

1
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

Add Section 519 to the Standard Specifications for this project as follows:

DESCRIPTION

519.01 This work consists of furnishing and placing a Polyester Polymer Concrete (PPC) overlay system with a High Molecular Weight Methacrylate (HMWM) resin primer on bridge concrete surfaces. The surface of the concrete shall be prepared and the PPC overlay system shall be applied in accordance with these specifications in conformity with the lines, grades, thickness, and typical cross-sections shown on the plans or as approved by the Engineer.

PPC shall be used as the patching material for Class 1 removals as shown on the plans. Polyester concrete shall not be used as the patching material for Class 2 or Class 3 deck removal areas.

MATERIALS

519.02 The Contractor shall submit a Certified Test Report from independent accredited laboratories for each of the materials associated with the polyester concrete overlay in accordance with subsection 106.13.

The PPC shall consist of polyester resin binder and aggregate as specified herein. It shall also include a compatible primer which, when mixed with other specified ingredients and applied as specified herein, is capable of producing a polyester concrete meeting the requirements of this specification.

519.03 Polyester Resin Binder. Polyester resin binder shall have the following properties:

- (1) Be an unsaturated isophthalic polyester-styrene co-polymer. The resin content shall be 12 percent +/- one percent of the weight of the dry aggregate.
- (2) Contain at least one percent by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
- (3) Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
- (4) Have the values for the material properties in accordance with Table 519-1.

Accelerators or inhibitor may be required to achieve proper setting time of polyester concrete. They shall be used as recommended by the overlay System Provider.

2
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

Table 519-1
POLYESTER RESIN BINDER PROPERTIES (Tested each lot sent to the job)

<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
Viscosity*	ASTM D2196	0.1x10 ⁻⁵ to 2.9x10 ⁻⁵ psi sec (0.075 to 0.20 Pa) RVT No.1 Spindle, 20 RPM at 77 °F
Specific Gravity*	ASTM D1475	1.05 to 1.10 at 77 °F
Elongation	ASTM D638	35% minimum Type I specimen, thickness 0.25 ± 0.03 inches at Rate = 0.45 inch/minute
Elongation	ASTM D618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D618	Sample Conditioning: 18/25/50+5/70
Tensile Strength	ASTM D618	Sample Conditioning: 18/25/50+5/70

* Test shall be performed before initiator is added.

519.04 High Molecular Weight Methacrylate (HMWM) Primer. Primer for the concrete surface shall be a wax-free, low odor, high-molecular-weight methacrylate primer, and consist of a resin, initiator, and promoter. The primer shall conform to Table 519-2 and the promoter shall be as recommended by the System Provider.

Initiator for the methacrylate resin shall consist of a metal drier and peroxide. If supplied separately from the resin, the metal drier shall not be mixed with the peroxide directly. The containers shall not be stored in a manner that allows leakage or spilling to contact the containers or materials of the other.

Table 519-2
HIGH MOLECULAR WEIGHT METHACRYLATE RESIN PROPERTIES (Tested yearly)

Property	Test Method	Requirement
Viscosity*	ASTM D2196	4.0x10 ⁻⁵ psi (0.025 Pa) maximum (Brookfield RVT with UL adapter, 50 RPM at 77 °F)
Volatile Content*	ASTM D2369	30% maximum
Specific Gravity*	ASTM D1475	0.90 minimum at 77 °F
Flash Point	ASTM D3278	180 °F minimum
Vapor Pressure*	ASTM D323	0.04 inch Hg maximum at 77 °F
PCC Saturated Surface-Dry Bond Strength (Adhesive)	Colorado Procedure - Laboratory 4302	700 psi minimum at 24 hours and 70 ± 1 °F (with polyester concrete at 12% resin content by weight of the dry aggregate)

*Test shall be performed before initiator is added.

3
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

519.05 Aggregates. Polyester concrete aggregate shall have the following properties:

- (1) The aggregate shall not have more than 45 percent crushed particles retained on the No. 8 sieve when tested in accordance with AASHTO Test Method T335.
- (2) Fine aggregate shall consist of natural sand.
- (3) The aggregate shall have a weighted-average aggregate absorption of no more than 1.0 percent when tested under AASHTO Test Methods T84 and T85.
- (4) At the time of mixing with resin, the aggregate shall have a moisture content of not more than one half of the weighted-average aggregate absorption when tested under AASHTO Test Method T255.
- (5) The aggregate shall meet the requirements for aggregate gradation in Table 519-3.

Table 519-3
AGGREGATE GRADATION (Tested yearly)

Sieve Size	Percent Passing
3/8"	100
No. 4	62-85
No. 8	45-67
No. 16	29-50
No. 30	16-36
No. 50	5-20
No. 100	0-7
No. 200	0-3

Sand for abrasive sand finish shall have the following properties:

- (1) The sand shall be commercial-quality blast sand.
- (2) At least 95 percent of the sand shall pass the No. 8 sieve and at least 95 percent shall be retained on the No. 20 sieve when tested under AASHTO Test Method T27.
- (3) The sand shall have an average absorption of not more than 1 percent when tested under AASHTO Test Method T85.

4
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

519.06 Composite System. The composite material shall meet the requirements of Table 519-4.

Table 519-4
COMPOSITE PROPERTIES (Tested every two years)

Property	Test Method	Requirement
PPC (Bond Strength)	Colorado Procedure - Laboratory 4302	500 psi minimum at 24 hours and 70 °F (without primer, at 12% resin content by weight of the dry aggregate, on Saturated Surface Dry Specimen)
Abrasion Resistance	Colorado Procedure - Laboratory 4301	<2g weight loss (at 12% resin content by weight of the dry aggregate)
Modulus of Elasticity	ASTM C469	1,000,000 psi to 2,000,000 psi (at 12% resin content by weight of the dry aggregate)

CONSTRUCTION REQUIREMENTS

519.07 The Contractor shall submit the Overlay System, System Provider Qualifications, Contractor Qualifications, System Provider Technical Representative Qualifications, Overlay Placement Plan, Equipment, Certificates of Compliance with laboratory testing for each property, and any other relevant documents for the overlay system at least 15 working days prior to the Polyester Overlay Pre-Paving Conference and delivery of any of the overlay materials. These submittals shall be approved by the Engineer.

- (a) *Overlay System.* The Contractor shall submit two copies of the System Provider’s material information, written installation instructions, material safety data sheets, and independent test results for approval.
- (b) *System Provider Qualifications.* The Contractor shall install an overlay system with all components provided through a single System Provider, with documented experience successfully supplying five projects of similar size and scope within the past five years. The Contractor shall submit documentation of the System Provider’s project experience including the following:
 - (1) Project construction date
 - (2) Overlay quantities.

5
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

(3) Reference name and contact information of owner's representative.

(c) *Contractor Qualifications.* The Contractor shall submit documentation of completing five successful projects placing polyester polymer concrete systems on bridge decks or concrete pavement to established grade lines using similar equipment as specified herein within the past five years. The documentation of Contractor's qualifications shall include the following:

(1) Project construction date

(2) Overlay quantities.

(3) Reference name and contact information of owner's representative.

The Contractor shall arrange for a qualified System Provider Technical Representative with five years of documented experience with PPC to be on-site throughout the duration of the PPC operation to provide technical support for the materials. Once the Contractor has demonstrated an acceptable experience level with the PPC, the requirement to have the Technical Representative continuously on-site during the PPC operation may be reduced at the Engineer's discretion.

(d) *System Provider Technical Representative Qualifications.* The System Provider Technical Representative shall have a minimum of five years of experience with PPC and be knowledgeable in all aspects of the work, including all materials to install the overlay system. The Technical Representative shall have experience on a minimum of five successful projects of similar size and scope within the past five years. The Contractor shall submit documentation of the System Providers Technical Representative's experience including the following:

(1) Years of experience working with polyester concrete

(2) Project construction dates

(3) Overlay quantities.

(4) Reference name and contact information for owner representatives.

The Technical Representative shall be available on-site while the Contractor is placing the overlay system to facilitate the installation of polyester concrete to provide technical support for the materials. This includes, but is not limited to, trial slab preparation and PPC application, deck surface preparation and PPC application, and PPC cure. Once the Contractor has demonstrated an acceptable experience level with the PPC, the requirements for the on-site Technical Representative may be reduced at the Engineer's discretion.

6
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

(e) *Overlay Placement Plan*. The Contractor shall submit an Overlay Placement Plan that includes the following:

- (1) Schedule of overlay work and testing for each bridge
- (2) Staging plan describing overlay placement sequence including:
 - A. Paving widths
 - B. Anticipated paving lengths.
 - C. Paving directions:
 - i. Contractor shall pave from high side of the bridge to the low side.
 - ii. No gaps between passes will be allowed.
 - D. Joint locations: Cold joints between passes shall be within 1 foot of the lane lines.
 - E. Location of proposed trial overlay(s)
- (3) Description of equipment used for:
 - A. Surface preparation including grinding and shot blasting.
 - B. Applying HMWM resin
 - C. Measuring, mixing, placing, and finishing the polyester concrete overlay
 - D. Applying sand
 - E. Method of protecting and finishing inlets and bridge drains
- (4) Method for preventing leakage of primer onto areas of deck that have not received surface preparation.
- (5) Method for isolating expansion joints including pourable joints at the abutment and over the piers.
- (6) Method for measuring and maintaining overlay thickness and profile.
- (7) Tining plan showing tining locations and describing methods that will be used for hand tining. Mainline tining shall be automated with the finisher.

7

**SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)**

- (8) Cure time for polyester concrete.
- (9) Storage and handling of HMWM resin and polyester concrete components.
- (10) Procedure for disposal of excess HMWM resin, polyester concrete, and containers.
- (11) Procedure for cleanup of mixing and placement equipment.

(f) *Equipment.* The Contractor shall submit documentation of certification of scales that will be used to calibrate the mobile mixing truck. The certification shall be dated within one month of the start of the placing of the Overlay System. A new certification shall be done if any adjustments are made to the scales.

The Contractor shall submit a documented history of the use of the paving machine to successfully place Polyester Polymer Concrete overlays on major bridge projects for review and approval by the Engineer.

(g) *Materials Samples.* Samples of materials, from the same lots used for the project, for all components of the overlay system shall be submitted to the Engineer a minimum of seven working days prior to the overlay application. Samples shall be representative of the materials to be used in the overlay application and shall consist of one 4-liter sample for each liquid and a 5-pound sample for each dry component. The Contractor shall perform a minimum of one gradation analysis per project of combined sand and aggregate taken from the belt during production. Additional gradations may be required as directed by the Engineer.

519.08 Polyester Overlay Pre-Paving Conference. A Pre-Paving Conference shall be held before any overlay paving operations begin. Attendees shall include all parties involved in the work.

519.09 Trial Application. Prior to constructing the overlay, one or more trial applications shall be placed on a concrete base to determine the initial set time and to demonstrate the effectiveness of the mixing, placing, and finishing equipment proposed. The set time shall be determined when the in-place PPC cannot be deformed by pressing with a finger, indicating the resin binder is no longer in a liquid state. Each trial application shall be the planned paving width and a minimum of 20 feet long, with the same thickness as the specified overlay. The trial applications shall be tined as per the tining requirements in this specification for the final application. The trial applications shall replicate field conditions and be constructed using all the equipment that is used in the production work including the paving machine and volumetric mixer. The location of the trial applications shall not be on the bridge deck or approach slab and shall be approved by the Engineer. Trial applications shall be properly disposed of off-site by the Contractor.

8
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

The number of trial applications required shall be as many as necessary for the Contractor to demonstrate the ability to construct an acceptable trial overlay section and competency in ability to perform the work.

Overlay pull bond testing shall be performed in accordance with the acceptance testing described herein. Acceptable test results shall be achieved on a trial application before the installation may proceed.

The methods, installer, or overlay system may be rejected after three trial applications if not shown to be adequate or in compliance with this specification as ordered by the Engineer.

519.10 Equipment. All equipment for cleaning the existing concrete surface and mixing and applying the overlay system shall be in accordance with the System Provider's recommendations as approved by the Engineer prior to commencement of work.

(a) Measuring Equipment.

The following equipment shall be used:

- (1) Certified Scales used to calibrate the mobile truck mixing equipment.
- (2) Means to measure the resin levels in the tank of the mobile truck mixer during paving operations and access to the resin tank.

(b) Mixing Equipment. A continuous mixer shall be used for all polyester concrete overlay applications. The Contractor shall submit a written calibration plan that is specific to the Contractor's continuous mixing truck(s). The calibration plan shall be submitted a minimum of seven days prior to use of the mixer(s).

The continuous mixer shall:

- (1) Employ an auger screw/chute device.
- (2) Be equipped with an automatic metering device that measures and records aggregate and resin weights and/or volumes. Record weights or volumes at least every five minutes, including time and date. Submit recorded volumes at the end of the work shift.
- (3) Have a visible readout gage that displays weights or volumes of aggregate and resin being recorded.
- (4) Produce a satisfactory mix consistently during the entire placement.
- (5) Be calibrated by certified scales provided by the Contractor. Calibration shall be verified by demonstrating that the computer tickets from the metering device are

9

**SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)**

within two percent of the certified scale weights. With CDOT witnessing, the Contractor shall produce three consecutive batches of aggregate that have batch tickets and actual material weights that are within two percent of each other, and three consecutive batches of resin that have scale weight tickets and actual material weights that are within two percent of each other. The calibration shall be verified at the beginning of the project, and the calibration shall be done every 60 days.

A portable mechanical mixer of appropriate size for proposed batches, as recommended by the System Provider and approved by the Engineer, may be used for all PPC patching applications and for smaller area applications of less than 4,000 square feet per bridge or pavement section.

- (c) *Finishing Equipment.* A track driven self-propelled slip-form paving machine, which is modified or specifically built to effectively place the PPC overlay in a manner that meets these specifications, shall be used for all polyester concrete overlay applications.

The paving machine shall:

- (1) Employ a vibrating pan to consolidate and finish the PPC.
- (2) Be fitted with hydraulically controlled grade automation to establish the finished profile. A 30-foot ski grade control device shall be used in all locations unless approved by the Engineer or noted herein. When grade corrections, uneven grades or inconsistent thicknesses are necessary as shown in the plans, placement of the overlay to the profile and cross-section shall be controlled by taut reference stringlines on both sides of the paver. The grade automation sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed PPC.
- (3) Be equipped with controls capable of maintaining the screed at the specified transverse slope.
- (4) Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward placement speed.
- (5) Have mainline tining automated with the finisher.
- (6) Be capable of forward or reverse motion.

Finishing of patches of Class 1 deck removal areas shall be completed using hand finishing tools and shall be flush with the top of the existing deck surface.

519.11 Surface Preparation. Existing bridge decks shall be repaired prior to the application of the polyester concrete overlay as shown in the plans and as determined in the field.

10
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

Spalled and delaminated areas of the deck shall be removed down to sound concrete. All removed areas shall be patched prior to overlay to provide a uniform thickness.

Patching mortars with magnesium phosphate will not be allowed on decks receiving a polyester concrete overlay. Existing mortars over 28 days old may remain in place if determined to be sound and acceptable by the Engineer.

All cement-based deck patching material, including mortar and concrete, shall attain a minimum compressive strength of 3,000 psi, cure a minimum five days, and pass the Deck Patch Moisture Transmission Test prior to placing the polyester concrete overlay.

For newly constructed bridge decks and approach slabs, the deck shall cure a minimum of 28 days and attain the required Field Compressive Strength per Section 601 prior to overlay placement.

The surface of concrete substrate shall be prepared for application of the overlay by shot blasting in order to remove all existing grease, slurry, oils, paint, dirt, striping, cure compound, membrane, and all other contaminants that could interfere with the proper adhesion of the overlay system. Steel shot shall comply with SSPC-AB3 and recycled steel shot shall comply with SSPC-AB2.

The final prepared surface shall adhere to the following requirements:

- (1) The areas to be overlaid shall be cleaned by shot blasting. Areas not accessible by shot blast shall be abrasive blast. Cleaning shall not commence until all work involving the repair of the concrete deck surface has been completed and the deck is dry. All contaminants shall be picked up and stored in the vacuum unit and no dust shall be created during the blasting operation that will obstruct the view of motorists in adjacent roadways. The travel speed and/or number of passes of the shot blasting unit shall be adjusted so as to result in all weak or loose surface mortar being removed and the aggregates of the concrete being exposed, as well as a visible change in the concrete color. Cleaned surfaces shall not be exposed to vehicular traffic unless approved by the Engineer. If the deck becomes contaminated before placing the overlay, the Contractor shall shot blast or abrasive sandblast the contaminated areas, per recommendation of the System Supplier's Technical Representative, and to the satisfaction of the Engineer at no additional cost to the project.
- (2) All loose particles shall be removed prior to the overlay placement by magnets and compressed air and vacuuming such that no trapped particles remain. Power washing will not be allowed.
- (3) The areas to be overlaid shall be blown off with compressed air just prior to placement of the primer and shall be completely dry.

11
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

519.12 Application of Overlay. Methods shown in this specification are typical of general installations and may be modified per the System Provider's recommendations as approved by the Engineer. The application of the overlay shall not begin until the deck patches have cured for five days, completely surface dry in accordance with ASTM D4263 or have a moisture content of five percent or less when measured by a moisture meter approved by the Engineer. Actual surface conditions at the time of overlay placement shall be evaluated based on more than just time to dry. The surface shall be free of any standing water or darkening of the surface that would indicate locations of previously standing water. The entire surface to receive PPC overlay shall uniformly appear light in color and show no further lightening when drying methods such as compressed air or propane torch are applied. There shall be no evidence of moisture in substrate cracks. The concrete surface temperature shall be between 40 °F rising and 100 °F falling, or per System Provider's recommendation, whichever is higher or lower, respectively. Stockpiled materials shall not be stored on the bridge deck.

(a) *HMWM Primer Application.* Immediately before placing primer, all exposed surfaces shall be completely dry and blown clean with oil-free compressed air. Exposed surfaces shall be protected from precipitation and heavy dew during and after the application of the primer.

After the exposed surfaces have been prepared and allowed to dry, primer shall be applied in accordance with the System Provider's recommendations. Primer shall be placed within five minutes of mixing at approximately 90 square feet per gallon, or at the rate recommended by the System Provider.

Primer shall be uniformly spread to completely cover surfaces to be overlaid. Primer shall be applied with push brooms or rollers. Care shall be taken to avoid excess application that results in puddling. Excess material shall be removed or distributed to meet the required application rate. Primer shall be reapplied to any areas that appear dry after 15 minutes of absorbing the material. Primer shall not be allowed to leak onto areas that have not received surface preparation.

Polyester Concrete Application. The polyester concrete shall be applied after 15 minutes and within two hours after the primer has been applied. The polyester concrete shall be placed prior to gelling or 15 minutes following addition of initiator, whichever occurs first, or within a more restrictive range if recommended by the System Provider.

The polyester resin binder shall be initiated and blended completely. Aggregate shall be added and mixed for at least two minutes when a portable mechanical mixer is used.

Polyester concrete shall have an initial set time of at least 30 minutes and at most 120 minutes when tested using an initial-setting time. The set time shall be determined in the field when the in-place PPC cannot be deformed by pressing with a finger, indicating that the resin binder is no longer in a liquid state. If the initial set is not within 30 to 120

12
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

minutes, the material shall be removed and replaced. Shorter set times may be required if suggested by the System Provider and approved by the Engineer.

The overlay shall be consolidated and finished to the required grade and cross-section using a PPC paver as defined herein.

Although the paver should yield a finished surface, additional finishing may be necessary. PPC shall be finished as necessary through traditional concrete finishing methods, producing a slight resin bleed indicating complete consolidation of aggregates.

A surface friction sand finish of at least 2.2 pounds per square yard shall be broadcast onto the glossy surface immediately after finishing and before resin gelling occurs. Surface friction sand shall be broadcast after finishing and prior to tining by hand; if the tining device is mounted directly to the paving machine the surface friction sand shall be broadcast after tining. To ensure adequate pavement friction, the completed PPC overlay surface shall be free of any smooth or "glassy" areas such as those resulting from insufficient quantities of surface aggregate. Any such surface defects shall be repaired by the Contractor in the manner recommended by the System Provider and approved by the Engineer at no additional cost to the project.

The overlay shall be longitudinally tined unless Plans indicate that the overlay shall be textured per subsection 601.15(e)2.

Tining shall produce grooves of 1/8 inch by 1/8 inch spaced at 3/4 to 1 inch apart. Tining grooves shall be neat in appearance and uniform in depth. Tining devices shall be maintained clean and free from encrusted mortar, polyester resin, sand and polyester concrete to ensure uniform groove thickness.

Unless indicated on the plans, tining shall run parallel with the direction of traffic and shall extend across the entire applied deck surface except for 1 foot next to the curb. The tining shall not be performed too early whereby the grooves may close up, or too late whereby the grooves are of inadequate depth.

Polyester concrete overlay edges shall be tapered if the overlay is not completed within the allowable lane closure time and is more than 3/4 inch higher in elevation than the adjacent pavement.

If the overlay thickness is greater than 3/4 inch in height, longitudinal polyester concrete tapered edges parallel to the direction of traffic shall be tapered to not less than a 4:1 (horizontal: vertical) slope. Transverse temporary asphalt tapered edges perpendicular to the direction of traffic shall be tapered to not less than a 50:1 (horizontal: vertical) slope. Longitudinal polyester tapers may remain and be overlaid with polyester concrete overlay. Transverse temporary asphalt tapers shall have a bond breaker and be completely removed prior to overlay placement.

13
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

(b) *Saw Cut Joints.* Saw cutting and sealing of all joints shall be done according to the joint specifications and the details in the plans. The time of sawing shall be determined by the Contractor to prevent random cracking and raveling from the sawing. The time will be dependent upon weather conditions, temperature, and other factors affecting the setting of the polyester concrete. If uncontrolled cracking occurs, the Contractor shall repair the crack as recommended by the System Provider and as approved by the Engineer.

(c) *Curing.* The Contractor shall protect the overlay from moisture for a minimum of four hours. The Contractor shall allow the overlay to cure sufficiently before subjecting it to loads or traffic of any nature that may damage the overlay. Cure time depends upon the ambient and deck temperatures. The overlay shall be considered cured to a firm, hard state when four hours have passed or a minimum reading of 25 on a properly calibrated Schmidt hammer.

519.13 Acceptance Testing. Acceptance of the deck patch, surface preparation, and thin bonded overlay will be determined by the Engineer based on materials sampling, moisture transmission tests, vertical axis pull bond tests, and smoothness quality testing performed by the Contractor.

(a) *Materials Sampling.* Contractor shall provide access to equipment in order to acquire materials samples and measuring of resin binder levels in the resin tank of the mobile mixing truck.

(b) *Deck Patch Moisture Transmission Testing.* Moisture transmission tests shall be performed by the Contractor using the Plastic Sheet Method in accordance with ASTM-D4263. This test consists of an 18 inch by 18 inch square of clear plastic sheeting that is sealed to the concrete surface with tape on all four sides. If after 16 hours any condensation is found on the underside of the plastic or if the concrete surface is darkened, the test will be considered failing. An alternative to the Plastic Sheet Method is a Moisture Meter Test, with a Moisture Meter approved by the Engineer, with a passing moisture reading on the patch or patches, of five percent or below. The patches to be tested will be approved by the Engineer.

(c) *Overlay Pull Bond Testing.* Vertical axis pull bond tests shall be performed after 24 hours by the Contractor in accordance with ASTM C1583, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-Off Method). A minimum of two pull bond tests shall be performed on each bridge. For bridges with deck areas greater than 15,000 square feet, additional tests shall be performed at a frequency of one test per 15,000 square feet of additional deck area, rounded up. Additional testing may be required as directed by the Engineer.

14
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

The test result shall be the average of the number of tests for each structure, drilled a minimum of 0.25 inches but no greater than 0.50 inches below the bond line.

The bond strength of the PPC overlay system on normal weight concrete shall be 250 pounds per square inch. An acceptable test will demonstrate that the overlay bond strength is sufficient by producing a concrete subsurface failure area greater than 50 percent of the test surface area. The Contractor shall repair all bond test locations with polymer overlay in accordance with this specification.

(d) *Smoothness Quality Testing.* The finished transverse and longitudinal surface elevation of the pavement shall be measured using a 10-foot straightedge. Areas to be measured will be as directed by the Engineer. The Contractor shall furnish an approved 10-foot straightedge, depth gauge, and operator to aid the Engineer in testing the pavement surface.

519.14 Corrective Work.

(a) *Repair of Surface Defects.* The repair materials and finishing methods for surface defects in the overlay shall be in accordance with those used for the application of the overlay. All surface defects shall be repaired to the satisfaction of the Engineer before acceptance of the work.

(b) *Correction for Smoothness.* Areas showing high spots of more than 3/16 inch in ten feet shall be marked and diamond ground until the high spot does not exceed 3/16 inch in ten feet. Longitudinal tining shall be grooved to restore the longitudinal texture (tining). Areas showing low spots of more than 3/16 inch in ten feet shall be marked, saw cut, removed with diamond grinding, and replaced at the Contractor's expense.

(c) *Replacement of Defective Overlay.* A defective overlay, identified by sounding for delamination or a failing pull bond test result, shall be removed and replaced at the Contractor's expense. The Contractor shall submit a written corrective work proposal to the Engineer, which shall include the methods and procedures that will be used. The Contractor shall not commence corrective work until the methods and procedures have been approved in writing by the Engineer. The Engineer's approval will not relieve the Contractor of the responsibility of producing work in conformity with the Contract.

(d) *Defective Tining.* If the Engineer determines tining to be unacceptable on any deck surfaces measuring 30 square feet or more, based on criteria in subsection 519.12(b), the tined surface shall be repaired with resin and the repaired surface shall be textured per requirements in subsection 601.15(e)2.

15
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

METHOD OF MEASUREMENT

519.15 Furnish Thin Bonded Overlay (Polyester Concrete) will be measured by the actual quantity of polyester concrete material complete-in-place and accepted. The volume shall include material used for patching Class 1 removal areas as shown on the plans. Any additional quantities in excess of the plan thickness as required for profile adjustments shall be included in the Contractor's submittal and approved by the Engineer prior to placement.

The Contractor shall collect a weight ticket for all material placed and ensure that the following information is shown on each ticket:

- (1) Project Number
- (2) Bridge Number
- (3) Date and Time
- (4) Ticket Number
- (5) Material Type
- (6) Location of Placement (Lane and Station Limits)
- (7) Aggregate Weight
- (8) Polyester Resin Binder Weight

Tickets shall be available on-site for CDOT personnel to inspect.

Each day, the Contractor shall provide to the Engineer separate envelopes for each bridge which contains the previous day's weight tickets and the following:

- (1) On each envelope: Project Number, Bridge Number, Date of Paving, Type of Material, Daily Total, Cumulative Total, and Suppliers Name.
- (2) One of the following:
 - A. Two adding machine tape tabulations of the weight tickets with corresponding totals run and signed by different persons.
 - B. One signed adding machine tape tabulation of the weight tickets that has been checked and signed by a second person.

16
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

C. Signed check tape of computer scale tickets that have a cumulative total. These scale tickets must be consecutive.

(3) A comparison of the actual yield for each day's placement to the theoretical yield. Theoretical yield shall be based on the actual area paved and the planned thickness of the mixture being placed. Any variance greater than five percent shall be indicated on the envelope with a written explanation included.

Place Thin Bonded Overlay (Polyester Concrete) will not be measured, but will be the quantities, in square yards, specified on the plans for the final surface.

BASIS OF PAYMENT

519.16 The accepted quantities will be paid at the contract unit price for each of the pay items listed below that appear in the bid schedule.

Payment will be made under:

Pay Item	Pay Unit
Furnish Thin Bonded Overlay (Polyester Concrete)	Cubic Foot
Place Thin Bonded Overlay (Polyester Concrete)	Square Yard

Construction and removal of trial applications including concrete base surfaces will not be measured and paid for separately but shall be included in the work.

Payment for Furnish Thin Bonded Overlay (Polyester Concrete) will be full compensation for all costs required to furnish the polyester concrete material, including freight, to the project site and disposal of any unused overlay material. All costs for time, labor, materials and equipment for all necessary trial slabs shall be included in the Furnish Thin Bonded Overlay (Polyester Concrete). Payment by cubic foot will be based on an average of three unit weight tests on three separate samples. A unit weight of 135 pounds per cubic foot may be used as the basis of payment if the unit weight tests become impractical at the Engineer's discretion.

Payment for Place Thin Bonded Overlay (Polyester Concrete) will be full compensation for all labor, materials, tools, equipment and incidentals required to prepare the concrete surface and complete the overlay placement. Quantities for placement of patching areas will not be measured and paid for separately but shall be included in the work.

Costs for placement of polyester concrete material in Class 1 removal areas will not be measured and paid for separately but shall be included in the work.

17
SECTION 519
THIN BONDED OVERLAY (POLYESTER CONCRETE)

INSTRUCTIONS TO DESIGNERS:

Use this project special provision when applying Polyester Polymer Concrete overlays (alternate to waterproofing and HMA) to bridge structures.

PERMANENT CHANGES TO PROJECT DATED SPECIAL PROVISIONS

REVISION OF SECTION 202 Thin Bonded Overlay (Polyester Concrete)

<u>DATE</u>	<u>AUTHOR</u>	<u>DESCRIPTION OF CHANGE</u>
2/8/19	KWH	Initial Web Issue
6/3/19	KWH/ajp	Revised requirements for string line equipment.
04.11.2023	M. Kayen	Revisions to make spec online ADA-compliant. 5.22.23 Additional ADA.