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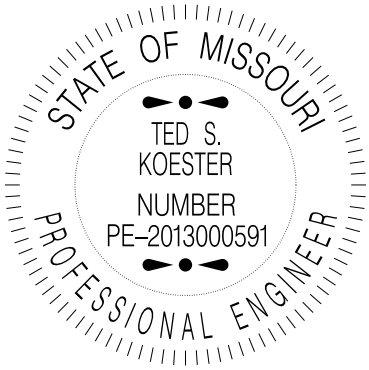

THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 W. CAPITOL AVE.
JEFFERSON CITY, MO 65101
Phone (888) 275-6636

If a seal is present on this sheet, JSP's has been electronically sealed and dated.

JOB NO. J8S3240
Greene County, MO
Date Prepared: 12/5/2023

Only the following items of the Job Special Provisions (Bridge) are authenticated by this seal: All

A. CONSTRUCTION REQUIREMENTS

1.0 Description. This provision contains general construction requirements for this project.

2.0 Construction Requirements. The plans and the asbestos and lead inspection report for the existing structure(s) are included in the contract in the bridge electronic deliverables zip file for informational purposes only.

2.1 In order to assure the least traffic interference, the work shall be scheduled so that a lane closure is for the absolute minimum amount of time required to complete the work. A lane shall not be closed until material is available for continuous construction and the contractor is prepared to diligently pursue the work until the closed lane is opened to traffic.

2.2 Bridge work by contractor forces, including erection, rehabilitation or demolition, shall not be allowed over traffic unless a bridge platform protection system is installed below the work area except for work performed above a deck that is intact. The protection system shall be capable of catching all falling objects such as tools, overhang brackets or materials. Lifting of objects that are heavier than the capacity of the bridge protection system shall not be permitted.

2.3 Qualified special mortar shall be a qualified rapid set concrete patching material in accordance with Sec 704. A qualified rapid set concrete patching material will not be permitted for half-sole repair, deck repair with void tube replacement, full depth repair, modified deck repair and substructure repair (formed) unless a note on the bridge plans specifies that a qualified special mortar may be used.

2.4 Provisions shall be made to prevent any debris and material from falling onto the roadway. If determined necessary by the engineer, any debris and material that falls below the bridge outside the previously specified limits shall be removed as approved by the engineer at the contractor's expense. Traffic under the bridge shall be maintained in accordance with the contract documents.

2.5 Any damage sustained to the remaining structure as a result of the contractor's operations shall be repaired or the material replaced as approved by the engineer at the contractor's expense.

2.6 Provisions shall be made to prevent damage to any existing utilities. Any damage sustained to the utilities as a result of the contractor's operations shall be the responsibility of the contractor. All costs of repair and disruption of service shall be as determined by the utility owners and as approved by the engineer.

3.0 Method of Measurement. No measurement will be made.

4.0 Basis of Payment. Payment for the above described work will be considered completely covered by the contract unit price for other items included in the contract.

B. RAPID SET CONCRETE PATCHING MATERIAL – HORIZONTAL REPAIRS

1.0 Description. This specification covers cementitious concrete, polymer-modified concrete and polymer concrete that are suitable for repairing concrete surfaces on bridges or roadways, particularly under fast setting or special conditions. The repairs would involve horizontal applications. The work shall consist of removing, furnishing, preparing, and placing materials at locations as shown on the plans or as directed by the engineer.

2.0 Material. All materials shall be in accordance with MoDOT specifications and as noted herein.

2.1 Aggregate For Extending Commercial Mixture. Coarse and fine aggregates shall be in accordance with Sec 1005, except the requirements for gradation and percent passing the No. 200 sieve shall not apply. Coarse aggregate meeting Gradation E requirements shall be used for repairs greater than one inch (25 mm) in depth. Fine aggregate will be allowed for repairs less than one inch (25 mm). Aggregate specified, bagged, labeled and furnished by the rapid set concrete patching material manufacturer may also be used for mortar extension.

2.2 Material Applications. The contractor shall select and use the product most suitable for the work and field conditions in accordance with these specifications.

2.3 Curing. Rapid set concrete patching material shall be cured until the minimum compressive strength 3200 psi is attained using standard curing specifications, unless otherwise specified by the manufacturer.

2.4 Qualification and Project Acceptance.

2.4.1 Inspection. All materials shall be subject to inspection and sampling by MoDOT at the source of manufacture, intermediate shipping terminal or destination. MoDOT will be allowed free access to all facilities and records as required to conduct inspection and sampling.

2.4.2 Qualification. Prior to use, rapid set concrete patching material shall be qualified. In order to become qualified, a material shall have completed testing through AASHTO's National Transportation Product Evaluation Program (NTPEP). The manufacturer shall contact the AASHTO/NTPEP coordinator to obtain the testing location for the rapid setting concrete patching material.

2.4.2.1 Requested Information. The manufacturer shall submit with samples of the materials, a written request to Construction and Materials with the following information:

(a) Brand name of the product.

(b) Certification that the material meets this specification.

(c) NTPEP test results showing compliance with this special provision.

(d) Specific mixing, handling and curing instructions.

(e) Application type (i.e., bridge or roadway).

2.4.2.2 Qualified List. Upon approval by the engineer, the brand name and manufacturer will be placed on a qualified list of rapid set concrete patching materials. The listing of qualified materials is available from Construction and Materials or on MoDOT's web site. New certified test results and samples shall be submitted any time the manufacturing process or the material formulation is changed. The material will be subject to removal from the qualified list if there is evidence of unsatisfactory performance or a change in manufacturing process or formulation, or when random sampling and testing of material offered for use indicates nonconformity with any of the requirements herein specified.

2.4.3 Provisional Approval. Provisional approval may be granted provided the following requirements have been met:

(a) New Products Evaluation Form

(b) Certified test results from an independent laboratory showing compliance with this special provision.

(c) Documentation prepared by MoDOT covering two years of field performance on MoDOT's system. MoDOT will need to approve the location of the test site. Documentation will contain the placement date, field observations (semi annual), description of field performance and photographs of in-place material.

(d) During placement the manufacturer's representative shall be present on the project to provide technical expertise.

2.4.3.1 Disqualification. If during the two year observation period the repair area(s) fails provisional approval will not be granted. Repair area(s) experiencing any cracking, debonding or spalling will be considered a failure.

2.4.3.2 Length of Provisional Approval. Provisional approval will be granted for three years or until NTPEP testing is completed.

2.5 Certification. The contractor shall supply a manufacturer's certification to the engineer for each lot of material furnished. The certification shall include the name of the manufacturer, a manufacturer certification statement that the material supplied is the same as that qualified and listing the date of qualification.

2.6 Acceptance. Acceptance of the material will be based on the use of a qualified or provisionally approved material, the manufacturer's certification that the material supplied is the same as that approved and upon the results of such tests as may be performed by the engineer.

3.0 Mixture. Unless otherwise specified, rapid set concrete patching material shall be approved commercial mixtures meeting Sections 3.1 – 3.1.3 or deck repair cementitious mortar meeting Section 3.2. Rapid set concrete patching materials shall be specifically designed for the application needed.

3.1 Commercial Mixtures. Rapid set concrete patching material in its sacked form and mixtures when properly prepared in accordance with the manufacturer's specifications, shall meet the minimum test requirements given in Table 1. Mixtures may be supplied, as required, as a patching mortar or as a patching mortar with aggregate extension. If the material is to be supplied with extender aggregate, this shall also pass the required tests in Table 1 using the maximum allowed amount of extender aggregate.

3.1.1 Mixture Requirements. Rapid set concrete patching material shall be single packaged dry mix requiring the addition of water or other liquid component just prior to mixing. The material shall be capable of 1/2 inch (13 mm) to full depth repair and require no bonding agent. The material shall not contain soluble chlorides as an ingredient of manufacture. The material shall be placed in accordance to the manufacturer's recommendations.

Table 1 **(English Unit)**

Physical Test Property	Specification	Requirement for cementitious concrete	Requirement for polymer-modified concrete	Requirement for polymer concrete
Bond Strength by Slant Shear[1]	ASTM C 882/C 928 [3]	min. 1000 psi @ 24hrs.& min. 1500 psi @ 7 days	n/a	min. 1000 psi @ 24hrs.& min. 1500 psi @ 7 days
Linear Coefficient of Thermal Expansion[1, 2] (for bagged mortar only, without extension aggregate)	ASTM C 531	n/a	n/a	4 – 8 X 10-6 in/in/deg F
Resistance to Rapid Freezing & Thawing[1]	AASHTO T 161 or ASTM C 666	80% min. using Procedure B[5] (300 Cycles)	80% min. using Procedure B[5] (300 Cycles)	n/a
Compressive Strength[1]	AASHTO T 22 or ASTM C 39	3200 psi @ 3 hr & 4000 psi @ 7 days	3200 psi @ 3 hr & 4000 psi @ 7 days	n/a
Rapid Chloride Permeability[1]	AASHTO T 277 or ASTM C 1202	Bridge Decks 1000 coulombs @ 28 days Roadway 2000 coulombs @ 28 days	Bridge Deck 1000 coulombs @ 28 days Roadway 2000 coulombs @ 28 days	Bridge Deck 1000 coulombs @ 28 days Roadway 2000 coulombs @ 28 days
Length Change[1, 4]	AASHTO T 160 or ASTM C 157	In water Storage (+0.15) In air storage (-0.15)	In water storage (+0.15) In air storage (-0.15)	n/a
Color		gray	gray	gray

[1] The commercial mix test values can be located in the AASHTO's National Transportation Product Evaluation Program (NTPEP) reports for Laboratory Evaluations of Rapid Set Concrete Patching Materials. Data for provisionally approved materials is located at the Construction and Materials Division.
[2] Not required for extended mixtures if the mortar passes this requirement.
[3] ASTM C 882 shall be performed on non-water based materials. ASTM C 928 shall be performed on water-based materials.
[4] As modified by ASTM C 928.
[5] Procedure A may be used in lieu of Procedure B.

3.1.2 Construction Requirements. The manufacturer shall provide with the bagged mixture, specifications for the mixing procedure, amount and kind of liquid to be added, and the amount of aggregate extension allowed, if any. All mixing, handling and curing practices recommended by the manufacturer shall be followed and will be considered a part of these specifications.

3.1.3 Removal from Qualified List. All mixtures shall be approved before use. Reoccurring failures of any mixture for any reason will be cause for removal from the qualified list.

3.2 Deck Repair Concrete. A qualified rapid set concrete patching material indicated for horizontal use and intended for patching concrete bridge decks may be used when specified on the plans and as approved by the engineer. If this option is selected, the contractor shall provide a trial mix to determine the total cure time needed to achieve a compressive strength of 3200 psi (22 MPa). Compressive specimens shall be prepared in accordance with current MoDOT test methods and cured to simulate actual field conditions. Testing of compressive specimens shall be performed by methods and at facilities acceptable to the engineer. The repaired deck shall not be opened to traffic until at least 4 hours after the last placement of deck repair concrete, the established cure time has elapsed and until such concrete has achieved a compressive strength of 3200 psi (22 MPa). A new trial mix may be required if the engineer determines the field conditions vary substantially from trial mix conditions. The engineer will make field cylinders to verify the 3200 psi (22 MPa) minimum strength.

4.0 Construction Requirements.

4.1 Mixing. Rapid set concrete patching material shall be mixed and finished according to the manufacturer's recommendation.

4.2 Preparation of Repair Area. Deteriorated, damaged or defective concrete as shown on the plans, required by the specifications or as directed by the engineer, shall be removed. All exposed reinforcement shall be thoroughly cleaned as shown on the plans, required by the specifications or as directed by the engineer. Unless otherwise specified by the commercial mixture manufacturer, the existing surface shall be damp and all free water shall be removed prior to placement of the required material.

4.3 Bonding Agent. A bonding agent may be used if recommended by the rapid set concrete patching material manufacturer.

5.0 Method of Measurement. No measurement will be made for rapid set concrete patching material.

6.0 Basis of Payment. Rapid set concrete patching material will be paid for at the contract unit price for other items and will be considered full compensation for all labor, equipment and material to complete the described work.

C. RAPID SET CONCRETE PATCHING MATERIAL – VERTICAL AND OVERHEAD REPAIRS

1.0 Description. This specification covers cementitious concrete, polymer-modified concrete and polymer concrete that are suitable for repairing concrete surfaces on bridges or concrete structures, particularly under fast setting or special conditions. The repairs would involve vertical or overhead applications. The work shall consist of removing, furnishing, preparing, and placing materials at locations as shown on the plans or as directed by the engineer.

2.0 Material. All materials shall be in accordance with MoDOT specifications and as noted herein.

2.1 Aggregate. For Extending Commercial Mixture. Coarse and fine aggregates shall be in accordance with Sec 1005, except the requirements for gradation and percent passing the No.

200 sieve shall not apply. Coarse aggregate meeting Gradation E requirements shall be used for repairs greater than one inch (25 mm) in depth. Fine aggregate will be allowed for repairs less than one inch (25 mm). Aggregate specified, bagged, labeled and furnished by the rapid set concrete patching material manufacturer may also be used for mortar extension.

2.2 Material Applications. The contractor shall select and use the product most suitable for the work and field conditions in accordance with these specifications.

2.3 Curing. Rapid set concrete patching material shall be cured until the minimum compressive strength 1500 psi is attained using standard curing specifications, unless otherwise specified by the manufacturer.

2.4 Qualification and Project Acceptance.

2.4.1 Inspection. All materials shall be subject to inspection and sampling by MoDOT at the source of manufacture, intermediate shipping terminal or destination. MoDOT will be allowed free access to all facilities and records as required to conduct inspection and sampling.

2.4.2 Qualification. Prior to use, rapid set concrete patching materials need to be qualified.

2.4.2.1 Requested Information. The manufacturer shall submit with samples of the materials, a written request to Construction and Materials with the following information:

(a) New Products Evaluation Form

(b) Brand name of the product.

(c) Certification that the material meets this specification.

(d) Certified test results from an independent laboratory showing compliance with this specification.

(e) Specific preparation instructions of repair area.

(f) Specific mixing, handling and curing instructions.

(g) Application type (i.e., vertical or overhead).

2.4.2.2 Field Evaluation. Final approval will be granted when the following requirements are met:

(e) MoDOT report documenting two years of field performance on MoDOT system. The report will contain the placement date, field observations (semi annual), description of field performance and photographs of in-place material.

(f) A manufacturer's representative shall be present during placement of the material to provide technical expertise.

2.4.2.3 Disqualification. If during the two year observation period the repair area(s) fails the product will not be added to the qualified list.

2.5 Qualified List. The listing of qualified products are available from Construction and Materials or on MoDOT's web site. New certified test results and samples shall be submitted any time the manufacturing process or the material formulation is changed. The material will be subject to removal from the qualified list if there is evidence of unsatisfactory performance or a change in manufacturing process or formulation, or when random sampling and testing of material offered for use indicates nonconformity with any of the requirements herein specified.

2.6 Certification. The contractor shall supply a manufacturer's certification to the engineer for each lot of material furnished. The certification shall include the name of the manufacturer, a manufacturer certification statement that the material supplied is the same as that qualified and listing the date of qualification.

2.7 Acceptance. Acceptance of the material will be based on the use of a qualified product, the manufacturer's certification that the material supplied is the same as that approved and upon the results of such tests as may be performed by the engineer.

3.0 Mixture. Unless otherwise specified, rapid set concrete patching material shall be approved commercial mixtures meeting Sections 3.1 – 3.1.3. Rapid set concrete patching materials shall be specifically designed for the application needed.

3.1 Commercial Mixtures. Rapid set concrete patching material in its sacked form and mixtures when properly prepared in accordance with the manufacturer's specifications, shall meet the minimum test requirements given in Table 1. Mixtures may be supplied, as required, as a patching mortar or as a patching mortar with aggregate extension. If the material is to be supplied with extender aggregate, this shall also pass the required tests in Table 1 using the maximum allowed amount of extender aggregate.

3.1.2 Mixture Requirements. Rapid set concrete patching material shall be single packaged dry mix requiring the addition of water or other liquid component just prior to mixing. The material shall not contain soluble chlorides as an ingredient of manufacture. The material shall be placed in accordance to the manufacturer's recommendations.

Table 1
(English Unit)

Physical Test Property	Specification	Requirement for cementitious concrete	Requirement for polymer-modified concrete	Requirement for polymer concrete
Bond Strength by Slant Shear	ASTM C 882/C 928 [2]	min. 1000 psi @ 24hrs.& min. 1500 psi @ 7 days	n/a	min. 1000 psi @ 24hrs.& min. 1500 psi @ 7 days
Linear Coefficient of Thermal Expansion [1] (for bagged mortar only, without extension aggregate)	ASTM C 531	n/a	n/a	4 – 8 X 10-6 in/in/deg F
Resistance to Rapid Freezing & Thawing	AASHTO T 161 or ASTM C 666	80% min. using Procedure B[3] (300 Cycles)	80% min. using Procedure B[3] (300 Cycles)	n/a

Compressive Strength	AASHTO T 22 or ASTM C 39	1500 psi @ 3 hr & 3000 psi @ 24 hr	1500 psi @ 3 hr & 3000 psi @ 24 hr	n/a
Rapid Chloride Permeability	AASHTO T 277 or ASTM C 1202	1000 coulombs @ 28 days	1000 coulombs @ 28 days	1000 coulombs @ 28 days
Length Change	AASHTO T 160 or ASTM C 157	In water Storage (+0.15) In air storage (-0.15)	In water storage (+0.15) In air storage (-0.15)	n/a
Color		gray	gray	gray

[1] Not required for extended mixtures if the mortar passes this requirement.
[2] ASTM C 882 shall be performed on non-water based materials. ASTM C 928 shall be performed on water-based materials.
[3] Procedure A may be used in lieu of Procedure B.

3.1.2 Construction Requirements. The manufacturer shall provide with the bagged mixture, specifications for the mixing procedure, amount and kind of liquid to be added, and the amount of aggregate extension allowed, if any. All mixing, handling and curing practices recommended by the manufacturer shall be followed and will be considered a part of these specifications.

3.1.3 Removal from Qualified List. All mixtures shall be approved before use. Reoccurring failures of any mixture for any reason will be cause for removal from the qualified list.

3.2 Vertical Repair. A qualified rapid set concrete patching material approved for vertical use may be used when specified on the plans and as approved by the engineer. The engineer will make field cylinders to verify the 1500 psi (10 MPa) minimum strength. The material shall adhere to the concrete surface without sagging.

3.3 Overhead Repair. A qualified rapid set concrete patching material approved for overhead use may be used when specified on the plans and as approved by the engineer. The material shall be placeable in layers of at least 1 inch on overhead applications without the use of formwork or anchoring devices. The material shall adhere to the concrete surface without sagging. The engineer will make field cylinders to verify the 1500 psi (10 MPa) minimum strength.

4.0 Construction Requirements.

4.1 Mixing. Rapid set concrete patching material shall be mixed and finished according to the manufacturer's recommendation.

4.2 Preparation of Repair Area. Deteriorated, damaged or defective concrete as shown on the plans, required by the specifications or as directed by the engineer, shall be removed. All exposed reinforcement shall be thoroughly cleaned as shown on the plans, required by the specifications or as directed by the engineer. Unless otherwise specified by the commercial mixture manufacturer, the existing surface shall be damp and all free water shall be removed prior to placement of the required material.

4.3 Bonding Agent. A bonding agent may be used if recommended by the rapid set concrete patching material manufacturer.

5.0 Method of Measurement. No measurement will be made for rapid set concrete patching material.

6.0 Basis of Payment. Rapid set concrete patching material will be paid for at the contract unit price for other items and will be considered full compensation for all labor, equipment and material to complete the described work.

D. DIAMOND GRINDING

1.0 Description. This work will only be performed at the discretion of the engineer and will be underrun if not required by the engineer. This work shall consist of grinding the new concrete surface to provide good riding characteristics, a surface texture and proper drainage. If the engineer determines it necessary to provide good riding characteristics, grinding shall be performed on all or part of the bridge approach slabs and sealed in accordance with Sec 703.3.8. The finished surface shall be in accordance with Sec 703.3.7 and as shown on the plans or as directed by the engineer except as modified below.

2.0 Equipment. The equipment shall be of a size that will grind a strip at least 3 feet wide using diamond blades and shall not cause spalls at cracks, joints or other locations.

3.0 Construction Requirements. The construction operation shall be scheduled and proceed in a manner that produces a uniform finished surface. Auxiliary or ramp lane grinding shall transition from the edge of the mainline as required to provide drainage and an acceptable riding surface.

3.1 Deck repair, if required, shall be completed prior to any grinding.

3.2 Grinding shall be accomplished in a manner that eliminates joint or crack faults and provides lateral drainage by maintaining a constant cross slope between grinding extremities in each lane. A maximum tolerance of 1/16 inch will be allowed for adjacent sides of joints and cracks, except that under no circumstances shall the grinding depth exceed 1/4 inch from the top of the original surface. When grinding across faulted joints, a minimum of a 20-foot transition onto the approach side slab shall be used.

3.3 The cross slope of the pavement shall be as shown on the plans and shall have no depressions or misalignment of slope greater than 1/4 inch in 12 feet when measured with a 12-foot straightedge placed perpendicular to the centerline. Areas of deviation shall be reground. Straightedge requirements will not apply across longitudinal joints or outside the ground area.

3.4 As soon as practical after grinding, the surface will be straight edged longitudinally, and all variations exceeding 1/8 inch in 10 feet will be plainly marked. Areas of deviation shall be reground.

3.5 Substantially all of the pavement surface shall be textured. Extra depth grinding to eliminate minor depressions in order to provide texturing on 100 percent of the pavement surface will not be required. No unground surface area between passes will be permitted, except as specified otherwise in the contract documents.

3.6 The grinding process shall produce a final pavement surface that is true to grade and uniform in appearance with a longitudinal line-type texture. The line-type texture shall contain parallel longitudinal corrugations that present a narrow ridge corduroy-type appearance. The

peaks of the ridges shall be approximately 1/32 inch higher than the bottoms of the grooves. The grooves shall be evenly spaced. There shall be approximately 50-55 grooves per foot, measured perpendicular to the centerline.

3.7 The contractor shall remove and dispose of all residue from the grinding in a manner and at a location to satisfy environmental regulations. The contractor shall have the engineer's approval for the method of spreading and disposal of the residue prior to beginning any grinding operations.

3.8 Solid residue shall be removed from the pavement surface before any residue is blown by traffic action or wind.

3.9 Residue shall not be permitted to encroach on open lanes.

3.10 The residue shall not enter into gutters or closed drainage systems.

3.11 The contractor may disperse residue onto unpaved shoulders, adjacent roadside embankments, or median ditch areas of divided highways where the residue runoff can percolate into the soil, unless specified otherwise in the contract. The spread rate shall not generate surface runoff. If surface runoff occurs at a grinding location, the contractor shall haul the residue to an approved location at the contractor's expense.

3.12 Discharge of any residue runoff shall not flow into adjacent rivers, streams, lakes, ponds or other open bodies of water.

3.13 Residue shall not be spread within 100 feet of any streams, lakes or other open bodies of water, or within 15 feet of a water filled ditch.

3.14 The contractor shall use appropriate equipment and methods so the discharging of the residue does not cause erosion of soil or damage to established vegetation along the roadway. The contractor shall repair and reseed any areas where the discharge of grinding residue causes damage to roadway slopes or vegetated areas at the contractor's expense.

3.15 If the solids concentration of discharged residue at any particular area is determined to be excessive by the engineer, the contractor shall provide equipment and material to flush the areas with water as directed by the engineer, at the contractor's expense.

3.16 The pavement shall be cleaned prior to opening to traffic as directed by the engineer.

4.0 Smoothness Requirements.

4.1 No diamond grinding shall be performed until the pavement has attained a strength sufficient to be opened to all types of traffic. All diamond grinding shall be completed on any section prior to opening that section to other than construction traffic, unless approved by the engineer.

4.2 The engineer will be the sole authority for determining if the driving surface is sufficiently smooth.

4.3 The engineer will evaluate the smoothness of the concrete wearing surface after the concrete has cured and direct the contractor to diamond grind where deemed necessary.

4.4 After initial diamond grinding operations, if any, the engineer will again evaluate the smoothness of the concrete wearing surface and approach slab, repeating as many times as necessary to achieve the desired surface smoothness.

4.5 Any deficiencies in the final surface due to improper contractor operations or equipment shall be corrected by the contractor at the contractor's expense.

4.6 All areas shall be tested with a 10-foot straightedge in accordance with section 3.4 of this job special provision.

5.0 Method of Measurement. Measurement for diamond grinding will be made to the nearest square yard. Measurement will be based upon the area of initial diamond grinding completed as directed by the engineer. Subsequent passes of diamond grinding over a previously ground area will not be measured. No deduction will be made for gaps to avoid striping or raised pavement markers. No additional measurement will be made for diamond grinding bridge approach slabs.

6.0 Basis of Payment. Payment for diamond grinding will be paid for at the contract unit price per square yard. Payment for diamond grinding will be considered full compensation for all labor, equipment, material, and incidentals to complete this work, including hauling and disposal of grinding residue and cleaning the pavement prior to opening to traffic.

E. DRAINAGE SYSTEM

1.0 Description.

1.1 This work shall consist of furnishing, fabricating and installing the drainage items necessary to complete the entire drainage system as shown on the contract plans.

1.2 Detailed shop drawings of the drainage system shall be prepared and submitted to the engineer. Shop drawings shall be in accordance with Sec 1080. Catalog data may be furnished for components that are standard manufactured items in lieu of detailed drawings, provided that governing dimensions are given.

2.0 Materials.

2.1 Reinforced fiberglass pipe, collection basins and fittings shall be a Reinforced Thermosetting Resin Pipe (RTRP) system in accordance with the requirements of ASTM D 2996. The RTRP system shall have a minimum short time rupture strength hoop tensile stress of 30,000 psi. The RTRP system shall be pigmented resin throughout the wall. The color of the RTRP system shall be concrete gray or as specified on the bridge plans. The RTRP system shall not be coated with paint, gel-coat or any other exterior coating.

2.2 The contractor shall furnish a manufacturer's certification to the engineer for each lot furnished, certifying that the materials supplied are in accordance with all requirements specified. The certification shall include results of all required tests. Acceptance of the material will be based on the manufacturer's certification and upon results of such tests as may be performed by the engineer. The certification shall show the quantity and lot number that is represented.

3.0 Construction Requirements.

3.1 All connections shown on the plans to facilitate future removal for maintenance cleanout or flushing shall be made with a threaded gasket coupler system, bolted gasket flange system or a female to male threaded PVC plug. Adhesive bonded joints will be permitted for runs of pipe between such connections.

3.2 Runs of pipe shall be supported at a spacing of not greater than the lesser of those as recommended by the manufacturer of the pipe or as shown on the bridge plans. Supports that have point contact or narrow supporting areas shall be avoided. Standard sling, clamp, clevis hangers and shoe supports designed for use with steel pipe may be used. Minimum hanger thickness shall be 3/16 inch with the minimum strap width for the pipe sizes shown in the table below. Straps shall have 120 degree minimum contact with the pipe. Pipe supported on a surface with less than 120 degrees of contact shall have a split fiberglass pipe protective sleeve bonded in place with adhesive. All new steel, hangers and miscellaneous hardware for drainage system shall be ASTM A 709 Grade 36 steel except as noted on the bridge plans. All new steel, hangers and miscellaneous hardware for drainage system shall be galvanized in accordance with ASTM A 153 except as noted on the bridge plans.

Pipe Size inches (mm)	Minimum Strap Width inches (mm)
3 (76.2)	1.25 (32)
4 (101.6)	1.25 (32)
6 (152.4)	1.50 (38)
8 (203.2)	1.75 (45)
10 (254.0)	1.75 (45)
12 (304.8)	2.00 (51)
14 (355.6)	2.00 (51)

3.3 The RTRP system shall be handled and installed in accordance with guidelines and procedures as recommended by the manufacturer.

3.4 When the drainage system continues between superstructure units and/or between the superstructure and substructure units, the drainage system shall have allowance for the expected differential expansion and contraction movements as recommended by the manufacturer. Runs of pipe shall not exceed 200 feet in length.

4.0 Method of Measurement. No measurement will be made.

5.0 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 lump sum price for Drainage System (On Structure).

F. REMOVAL OF LOOSE CONCRETE FROM PRESTRESSED PANEL JOINTS

1.0 Description. In order to protect the traffic from falling concrete from prestressed concrete panels, the contractor shall inspect all accessible prestressed panel joints. Loose and delaminated concrete shall be removed, and any loose strands shall be cut flush at the concrete surface in accordance with the bridge plans and this job special provision. Areas of repair in addition to those shown on the bridge plans shall be per the approval of the engineer.

2.0 Construction Requirements. At the prestressed concrete panel joints determined to need repair during inspection, all loose and/or delaminated concrete shall be removed, and any loose

strands shall be cut flush at concrete surface after the removal of loose concrete. The work shall be performed with hand tools which may include but not necessarily be limited to chipping chisels, wire brushes, dust brushes, etc.

3.0 Method of Measurement. The extent of repair may vary from the estimated quantities, but the contract unit price shall prevail regardless of the variation. The areas to be cleaned will be computed to the nearest square foot with the areas made approximately rectangular.

4.0 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 based on the accepted quantities and will be considered completely covered by the contract unit price for Removal of Loose Concrete from Prestressed Panel Joints. Any change in the contract plan quantities, based on approved change orders, will be paid for at the contract unit price.

G. HYBRID POLYMER CONCRETE OVERLAY

1.0 Description. This work shall consist of constructing a wearing surface of hybrid polymer concrete (HPC) on a prepared surface in accordance with these specifications, as shown on the plans, or as directed by the engineer. Hybrid polymer concrete shall be composed of polymer overlay components and broadcast sand or aggregate and shall be in accordance with this specification and the manufacturer/supplier's recommendations.

1.1 Acceptable Manufacturer Systems. The chosen HPC system shall meet the performance requirements as stated in this provision and shall be FasTrac CE700 HPC or approved equal.

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 Resin Binder. The HPC resin binder shall be a 100% solid two-component, thermosetting hybrid system that is moisture insensitive and shall comply with the following requirements:

Resin Binder		
Property	**Requirement**	**Test Method**
Viscosity*	750 Centipoise, minimum	ASTM C 881 / AASHTO M 235
Flash Point	>200° F	ASTM D 3278
VOC Content	<10 g/L	EPA 24
Styrene Content	0%, maximum	ASTM D 2369
Gel Time	10 minutes, minimum	C881 / ASTM M 235
Tensile Strength	2500 psi, maximum at 7 Days	ASTM D 638
Tensile Elongation	50% minimum at 7 Days	ASTM D 638
Tensile Bond Strength to Concrete	250 psi or 100% Substrate Failure	ASTM C 1583 (ACI 503r)
Water Absorption	0.5% @ 24 hours, maximum	ASTM D 570
Type D Hardness	60 – 80	ASTM D 2240

Resin Binder		
Property	**Requirement**	**Test Method**
Thermal Compatibility	Pass	ASTM C 884
Chloride Ion Permeability	<10.0 Coulombs	AASHTO T 277

*Spindle and speed selection based upon ASTM D 2556.

2.2 Mixed Aggregates.

2.2.1 Crushed Particles. Aggregate retained on the No. 8 sieve shall have a maximum of 45 percent crushed particles as determined by AASHTO T 335.

2.2.2 Moisture Content. Moisture content shall not be more than one half of the weighted average as determined by AASHTO T 255 at the time of mixing with the resin.

2.2.3 Aggregate Gradation.

Gradation Requirements	
Sieve Size	**Percent Passing by Weight**
1/2”	100
3/8”	98-100
No. 4	77-100
No. 8	60-82
No. 16	34-56
No. 30	5-25
No. 50	0-15
No. 100	0-7
No. 200	0-3

2.3 Surface Aggregates. Only light-colored aggregate (i.e. flint rock or similar) that meets the requirements of Sec 1039 shall be used on this job. 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 contaminants on the job site and from exposure to rain or other moisture.

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

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

2.6 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.

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

2.6.2 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.

2.6.2.1 Damaged or debonded areas of hybrid 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.

2.6.3 Required Amount. Sufficient material to perform the entire HPC 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.

2.7 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. The installer shall be certified by the HPC system supplier.

2.8 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 12 x 12-foot area (or approved equivalent area) prior to the placement of the production overlay. The trial area shall be constructed with the same material, equipment and construction methods to be used in the work and under conditions similar to those anticipated when the work will be performed. The initial set time of the HPC shall be determined from the trial. 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 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 job special provision. Upon approval from 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.

4.1.2 Any patches encountered shall be completely removed to sound, natural concrete. Hybrid polymer concrete shall 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 HPC or HPC patches shall be cured in accordance with section 4.6 of this job special provision.

4.1.3 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. No traffic of any kind shall be permitted on any portion of the deck which has been shot blasted or on the overlay without approval from the engineer. The time between surface preparation and application of the overlay shall not exceed 24 hours.

4.1.4 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 hybrid polymer concrete. The exposed concrete surface shall be prepared in accordance with the requirements of section 4.1.3 of this job special provision.

4.2 Placement of Overlay System. The overlay system shall not be placed when weather or surface conditions are such that the material cannot be properly handled, placed and cured within the specified requirements of traffic control, or when rain is forecast within 24 hours of application.

4.2.1 Surface Temperature. The concrete bridge deck surface shall be a minimum of 50° F and rising and a maximum of 90° F.

4.2.2 Moisture Content. The overlay system shall not be placed if it has been less than 24 hours since the last rainfall. The concrete bridge deck surface shall have a moisture content of less than 5% when measured with a multi-pin moisture meter.

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

4.2.4 Mixing Equipment. The concrete shall be volumetrically mixed at the bridge site by a continuous mixer in accordance with Sec 501.

4.2.4.1 Batching Information. The continuous mixer shall be equipped with a metering device that automatically measures and records the aggregate volumes and corresponding resin volumes. The volumes shall be recorded at no greater than five minute intervals along with the time and date of each recording. A printout of the recordings shall be furnished to the engineer at the end of each shift. Readout gages shall be visible to the engineer at all times.

4.2.4.2 Mixture Consistency. The concrete discharged from the mixer shall be uniform in composition and consistency. Mixing capability shall be such that initial and final finishing operations can proceed at a steady pace.

4.2.5 Finishing Equipment. Finishing equipment shall be capable of consolidating the hybrid polymer concrete and striking off the hybrid polymer concrete to the final grade, thickness and cross-sections as shown in the contract documents.

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

4.2.7 Overlay Thickness. The HPC overlay shall be placed at a minimum thickness of 1 inch.

4.3 Placement of Surface Aggregate.

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

4.3.2 Wet spots shall be covered with the aggregate prior to the gelling of the resin binder.

4.3.3 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 job special provision.

4.4 Overlay System. The overlay system 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. The contractor shall provide neat clean lines for staging, joints, obstacles or any break in production.

4.5 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.

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

4.6 Curing. Traffic and construction equipment will not be permitted on the hybrid polymer concrete overlay for at least two hours and until the hybrid polymer overlay has reached a minimum compressive strength of 750 psi as verified by the rebound number determined in accordance with ASTM C 805.

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 hybrid polymer concrete will be measured to the nearest square yard of accepted, in-place hybrid polymer concrete 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 Hybrid Polymer Concrete Overlay.