

738-B-297 WARRANTED POLYMER OVERLAY SYSTEM FOR BRIDGE DECK SURFACES AND  
POLYMER OVERLAY SYSTEM FOR NON-BRIDGE DECKS

(Revised 01-18-24)

The Standard Specifications are revised as follows:

SECTION 737, AFTER LINE 154, INSERT AS FOLLOWS:

**SECTION 738 – WARRANTED POLYMER OVERLAY SYSTEM FOR BRIDGE  
DECK SURFACES AND POLYMER OVERLAY SYSTEM FOR OTHER  
CONCRETE SURFACES**

**738.01 Description**

*This work shall consist of cleaning and preparing a bridge deck surface and other, non-bridge deck surfaces, furnishing and mixing materials, and applying a two-coat polymer overlay system in accordance with 105.03.*

*The Contractor shall provide a performance warranty for the two-coat polymer overlay system in accordance with 738.13 when the polymer overlay system is applied to the surface of a bridge deck. A performance warranty will not be required for two-coat polymer overlay systems applied to an RCBA or other concrete surface, other than a bridge deck.*

**MATERIALS**

**738.02 Materials**

*Materials shall be in accordance with the following:*

<i>Fine Aggregates .....</i>	<i>904.02</i>
<i>Polymer for Polymer Overlay Systems .....</i>	<i>909.13</i>
<i>Rapid Setting Patch Materials .....</i>	<i>901.07</i>

*All aggregate shall be delivered to the project site in sealed waterproof bags or containers.*

**CONSTRUCTION REQUIREMENTS**

**738.03 Quality Control**

*Prior to beginning work, the Contractor shall prepare a QCP detailing the construction of the polymer overlay system. The QCP shall be approved by the manufacturer of the polymer materials and be documented with the manufacturer's signature on the QCP approval page. Any deviations from the application prescribed by this specification shall be explained in the QCP. Once the QCP has been approved by the manufacturer, it shall be submitted to the Engineer.*

*The QCP shall include:*

- (a) a current copy of ISO 8502-3, Tests for the Assessment of Surface Cleanliness,*

- (b) all materials proposed to be used including product data sheets,*
- (c) all equipment proposed to be used,*
- (d) all verification testing equipment to be used,*
- (e) application procedures,*
- (f) minimum and maximum air and deck surface temperatures for which work will occur,*
- (g) proposed schedule for, and means of, traffic control,*
- (h) methods to be used for patching and crack repair,*
- (i) methods to be used for surface preparation and application of the polymer overlay system,*
- (j) any other information the Contractor believes relevant and will help the Engineer in their review of the submitted QCP.*

*No work shall begin until the Engineer has signed the QCP.*

#### **738.04 Equipment**

*Equipment shall be in accordance with the following.*

##### **(a) Concrete Surface Preparation Equipment**

*Concrete surface preparation equipment shall consist of shot-blasting equipment that can remove the existing surface texture and generate the required surface macrotexture in accordance with 738.05. The shot-blasting equipment shall be equipped with oil and moisture traps.*

*On a bridge deck, the concrete surface shall be removed up to the vertical face of bridge railings or barriers and to the edge of transverse bridge joints. If the equipment specified in this section for surface preparation is not capable of removing the concrete surface in these areas, hand tools or other equipment may be proposed in the QCP for use by the Contractor.*

*The blasting medium for shot blasting shall be steel shot. No substitutions will be allowed.*

*The residue generated by the surface preparation shall be contained, removed, and disposed of in accordance with 202.*

##### **(b) Air Compressor**

*When compressed air is used, it shall be free from oil and moisture contamination in accordance with ASTM D4285. Cleanliness of the compressed air shall be verified by using either an absorbent or non-absorbent white collector material positioned a maximum*

*of 24 in. from the air discharge point, centered in the compressed air stream. Compressed air shall discharge onto the collector material a minimum of 1 minute. The Contractor and Engineer shall jointly visually examine the collector material for the presence of oil or water. The Engineer will be the final authority in case of disagreement on the presence of oil or water. Verification of the cleanliness of the compressed air shall be performed a minimum of one time per shift for each air compressor in operation. If contamination is observed on the collector material, that air compressor shall not be used until necessary repairs are made to the unit so clean, dry air is achieved. All work performed since the previous cleanliness verification shall be examined to determine if the work area has been contaminated. If contaminated, the affected work area shall be re-shot blasted to remove the contamination.*

***(c) Polymer Mixing and Distribution Equipment***

*Polymer mixing and distributing equipment shall, at a minimum, consist of a truck-mounted, temperature-controlled polymer mixing and distribution system capable of accurately blending the resin and hardening components of the polymer system. The mixing and distributing system shall include thermostat heating element-controlled mixing capability. Each component of the polymer shall be in a tote made of a translucent material and shall be supplied by a pump. Wheelbarrows shall not be used as a polymer mixing and distribution system.*

*The amount of the resin and hardener components shall be continuously and independently measured with flow meters prior to mixing. Mixing shall be in-line and produce a continuous stream of mixed polymer at the manufacturer's required proportioning prior to exiting the dispensing nozzle. The mixing equipment may be either a truck mounted mechanical mixer or the material may be mixed by a static mixer contained in the wand applicator.*

***1. Hand Applications***

*Notched squeegees with 3/16 in. deep notches and 1/2 in. nap rollers shall be used to distribute the mixed polymer.*

***2. Mechanical Applications***

*The mixing equipment and distribution system shall automatically and accurately proportion the components in accordance with the manufacturer's recommendations, mix, and continuously apply the mixed polymer uniformly and accurately to the work area at the specified rate.*

***(d) Aggregate Distribution Equipment***

*The aggregate distribution system shall consist of a truck-mounted air-blown pneumatic spreader using oil-free compressed air in accordance with 738.04(b). The spreader shall apply the aggregate to the surface in a uniform manner. Chip spreaders, salt spreaders, or other rotary-type spreaders shall not be used.*

***738.05 Preparation of Concrete Surfaces***

***(a) Removal of Existing Polymer Overlay System from Concrete Surfaces***

*When an existing polymer overlay system is to be removed from concrete surfaces, the removal shall be performed with a milling machine affixed with a fine milling drum. The teeth spacing on the fine milling drum shall not exceed 5/16 in. Removal in areas that are inaccessible to the milling machine shall be performed by shot blasting, hand grinding, scarification, scabbling, or chipping using a maximum 30 lb chipping hammer.*

*Once the existing polymer overlay system has been removed, the resulting concrete surface shall be prepared in accordance with 738.05(b) if the concrete surface is to receive another polymer overlay system, or prepared in accordance with 722.06(b) if the concrete surface is to receive a concrete bridge deck overlay.*

***(b) Removal of Existing Concrete Surface***

*The existing concrete surface shall be removed with equipment in accordance with 738.04(a) until a macrotexture producing a concrete surface preparation, CSP, value of 7 in accordance with the International Concrete Repair Institute, ICRI, Guideline 310.2R, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair has been achieved. The Contractor shall provide a set of the CSP chips for the Engineer's use on the project. The CSP chip set shall remain the property of the Contractor.*

*Compressed air used for shot blasting activities shall be in accordance with 738.04(b).*

*After the existing concrete surface material has been removed, all remaining residue from the operation shall be gathered up with a vacuum system equipped with fugitive dust control devices that can remove all dust and other material not securely bonded to the concrete surface and discarded. The Contractor shall then sound the entire concrete surface and mark any areas to be repaired. All existing partial depth patches, delaminated areas, spalls, and breakouts shall be removed and repaired by partial depth patching in accordance with 722.07, except that the patching materials used shall be in accordance with the following:*

- 1. Rapid setting patch materials shall be used for patching areas that are 2 1/2 in. or deeper as measured from the prepared concrete surface. The rapid setting patch material selected shall have written approval from the manufacturer that there are no compatibility issues between the polymer overlay system materials and the rapid setting patch materials.*
- 2. If the patch depth is less than 2 1/2 in. from the prepared concrete surface either the polymer material or rapid setting patch materials may be used for patching.*

*Patches shall be cured for the longer of the minimum times required by either the manufacturer of the rapid setting patch material or the manufacturer of the polymer materials, prior to performing any additional surface preparation activities or installing a polymer overlay system.*

Type I-A joints shall be cleaned, and all existing joint sealing material shall be completely removed. If the repair is 2 1/2 in. or deeper as measured from the prepared concrete surface, rapid setting patch materials shall be used and allowed to fully cure prior to applying the polymer overlay system. If the depth of repair is less than 2 1/2 in., the repair may be made at the time of the polymer overlay system installation using the polymer material proportioned in accordance with the manufacturer's instructions.

Once all deleterious material has been removed and areas 2 1/2 in. and deeper have been patched, the Engineer will sound the entire concrete surface. When the Engineer is satisfied that all deleterious material has been removed and patches and repaired areas are sound, the Contractor shall proceed with shot blasting all patched and repaired areas with steel shot using equipment in accordance with 738.04(a) until a macrotexture producing CSP value of 7, has been achieved. Sand blasting shall not be used in place of shot blasting.

The concrete surface shall be cleaned with a vacuum system equipped with fugitive dust control devices that is capable of removing all dust and all other material not securely bonded to the concrete surface. Mechanical brooms, without water or vacuuming, shall be used to remove any residual dust or material that adheres to the prepared concrete surface after it has been vacuumed. After brooming is performed, the concrete surface shall be vacuumed again to remove the last remaining residual dust and loose material. The entire concrete surface shall be completely free of asphalt material, oil, dirt, rubber, curing compounds, paint carbonation, laitance, weak surface mortar, traffic marking materials, and other potentially detrimental materials, which may interfere with the bonding or curing of the polymer overlay system.

Pretreatment for cracks in accordance with the manufacturer's recommendations shall be incorporated into the installation of the polymer overlay system. The material used in the pretreatment of cracks shall be in accordance with the manufacturer's recommendations and specifications.

### **738.06 Surface Cleanliness Verification Testing**

After the final surface preparation has been completed and immediately before application of the polymer overlay system, the cleanliness of the prepared concrete surface shall be verified by testing in accordance with ISO 8502-3. The testing criteria shall be as follows:

Sample Size	Frequency	Minimum Requirements (Class size)
Each bridge span or concrete surface less than 600 sq yd in area	1 test patch per 100 sq yd area	Average of tests not more than class 2 with no single test patch greater than class 3.
Each bridge span or concrete surface 600 sq yd and greater in area	6 per 600 sq yd area	Average of tests not more than class 2 with no single test patch greater than class 3.

*Testing shall be performed in the presence of the Engineer and a copy of ISO 8502-3 shall be provided to the Engineer so the Engineer may determine the class. If the surface cleanliness verification test results in an average class greater than that shown in the table above, the entire concrete surface shall be cleaned again with a vacuum system or mechanical broom and a vacuum system in accordance with 738.04(b) and retested until the concrete surface is clean enough to yield an average class result in accordance with the requirements shown in the table above.*

### **738.07 Applying the Polymer Overlay System**

*Patching and cleaning operations shall be inspected and approved prior to applying each layer of the polymer overlay system. Any contamination of the concrete surface or intermediate polymer overlay system courses, after initial cleaning, shall be removed. Both courses of the polymer overlay system shall be applied within 24 hours following the final cleaning and prior to opening the area to traffic.*

#### **(a) Environmental Condition Requirements**

##### **1. Surface Moisture**

*A self-calibrating electrical impedance meter meeting the requirements of ASTM F2659 shall be used to check surface moisture on the concrete surface. The brand and model of the meter as well as manufacturer specification sheets showing compliance with ASTM F2659 shall be included in the QCP.*

*Immediately prior to beginning application of the polymer overlay system, surface moisture readings shall be taken at six locations per bridge span. Three locations shall be within 1 ft of the bridge railing on the low side of the cross slope spaced throughout the span and the other three shall be located within a lane between the typical wheel paths in the span. If the polymer overlay system is being applied to the RCBA or another concrete surface, four surface moisture readings shall be taken on each RCBA or other concrete surface. Two locations shall be within 1 ft of the outside edge of the RCBA or other concrete surface and the other two shall be located within a lane between the typical wheel paths in the span. The meter shall be calibrated before taking any readings at the first location. Thereafter, the meter shall again be calibrated before taking any readings at a new location on the bridge or RCBA. All readings shall be 4.0% moisture content or lower in order to begin application of the polymer overlay system. No visible moisture shall be present on the prepared concrete surface or patch material at the time of application of the polymer overlay system. Compressed air in accordance with 738.04(b) may be used to dry the concrete surface.*

##### **2. Weather Limitations**

*Polymer overlay materials shall be applied when the temperature of the concrete surface is between 50°F and 100°F and the ambient temperature is forecast to be 50°F and rising within 8 h of application. Materials shall not be applied on a wet surface when surface moisture readings taken on the deck exceed 4.0%, or when rain is forecast within 12 h of beginning the application.*

#### **(b) Application Verification Rate Requirements**

The Contractor shall verify the volume of polymer overlay being applied by performing volume measurements at 25 ft intervals as measured along the longitudinal length of the concrete surface. This shall be done by marking the resin and hardener component tote levels in permanent marker concurrent with the completion of a 25 ft longitudinal length section of concrete surface. Marking of the resin and hardener component tote levels shall continue every 25 ft of completed concrete surface length as work progresses. Volume of each 25 ft section shall then be calculated and logged based upon the height between marks and the actual tote length and width. Actual volume applied for each 25 ft section shall be logged per course of polymer overlay. The actual volume shall be divided by the actual area of coverage, 25 ft x width, in order to verify quantity applied meets or exceeds the minimum rates shown in the table below. Volumes utilized and calculations shall be logged by the Contractor with station information for each section and provided to the Engineer.

Course	Rate, gal./100 sq ft	Aggregate, lbs/sq yd*
1	No less than 2.5	No less than 10
2	No less than 5.0	No less than 14
* Aggregate application shall be of sufficient quantity to completely cover the polymer.		

### **(c) Mixing, Application, and Curing**

The polymer course and the aggregate course shall be applied in two separate operations in accordance with the following rates of application.

#### **1. Polymer**

Both the resin and hardener components of the polymer shall have a temperature of 75°F or higher at the time of mixing and application. Handling and mixing of the polymer resin and hardening components shall be performed in a manner to achieve the desired results in accordance with these specifications and the manufacturer's recommendations as approved or directed by the Engineer. Polymer overlay systems shall not be applied when weather or surface conditions are such that the material cannot be properly handled, applied, spread, and cured within the specified requirements or cure time and traffic control.

After the polymer mixture has been prepared, it shall be immediately and uniformly applied to the entire concrete surface using one of the following application methods. The rate of application for each course shall be verified by using the application verification rate requirement in accordance with 738.07(b). The distribution system, or distributor, shall apply the mixed polymer uniformly and accurately to the work area at the specified rate. The viscosity of the polymer shall be such that a uniform thickness is maintained during curing and ponding along the railing or other low points does not occur.

#### **a. Hand Application**

Notched squeegees and rollers in accordance with 738.04(c)1 shall be used to control and ensure the application of a uniform thickness of the polymer overlay. Flat squeegees shall not be used.

#### **b. Mechanical Application**

Placement of the polymer overlay system using mechanical means shall be performed by equipment in accordance with 738.04(c)2. The operation shall proceed in such a manner that does not allow the mixed polymer to segregate, dry, be exposed, or otherwise harden or set in a way as to impair the retention and bonding of broadcasted aggregate.

## **2. Aggregate**

Dry aggregate shall be applied immediately after applying the polymer to the prepared surface. The aggregate shall be applied in such a manner as to cover the entire surface in excess within 5 minutes of polymer placement.

## **3. Curing**

The Contractor shall plan and prosecute the work to provide the following minimum curing periods, or other longer minimum curing periods if prescribed by the manufacturer.

The deck temperature shall be taken immediately prior to placing the polymer overlay system. This deck temperature reading shall be the one used in the curing table below to obtain the required minimum curing time. The polymer overlay system shall be cured in accordance with the curing table below and based on the manufacturer's requirements prior to vacuuming and brooming the finished surface.

The minimum curing periods shall be as follows:

Course	Minimum Cure Time by Deck Temperature, °F							
	50 - 54	55 - 59	60 - 64	65 - 69	70 - 74	75 - 79	80 - 84	≥ 85
1	7 1/2 h	5 1/2 h	4 h	3 h	2 1/2 h	2 h	1 1/2 h	1 h
2	11 h	8 1/2 h	6 1/2 h	5 h	4 h	3 h	3 h	2 h

Traffic or equipment shall not be allowed on the polymer overlay system surface during the curing period. The Contractor shall minimize all foot traffic on the uncured polymer overlay system and ensure that any foot traffic will only be done with steel spiked shoes approved by the Engineer. After the first course curing period, all loose aggregate shall be removed by vacuuming or brooming, without tearing or damaging the surface. Then the next course of polymer shall be applied to completion. All loose aggregate from both the first and second courses shall be discarded and not reused in the polymer overlay system.

A surface having received only the first course application of aggregate shall not be opened to traffic.

### **738.08 Joints and Raised Pavement Markers**

Unless otherwise specified by the Engineer, the polymer overlay system shall not be applied over expansion joints or raised pavement markers. Expansion joints and raised pavement markers shall be coated with a bond breaker or covered using an approved tape that can adequately seal the joints and markers from the polymer. Duct tape may be used to delineate application areas. All taped areas or bond breakers shall be removed before the polymer fully cures.



*The Type I-A joint gap shall be reestablished by saw cutting and sealing in accordance with 609.05 after both courses of the polymer overlay system have been applied and cured.*

*In the event saw cutting for the Type I-A joint damages or mars the top surface of the polymer overlay system, damaged areas shall be removed by saw cutting in rectangular sections to the top of the deck surface and reapplying the polymer overlay system courses in accordance with this specification.*

### **738.09 Required Records**

*For all materials provided, the Contractor shall maintain and provide records to the Engineer including but not limited to, the following:*

- 1. Batch numbers and sizes.*
- 2. Location of batches as applied to the concrete surface, referenced by stations.*
- 3. The calculated rate of application for each 25 ft length of concrete surface for each course.*
- 4. Batch time, gel time.*
- 5. Temperature of the air, concrete surface, polymer resin and hardener components, and aggregates.*
- 6. Loose aggregate removal time.*
- 7. Time opened to traffic.*

### **738.10 Opening to Traffic**

*The polymer overlay system may be opened to traffic after meeting all cure time requirements for both courses in accordance with 738.07(c)3 and all other manufacturer's requirements.*

### **738.11 Temporary and Permanent Pavement Markings**

*Temporary pavement marking tape, Type I, used on portions of the completed polymer overlay system shall be installed per the manufacturer's recommendations and shall be firmly pressed into place to provide adequate bond to the exposed aggregate surface.*

*Retro-reflectivity testing will not be required on concrete surfaces where a polymeric overlay system has been applied.*

*Heat-bonded pavement markings or temporary paint pavement markings shall not be used on any portions of the polymer overlay system.*

### **738.12 Final Clean Up**

*If directed by the Engineer, at the end of the project or a minimum of 7 days after the polymer overlay system has fully cured, all loose aggregate that has shed shall be removed by vacuuming or brooming and not re-used. In addition, if the visibility of the recently applied pavement markings has been reduced due to adherence to loose aggregate, they shall be reapplied.*

### **738.13 Performance Warranty**

#### **(a) General**

*The Contractor shall be responsible for and guarantee the performance of the polymer overlay system that has been applied to the bridge deck surface, as defined herein, for a period of three years after the initial acceptance date defined in 738.13(b)4. The Contractor shall warrant to the Department that the warranted work will be free of defects as measured by the condition parameters in 738.14(c)1 and not exceed the specified threshold values for each.*

*The performance warranty requirements for the polymer overlay system will not apply to an RCBA or other surfaces outside of the limits of the bridge deck surface.*

*The performance warranty and its provisions shall not be construed as extending or otherwise affecting the claim process and statute of limitations otherwise applicable to this contract.*

#### **(b) Definitions**

*The following definitions shall apply.*

- 1. Bridge Deck Surface. The surface area contained within the out-to-out of coping width dimension and end-to-end of bridge floor length dimension. Items with raised vertical faces such as but not limited to bridge railings, sidewalks, curbs, median curbs, and barriers will not be considered part of the bridge deck surface for purposes of this specification.*
- 2. Conflict Resolution Team, CRT. A group consisting of five individuals whose sole responsibility is to provide a decision on disputes between the Department and the Contractor regarding application or fulfillment of the warranty requirements. The CRT is described in more detail in 738.15.*
- 3. Delamination. Debonding of the polymer overlay system from the existing bridge deck surface.*
- 4. Initial Acceptance Date. The same date as the date of substantial completion in accordance with 101.64. This date will be considered the start of the warranty period.*

*Alternatively, when the completion date shown on the proposal page is more than one year later than the completed overlay and all work has been completed on a bridge such that it is open to unrestricted traffic, the Contractor may submit a written request to the Engineer for the warranty period to start. The Engineer will approve in writing within 14 calendar days provided all applicable contract requirements have been met and no initial issues have been observed. Any subsequent*

*construction activity by the Contractor on a bridge where the warranty has started will void the requested warranty start date. Either a new warranty start date shall be requested or the warranty start date will revert to the substantial completion date.*

5. Scaling. *Worn polymer overlay system surface with loss of epoxy and aggregate resulting in a reduction in thickness of the polymer overlay system greater than 20% of the initial overlay thickness.*
6. Spalling. *Broken or missing pieces of the polymer overlay system.*
7. Warranted Work. *The work product, polymer overlay system, that is guaranteed not to fall outside the specified thresholds of the condition parameters as defined in 738.14(c)1 during the warranty period.*
8. Warranty Period. *The three-year period of time the Contractor is required to ensure the performance of the polymer overlay system meets or exceeds the minimum specified threshold condition parameters as defined in 738.14(c)1.*
9. Warranty Work. *Corrective actions or remedial actions performed by the Contractor during the warranty period to bring the warranted work back into compliance with the specifications. All costs of warranty work shall be borne by the Contractor including traffic control, mobilization/demobilization, materials, pavement markings, and other incidental work and items. For purposes of this specification, the terms warranty work, corrective action, and remedial action are all interchangeable and shall have the same meaning.*

#### **738.14 Warranted Conditions and Warranty Work**

*The warranty period shall start as defined in 738.13(b)4.*

##### **(a) Warranted Elements**

*For the warranty period, the Contractor shall ensure that the polymer overlay system that is applied to the bridge deck surface performs as intended and none of the thresholds for condition parameters in 738.14(c)1 are exceeded at any time during the warranty period.*

##### **(b) Evaluation Method**

*The Department will monitor and conduct polymer overlay system evaluations for each bridge deck surface throughout the warranty period by means of the Indiana Bridge Inspection Application System in accordance with the National Bridge Inspection Standards. Evaluations will consist of regular field condition reviews conducted by Department personnel. The Department will be responsible for notifying the Contractor, in writing, of any condition parameters that exceed threshold limits defined herein. The Department reserves the right to conduct impromptu inspections to evaluate the performance of the warranted polymer overlay system. The Contractor shall not be*

*relieved of any responsibility based upon a claim that the Department failed to adequately monitor the structure or to report its findings to the Contractor.*

***(c) Warranty Work***

*Warranty work will be required when a threshold limit for a condition parameter identified in the Thresholds for Condition Parameters Table in 738.14(c)1 has been exceeded. All warranty work shall be in accordance with the 738 specifications.*

*During the warranty period, warranty work shall be performed at no cost to the Department and shall be based on evaluations of the condition parameters in 738.14(c)1. Upon written notification from the Department that warranty work is required, the Contractor shall submit a written course of action for performing needed warranty work for approval a minimum of 10 days prior to the desired start date. If the Contractor disputes the findings, written notification of the dispute shall be provided within 30 days of the date of the notification from the Department. Warranty work shall be performed no later than October 1 of the year of Department notification. Warranty work to be performed and materials to be used will be the joint decision of the Department and the Contractor.*

*The Department will review the Contractor's proposal for time, methods, and traffic control to perform warranty work. No warranty work shall proceed until the Contractor has been issued written permission to proceed from the Engineer. The Department will be the sole decider whether warranty work performed by the Contractor meets the contract specifications. If warranty work performed by the Contractor necessitates repair of adjacent lanes or roadway shoulders, or reapplication of pavement markings, the required work and corresponding costs shall be the responsibility of the Contractor.*

*Coring, milling, grinding, or other destructive procedures shall not be performed by the Contractor without prior written approval from the Department. If the Contractor elects to conduct any independent testing, both destructive and non-destructive, the equipment shall be calibrated and correlated with the Department's equipment.*

*The Contractor will not be responsible for damages to the pavement as a result of coring, milling, grinding, or other destructive procedures conducted by the Department.*

*During the warranty period, the Contractor will not be held responsible for polymer overlay system distresses including but not limited to chemical and fuel spills, vehicle fires, structural repairs requiring deck patching, removal or replacement, and quality assurance testing such as coring. However, the Contractor shall be responsible for wear or damage by snowplow blades and other winter maintenance operations.*

*Other factors considered to be beyond the control of the Contractor which may contribute to polymer overlay system distress will be considered by the Engineer on a case-by-case basis upon receipt of a written request from the Contractor.*

***1. Condition Parameters***

*Condition parameters identified in the table below will be used to determine the performance of the polymer overlay system during the warranty period. Each condition*

*parameter has a threshold limit applied to each structure and a maximum percentage of defects allowed before warranty work or corrective action is required.*

*If one or more of the following threshold limits for condition parameters listed in the table below is exceeded, warranty work will be required and shall be performed. Warranty work shall be performed prior to conclusion of the warranty period or within such other time frame as agreed to between the Department and the Contractor unless conditions dictate otherwise.*

<i>Thresholds for Condition Parameters</i>	
<i>Condition Parameter</i>	<i>Threshold Limits per Surface Area for Each Structure*</i>
<i>Spalling</i>	<i>0.5% or 15 sq ft, whichever is less</i>
<i>Scaling</i>	<i>1.0%</i>
<i>Delamination</i>	<i>1.0%</i>
<i>* once exceeded, warranty work shall be performed</i>	

*The defective areas of the polymer overlay system may or may not be contiguous to necessitate warranty work. The Contractor shall ensure any warranty work requiring removal or replacement is made at a sufficient depth to restore the integrity of the polymer overlay system surface.*

## **2. Corrective Actions**

*The Contractor shall perform the work necessary to repair all deficiencies associated with the warranted condition parameters. The Department will accept the listed corrective action if the action addresses the cause of the condition parameter as listed in the Thresholds for Condition Parameters Table in 738.14(c)1. The Contractor may use an alternative corrective action subject to Department approval.*

<i>Corrective Actions</i>	
<i>Condition Parameter</i>	<i>Recommended Corrective Action</i>
<i>Spalling</i>	<i>Repair with polymer overlay system of equal thickness and durability as the original overlay.</i>
<i>Scaling</i>	
<i>Delamination</i>	<i>Sound overlay to determine extent of delamination. Remove damaged polymer overlay, and repair with polymer overlay system of equal thickness and durability as the original polymer overlay system.</i>

### **738.15 Conflict Resolution Team**

*If a dispute arises on the application or fulfillment of the terms of this performance warranty, either party may serve written notice that the appointment of a CRT is necessary.*

*The CRT will consist of five members:*

- (a) two members selected and fully compensated by the Department,*
- (b) two members selected and fully compensated by the Contractor, and*

- (c) *one member mutually selected by the Department and the Contractor. Full compensation for the third-party member will be equally shared by the Department and the Contractor.*

*The CRT members will be identified in writing when needed and will be knowledgeable in the terms and conditions of this performance warranty, specification, and the methods used in evaluating the overlay condition. The CRT will render a final recommendation to the Chief Engineer by a majority vote. Each member has an equal vote.*

#### **738.16 Department Maintenance**

*The Department will retain the right to perform, and may perform, routine maintenance operations during the warranty period including, but not limited to, plowing, applying de-icing chemicals, repairs to safety appurtenances, pavement markings, mowing, and sign maintenance. The Department, during the warranty period, will perform no routine bridge surface maintenance activities.*

*Routine maintenance performed by the Department will not diminish the Contractor's responsibilities under this warranty.*

#### **738.17 Method of Measurement**

*Removal of the existing polymer overlay system will be measured by the square yard of deck area regardless of the number of passes with the milling machine.*

*The accepted quantities of the warranted polymer overlay system for bridge decks will be measured by the square yard. The accepted quantities of the polymer overlay system applied to an RCBA or other concrete surfaces will be measured by the square yard. Partial depth patching will be measured by the square foot. Pavement markings, temporary and permanent, will be measured in accordance with 801.17 and 808.12, respectively.*

*Rapid setting patch materials used for patching concrete for partial depth patching will not be measured. Polymer material used for partial depth patching will not be measured. Construction or repairs to Type I-A joints will not be measured.*

#### **738.18 Basis of Payment**

*Removal of the existing polymer overlay system will be paid for at the contract unit price per square yard of bridge deck, remove existing polymer overlay system.*

*Warranted polymer overlay systems for bridge decks will be paid for at the contract unit price for warranted polymer overlay, bridge deck. Polymer overlay systems applied to the RCBA or other concrete surfaces will be paid for at the contract unit price for polymer overlay, other concrete surface. Partial depth patching will be paid for at the contract unit price per square foot as bridge deck patching, partial depth, in accordance with 722.16. Pavement markings, temporary and permanent, will be paid for in accordance with 801.18 and 808.13, respectively.*

*Payment will be made under:*

**Pay Item**

**Pay Unit Symbol**

<i>Bridge Deck, Remove Existing Polymer Overlay System .....</i>	<i>SYS</i>
<i>Polymer Overlay, Other Concrete Surface .....</i>	<i>SYS</i>
<i>Warranted Polymer Overlay, Bridge Deck.....</i>	<i>SYS</i>

*The cost of removing an existing polymer overlay system by shotblasting or other acceptable means in areas adjacent to the curb or areas otherwise inaccessible to the power-operated mechanical milling machine shall be included in the cost of bridge deck remove existing polymer overlay system. The cost of disposing of overlay removal residue, including water, dust, concrete, polymer, and incidentals shall be included in the cost of bridge deck remove existing polymer overlay system.*

*The cost of hand-chipping, removal of unsound concrete, preparation of cavity surfaces, furnishing and applying bond coat or polymer resin adhesive as required, furnishing and placing rapid setting patch materials used as patching concrete, furnishing and placing polymer materials used for patching, and necessary incidentals shall be included in the cost of bridge deck patching, partial depth.*

*The cost of all re-cleaning of suspect areas or verification through tests that the altered cleaning method is acceptable shall be included in the cost of the pay items of this section.*

*All costs associated with cleaning the concrete surface by shot blasting, milling, mechanical brooming, vacuuming, sounding, verification testing, removal of any joint or crack sealants, removal of excess aggregate, warranting the performance of the two-coat polymer overlay system on a bridge deck surface, keeping and furnishing records, removal and disposal of all waste materials, and furnishing all equipment, labor, materials, and incidentals to perform the work described herein shall be included in the cost of the warranted polymer overlay, bridge deck or polymer overlay, other concrete surface pay items.*

*The cost of all labor and materials for the placement or repair of Type I-A joints shall be included in the cost of the warranted polymer overlay,-bridge deck pay item.*

*The cost of returning a minimum of 7 days after work is completed and cleaning up loose aggregate and reapplying pavement markings shall be included in the cost of the pay items of this section.*

### **738.19 Final Warranty Acceptance**

*At the end of the warranty period, the Engineer will review the project in the field for the presence of any of the condition parameters in 738.14(c)1 and, provided none are observed, will recommend a Final Warranty Acceptance. The Department will issue the Contractor a Final Warranty Acceptance letter upon completion of the warranty period and all required remedial work.*

SECTION 904, AFTER LINE 165, INSERT AS FOLLOWS:

#### **(h) For Polymer Overlay System**

*Fine aggregate for all layers of the polymer overlay system shall be selected from the Department's QPL of Polymers and Aggregates for Overlay Systems and shall be comprised of one of the following:*

1. Aluminum oxide
2. Basalt
3. Calcined bauxite
4. Crushed granite
5. Flint
6. Glacial gravel
7. Rhyolite.

*The aggregate shall also be in accordance with 904.02, shall be clean and dry, and free of dirt, clay, asphalt, and other foreign or organic materials, and shall comply with the following properties.*

<i>Physical Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Fine Aggregate Angularity (min.)</i>	<i>AASHTO T 304, Method A</i>	<i>45</i>
<i>Micro-Deval abrasion loss, % (max.)</i>	<i>ASTM D7428</i>	<i>11.0</i>
<i>Moisture content, % (max.)</i>	<i>AASHTO T 255</i>	<i>0.2</i>

*The aggregate gradation shall be as follows.*

### **1. Basalt Aggregate Gradation**

*Basalt aggregate gradation shall be in accordance with either the polymer overlay system manufacturer's gradation recommendation or shall meet the following gradation:*

<i>Sieve Sizes</i>	<i>% Passing by Weight</i>
<i>No. 4 (4.75 mm)</i>	<i>100</i>
<i>No. 8 (2.36 mm)</i>	<i>30 to 75</i>
<i>No. 16 (1.18 mm)</i>	<i>1 to 5</i>
<i>No. 30 (600 μm)</i>	<i>0 to 1</i>

### **2. Gradation of Other Aggregates**

*Aluminum oxide, calcined bauxite, crushed granite, flint, glacial gravel, or rhyolite shall be in accordance with either the polymer overlay system manufacturer's gradation recommendation or shall meet the following gradation:*

<i>Sieve Sizes</i>	<i>% Passing by Weight</i>
<i>No. 4 (4.75 mm)</i>	<i>95 to 100</i>
<i>No. 6 (3.35 mm)</i>	<i>70 to 85</i>
<i>No. 10 (2 mm)</i>	<i>15 to 35</i>
<i>No. 20 (850 μm)</i>	<i>0 to 3</i>

### **(hi) Sizes of Fine Aggregates**



SECTION 904, BEGIN LINE 169, INSERT AS FOLLOWS:

**(j) Sampling and Testing**

Sampling and testing shall be conducted in accordance with the following AASHTO, *ASTMs*, and ITMs.

SECTION 904, AFTER LINE 182, INSERT AS FOLLOWS:

*Resistance of Fine Aggregate to Abrasion/Micro-Deval\* .....ASTM D7428*

SECTION 904, BEGIN LINE 379, INSERT AS FOLLOWS:

**904.07 Exceptions to AASHTO and ASTM Standard Methods**

SECTION 904, AFTER LINE 440, INSERT AS FOLLOWS:

**(f) Exceptions to ASTM D7428**

Modify section 8.2 of ASTM D7428. Aggregate for the test sample will consist of material passing the 4.75 mm sieve and retained on the 1.18 mm sieve. An oven dried sample of 500 ±5 g will be prepared as follows:

<i>Passing</i>	<i>Retained</i>	<i>Mass</i>
<i>No. 4 (4.75 mm)</i>	<i>No. 8 (2.36 mm)</i>	<i>250 g</i>
<i>No. 8 (2.36 mm)</i>	<i>No. 16 (1.18 mm)</i>	<i>250 g</i>

SECTION 909, AFTER LINE 411, INSERT AS FOLLOWS:

**909.13 Polymer for Polymer Overlay Systems**

The polymer shall be in accordance with the following criteria in order to be included on the Department's QPL for Polymers and Aggregates for Overlay Systems. The polymer shall be a two-component material consisting of a resin base and hardener in accordance with ASTM C881, Type III, Grade 1, Class C and the table below.

<i>Property</i>	<i>Test Method</i>	<i>Value</i>
<i>Epoxide equivalent</i>	<i>ASTM D1652</i>	<i>270 max.</i>
<i>Gel Time, minutes</i>	<i>ASTM C881, modified (70 ml sample in unwaxed paper cup)</i>	<i>15 to 45 at 75°F (23.9°C)</i>
<i>Tensile strength</i>	<i>ASTM D638</i>	<i>13.8 MPa (2,000 psi) at min. of 7 days of cure time</i>
<i>Tensile elongation</i>	<i>ASTM D638</i>	<i>30 to 70 % at max. of 24 h of cure time</i>
<i>Water absorption</i>	<i>ASTM D570</i>	<i>0.50 % max. increase by weight</i>
<i>Viscosity</i>	<i>ASTM D2196 (Spindle No. 3 at 20 RPM)</i>	<i>15 ±5 poise</i>
<i>Compressive strength at 3 h, minimum</i>	<i>ASTM C579, Method B, modified to be reported at 3 h</i>	<i>1,000 psi</i>
<i>Compressive strength at 24 h, minimum</i>	<i>ASTM C579, Method B, modified to be reported at 24 h (With plastic inserts. Aged in air at a temperature of 73 ±4°F)</i>	<i>5,000 psi</i>

<i>Volatile content</i>	<i>ASTM D1259, Method B for mix system</i>	<i>Report the values</i>
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