing compound, loose material and any foreign matter. Sandblast the joint opening without causing pitting or uneven surfaces. The aggregate in the elastomeric concrete may be exposed after sandblasting.

After blasting, either brush the surface with clean brushes made of hair, bristle or fiber, blow the surface with compressed air, or vacuum the surface until all traces of blast products and abrasives are removed from the surface, pockets, and corners.

If nozzle blasting is used to clean the joint opening, use compressed air that does not contain detrimental amounts of water or oil.

Examine the blast cleaned surface and remove any traces of oil, grease or smudge deposited in the cleaning operations.

Bond the seal to the blast cleaned surface on the same day the surface is blast cleaned.

### Seal Installation

Install the joint seal according to the manufacturer's procedures and recommendations and as recommended below. Do not install the joint seal if the ambient air or surface temperature is below 45°F (7°C). Have a manufacturer's certified trained factory representative present during the installation of the first seal of the project.

Before installing the joint seal, check the uninstalled seal length to insure the seal is the same length as the deck opening. When the joint seal requires splicing, use the heat welding method by placing the joint material ends against a teflon heating iron of 425-475°F (218-246°C) for 7-10 seconds, then pressing the ends together tightly. Do not test the welding until the material has completely cooled.

Begin installation by protecting the top edges of the concrete deck adjacent to the vertical walls of the joint as a means to minimize clean up. After opening both cans of the bonding agent, stir each can using separate stirring rods for each component to prevent premature curing of the bonding agent. Pour the two components, at the specified mixing ratio, into a clean mixing bucket. Mix the components with a low speed drill (400 rpm max.) until a uniform gray color is achieved without visible marbling. Apply bonding agent to both sides of the elastomeric concrete as well as both sides of the joint seal, making certain to completely fill the grooves with epoxy. With gloved hands, compress the joint seal and with the help of a blunt probe, push the seal into the joint opening until the seal is recessed approximately 1/4" (6 mm) below the surface. When pushing down on the joint seal, apply pressure only in a downward direction. Do not push the joint seal into the joint opening at an angle that would stretch the material. Seals that are stretched during installation shall be removed and rejected. Once work on placing a seal begins, do not stop until it is completed. Clean the excess epoxy from the top of the joint seal immediately with a trowel. Do not use solvents or any cleaners to remove the excess epoxy from the top of the seal. Remove the protective cover at the joint edges and check for any excess epoxy on the surface. Remove excess epoxy with a trowel, the use of solvents or any cleaners will not be allowed.

The installed system shall be watertight and will be monitored until final inspection and approval.

# **Basis of Payment**

Payment for all evazote joint seals will be at the lump sum contract price bid for "Evazote Joint Seals". Prices and payment will be full compensation for furnishing all material, including elastomeric concrete, labor, tools and equipment necessary for installing these units in place and accepted.

# 725-A

### **BASCULE GIRDER REPAIR**

**SPECIAL** 

### Scope of Work

The South Bascule girder on the East Leaf of Bridge #27 (Westbound Bridge) has an existing crack in the web plate located at the welded juncture of the counterweight leaf's top flange plate with the top of the vertical web stiffener forward of the trunnion. A portion of the web stiffener plate has been removed to access and investigate the extent of the crack. Work includes removing portions of the concrete counterweight to access the crack from the inside face of the girder, making repairs to the crack and replacing the removed section of web stiffener; as well as doweling and placing reinforcing steel and forming and pouring counterweight concrete as shown in the plans. All work shall be performed in accordance with the Standard Specifications.

### **Measurement and Payment**

Bascule Girder Repair will be paid for at the lump sum contract price and shall be full compensation for all materials, fabrication, furnishing and installing high strength bolts, welding, grinding, Class AA concrete, reinforcing steel, equipment, tools, labor, and incidentals necessary to complete the work including any miscellaneous steel.

Payment will be made under:

Pay Item
Bascule Girder Repair

Pay Unit Lump Sum

