

619.01

**SECTION 619 – POLYMER MODIFIED CONCRETE  
BRIDGE DECK OVERLAY FOR NEW AND EXISTING  
BRIDGES**

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**DESCRIPTION**

**619.01 Description**

This work consists of constructing a polymer modified concrete (PMC) bridge deck overlay for the purpose of protecting structural concrete from the deterioration caused by absorption of deicing salts and water.

**MATERIALS**

**619.02 Materials**

Provide materials as specified in:

Portland Cement (Type I or Type III).....	<b>901.01</b>
Fine Aggregate (Natural Sand).....	<b>903.01</b>
Coarse Aggregate (Size 7).....	<b>903.03</b>
Water .....	<b>921.01</b>

Use a polymer that appears on the Department's QPL.

### 619.03 Proportioning

Proportion the polymer modified concrete mixture to contain no less than 658 pounds of cement per cubic yard and to meet the requirements specified in Table 619.03-1.

**Table 619.03-1: Polymer Modified Concrete Mixture - Proportioning**

<b>Component</b>	<b>Value</b>
Type I or III Portland Cement	94 pounds
Polymer Admixture	3.5 gallons
Natural Sand	215 to 255 pounds
Coarse Aggregate	208 to 168 pounds
Water (including free moisture on the sand and coarse aggregate)	8 to 22 pounds

The polymer modified concrete mixture shall meet the properties specified in Table 619.03-2.

**Table 619.03-2: Polymer Modified Concrete - Required Properties**

<b>Property</b>	<b>Value</b>
Slump (measured 4 to 5 minutes after discharge from a continuous mixer)	4 to 6 inches
Air Content	0 to 8%
Water-Cement Ratio	Not more than 0.40 considering all the non-solids as part of the water

The polymer admixture shall contain a minimum of 46% solids. Submit to the Department in writing a concrete design identifying the name and location of aggregate suppliers, and the type and brand of the cement and

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polymer proposed for use. Do not place any concrete before obtaining the Department's approval of the design. Do not change materials without the Engineer's written approval.

## **EQUIPMENT**

### **619.04 Equipment**

Obtain the Engineer's approval as to the design, capacity, and mechanical condition of all equipment and tools necessary for handling materials and performing all parts of the work. Have the equipment onsite sufficiently ahead of the start of construction operations to allow for the Engineer's examination and approval.

#### **A. Mixer**

Use a continuous type mixer, calibrated to accurately proportion the specified mix, to mix and discharge the PMC overlay. Equip the mixer so that the proportions of the cement, natural sand, and coarse aggregate can be fixed by calibration of the mixer and cannot be changed without destroying a seal or other indicating device affixed to the mixer by the Engineer.

Equip the mixer with a flow meter for calibrating the water supply portion of the mixer. In addition, also equip the mixer with a cumulative-type water meter that can be read to the nearest 0.1 gallon. The water meters shall be readily accessible, accurate to within 1%, and easy to read. The Engineer will check both water meters each time the mixer is calibrated.

Use approved methods to add the admixture so as to keep it separated as far as is practicable.

Calibrate the continuous type mixer to the Engineer's satisfaction before starting the work. Conduct yield checks for each 50 cubic yards of mix. Recalibration will be necessary when indicated by the yield checks, and at any other times the Engineer deems necessary to ensure proper proportioning of the ingredients. Do not use continuous type mixers that entrap unacceptable volumes of air in the mixture. Do not use batch type and drum-type transit truck mixers or rotating drum batch type mixers to mix PMC overlay concrete. Keep the mixer clean and free of partially dried or hardened materials at all times. Ensure that

the mixer consistently produces a uniform, thoroughly blended mixture within the specified air content and slump limits. Immediately repair or replace malfunctioning mixers.

#### **B. Placing and Finishing Equipment**

Provide hand tools for placing and brushing-in freshly mixed polymer modified concrete and for distributing it to approximately the correct level for striking-off with the screed.

Use an approved finishing machine complying with the following requirements for finishing large areas of work.

1. Use a self-propelled finishing machine capable of forward and reverse movement under positive control. Provision shall be made for raising all screeds to clear the screeded surface for traveling in reverse.
2. The Contractor may use a self-propelled finishing machine equipped with one or more rotating rollers, augers, and 1,500 to 2,500-vpm vibratory pans.
3. The machine shall be of the vibrating-screed type designed to consolidate the modified composition by vibration. Vibration frequency shall be variable with positive control between 3,000 and 11,000 vibrations per minute. The bottom face of the screeds shall be not less than 4 inches wide and shall be metal covered. The screeds shall have positive control of the vertical position.
4. Provide and use a suitable portable lightweight or wheeled work bridge behind the finishing operation.

### **CONSTRUCTION REQUIREMENTS**

#### **619.05 Limitations**

On new structures, deck concrete shall be in place and properly cured before starting overlay operations. Overlay operations may begin as soon as the concrete has gained sufficient strength to resist damage from the blast cleaning.

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Construct the overlay during favorable weather conditions. Preferably, place the mixture when the atmospheric temperature is between 55 and 75 °F; when the wind velocity is low; when the relative humidity is normal or high; and when hot conditions or rain are not expected. In all instances, place and keep the PMC overlay at a temperature above 45 °F for at least 96 hours after placement. Provide approved housing, heating, insulation methods, or some combination thereof, during cold weather. Do not place the mixture when the temperature is 85 °F or higher; when the wind velocity is high; when the relative humidity is extremely low; when rain is expected within the working period; or when any other atmospheric conditions cause difficulty in the satisfactory finishing, texturing, or curing of the overlay. This may require night work or other limited work periods. Keep PMC overlay aggregate and sand as cool as possible at the storage site during high temperatures to help prevent cracking in the new overlay.

#### **619.06 Hydro-Demolition**

Before placing the overlay, hydro-blast the concrete surface to be covered to the depth shown on the Plans. In areas where machine hydro-blasting cannot reach, in areas of spalling, and where steel reinforcement is exposed, remove deteriorated concrete to sound material using hand tools. Do not use pneumatic hammers heavier than a nominal 45 pounds.

After hydro-blasting, clear the deck of all debris. Do not allow traffic on the cleaned portion of the deck.

#### **619.07 Cleaning**

After hydro-blasting but before placing the overlay, power wash the entire area of the deck surface with a minimum 10,000-pound per square inch washing system to provide a bright, clean appearance that is free from laitance, dust, dirt, oil, grease, bituminous material, paint, and all other foreign matter. Perform the hydro-demolition of an area of the deck within the 24-hour period preceding the placement of the overlay on the area. Clean the existing deck using a process that will ensure conformance with the air and water pollution regulations applicable to the county or city where the site of work is located and with applicable safety and health regulations. Discontinue use of any method that does not consistently produce satisfactory work and conform to the above requirements, and replace with an acceptable method. While cleaning, reasonably confine all debris of every type, including dirty water, resulting from the cleaning operation. Immediately and thoroughly clean such debris from the blast-

cleaned surfaces and all other areas where any escaped debris may have accumulated.

Protect the cleaned areas, as necessary, against contamination before placing the overlay. Cover cleaned areas with a plastic cover that will be rolled up as the placement equipment passes over it so that the cleaned surface is not exposed to wheels, dirt, oil, grease, or any other contaminants. Re-clean contaminated areas and areas exposed more than 36 hours as directed by the Engineer at no cost to the Department.

#### **619.08 Mixing**

Mix concrete at the work site, where PMC is to be placed, in accordance with the specified requirement for the equipment used. Do not allow more than 5 minutes to elapse between the completion of mixing and the start of placement operations. Mixing capability shall be such that finishing operations can proceed at a steady pace with final finishing completed before the formation of the plastic surface film.

#### **619.09 Placing, Consolidating, and Finishing**

The Contractor may vibrate and finish using approved hand methods in areas that are not accessible to the finishing machine.

Place and fasten screed rails in position to ensure the new surface will be finished to the required profile. Anchorage for supporting rails shall provide horizontal and vertical stability. Do not treat screed rails with parting compound to facilitate their removal.

While placing the PMC, have two water vacuums present for removing excessive water.

Finished surface smoothness shall comply with **604.27**.

#### **619.10 Texturing**

Form transverse grooves in the concrete overlay by mechanical texturing. Form the grooves at an appropriate time during the stiffening of the concrete mixture so that in the hardened concrete, the grooves will be between 0.09 and 0.13 inches in width; between 0.12 to 0.19 inches in depth; and will be spaced at random intervals between 0.3 and 1 inch. The grooves shall terminate approximately 18 inches from curbs, concrete parapets, barrier walls, or other vertical walls. The grooves shall be

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relatively smooth and uniform. Form the grooves without tearing the surface or without bringing pieces of the coarse aggregate to the top of the surface. Form grooves to drain transversely. Correct areas that do not conform to these requirements using approved methods at no cost to the Department.

### **619.11 Curing**

Promptly cover the overlay surface with a single layer of wet burlap. Avoid using new burlap, as even when pre-soaked, it can dry out quickly. It may be necessary, at the Engineer's request, to wet the burlap and let it dry out, and then repeat this procedure several times to allow for total absorption. Use white plastic (visqueen) to cover the wet burlap.

Consistently spray a mist of water over the burlap before covering it with white plastic; however, ensure that the amount of water sprayed is not so excessive as to damage the fresh overlay surface.

Pull, place, and keep the white plastic within 10 to 30 feet of the front cover of burlap. Adjust these distances based on the weather conditions at the time of placement. Secure the plastic so that it will not blow off the burlap during the wet cure. Minimize the number of seams in the plastic.

Secure the plastic by using the rails, rolling over the edges of wet burlap onto the plastic, laying folded wet burlap transversely across the deck, or by keeping water on the surface of the plastic. Seal the plastic to prevent the wind from puffing up the plastic during the wet cure. Exercise caution when wetting down the surface of the plastic to prevent the water from running into the overlay being placed.

Place soaker hoses under the plastic once the overlay has set long enough to support the weight of the soaker hoses and after the overlay placement is completed. In hot weather, use cold water to enhance these procedures.

Take a random 1-quart sample of the latex off each concrete mobile supplier and deliver it to the Division of Materials and Tests lab for evaluation. An engineer from the office of Bridge Inspection and Repair shall be present for the initial calibration of the concrete mobile. The Engineer will check and measure the volume of the latex, cement, aggregate, and water at the concrete mobile before and after as an approximate check of the calibration of the concrete mixer.

Place a plastic cover over the deck area after the deck has received hydro-demolition and the deck area has been cleaned. Remove the plastic as the PMC is being placed.

#### **619.12 Reconstruction**

Remove all areas of the overlay that either display a significant number of cracks or that are not intimately bonded to the underlying deck, and replace with acceptable concrete at no cost to the Department. Seal all small cracks, which are not significant enough to require removal of the overlay, with a high molecular weight methacrylate sealant at no cost to the Department.

#### **619.13 Traffic Loading**

When Type I cement is used, do not allow traffic loading on the new PMC overlaid surface until it has undergone a 24-hour wet cure and 24-hour dry cure and has attained a compressive strength of 3,000 pounds per square inch.

When Type III cement is used, do not allow traffic loading on the new PMC overlaid surface until it has undergone a 12-hour wet cure and a 12-hour dry cure and has attained a compressive strength of 3,000 pounds per square inch.

### **COMPENSATION**

#### **619.14 Method of Measurement**

The Department will measure PMC by the square yards in accordance with **109**.

The Department will measure PMC Variable Depth by the cubic yard complete in place, as determined by deducting the theoretical volume of Bridge Deck Overlay (PMC) from the total volume of PMC required to obtain the finished grade shown on the Plans or established by the Engineer.

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**619.15 Basis of Payment**

The Department will pay for accepted quantities at the contract prices as follows:

<i>Item</i>	<i>Pay Unit</i>
Bridge Deck Overlay (PMC)	Square Yard
Polymer Modified Concrete (Variable Depth)	Cubic Yard

Payment for Bridge Deck Overlay (PMC) is full compensation for placing and finishing the overlay, including providing all tools, labor, equipment, and incidentals for such placement. This item includes only the PMC for the theoretical plan depth of the overlay.

The Department will pay for accepted quantities of Polymer Modified Concrete (Variable Depth) at the invoice price of the materials delivered to the Project plus 5%. The invoice provided to the Department must reflect the producer's price used to establish the bid price for PMC and the total quantity of PMC purchased by the Contractor for the entire Project. All other costs associated with placing Polymer Modified Concrete (Variable Depth) are incidental to the price bid for Bridge Deck Overlay (PMC).