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PROJECT SPECIAL PROVISIONS

Project No.: 17BP.1.P.3 Bertie & Martin Counties

SCOPE OF WORK

This work shall consist of furnishing all labor, equipment, and materials to rehabilitate elements of existing bridge structures and overlay existing bridge decks with latex modified concrete as directed in the plans. Work includes: existing deck surface preparation, removing deteriorated concrete using hydro-demolition methods and overlaying with latex modified concrete, milling of roadway approaches, disposal of waste material, installing foam joint seals and joint drain trough, grooving bridge deck, substructure repairs using pile encapsulation, asphalt paving approaches, pavement markings, seeding and mulching all grassed areas disturbed; and all incidental items necessary to complete the project as specified and shown on the plans.

Work will be performed on existing bridges at the following locations:

1.) Bertie County Bridge #12 – US13 SBL over Roanoke River (Latex Modified Concrete Overlay)
2.) Bertie County Bridge #25 – US13 NBL over Roanoke River (Latex Modified Concrete Overlay)
3.) Bertie County Bridge #47 – US13 NBL over Roanoke River (Latex Modified Concrete Overlay)
4.) Martin County Bridge #7 – US64 EBL over Sweetwater Creek (Latex Modified Concrete Overlay)
5.) Martin County Bridge #12 – NC125 over Conoho Creek (Latex Modified Concrete Overlay)
6.) Martin County Bridge #14 – NC11 over Conoho Creek (Latex Modified Concrete Overlay)
7.) Martin County Bridge #28 – NC125 over Conoho Creek (Latex Modified Concrete Overlay)
8.) Bertie County Bridge #35 – US13 NBL over Connie Creek (Latex Modified Concrete Overlay, Pile Encapsulation)
9.) Bertie County Bridge #49 – US13 NBL over Roquist Creek (Latex Modified Concrete Overlay, Pile Encapsulation)
10.) Bertie County Bridge #50 – US13 SBL over Roquist Creek (Latex Modified Concrete Overlay, Pile Encapsulation)
11.) Martin County Bridge #42 – SR1528 over Hardison Mill Creek (Latex Modified Concrete Overlay, Pile Encapsulation)

Contractor shall provide all necessary access; provide all traffic control; provide all staging areas, material storage, waste disposal, provide environmental controls to limit loss of materials from collection of hydro-demolition water, 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 January 2012, except as otherwise specified herein.

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 hydro-demolition. 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 cannot be discharged through them any longer.

A. Scarifying Bridge Deck: Removal of any asphalt wearing surface from the bridge deck or if applicable, the approach roadway pavement, and scarification of the concrete deck to remove the entire concrete surface of the deck to a uniform depth within ¼" of the plan overlay thickness, but not less than ½" inch above the top mat of reinforcing steel.

Estimated average cover to top mat:	
Bridge # 12 in Bertie County:	**1 1/8" +/- 3/8"**
Bridge # 25 in Bertie County:	**1 1/8" +/- 3/8"**
Bridge # 35 in Bertie County:	**1 1/8" +/- 3/8"**
Bridge # 47 in Bertie County:	**1 3/8" +/- 3/8"**
Bridge # 49 in Bertie County:	**1 3/8" +/- 3/8"**
Bridge # 50 in Bertie County:	**1 1/4" +/- 3/8"**
Bridge # 7 in Martin County:	**1 1/4" +/- 3/8"**
Bridge # 12 in Martin County:	**1 3/8" +/- 3/8"**
Bridge # 14 in Martin County:	**1 1/8" +/- 3/8"**
Bridge # 28 in Martin County:	**1 3/8" +/- 3/8"**
Bridge # 42 in Martin County:	**1" +/- 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 remove 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. Class II Surface Preparation (Partial Depth): 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^2/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^2/ft length of bridge. Submit details of overhang support to the Engineer for approval prior to beginning the work.

D. Class III Surface Preparation (Full Depth): 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^2 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. Under Deck Containment: 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. Class AA Concrete: 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 ¼". 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^2.
- The Engineer directs the fill.

For areas of less than 3 ft^2 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 hydro-demolition 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

Scarifying Bridge Deck 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 from the bridge deck or approaches, milling of the entire concrete bridge deck, 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	Pay Unit
Scarifying Bridge Deck	Square Yard
Hydro-demolition of Bridge Deck	Square Yard

MANAGING HYDRODEMOLITION WATER

(6-17-08) SPI 4-03

1.0 Description

Collect and properly dispose of hydro-demolition water from bridge decks.

2.0 Construction Methods

(A) Prepare a written hydro-demolition water management plan in accordance with the Guidelines for Managing Hydro-demolition Water available at http://www.ncdot.gov/projects/ncbridges/#stats. Submit plan and obtain approval from the Engineer prior to beginning of the hydro-demolition operation.

(B) Prior to final payment, submit a paper copy of all completed records pertaining to disposal of hydro-demolition water.

3.0 Measurement and Payment

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

LATEX MODIFIED CONCRETE

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 finished bridge deck in accordance with Section 420 of the *Standard Specifications* 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:

$E=(T_c^{2.5}-rT_a^{2.5})(1+0.4V)(10^{-6})$ 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 Item	Pay Unit
Latex Modified Concrete Overlay	Cubic Yard
Placing and Finishing Latex Modified Concrete	Square Yard

FOAM JOINT SEALS (9-30-11)

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"± wide by 1/8"± deep and spaced between 1/4" and 1/2" 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". 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
Compression Set	ASTM D1056 Suffix B, 2 hr recovery	10% - 16%
Water Absorption	ASTM D3575	< 0.03 lb/ft^2
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 lb/ft^3
Toxicity	ISO-10993.5	Pass (not cytotoxic)

Have the top of the joint seal clearly shop marked. Inspect the joint 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 (min.)
Compressive strength	ASTM D695	7000 psi (min.)
Hardness	Shore D Scale	75-85 psi
Water Absorption	ASTM D570	0.25% by weight max.
Elongation to Break	ASTM D638	5% (max.)
Bond Strength	ASTM C882	2000 psi (min.)

Use an adhesive that is workable to 40°F. When installing in ambient air or surface temperatures below 40°F 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.

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.

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 foam 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" above the top of the seal plus approximately 1" 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" 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. 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 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" 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. Do not place pavement markings on top of foam joint seals.

BASIS OF PAYMENT

Payment for all foam joint seals will be at the lump sum contract price bid for "Foam 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.

ELASTOMERIC CONCRETE (9-30-11)

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	ASTM D695	2000
5% Deflection Resilience	ASTM D695	95
Splitting Tensile Strength, psi	ASTM D3967	625
Bond Strength to Concrete, psi	ASTM D882 (D882M)	450
Durometer Hardness	ASTM D2240	50

BINDER PROPERTIES (without aggregate)	TEST METHOD	MINIMUM REQUIREMENT
Tensile Strength, psi	ASTM D638	1000
Ultimate Elongation	ASTM D638	150%
Tear Resistance, lb/in	ASTM D624	200

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 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 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 three 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 "Foam Joint Seals" will be full compensation for furnishing and placing the Elastomeric Concrete.

PILE ENCAPSULATION SPECIAL

Description

The work specified in this section consists of surface preparation of the pile, placement of a translucent, fiberglass reinforced plastic (FRP) jacket around the pile and injecting a water insensitive epoxy grout into the space between the jacket and the pile. The epoxy grout is batched, mixed and pumped by equipment, expressly designed for that purpose.

Materials

FRP Outer Jacket

The FRP Outer Jacket shall be Translucent FRP Jacket, as described in this section. For a submission to be approved it must meet ALL requirements of this section and approved by the engineer prior to performing the work.

The translucent outer jacket shall be a marine grade laminate of fiberglass reinforced plastic (FRP), constructed of layers of woven roving and mat. Construction by the spray-up process, using a chopper gun, is not acceptable. The glass content shall be sufficient to meet the strength requirements specified herein, but shall not be less than 30% of the laminate. An Ultra-Violet (UV) screening ingredient shall be integrally bound within the polyester matrix.

The strength and thickness of the outer jacket shall be as required to provide adequate strength and rigidity to withstand the forces and stresses it may be subjected to during handling, installation and the injection of epoxy grout, but shall not be less than 1/8 inch (3 mm) thick.

The outer jacket shall be translucent to the extent that the progression of epoxy grout inside the jacket during injection can be visually monitored from outside the jacket.

The outer jacket shall be equipped with 1" NPT injection ports, spaced at intervals not to exceed five (5) feet, along its entire length. The injection ports shall be positioned on alternately opposite sides of the jacket to allow for more even distribution of grout. The injection ports shall be of all-polymer construction and be fitted into the jacket wall prior to jacket installation, except in special situations, approved by the engineer, where a port may be added to accommodate an unanticipated jobsite condition.

The outer jacket shall have a sufficient number of polymer stand-offs, adhered to its inside surface, to maintain a minimum space between the pile and the jacket of 3/8 inch (9.5 mm). When loss of pile section exists, it may be necessary to use adjustable stand-offs to keep the outer jacket in proper alignment with the pile. At an adjustable stand-off location, a polymer boss shall be adhered to the inside surface of the jacket to provide adequate thread length to accommodate the adjustable polymer screw.

The outer jacket material, exclusive of polymer stand-offs and injection ports, shall possess the following minimum physical properties.

1. Ultimate Tensile Strength per ASTM D-638: 10,000 PSI

2. IZOD Impact Strength per ASTM D-256: 15 ft-lbf/inch. (Notched Sample)

3. Barcol Hardness per ASTM D-2583: 30

4. Water Absorption per ASTM D-570: 1% Maximum

5. Ultra Violet (UV) Stability as demonstrated by Accelerated Weathering Tests per ASTM G-23: Samples of outer jacket subjected to 500 hour exposure in Twin Carbon Arc Weather-ometer (ASTM G-23, Type D) operated at 145 degrees F., shall not exhibit any chipping, flaking or peeling. Said test to be conducted in twenty (20) minute cycles, consisting of seventeen (17) minutes of arc light and three (3) minutes of water spray, throughout the 500 hour test duration.

The outer jacket shall be fabricated in sections. Each section shall not contain more than two (2) longitudinal joints. Sections of jacket may be placed one above the other and joined together with transverse joints. All joints in the outer jacket shall meet the following minimum requirements:

1. All joints shall have sufficient strength to assure that they will not open or separate when subjected to installation stresses, sea forces and epoxy grout injection pressures.

2. The longitudinal joint design shall be of overlapping configuration and shall allow for minor field adjustment to pile size. The design of all joints shall ensure that a minimum 3/8 inch annulus between jacket and pile is maintained.

3. Transverse joints (if any) shall be of overlapping configuration.

The lower end of each outer jacket shall be provided with a molded upset cavity to properly receive and contain a bottom seal gasket.

Epoxy Grout

The Epoxy Grout must meet ALL requirements of this section and approved by the engineer prior to performing the work.

The epoxy grout shall be a manufactured, prepackaged, solvent-free, underwater curing, three component product, consisting of epoxy resin (component A), epoxy hardener (component B) and graded dry silica aggregate (component C). The ratio of the epoxy components A and B (collectively called the binder) shall be 1:1 by volume. The A and B components shall be of sharply contrasting colors, as supplied to the project, to minimize error in field proportioning and to assist in evaluating thoroughness of mixing. The grout shall be proportioned to meet the handling and placement requirements of this specification and the ratio of the filler to binder shall not exceed 3.5:1, by weight.

The mixed epoxy grout shall exhibit the following characteristics in the plastic state:

1. Viscosity of filled resin and filled curing agent shall be such that it may be pumped without segregation and be inject able into the space between the jacket and the pile without causing distortion or rupture of the jacket. The viscosity shall also be such that the blended grout completely fills the space between jacket and pile without voids and be reasonably self-leveling, once placed within the jacket.

2. The gel time or "Pot Life" of the blended grout shall be suitable for proper placement without voids, and allow sufficient time for reasonable self leveling within the jacket, yet in

no case shall exceed 65 minutes after blending at a control temperature of 77 degrees F. (This requirement minimizes the possibility of the filler settling out of the liquid components.)

3. The blended grout shall be uniform in color and not contain any pockets or streaks of the original component colors.

The catalyzed Epoxy Grout, after curing under water, shall possess the following minimum physical properties in the hardened state.

1. 7 Day Compressive Strength per ASTM C-579: 7,000 PSI
2. 7 day Tensile Strength per ASTM C-307: 2,000 PSI
3. 7 day Bond/Shear Strength per ASTM C-882: 150 PSI
4. Shrinkage after 7 day's cure per ASTM C-531: 0.07% (Maximum)
5. Water Absorption after 7 day's cure per ASTM C-413: 0.45% (Maximum)

Marine Epoxy Pastes

The epoxy paste used to adhere the outer jacket seams and bottom seal gaskets, shall be a two component epoxy compound, capable of being applied underwater. The ratio of resin component to hardener component shall be 1:1 by volume and each component shall be of sharply contrasting color (e.g. black and white) to the other, to assist in evaluating the thoroughness of jobsite mixing.

The epoxy paste used to finish the tops of the encapsulations and to seal any in-situ bond test locations, shall be be a non-sag, two component epoxy compound, capable of being applied underwater. The ratio of resin component to hardener component shall be 1:1 by volume and each component shall be of sharply contrasting color (e.g. black and white) to the other, to assist in evaluating the thoroughness of jobsite mixing.

Epoxy Grout Hose Lubricant shall be approved by the manufacturer of the epoxy grout manufacturer. The lubricant must be an epoxy diluent, compatible with the chemistry of the epoxy grout used.

Equipment

The epoxy grout to be injected into the outer jackets shall be proportioned, mixed and pumped with equipment expressly designed for that purpose. The equipment shall be capable of delivering mixed grout into the jackets at the rate of 2 GPM or greater.

Temperature Control Equipment

When ambient and/or water temperatures are expected to fall below 70 degrees F., a source of heated water, such as a diver's water heater, shall be provided. The heated water shall be directed into water jackets surrounding the epoxy grout hoppers and injection hose(s). This equipment shall be capable of delivering a sufficient amount of heated water to maintain grout viscosity suitable for proper grout placement.

Materials Handling and Storage

Handling and storage of pile encapsulation materials shall strictly conform to the manufacturer's recommendations. A list of minimum handling and storage requirements follows:

Outer Jackets

Outer jackets shall be shipped in closed containers or covered with tarpaulins to prevent contamination by dirt or road films. Outer jackets shall be properly stored at the jobsite to minimize distortion and to prevent contamination by foot traffic and blown debris. If storage at project is to exceed 30 days, shaded storage shall be provided.

Epoxy Grout Components

The silica aggregate component of the epoxy grout shall be properly packaged and labeled to indicate point of origin and manufacturer's lot number. The aggregate shall be stored to assure that it is thoroughly dry when mixed in the epoxy grout. All liquid epoxy components to be used in the work shall be delivered to the jobsite in tightly sealed unopened containers, clearly labeled to indicate:

Name of manufacturer.

Manufacturer's product name and component designation.

Manufacturer's lot number and "Use before" date.

ANSI (American National Standards institute) hazardous material rating and handling precautions.

Epoxy liquid epoxy components shall be stored in a covered, well ventilated space. The storage temperature of the liquid components shall not exceed 120 degrees F nor be less than 40 degrees F at any time after receipt by the contractor. (See Epoxy Grout Preparation)

Containers containing liquid epoxy components shall always be sealed and air tight from time of receipt by contractor until entering the proportioning and blending process. When containers are opened for sampling or other purposes and containers remain partially filled, their lids will be tightly closed to prevent contamination by moisture or other substances. After the seal has been broken on a container, its contents must be used within seven (7) days or removed from the project.

All project personnel handling the epoxy grout or its liquid components shall be properly alerted to the Epoxy Safety Requirements supplied by the manufacturer. A Material Safety Data Sheet (MSDS) shall be supplied with each shipment of liquid epoxy materials.

Submittals

Submit shop drawings and calculations to the Engineer for approval prior to start of fabrication. Submittal shall include:

1. Top and bottom elevations relative to project datum of each outer jacket to be installed.

2. Details and locations of typical longitudinal and transverse joints in the outer jackets, including a description of the joint sealing method(s).

3. Details of fixed and/or adjustable stand-offs and their location on the outer jackets.

4. Detail of typical outer jacket bottom seal.

5. Location and details of temporary bracing and outer jacket support required during placement and curing of epoxy grout.

6. Details of injection ports or other access points into outer jacket to facilitate placement of epoxy grout.

7. Details of installation sequence to be used to place the epoxy grout in the space between jacket and pile.

8. Detail of final finishing of epoxy grout at the top of the encapsulation.

9. Details of permanent closure of all injection ports and test locations in the outer jacket to be accomplished after epoxy grout placement is complete.

Material Certification

For materials to be used, the Supplier shall furnish a certificate to the Engineer attesting that the materials meet all the requirements contained herein and that they conform in all respects to the materials subjected to the tests required. Copies of current test reports shall be attached to the certificate. No test report for tests made more than one year prior to shipment will be accepted for the form material.

Construction Methods

Pile Cleaning

Prior to application of the encapsulation process, all pile surfaces shall be thoroughly cleaned of marine growth, oil, grease, mud, rust, broken concrete, micro-organisms and any other deleterious material which might prevent proper bonding between the epoxy grout and the pile. Pile cleaning may be accomplished by grit blasting, water blasting, or by powered rotary abraders, and shall meet the satisfaction of the Engineer.

In environments where active marine growth occurs, it may be necessary to perform the pile cleaning in two (2) phases. In such environments, the first phase shall consist of removing marine growth, oil, grease, rust, broken concrete, etc., and shall occur not more than seven (7) days prior to the encapsulation. The second phase shall be a final surface preparation, removing all remaining deleterious substances including micro-organisms and shall occur not more than 48 hours prior to the placement of the epoxy grout in the outer pile jacket.

Outer Jacket Assembly

Only jackets with pre-fitted injection ports (by the contractor) are to be used.

The entire inside surface of the jacket shall be lightly grit blasted by the contractor to remove any bond breaking residue that may be present.

All fixed stand-offs or adjustable stand-off bosses shall be affixed to the jacket by the contractor in accordance with approved shop drawings. Maximum spacing between fixed stand-offs shall be 18" in the longitudinal direction and 12" in the transverse direction.

Jacket assembly and positioning around the pile shall be performed by the contractor in such a manner as to assure that no damage to stand-offs and/or set screws occurs and that there will be no detrimental movement of the joints while joint adhesive is curing.

Both the longitudinal and transverse seams, if any, shall be sealed by the contractor with marine epoxy paste as described above and fastened with 3/16" diameter stainless steel rivets. The spacing between individual fasteners shall not exceed 5".

The jacket shall be supported by temporary bracing or other means supplied by the contractor to assure that it will not move or distort during the epoxy grout placement and curing period and that the minimum annular space of 3/8 inch between pile and jacket is maintained throughout the entire encapsulation.

The contractor shall install a gasket to prevent the epoxy grout from leaving the bottom of the jacket during the injection process. The gasket shall be fitted into the molded cavity at the lower end of the jacket and adhered in place with marine epoxy paste. Any gasket material used in the bottom seal shall be contained within the molded cavity and shall not extend up into the jacket above the cavity.

Epoxy Grout Preparation

Proportioning and mixing of the epoxy grout shall be accomplished with equipment expressly designed for that purpose and shall be performed in a suitable work area within hose distance of the piles to be encapsulated.

Proportioning of the silica aggregate and the liquid epoxy components shall be performed in strict accordance with the manufacturer's recommendations, with particular regard to temperature control. When ambient and/or water temperatures are expected to fall below 70 degrees F., the day's supply of grout filler and liquid components shall he pre-heated to above 80 degrees F., but never greater than 120 degrees F., prior to being introduced into the grout handling equipment. In no case shall open flame be used in direct contact with the equipment or the epoxy components.

Epoxy Grout Placement (Injection)

Before the injection process begins, at least 2 gallons of an approved grout hose lubricant shall be placed in each grout hopper. This lubricant shall be pumped through the entire system to coat all wetted surfaces of the hopper(s), pump(s) and hoses. When the lubricant level has reached the bottom of the hopper(s), it may be immediately followed by the epoxy grout and the remaining lubricant "chased" out of the hoses. All lubricant, that is not intermixed with the epoxy grout, may be collected at the downstream end of the hoses for re-use.

The premixed, aggregate filled epoxy grout shall be pumped through hoses to the jacket injection ports. If the plural component method of grout handling is used, the separate aggregate filled components shall be pumped through separate hoses to the mixer/blender assembly, where the components are then thoroughly blended and catalyzed, just prior to entering the pile jacket.

Grout injection shall begin at the bottom injection port. As the grout appears at the next higher port, and it has been determined that the space between the pile and the jacket is filled to that port, the lower port shall be capped off and the injection begun at the next higher port where the grout appeared. This process is repeated from port to port until the grout reaches the top of the jacket. NOTE: If project experience indicates that the grout can be injected from a lower port, past the next higher port or ports, without difficulty or undo stress on the jacket, the higher port

or ports may be plugged and bypassed. The plugs shall be 1" NPT, Schedule 40, PVC, CPVC or Polypropylene.

At the contractor's option, he may inject a short lift of grout (six inches to 1 foot in height) into the bottom-most port and allow it to cure before proceeding with subsequent lifts. If this practice is used, the jackets shall be fitted with an additional injection port to coincide with the top of the first lift. Subsequent lifts of grout will follow the above procedures.

The injection process shall be continuous, except for brief interruptions when the injector is moved from port to port, and the speed of the injection process shall be controlled to prevent entrapment of water or air in the grout cavity being filled.

The maximum permissible voids in the epoxy grout within the jackets shall not exceed 0.01 square foot per one (1) square foot of encapsulation area. Any voids larger than two (2) inches in diameter shall be repaired by the contractor, using an approved method, at no expense to the owner.

Final Finishing and Inspection of the Completed Encapsulation

After the grouting process is completed and the grout has sufficiently cured, all temporary support for the jacket shall he removed.

The exposed epoxy grout at the top of each encapsulation shall he finished with the marine epoxy paste using the method shown in the approved shop drawings.

Measurement and Payment

Pile Encapsulation will be measured and paid for at the contract unit price bid per linear foot of encased pile 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; shop drawings, cleaning the pile, jacket installation, falsework; furnishing and placement of epoxy grout including pumping equipment, pollution control, turbidity curtains, and all else required to repair deteriorated piles using pile encapsulation.

Payment will be made under:

Pay Item	**Pay Unit**
Pile Encapsulation	Linear Feet