SECTION 00590 - POLYMER MEMBRANE

(Follow all instructions. If there are no instructions above a subsection, paragraph, sentence, or bullet, then include it in the project. These specifications may be modified to include project specific specifications, but all additions, deletions, or modifications must be sent to the ODOT Technical Resource and State Specifications Engineer for review and approval.)

(Use this specification only for cast-in-place decks. Obtain information from the Bridge Designer.)

Section 00590, which is not a Standard Specification, is included in this Project by Special Provision.

Description

00590.00 Scope - This Work consists of preparing, sealing, and resurfacing Bridge decks with a primer, a single-layer polymer membrane, an Aggregate top course, and an ACP wearing surface.

00590.02 Submittals - Submit the following at least 7 Calendar Days before the pre-placement conference:

- The manufacturer's product data sheet
- The manufacturer's written installation instructions
- A Material Safety Data Sheet for each primer and epoxy polymer component
- Manufacture dates and shelf-life expiration dates for each production lot of primer and epoxy polymer components
- Tabulated data indicating the estimated cure time, in minutes, for the allowable ambient temperature range, in increments of 10 °F, for both the primer and polymer membrane
- A detailed work plan that meets the lane restriction requirements of 00220.40 for the membrane preparation, application, and cleanup
- The Manufacturer's recommended application rate, square feet per gallon, to achieve a minimum membrane thickness of 3/16 inch
- Names of manufacturer-approved supervisory personnel meeting the requirements of 00590.30
- An inclement weather plan according to 00590.04

00590.04 Inclement Weather Plan - Submit an inclement weather plan when application conditions of 00556.40(b)(1) are not met. The inclement weather plan includes all Materials, Equipment, and methods to be used to heat the substrate, Aggregate, and resin. If concrete moisture content or capillary moisture is to be tested, provide Equipment information and calibration certificates.

00590.05 Pre-placement Conferences:

(a) Supervisory Personnel - Hold a pre-placement conference with the Engineer and all supervisory personnel, Subcontractors, Suppliers, and all other personnel who will be involved in the membrane work. Meet at a mutually agreed time at least 14 Calendar Days before beginning the membrane work. Present and discuss all phases of the membrane work, including ACP placement.

If the Contractor's manufacturer-approved personnel change, or if the Contractor proposes a significant revision to the work plan, hold an additional meeting before any additional Work is performed.

(b) Placement Crew - Before beginning membrane Work, hold a second pre-placement conference with the Engineer and the entire membrane work crew at the Project Site, 30 minutes before membrane Work begins, to discuss placement duties and procedures.

Materials

00590.10 Materials:

(a) Primer - Furnish a low modulus epoxy concrete and crack sealer from section 02060.10 of the QPL.

(b) Polymer Membrane - Furnish epoxy polymer from section 00556.10(a) of the QPL. Provide epoxy polymer and primer from the same manufacturer.

(c) Broadcast Aggregate - Furnish Aggregate from section 00556.10(b) of the QPL.

Sample the furnished Aggregate and test according to the following:

Property	Test Method	Requirements
Moisture Content *	AASHTO T 255	0.20% max.
Field Moisture Content **	AASHTO T 255	1.00% max.

* Test at time of packaging and shipment.
** Field test at the time of mixing the polymer resin.

Package and store all Aggregate Material so that it remains clean and meets moisture content requirements.

(d) Tack Coat - Furnish PG 64-22, PG 70-22, PG 64-28 or PG 70-28, hot asphalt cement tack coat unless otherwise approved. Do not use an Emulsified Asphalt tack coat.

Equipment

00590.20 Equipment - Provide approved Equipment to place the membrane. Remove all Equipment that leaks oil or other contaminants from the Work area until they are repaired.

(a) Tools - Furnish squeegees, heavy-nap rollers, and other approved tools to apply the primer and the membrane polymer resin.

Furnish a mechanical broadcaster to uniformly apply the membrane Aggregate.

Furnish pickup type power brooms capable of removing loose Aggregate.

(b) Coring Equipment - Furnish core cutting Equipment that can produce a core 2 inches in diameter.

(c) Bond Testing Equipment - Furnish bond testing Equipment that:

- Is compatible with the core tested.
- Can exert a tensile load to the core sufficient to exceed 300 psi.
- Is equipped with a measuring device capable of reading tensile force exerted within 1 percent accuracy.

(d) Resin Conditioning Equipment - Furnish Equipment capable of conditioning resin to between 65 °F and 85 °F.

(e) Aggregate Heating Equipment - Furnish heating Equipment capable of pre-heating Aggregate to a minimum of 70°F as measured at the time of placement.

(f) Membrane Heating Equipment - If required, furnish heating Equipment that;

- Can apply heat to ensure that the entire membrane meets the bond test requirements of 00590.50.
- Can maintain a minimum temperature of 70 °F within the heated area
- Does not segregate, shove, tear or gouge the membrane system

(g) Concrete Moisture Meter - Furnish a pin-type, instant read, concrete moisture meter meeting ASTM F2659. Provide current calibration documentation.

Labor

00590.30 Personnel Qualifications - Provide supervisory personnel who are approved by the polymer material manufacturer, in writing, as qualified and who shall oversee the placement.

Construction

00590.40 Construction:

(a) General - Do not begin membrane installation until all Materials and Equipment necessary to perform the installation and required repairs, and qualified personnel are at the Project Site.

(b) Application Conditions - Apply the membrane system on prepared surfaced when the following conditions are met:

- The deck surface has been visually dry for at least 72 hours.

- The ambient temperature and deck surface temperature are between 50 °F and 90 °F, or as specified by the resin manufacture's product data sheet, whichever is more restrictive.
- The deck surface temperature is at least 5 °F above the dew point.
- No rain is forecasted for the duration of the membrane installation and estimated cure time, based on ambient and surface temperatures.

(c) Inclement Weather Plan - When an inclement weather plan has been approved, apply membrane system on prepared surfaces when the following conditions are met:

- If the deck has been dry for less than 72 hours, mechanically heat the deck to a minimum of 300 °F and a maximum temperature of 350 °F. Perform one of the following tests after applying heat:
- Test for capillary moisture using the plastic sheet method, according to ASTM D4263, with a minimum test time of 2 hours. Perform one test per 500 square feet.
- Test for concrete moisture content using a pin-type moisture meter according to 00557.21(f). Maximum allowable deck moisture content is 4%. Perform number of tests and locations according to ASTM F2659, with a minimum of eight tests per primer placement. Test additional locations as directed by the Engineer.
- The ambient temperature and deck surface temperature are between 40 °F and 90 °F. If the temperature falls, or is forecasted to fall below 50 °F perform the following:
  - Pre-heat the Aggregate to a minimum of 70 °F.
  - Heat the membrane to a minimum of 70 °F to facilitate curing. Do not exceed 110 °F on the membrane surface.
- The deck surface temperature is at least 3 °F and rising above the dew point.
- No rain is forecasted for the duration of the membrane installation and estimated cure time, based on ambient and surface temperatures.
- Do not place membrane system when temperatures are below 40 °F.

(d) Deck and MPCO Materials Heating - Do not use manually operated propane torches to heat the deck surface or membrane material. When the deck surface is mechanically heated, do not proceed with Work until the surface temperature is less than 90 °F.

(e) Daily Report Requirements - Submit a daily written report to the Engineer by the end of each day that Work is being performed under this Section. The daily written report shall include the following:

- Broadcast Aggregate moisture content AASHTO T 255 (00590.10(d))
- Surface preparation process and results of ASTM E965 (0590.41(c)) according to Section 00504.
- Total gallons of primer and associated application rate, for each Bridge
- Total gallons of hot asphalt cement tack coat applied to each Bridge
- Bond test results ASTM D4541 (00590.50)

- Size and location of repair areas with digital photographs taken both before and after placement of the membrane. Provide the digital photographs in a format acceptable to the Engineer.

00590.41 Preparing Bridge Decks - Prepare all surfaces that are to be in contact with the polymer membrane according to Section 00504.

00590.42 Installation - Install membrane according to the following:

- Condition and mix the primer and membrane resin according to the manufacturer's product data sheet and written installation instructions. Do not dilute, thin, or add foreign material to either the individual polymer resin components or the mixed polymer resin.
- After the Engineer has approved the surface preparation, completely flood the deck surface with primer at the rate recommended by the primer manufacturer, or as directed. Use heavy-nap rollers to work the primer into the concrete surface and all visible cracks. Fill all visible cracks to refusal. Allow the prime coat to pond and penetrate into the deck surface a minimum of 15 minutes. Before the resin becomes tack free, remove excess primer using a broom or heavy-nap roller to prevent ponding.
- Flood the deck with membrane resin to cover a maximum area of 50 square feet per gallon. Before gelling of the membrane resin occurs, broadcast a single layer of Aggregate to refusal (100 percent coverage) so no wet spots are visible.
- Extend the membrane to the expansion joint edges and 2 inches up the curb or rail face, to ensure the deck is sealed in those locations. Aggregate need not be placed up the curb or rail face.
- Allow the membrane enough time to cure to initial set according to the manufacturer's product data sheet before subjecting it to loads or traffic.

00590.43 Membrane Bond Test - Test the full depth membrane according to ASTM D4541, Method "E", using Type "V" tester prior to allowing traffic on the membrane. Test using 50 mm (2-inch) test dollies, at locations as directed.

Perform at least two bond ~~strength~~ tests for each Day~~stage or complete~~ of placement ~~in one night,~~ in the presence of and at locations designed by the Engineer. ~~Perform at least two bond tests during the first shift.~~

Take 50 mm (2-inch) diameter cores through the Aggregate surface and 1/2 inch into the concrete substrate.

Minimum allowable bond strength is 250 psi or substrate failure, at each test location.

Repair core holes with matching membrane system materials. Avoid taking cores in the wheel tracks.

00590.44 Delamination Survey and Repair - The completed membrane surface may be inspected by the Engineer for delamination, bond failure, and other damage by use of a chain drag, coring, and other devices. If directed by the Engineer, perform additional bond tests as set forth in 00590.43, at locations directed.

Repair all surface defects, including loss of Aggregate, prior to paving by removing the defective material and reapplying the membrane according to these Specifications, at no additional cost to the Agency. Do not damage adjacent materials or steel substrates.

Perform bond testing on repair areas to ensure a membrane bond strength of at least 150 psi before paving and 250 psi if traffic will be allowed on the membrane. Test at locations as identified by the Engineer.

00590.45 Vehicles and Temporary Traffic Use of New Surface - Staged traffic will not be allowed on the membrane for more than 21 Calendar Days.

Do not open sections to traffic until approved by the Engineer. Before opening to traffic, remove all loose aggregate by power brooming, and open all drains.

00590.46 ACP Paving – Prior to applying the asphalt cement tack coat, thoroughly clean the membrane surface using blowers, brooms, vacuums, or other methods to achieve a clean, dry surface.

Before placing ACP, apply a hot asphalt cement tack coat to cover a maximum area of 35 square feet per gallon to the entire membrane surface, extending 2 inches up the face of the curb or rail. Pave over the tack within 4 hours of tack placement.

Measurement

00590.80 Measurement - The quantities of Polymer membrane will be measured on the area basis. The area will be determined by measuring the actual surface area of the sealed bridge deck.

Payment

00590.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per square foot, for the item “Polymer Membrane”.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals required to complete the Work as specified.

No separate or additional payment will be made for hot asphalt cement tack coat, or heating of the substrate, Aggregate, primer or membrane.

No payment will be made for additional bond tests.