Reviewer Guidance:

See Section 2.3 Black beauty type aggregate material could be acceptable if the core team favors that look. Light colored aggregates are readily available and the cost differential is not significant. Also option to switch to High Friction (HFST) aggregate pending safety Benefit/Cost ratio analysis performed by District Traffic staff. See Roadway Non Standard JSP 15-13 to reference aggregate requirements and surface friction test.

See Section 4.1.2.2 – 4.1.2.6 are optional requirements to have in JSP pending concern of primer loss with reflective deck crack size at the precast panels joints during scoping of overlay.

METHYL METHACRYLATE (MMA) SLURRY POLYMER CONCRETE OVERLAY 9/3/19

**1.0 Description.** This work shall consist of constructing a wearing surface of polymer concrete on a prepared surface in accordance with these specifications as shown on the plans or as directed by the engineer. Polymer concrete shall be composed of the following components – primer, polymer overlay components and broadcast sand or aggregate and top coat in accordance with this special provision and the manufacturer/supplier’s recommendations.

**1.1 Preapproved Products.** The following materials have been preapproved for use under this specification: Transpo T-18 Thin Overlay and SterlingLloyd Bridgemaster.

**1.2 Required Experience.** The contractor shall have experience placing similar thin polymer overlay systems on at least three structures prior to performing work on this project. Written proof of this experience along with project contacts shall be provided to the engineer in writing for approval prior to the preconstruction meeting. Prior to installation of the overlay, the contractor shall also provide certification by the material supplier that the contractor is a trained and qualified installer of the selected overlay system.

**2.0 Materials.**

**2.1 Primer.** The prepared surface shall receive a wax-free, low odor methacrylate prime coat. The primer shall meet the following requirements:

| **Methacrylate Primer** | | |
| --- | --- | --- |
| **Property** | **Requirement** | **Test Method** |
| Viscosity | 50 - 70 cps | ASTM D2393 |
| Density | 8 - 9 lb/gal (0.96 – 1.08 kg/L) | ASTM D2849 |
| Pot Life @ 70ºF (21°C) | 10 - 30 minutes | ASTM C881 |
| Flash Point | >43°F (>6°C) | ASTM D1310 |
| Solids Content (w/catalyst) | 100% | ASTM D1644 |

**2.2 Slurry System**. The slurry system shall be meet the following requirements:

| **Polymer Resin Binder** | | |
| --- | --- | --- |
| **Property** | **Requirement** | **Test Method** |
| Elongation at Break | 50 percent, minimum | ASTM D 638 Type 1 |
| Tensile Strength | 500 psi minimum and  900 psi maximum at 75° F | ASTM D 638 |
| Tensile Adhesion | 250 psi, minimum | ASTM C 1583 |
| Water Absorption | * 1. percent, @ 24 hours | ASTM D 570 |
| Volatile Content | 3 percent, max | ASTM D 2369 |

**2.3 Aggregates.** Only light-colored aggregate (i.e. flint rock or similar) that meets the requirements of Sec 1039 shall be used. No dark colored aggregate will be allowed (i.e. coal slag).

**2.3.1** All aggregates shall be furnished in appropriate packaging that is clearly labeled and protects the aggregate from any contaminates on the jobsite and from exposure to rain or other moisture.

**2.4 Top Coat.** A final methacrylate top coat shall be applied to lock the aggregate following broadcast and removal of loose aggregate. Top coat shall meet the following requirements:

| **Top Coat** | | |
| --- | --- | --- |
| **Property** | **Requirement** | **Test Method** |
| Viscosity | 200 – 400 cps | ASTM D2393 |
| Flash Point | >50ºF (>10°C) | ASTM D1310 |

**2.5 Mixing and Application Requirements.** Mixing and application requirements shall be in accordance with the manufacturer’s recommendations.

**2.6 Delivery of Materials.** All materials shall be delivered in their original containers bearing the manufacturer’s label and specifying date of manufacturing, batch number, trade name, and quantity. Each shipment shall be accompanied by a Material Safety Data Sheet (MSDS).

**2.7 Storage of Materials.** The material shall be stored to prevent damage by the elements and to ensure the preservation of their quality and fitness for the work. The containers shall be stored in a manner that will not allow leakage or spillage from one material to contact the containers or materials of the other. The storage space shall keep the materials clean and dry and shall contain a high-low thermometer. The temperatures of the storage space shall not fall below nor rise above that recommended by the manufacturer. Every precaution shall be taken to avoid contact with flame.

**2.7.1 Inspection.** Stored materials shall be inspected prior to their use and shall meet the requirements of this special provision at the time of use.

**2.7.2 Failure.** Any material which is rejected because of failure to meet the required tests or that has been damaged so as to cause rejection shall be immediately replaced at no additional expense to the Commission.

**2.7.2.1** Damaged or debonded areas of a slurry concrete overlay course shall be removed and repaired prior to acceptance. Repair shall consist of saw-cutting in rectangular sections to the top of the concrete deck surface and repairing using the same procedure called for in the specification. All repairs shall be at the contractor’s expense.

**2.7.3 Required Amount.** Sufficient material to perform the entire polymer concrete application shall be in storage at the site prior to any field application so that there shall be no delay in procuring the material for each day’s application.

**2.8 Training.** The contractor shall arrange to have the material supplier furnish technical service related to application of material and health and safety training for personnel who are to handle the materials.

**2.9 Technical Support.** The materials supplier shall have a representative onsite during the surface preparation and placement of the overlay. The material representative shall provide onsite consultation as Quality Control of the installation of the product, but the engineer will have final decision-making authority in all matters.

**3.0 Mix and Application Procedure.** The contractor shall prepare and submit all applicable mixing and application procedures to the engineer for approval prior to the preconstruction meeting. The contractor shall not begin ordering materials for application of the overlay until the mixing and application procedures are approved. All equipment and materials used in the mixing and application procedure shall be in accordance with the manufacturer’s requirements.

**3.1 Trial Area.** The contractor shall demonstrate their proficiency by preparing and placing the overlay on a 10 foot by 10 foot area (or approved equivalent area) prior to the placement of the production overlay. The engineer shall select the location of the trial area. Final overlay production shall not proceed without the approval of the engineer.

**4.0 Construction.**

**4.1 Surface Preparation.**

**4.1.1.1** The concrete surface shall be prepared in accordance with Sec 623.30 by shot blast method. Removal of pavement marking and other surface contaminants are to be considered part of the required surface preparation and basis of payment in section 6.0 of this special provision. Upon approval by the engineer, scarifiers or hand grinders may be used to aid in the removal of pavement marking and other surface contaminants, but shot blast will still be required for final acceptable surface preparation.

**4.1.1.2** Any patches encountered shall be completely removed to sound, natural concrete. Polymer concrete or other patching material, approved by the engineer, may be used to repair the deck. Surfaces of concrete patches shall be prepared in the same manner as the rest of the deck. Any new concrete or concrete patches shall cure a minimum of 28 days prior to application of overlay system.

**4.1.2.1 Deck Preparation.** The contractor shall submit in writing to the engineer for approval the deck preparation procedure. The contractor’s procedure shall include but not be limited to; equipment used for surface preparation and deck cleaning, shot size, rate of speed to achieve required profile and method of surface profile testing for Quality Control. The contractor shall note that there may be cracks, pop-outs or other irregularities in the deck surfaces. These irregularities may have been treated prior with a bituminous based crack sealer (i.e. Pavon Indeck). There is potential for residual sealer on the deck surfaces near these cracks. The deck preparation shall remove this material and any debris from the entire deck including: within tining grooves, deck grooves, gutter lines or any other areas that have trapped material. Removal shall be to the satisfaction of the engineer. The contractor shall be responsible to make note of the deck conditions prior to bidding.

**4.1.2.2** Deck shall be water blasted to clean out cracks and allowed to dry prior to priming.

**4.1.2.3** Before starting priming operations, all cracks shall be blown out with dry high pressure air.

**4.1.2.3** Reflective cracks or any open cracks greater than 0.06” shall be treated to keep the primer material from leaking through the joints of the deck panels below.

**4.1.2.4** All panel deck joints below open deck cracks greater than 0.06” shall be identified, mapped and sealed from below at the panel joints with a material resistant to effects of the deck primer to prevent leakage of the deck primer through the bridge deck.

**4.1.2.5** After sealing of the required deck panel joints from below, deck cracks above greater than 0.06” shall be prefilled with deck primer.

**4.1.2.6** After cracks greater than 0.06” are prefilled, a flood primer application shall be performed on the concrete surface to fill all other smaller and fine cracks.

**4.1.3 Existing Bridge Decks Containing Wearing Surface.** On existing concrete decks with an existing wearing surface, the wearing surface shall be removed prior to placing the polymer concrete. The exposed concrete surface shall be prepared in accordance with the requirements of section 4.1.2 of this special provision.

**4.2 Application of Prime Coat.** One coat of the primer coat shall be applied to the prepared concrete surfaces immediately before placing the overlay in accordance with the manufacturer’s recommended procedures. The prime coat shall be uniformly applied to completely cover the surface to receive the overlay. The area receiving the prime coat shall be dry and have had no exposure to any moisture within the past 24 hours. Prior to applying the prime coat, the surface shall be cleaned with compressed air to remove accumulated dust and any other loose material. Traffic shall not be allowed on the prepared surface prior to overlay placement.

**4.2.1 Surface Temperature.** The concrete bridge deck surface shall be between 45° F and 90° F when applying the prime coat.

**4.2.2 Relative Humidity.** The overlay system shall not be placed when the relative humidity is above 90 percent.

**4.2.3 Prime Coat Contaminated.** If the primed surface becomes contaminated, the contaminated area shall be cleaned by abrasive blasting and re-primed at no additional expense to the Commission.

**4.3 Placement of Overlay System.**

**4.3.1 Placement Time.** The overlay system shall be placed on the prime coat in accordance with the manufacturer’s recommendations but no later than two hours after placing the prime coat.

**4.3.2 Surface Temperature.** The surface temperature of the area to receive overlay system shall be the same as specified in section 4.2.1 of this special provision or as approved by the overlay manufacturer’s representative.

**4.3.3 Contamination.** The contractor shall prevent any cleaning chemicals from reaching the overlay system components during the mixing operation.

**4.3.4 Overlay Thickness.** The polymer concrete overlay shall be placed at a minimum thickness of 1/4 inch and a maximum of 3/8 inch.

**4.3.5.1 Broadcast Aggregate Application.** Dry aggregate shall be applied in such a manner as to cover the slurry mixture completely within 5 minutes of application. The dry aggregate shall be placed in a manner such that the level of the slurry mixture is not disturbed.

**4.3.5.2** Wet spots shall be covered with the aggregate prior to the gelling of the slurry resin binder.

**4.3.5.3** After the curing period, all loose aggregate shall be removed by brooming or vacuuming. Any loose aggregate reclaimed for reuse as broadcast aggregate shall be approved by the engineer. At a minimum, the reclaimed aggregate shall be screened and verified to be clean, uncontaminated and dry. All reclaimed aggregate shall be in accordance with the requirements in section 2.0 of this special provision.

**4.3.6 Top Coat Application.** The surface shall be dry, and the top coat shall not be allowed to puddle. Top coat shall be placed no later than two hours after the slurry overlay has cured. During the course of work, the contractor shall ensure that top coat is applied to all overlay areas prior to any forecasted rain events.

**4.3.7 Overlay System.** The primer, slurry or top coat shall not be permitted to run into drains. Unless otherwise specified, the overlay shall not be applied over the expansion joints and joint seals of the bridge deck. Prior to opening a section to public or construction traffic, the overlay shall be allowed to cure in accordance with the manufacturer’s recommendations. Surfaces with primer only shall not be opened to traffic. During primer, slurry and top coat applications, the contractor shall provide neat clean lines for staging, joints, obstacles or any break in production.

**4.4 Testing**. Bond testing shall be performed for each bridge placement per stage on each day. Testing will be conducted at three locations 24 hours after placement. Testing will be performed in accordance with ASTM C 1583. A passing test is the failure of the concrete substrate or bond strength above 250 psi. Tests shall not be performed if the deck temperature is above 90°F.

**4.4.1** All adhesion strength test areas, thickness test holes or any debonded areas shall be repaired by filling with overlay material before final acceptance.

**5.0 Method of Measurement.** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, the area of methyl methacrylate (MMA) slurry polymer concrete overlay will be measured to the nearest square yard of accepted, in-place overlay. The revision or correction will be computed and added to or deducted from the contract quantity.

**6.0 Basis of Payment.** Payment for the above described work, including all material, equipment, labor and any other incidental work necessary to complete this item, will be considered completely covered by the contract unit price for Methyl Methacrylate (MMA) Slurry Polymer Concrete Overlay.