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<b>“THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT.”</b>	<b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b> 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. J4I2384 Clay County, MO Date Prepared: 12/18/2012

JOB SPECIAL PROVISIONS (BRIDGE)

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A. CONSTRUCTION REQUIREMENTS

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

**2.0 Construction Requirements.** Plans for the existing structure are included in the contract with the bridge plans for informational purposes only.

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

**2.2** 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 repairing concrete deck (half-soling), 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.

**2.3** Provisions shall be made to prevent any debris and materials from falling onto the roadway. Any debris and materials that falls below the bridge outside the limits mentioned previously and if determined necessary by the engineer, the debris 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.

**2.4** 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.

**2.5** 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.

**2.6** SSPC-SP2 and SSPC-SP-3 surface preparation shall be in accordance with the environmental regulations in [Sec 1081](#) and collection of residue shall be in accordance with [Sec 1081](#) for collection of blast residue. SSPC-SP6, SSPC-SP10 and SSPC-SP-11 surface preparation shall be in accordance with the approved blast media and environmental regulations in [Sec 1081](#) and collection of blast residue shall be in accordance with [Sec 1081](#).

**3.0 Coating Information.**

**3.1 Existing Bridge Information.** The informational plans may be used by bidders in determining the amount of steel to be cleaned and painted/coated with the full understanding that the State accepts no responsibility for accuracy of the estimated tons of existing steel shown in the table below. The bidder's acceptance and use of the estimate shown below shall be no cause for claim for any final adjustment in the contract unit price for the work involved in repainting. Each bidder is expected to carefully examine the structure, investigate the condition of existing paint and to prepare their own estimate of quantities involved before submitting a bid. Surface preparation and applying field coatings to the structural steel will be based on the contract plan quantities. No final measurements will be made.

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Bridge No.	Estimated Tons			Existing Paint System	Lead Based
	Coating System		Total		
	System G	Calcium Sulfonate			
L06562	24	0	24	Basic Lead Chromium ('78)	Yes

**3.2 Environmental Contact.** Environmental Section may be contacted at the below address or phone number. The Missouri Department of Health may be contacted at 573-751-6102.

- (a) MoDOT - Design Division - Environmental Section  
PO Box 270  
105 W Capitol Ave, Jefferson City, MO 65102  
Telephone (573) 526-4778

**3.3 Approved Smelters and Hazardous Waste Treatment, Storage and Disposal Facilities.** The following are the approved smelters and hazardous waste treatment, storage and disposal facilities:

- (a) Doe Run Company-Resource Recycling Division-Buick Facility  
Highway KK  
Boss, MO 65440  
Telephone 573-626-4813
- (b) Doe Run Company-Herculaneum Smelter  
881 Main Street  
Herculaneum, MO 63048  
Telephone 314-993-3164

**4.0 Method of Measurement.** No measurement will be made.

**5.0 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 – 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:

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

**2.4.2.2.3 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

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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.

**3.1.1 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 not contain soluble chlorides as an ingredient of manufacture. The material shall be placed in accordance to the manufacturer's recommendations.

<b>Table 1 (English Unit)</b>				
<b>Physical Test Property</b>	<b>Specification</b>	<b>Requirement for cementitious concrete</b>	<b>Requirement for polymer-modified concrete</b>	<b>Requirement for polymer concrete</b>
Bond Strength by Slant Shear	ASTM C882/C928 <sup>2</sup>	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 <sup>1</sup> (for bagged mortar only, without extension aggregate)	ASTM C531	n/a	n/a	4 – 8 X 10-6 in/in/deg F
Resistance to Rapid Freezing & Thawing	AASHTO T161 or ASTM C666	80% min. using Procedure B <sup>3</sup> (300 Cycles)	80% min. using Procedure B <sup>3</sup> (300 Cycles)	n/a
Compressive Strength	AASHTO T22 or ASTM C39	1500 psi @ 3 hr & 3000 psi @ 24 hr	1500 psi @ 3 hr & 3000 psi @ 24 hr	n/a
Rapid Chloride	AASHTO T277 or	1000 coulombs	1000 coulombs	1000 coulombs

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Permeability	ASTM C1202	@ 28 days	@ 28 days	@ 28 days
Length Change	AASHTO T 160 or ASTM C157	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

<sup>1</sup> Not required for extended mixtures if the mortar passes this requirement.

<sup>2</sup> ASTM C882 shall be performed on non-water based materials. ASTM C928 shall be performed on water-based materials.

<sup>3</sup> 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.

**C. 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:

- (c) New Products Evaluation Form
- (d) Certified test results from an independent laboratory showing compliance with this special provision.
- (e) 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.
- (f) 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



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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 be capable of ½ 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.

<b>Table 1 (English Unit)</b>				
<b>Physical Test Property</b>	<u>Specification</u>	<b>Requirement for cementitious concrete</b>	<b>Requirement for polymer-modified concrete</b>	<b>Requirement for polymer concrete</b>
Bond Strength by Slant Shear <sup>1</sup>	ASTM C882/C928 <sup>3</sup>	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 <sup>1, 2</sup> (for bagged mortar only, without extension aggregate)	ASTM C531	n/a	n/a	4 – 8 X 10 <sup>-6</sup> in/in/deg F
Resistance to Rapid Freezing & Thawing <sup>1</sup>	AASHTO T161 or ASTM C666	80% min. using Procedure B <sup>5</sup> (300 Cycles)	80% min. using Procedure B <sup>5</sup> (300 Cycles)	n/a
Compressive Strength <sup>1</sup>	AASHTO T22 or ASTM C39	3200 psi @ 3 hr & 4000 psi @ 7 days	3200 psi @ 3 hr & 4000 psi @ 7 days	n/a
Rapid Chloride Permeability <sup>1</sup>	AASHTO T277 or ASTM C1202	<u>Bridge Decks</u> 1000 coulombs @ 28 days <u>Roadway</u> 2000 coulombs @ 28 days	<u>Bridge Deck</u> 1000 coulombs @ 28 days <u>Roadway</u> 2000 coulombs @ 28 days	<u>Bridge Deck</u> 1000 coulombs @ 28 days <u>Roadway</u> 2000 coulombs @ 28 days
Length Change <sup>1, 4</sup>	AASHTO T 160 or ASTM C157	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

<sup>1</sup>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.

<sup>2</sup>Not required for extended mixtures if the mortar passes this requirement.

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<sup>3</sup> ASTM C882 shall be performed on non-water based materials. ASTM C928 shall be performed on water-based materials.

<sup>4</sup> As modified by ASTM C928.

<sup>5</sup> 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.

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D. CLASS 2 PENETRATING CONCRETE SEALER

**1.0 Description.** This work shall consist of preparing and treating the concrete bridge deck, approach slabs, roadway face and top of barrier curb surfaces with a class 2 penetrating concrete sealer meeting this specification. This type of sealer shall be used in lieu of the normal surface sealing for concrete in accordance with Sec 703.

**2.0 Materials.** The sealer shall meet the requirements of this job special provision. The sealer selected by the contractor shall be submitted to the engineer for approval two weeks before application and shall be listed on MoDOT's Pre-Qualified Product List. If the contractor chooses to submit a new product for MoDOT's Pre-Qualified Product List, the product shall be submitted to the engineer 30 days prior to application. Either submittal shall include certified test data from an independent test laboratory and the concrete mix design and curing procedure on the test specimens in which sealer was tested.

**2.1** The sealer shall be a solvent-free 100% solids isobutyltrialkoxysilane, with low oligomer and polymer compound content. The chemical composition shall meet the following requirements:

Property	Specification
Purity	98% minimum monomer by weight
Solvent	Less than 0.1% by weight
Siloxan or polymer Residue	Less than 0.1% by weight
Chloride Ion Content	Less than 40 PPM
Density	ASTM D2111: 7.2 to 7.4 pounds per gallon
Flash Point	ASTM D93: greater than 145 degrees F
Dry Time	ASTM D7539: less than one hour

**2.2** The sealer shall meet the following performance criteria based on a single application at the manufacturer's recommended application rate. All test specimens shall be produced using MoDOT Class B-2 concrete in accordance with Section 501.

Test	Test Method	Duration	Max Absorption / Cl'
Water Immersion	ASTM C 642	48 hours	0.5 percent by weight (mass)
Water Immersion	ASTM C 642	50 days	1.5 percent by weight (mass)
Salt Water Ponding (based on non-abraded specimen)	AASHTO T 259	90 days	0.50 lbs/cu yd (0.30 kg/m <sup>3</sup> ) Cl' Depth: (1/2 to 1") (13 to 25 mm)

**2.2.1 Absorption.** The absorption of the treated concrete under total immersion shall not exceed 0.5 percent after 48 hours or 1.5 percent after 50 days per ASTM C 642 as modified below for non-air entrained concrete.

**2.2.1.1** In addition to ASTM C 642 section 4.1, one 4-inch (10 cm) diameter by 4 inch (10 cm) long core shall be retrieved from the surface of a concrete test specimen to which sealer has been applied. No coring are to be taken from the bridge deck. The core shall be oven dried as designated by ASTM C 642 section 5.1. The core shall be sealed with a rapid setting two part epoxy on the sides and bottom. The epoxy shall overlap the top edge of the core 1/8" (3mm). The core shall be weighed to determine the oven dry weight (mass) of the core and coating. The weight (mass) shall be designated as "A".

**2.2.1.2** The core, processed in accordance with section 2.2.1.1 of this job special provision, shall be immersed in a suitable receptacle and covered with tap water. The procedure as

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designated by ASTM C 642 section 5.2 shall be followed to determine the soaked surface dry weight (mass) of the core and coating. This weight (mass) shall be designated as "B".

**2.2.1.3** The percent moisture absorption of the core shall be determined by ASTM C 642 section 6.1, equation (1). ASTM C 642 sections 5.3, 5.4, 6.1 and equations (2) through (7) shall not apply.

**2.2.2 Salt water ponding.** After 90 days ponding of 3 percent NaCl solution per ASSHTO T 259, the chloride ion content of the concrete shall not exceed 0.5 pounds per cubic yard (0.30 kg/m<sup>3</sup>) at ½ to 1 inch (13 to 25 mm) depth.

**2.3** The sealer shall not permanently stain, discolor or darken the concrete. Application of the sealer shall not alter the surface texture or form a coating on the concrete surfaces. Treated concrete shall be surface dry within 60 minutes after application.

**2.4** The sealer shall be tinted with a fugitive dye to enable the coating to be visible on the treated concrete surface for at least 4 hours after application. The fugitive dye shall not be conspicuous more than 7 days after application when exposed to direct sunlight.

**2.5** The sealer shall be delivered to the project in unopened containers with the manufacturer's label identifying the product and with the seal(s) intact. Each container shall be clearly marked by the manufacturer with the following information:

- Manufacturer's name and address.
- Product name.
- Date of manufacture and expiration date.
- Lot identification.
- Storage requirements.

**3.0 Construction Requirements.**

**3.1 Equipment.** Application equipment shall be as recommended by the manufacturer. The spray equipment, tanks, hoses, brooms, rollers, coaters, squeegees, etc. shall be thoroughly clean, dry, free of foreign matter, oil residue and water prior to applying the treatment.

**3.2 Cleaning and Surface Preparation.** Surfaces which are to be treated shall meet the approved product's requirements for surface condition. Sealing shall not be done until all concrete construction or repair has been completed and cured to the requirements of the manufacturer. A minimum of a 7 day wet cure and 5 day drying period are required. The contractor shall furnish the engineer with written instructions for the surface preparation requirements and a representative of the manufacturer shall be present to assure that the surface conditions meet the manufacturer's requirements.

**3.2.1** Sealing shall be done after the bridge deck has been textured.

**3.2.2** At a minimum, the surface shall be thoroughly cleaned to remove dust, dirt, oil, wax, curing components, efflorescence, laitance, coatings and other foreign materials. The manufacturer or manufacturer's representative shall approve the use of chemicals and other cleaning compounds to facilitate the removal of these foreign materials before use. The treatment shall be applied within 48 hours following surface preparation.

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**3.2.3** Cleaning equipment shall be fitted with suitable traps, filters, drip pans and other devices to prevent oil and other foreign material from being deposited on the surface.

**3.3 Test Application.** Prior to final application, the contractor shall treat a measured test coverage area on horizontal and vertical surfaces of the different components of the structure to be treated for the purpose of demonstrating the desired physical and visual effect on an application or of obtaining a visual illustration of the absorption necessary to achieve the specified coverage rate. In the latter case, the applicator shall use at least ½ gallon (1.9 liter) of treatment following the manufacturer's recommended method of application for the total of the test surfaces. Horizontal test surfaces shall be located on the deck and on the curb or sidewalk, and vertical test surfaces shall be located on a parapet or safety barrier curb so that the different textures are displayed.

**3.4 Application.** The sealer shall be applied by thoroughly saturating the concrete surfaces at an application rate of 175 square feet per gallon or the rate designated on the plans.

**3.4.1** The concrete surface temperature shall be above 35°F (2°C).

**3.4.2** Allow concrete to dry a minimum of 48 hours after any measurable precipitation.

**3.4.2** The treatment shall be spread from puddles to dry areas.

**3.4.3** If the applicator is unable to complete the entire application continuously, the location where the application was stopped shall be noted and clearly marked.

**3.5 Protection of Adjoining Surfaces and the Public.**

**3.5.1** When applying the sealer, the contractor shall protect adjoining surfaces of the structure that are not to be sealed by masking off or by other means. Sealer shall not leave residue on glass, painted metal or automobiles. The contractor shall also make provision to protect the public when sealing the fascia of a bridge that spans an area used by the public.

**3.5.2** Asphalt and mastic type surfaces shall be protected from spillage and heavy overspray. Joint sealants, traffic paints and asphalt overlays may be applied to the treated surfaces 48 hours after the treatment has been applied. Adjoining and nearby surfaces of aluminum or glass shall be covered where there is possibility of the treatment being deposited on the surfaces. Plants and vegetation shall be protected from overspray by covering with drop cloths. Precautions shall be followed as indicated on the manufacturer's product and material safety data sheet.

**3.6 Opening to Traffic.** Traffic shall be allowed on a deck only after a treated area is visibly dry. Dried coating shall not leave residue on glass, painted metal or automobiles.

**4.0 Method of Measurement.** No direct measurement will be made.

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

JOB SPECIAL PROVISIONS (BRIDGE)

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E. FIBER REINFORCED POLYMER (FRP) WRAP

**1.0 Description.** This work shall consist of designing, furnishing and placing fiber reinforced polymer (FRP) composite wrap for concrete column confinement at intermediate bents no. 3 & 4 as shown on bridge plans and as directed by the engineer.

**2.0 Materials.** The storage and handling of materials for the FRP composite work shall be in accordance with the manufacturer's written recommendations in factory sealed containers with the FRP manufacturer's labels. Labels shall be intact and legible with date of manufacture and shelf life.

**2.1 Material Properties.**

**2.1.1** The contractor shall provide a unidirectional, high-strength fiber fabric fully saturated with compatible epoxy resin per manufacturer's recommendations. FRP provided shall meet or exceed ASTM D3039 test procedure requirements (tensile modulus, stress and strain) as determined from independent laboratory testing.

**2.1.2** The contractor shall provide a flexible, waterproofing, non-vapor barrier protective top coating compatible with the FRP manufacturer's recommendations to protect the FRP from ultraviolet radiation and heavy abrasion. The protective top coating shall be concrete gray in color and match the color of the adjacent unwrapped concrete.

**2.2 Product Data.** Manufacturer's product data including physical and chemical characteristics, material specifications for each component, limitations on use of the system, construction or application specifications, maintenance instructions and general manufacturer's recommendations regarding each system shall be provided. Product data on the proposed primer, putty, resin, saturant, and carbon fiber shall be included. Testing information on the combination of the proposed carbon fiber reinforcement and epoxy when used together as a system shall be provided. The contractor shall provide certifications by the producers of the materials that all materials supplied are in accordance with all the requirements and standards of the appropriate ASTM and other agencies. Manufacturer's Material Safety Data Sheets (MSDS) for all materials to be used shall be provided.

**2.2 Contractor Submittals.** Submit the following documentation and obtain approval 3 weeks before work commences:

**2.2.1 Contractor Qualifications.** The contractor shall provide a manufacturer's certification of technical training, FRP system selected, project supervisor, and documentation showing the contractor has been certified or approved by the manufacturer of the FRP system. A contractor specializing in the supply and installation of FRP repair systems with minimum of 5 years of experience in performing FRP composite retrofits shall perform the work. A trained project supervisor shall remain at the work site at all times to instruct the work crew in the FRP application procedures.

**2.2.2 Shop Drawings.** Shop drawings shall be submitted signed and sealed by a Missouri Professional Engineer in accordance with [Sec 107](#) for "Authentication of Certain Documents". Shop drawings shall include the detail of types, locations, dimensions, number of layers and splice details and orientation of all FRP materials and coatings to be installed. The wrap shall completely enclose the column with a minimum lap of wrap as recommended by the FRP manufacturer.

JOB SPECIAL PROVISIONS (BRIDGE)

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**2.2.3 Calculations.** Signed and sealed calculations with the shop drawings shall be submitted indicating that the proposed system provides an equivalent or better confinement capacity than the original confinement reinforcement provided for the column.

**3.0 Construction Requirements.** FRP shall be required for concrete columns as noted on the plans and as directed by the engineer.

**3.1 Drainage Requirement.** The surfaces of the concrete column to receive the FRP composite shall be reasonably dry in the judgment of the engineer and as recommended by the FRP manufacturer.

**3.2 Surface Preparation for Columns (Contact-Critical).**

**3.2.1** The concrete surfaces to receive the FRP composite shall be free from fins, sharp edges and protrusions that may cause voids or depressions behind the installed FRP composite or that, in the opinion of the FRP installer and as directed by the engineer, will damage the fibers. Existing uneven surfaces to receive FRP composite, including voids or depressions shall be filled with compatible epoxy filler. The contact surfaces shall have no free moisture on them at the time of application. If moisture is present, FRP manufacturer written recommendation shall be followed for when moisture is present.

**3.2.2** All damaged or unsound concrete, spalls and loose material, dirt and debris shall be removed. Irregular surfaces and voids shall be filled with thickened epoxy to eliminate air surface voids. Paint and concrete that is well adhered are not required to be removed. Round off sharp and chamfered corners to a minimum radius of 3/4 inch shall be performed by means of forming with the system's thickened epoxy. Variations in the radius along the vertical edge shall not exceed 1/2 inch for each foot of column height.

**3.3 Installation of FRP.** The FRP shall be installed in accordance with the manufacturer's written recommendations.

**4.0 Method of Measurement.** This work will be measured by each.

**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 unit price for "Fiber Reinforced Polymer Wrap".