

February 28, 2024

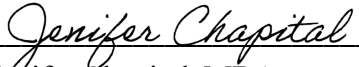
TO: ALL BIDDERS UNDER ITB No. 24-101626, BRIDGE REHABILITATION ON ORION DRIVE

FROM: Department of Purchasing and Contracting, DeKalb County, Georgia

ADDENDUM NO. 2

Invitation To Bid (ITB) No. 24-101626, Bridge Rehabilitation on Orion Drive is hereby amended as follows:

1. The Special Provision for the below listed line items on page 16, Bidder's Unit Price Form have been added and are attached hereto.
 - Line-Item No. 519-0530, Orion Drive Special Provision SP519, Two-Part Epoxy Polymer Overlay
 - Line-Item No. 528-0501, Epoxy Pressure Injection of Concrete Cracks
 - Line-Item No. 590-1000, Fiber Reinforced Polymer (FRP) Composite
 - Line-Item No. 150-1000, Traffic Control
2. It is the responsibility of each bidder to ensure that he/she is aware of all addenda issued under this ITB. Please sign and return this addendum with your response. You may email Jenifer Chapital, Procurement Agent, at JChapital@dekalbcountyga.gov or call 404-371-2569 before the Bids are due to confirm the number of addenda issued.
3. All other conditions remain in full force and effect.



Jenifer Chapital, MBA
Procurement Agent

DR/jgc

Attachments: Special Provisions SP519, SP528, SP590, & SP150

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Addendum No. 2

ITB No. 24-101626 – Bridge Rehabilitation on Orion Drive

ACKNOWLEDGEMENT

Date: _____

The above Addendum #2 is hereby acknowledged:

(NAME OF BIDDER)

(Signature)

(Title)

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
SPECIAL PROVISION
ORION DRIVE OVER PEACHTREE CREEK FORK
DEKALB COUNTY

SECTION 519 – Two-part Epoxy Polymer Overlay

519.1 General Description

This work includes preparation of the concrete surface and furnishing and placing of a two-part polymer overlay at the location and thickness as indicated on the plans. This overlay system consists of a minimum 3/8 " (9.5mm) thick application to provide complete waterproofing as well as providing a non-skid surface that withstands continuous heavy traffic and extreme changes in weather conditions.

519.1.01 Definitions

General Provision 101 through 150

ICRI: International Concrete Repair Institute

CSP: Concrete Surface Profile

519.1.02 Related References

A. Standard Specifications

[Section 107 – Legal Regulations and Responsibility to the Public](#)

[Section 504—Twenty-Four Hour Accelerated Strength Concrete](#)

[Section 886—Epoxy Resin Adhesives](#)

[Section 934—Rapid Setting Patching Materials for Portland Cement Concrete](#)

B. Referenced Documents

ASTM C 1583

ASTM D 570

ASTM D 638

ASTM D 2240

ASTM D 2556

ASTM D 4263

AASHTO T 27

AASHTO T 255

GDT 58

519.2 Materials

Submittals: The Contractor must submit overlay materials for each Concrete Overlay project to the Office of Materials and Testing for approval a minimum of 30 days prior to beginning work. Any change to approved overlay materials during the project must be submitted for approval before continuing work. Sample requirements: Two Part Epoxy Polymer components, one gallon each, Part A and Part B. Aggregate, 20 lb. or one bag minimum. Each polymer overlay component product container shall be clearly labeled with the following: Manufacturer and Brand Names, mixing instructions, material data sheet, and a copy of this Special Provision. The Office of Materials and Testing will grant approval based on laboratory test results and on the system's performance during a 2 year field evaluation. The following Two-Part Epoxy Polymer may not be used on this project under this Special Provision 519: Olin Epoxy-Poly-Carb-Mark 154.

- A. Concrete Surface Overlay:** Use an overlay consisting of a two-part epoxy polymer that is free of any fillers or volatile solvents and formulated to provide simple volumetric mixing ratio of two components such as one to one or two to one by volume. Use a two-part epoxy polymer system formulated to provide flexibility in the system without any sacrifice of the hardness, chemical resistance or strength of the system. Do not use external or conventional plasticizers. Introduce flexibility by interaction of elastomers to chemically link in the process of curing so that the flexibility of the molecule is minimally affected during the low temperature conditions that are confronted in actual use. Use a two-part polymer overlay system having the following physical properties when cured:

PHYSICAL PROPERTIES FOR CURED TWO-PART EPOXY POLYMER OVERLAY SYSTEM		
TEST	REQUIREMENTS	TEST METHOD
Compressive Strength w/aggregate @ 3 days	5,000 PSI min. (35 MPa)	ASTM C 109 w/plastic inserts
Tensile Strength @ 3 days	2,500 PSI min. (17 MPa)	ASTM D 638
Tensile Elongation @ 3 days	30% min.	ASTM D 638
Water Adsorption @ 3 days	0.20% max.	ASTM D 570
Shore "D" Hardness @ 3 days	60 min.	ASTM D 2240
Viscosity (Mixed Polymer)	1500 – 2500 cps	ASTM D 2556
Pot Life (Mixed Polymer)	15-40 minutes	GDT-58
Concrete Briquette Bond Strength @ 24 hours	400 PSI min. (2.76 MPa)	GDT-58
Field Adhesion to Concrete @ 72 hours	100% failure in concrete	ASTM C 1583 (Pull Out Method)

- B. Aggregate:** The aggregate for all layers shall be angular, nonfriable, non-polishing, clean and free dirt, clay, asphalt and other deleterious substances. The aggregate shall be dry to a maximum moisture content 0.2% by weight in accordance with AASHTO T 255. Use Basalt, Chert, or Flint aggregate tested according to AASHTO T 27 conforming to the following gradation.

AGGREGATE GRADATION	
SIEVE SIZE	% PASSING BY WEIGHT
No. 4	100
No. 20	0 – 5
No. 200	0 – 1.0

519.2.01 Delivery, Storage and Handling

Deliver all materials in their original containers, bearing the manufacturer's label, specifying date of manufacture, batch number, trade name brand, quantity and mixing ratio.

Store all materials to prevent damage from the elements and to insure the preservation of its quality and fitness for the work. Avoid contact with flame.

Inspect all stored materials, although accepted before storage, prior to their use in the work. Ensure that all stored materials meet the requirements of the Contract at the time of use.

Remove from the site of the work immediately, any material rejected because of failure to meet the required tests or rejected because of damage. Replace all removed material at no additional cost to the Department.

519.3 Construction Requirements

519.3.1 Contractor Qualifications

Submit to the Engineer for approval written verification from the Contractor or Subcontractors proving at least three (3) years' experience in concrete preparation, cleaning, and application of two part epoxy polymer and aggregate overlay systems on concrete. The Contractor or Subcontractor must also submit a list of at least three (3) successful two part epoxy polymer and aggregate overlay projects on concrete which have been in service for at least two (2) years without failure. List each project location including; total installed area of two part epoxy and aggregate concrete overlay, manufacturer of two part epoxy polymer and aggregate, and a reference contact for each project.

519.3.2 Preparation

A: Removal and Preparation of Repair Area

Sound all visual concrete surface defects of greater than 1 inch X 6 inch (25 mm X 150 mm) to determine the limits of the damaged areas. Strike the concrete surface around the defect with a hammer, chain drag, or other similar tool to detect unsound concrete having a "flat" or "hollow" sound. Mark the limits of the defective areas on the concrete surface by making a rectangular area 2 inches (50mm) beyond the outer limits of the unsound concrete area to serve as a guide for sawing. Mark spalled areas within less than 6 inches (150mm) of each other as one spall area.

Saw the rectangular marked areas with near vertical faces not less than one inch (25mm) in depth. Exercise extreme care not to saw or damage the reinforcing steel. Remove all unsound material within the sawed areas. Remove concrete to a minimum depth of $\frac{1}{2}$ inch (13mm) below the top mat of reinforcing steel by power chipping or hand tools. Do not use pneumatic hammers heavier than a 15 lb. class (nominal). Do not operate pneumatic hammers and chipping tools at an angle exceeding 60 degrees relative to the surface of the concrete surface. Such tools may be started in the vertical position but must be immediately tilted to a 60 degree operation angle. Clean all exposed reinforcing steel of all rust, corrosion products, oil, dirt, concrete fragments, loose scale and any other coating of any character that would destroy or inhibit the bond with the patching material. Exercise utmost care not to damage or fracture the sound concrete substrate left on the bottom of the spall repair area. Do not use sharp pointed bits.

Hold "over-cutting" of the concrete surface beyond marked areas to the minimum amount possible. Thoroughly clean all "over-cutting" of "saw slurry" and other contaminants. Then repair by filling full-depth with an approved Type II epoxy adhesive as specified in Section 886. Make such repairs as soon as possible.

Just prior to placing the patching material, thoroughly clean the surfaces within the repair areas by abrasive blasting and air blasting to remove any oil, dust, dirt, slurry from saw operation, and other contaminants. Remove abrasives from the blasting operation from the concrete surface. During blasting, protect traffic in adjacent lanes.

B. Placement of Patching Material

Ensure that the Contractor uses Repair Method No. 1 or Method No. 2 as described below. For both repair methods, ensure that the surface within the repair areas is dry and thoroughly cleaned of all contaminants immediately before placement. Ensure that air compressors used for cleaning repair areas are equipped with suitable traps capable of removing all surplus water and oil in the compressed air. Do not use contaminated air. Ensure that the compressor is capable of delivering compressed air at a continuous pressure of 90 psi (620kPa).

Ensure that the finished surface meets a surface tolerance of $\frac{1}{16}$ inch (1.6mm). Utilize such approved measures as necessary to keep the concrete surface adjacent to the patching operation reasonably clean of excess grout and other materials at all times. Unless otherwise specified, complete all patching operations and open all lanes to traffic before sunset each day.

1. Repair Method No. 1 (24 Hour Accelerated Strength Concrete)

After the repair area preparation is complete, completely coat all concrete surfaces within the repair area with a film of Type II epoxy at a thickness of 10 to 20 mils (0.25 to 0.50mm).

Use concrete that meets the requirements of Section 504. Mix the concrete on site. Use a mix design and mixing method approved by the Laboratory. Deposit concrete in the repair area while the epoxy is still tacky and vibrate sufficiently to form a dense, homogeneous mass of concrete, completely filling the area of the patch. Scream the

concrete to the proper grade and allow to remain undisturbed until the water sheen disappears from the surface. Then cover the concrete with wet burlap or membrane curing compound. Ensure that curing continues for a minimum of 3 hours. The Engineer may require a longer curing time to ensure sufficient strength development of the concrete prior to opening to traffic.

2. **Repair Method No. 2 (Rapid Setting Patching Material)**

Follow the above requirements for Repair Method No. 1. Additionally, prepare the surfaces in the repair areas in accordance with the manufacturer's written recommendations. Ensure that handling, mixing, placement, consolidation, screeding, and curing of the patching material are in accordance with the manufacturer's written instructions as approved by the Laboratory. Ensure that curing continues for at least one hour and until the section is opened to traffic.

519.3.3 Construction

A: Surface Preparation: Clean the concrete surface by shot blasting to remove oil, dirt, rubber or any other potentially detrimental material such as curing compound and laitance which may prevent proper bonding and curing of the material. Clean concrete surface to International Concrete Repair Institute (ICRI), Concrete Surface Profile (CSP) standard CSP 4 (light scarification) minimum. The Contractor will maintain a set of ICRI Concrete Surface Profile chips on the project. CSP chips will be made available to the Engineer to ensure the CSP 4 standard is maintained.

The Contractor is directed to Section 107 of the Standard Specifications giving the Contractor responsibility for the work site, and requiring conformance to all federal, state, and local laws relating to pollution control and worker protection. In particular, ensure that the Contractor is familiar with and in full compliance with the provisions of the laws concerning the management of waste and worker protection.

Do not allow construction traffic on any portion of the concrete surface that has been shotblasted or on the overlay without specific approval of the Engineer. Overlay the concrete surface-within 24 hours of the surface preparation operation.

Ensure that all surfaces to be overlaid are dry at the time of application. Immediately before applying the overlay system, clean all prepared surfaces with compressed air (or vacuum) to remove dust and debris. Ensure that the compressor is equipped with a filter to prevent oil in the air supply. Do not apply the overlay system when rain is forecast to occur within 24 hours of application. Do not apply the overlay system unless the minimum ambient temperature is 50° and rising or when concrete surface temperature is expected to exceed 100 °F.

If, in the opinion of the Engineer, the surface has become soiled or contaminated prior to the application of the overlay, re-clean the surface to (ICRI) CSP 4 standard and the satisfaction of the Engineer at no additional cost to the Department.

B. Field Test: Prior to commencing the overlay operation, place a full depth overlay test area on the concrete surface of each bridge in this project. Prepare the area for the test overlay as described above. Ensure that the test is large enough so that the cleaning equipment and methods to be employed in the full-scale operation can be used for the field test. Ensure that the degree of cleaning used on the test area meets (ICRI) CSP-4 minimum. The application of the overlay system to the test area should be used to establish proper procedures and techniques for applying the overlay to the full structure.

After the test area has cured for 72 hours, the contractor will check adhesion in accordance with ASTM C 1583 (Pull Out Method). Test a minimum of three sample areas in the presence of the Engineer. Ensure that no adhesion test has an adhesive strength less than 250 psi (1.7 MPa) and that the minimum average value for the 3 tests is greater than 300 psi (2.0 MPa). Do not perform tensile test when surface temperature is at or above 90°F (32°C). Ensure that the polymer overlay thickness meets requirements of 519.3.02.C. Ensure that aggregate is broadcast evenly into polymer until refusal and that no epoxy bleed through is present.

If the Field Test of a sample area fails to meet the above requirements due to a cohesive failure of the concrete substrate, thickness of epoxy polymer overlay, or epoxy polymer bleed through is present, the sample area will be considered unacceptable. Successful completion of the Field test will be required before beginning full-scale overlay operations.

Equipment:

1. Mechanical Epoxy Polymer Application Equipment.

Ensure that each component of the two-part polymer is metered, mixed together, and distributed onto the concrete surface by machine. Ensure that the dispensing machine is capable of ratio check verification at the

pump outlets as well as cycle counting to monitor output. Ensure that the in line mixing is motionless so as not to overly shear the material. Ensure that the machine makes maximum use of the working time of the polymer by mixing it immediately prior to dispensing onto the concrete surface. Adequate hand tools to facilitate the placement of the overlay according to this specification. Use V-Notched squeegees with 1/4 in. or 3/8 in. notches to spread the epoxy polymer to a consistent thickness. Discard worn squeegees when they are no longer capable of spreading the epoxy polymer at the specified spread rate.

2. Hand Epoxy Polymer Application Equipment.

Use calibrated containers for accurate measurement of epoxy polymer components. Use paddle type or other mixing device capable of accurate and complete mixing of epoxy resin and hardening components. Use V-Notched squeegees with 1/4 in. or 3/8 in. notches to spread the epoxy polymer to a consistent thickness. Discard worn squeegees when they are no longer capable of spreading the epoxy polymer at the specified spread rate.

3. Aggregate Application Equipment.

All methods of aggregate application shall distribute aggregate uniformly allowing aggregate to fall into the epoxy polymer to refusal. Aggregate spreaders similar to agricultural fertilizer spreaders shall be capable of accurate application of the aggregate over 100% of the work area. A sand blaster or venture system connected to an air compressor may be used to draw aggregate from bulk bags or cement tanker through hoses adequate to place aggregate into epoxy polymer. Aggregate may be broadcast by hand ("Chicken Feeding"). Methods of aggregate placement that displace or pushes the epoxy polymer will not be allowed.

C. Application: Provide suitable coverings, such as heavy duty drop cloths, to protect all exposed areas not to be overlaid, such as curbs, railings, parapets, deck drains, locations of expansion joints that are to receive expansion joint membranes, etc. Clean or repair any damage or defacement resulting from the application, at the Contractor's expense, to the satisfaction of the Engineer.

Ensure that application of the overlay system is done by the supplier, or by a factory trained or licensed applicator, with written approval from the manufacturer of the overlay system.

Ensure that the number of layers and the application rates of the materials in the various layers are adequate to achieve a minimum 3/8 in. (9.5mm) and maximum 1/2 in. (13mm) overlay thickness when measured from the top of the concrete substrate to the top of the polymer (not the peaks of the aggregate). Ensure that the application of the overlay system is as follows:

1. **APPLICATION OF INITIAL EPOXY POLYMER LAYER:** Application of the initial epoxy polymer overlay layer shall not begin until the substrate is visibly surface dry, free of water and moisture. ASTM D 4263 modified for 2 hours may be used to verify dryness. After mixing of the epoxy polymer components, evenly distribute on the clean, dry concrete surface at the minimum rate of 40 ft²/gal (.98 M²/L).
2. **APPLICATION OF AGGREGATE:** Apply dry aggregate to epoxy polymer within ten minutes of placement of epoxy polymer and before it becomes tacky. The initial layer of aggregate shall be applied at a minimum rate of 10 lbs. /yd² (5.5 Kg/M²) to refusal so that no wet spots are visible. If epoxy bleeds through the aggregate, the area should be immediately covered with additional aggregate prior to initial set.
3. **CONSOLIDATION:** If required by the manufacturer, use a hand operated roller as approved by the Engineer and the manufacturer within 10 minutes of the aggregate application to evenly consolidate the aggregate into the polymer.
4. **REMOVAL OF EXCESS AGGREGATE:** After initial cure, remove excess aggregate by a power vacuum or other Engineer approved method prior to the application of subsequent layers of polymer.
5. **APPLICATION OF ADDITIONAL LAYERS:** Additional layers may be applied immediately after the initial set of the preceding layer (as determined by the Manufacturer and Engineer) and removal of all excess aggregate. The maximum time allowed between each layer shall be at the discretion of the Engineer and the Manufacturer and may vary depending on the temperature and circumstances of the project. Ensure that joints are staggered and overlapped between successive layers so that no ridges will appear.
 - a. Apply additional epoxy polymer components at a minimum rate of 22 ft²/gal (.54 M²/L).
 - b. Apply aggregate to additional epoxy polymer at a minimum rate of 14 lbs. /yd² (7.6 Kg/M²) to refusal so that no wet spots are visible. Apply additional aggregate to areas where epoxy polymer bleeds through immediately before epoxy polymer becomes tacky.
 - c. Contact the epoxy polymer manufacture for minimum cure time estimates.

6. **TRAFFIC CONSIDERATIONS:** Traffic may be allowed on the final layer after the polymer has reached its final cure (as determined by the Manufacturer) and after removal of all excess, loose aggregate.
7. **OVERLAY SURFACE:** Ensure that the finished surface consists of a uniform coat of imbedded exposed aggregate.

519.3.4 Quality Acceptance

A: Thickness Verification

Ensure that the overlay is at least $\frac{3}{8}$ " (9.5mm) thick as measured from the concrete substrate to the top of the polymer at three random locations for every 1000 yd² (830 m²) of surface area. Recoat thin areas as described above and re-verify thickness at no additional cost to the Department. This verification may consist of cores, holes, etc., but in all cases repair any areas tested to destruction before final acceptance.

In thin areas that have been recoated to obtain the required minimum thickness, the Engineer may require additional adhesion strength tests in accordance with ASTM C 1583 (Pull Out Method) to verify the Contractor's procedure for recoating existing overlay.

519.3.5 Contractor Warranty and Maintenance

The polymer manufacturer and the Contractor, by acceptance of the work described in this Specification, shall jointly agree to guarantee the wearing surface against all defects incurred during normal traffic use for a period of ten years. Commence the ten year period on the date of acceptance of the work. The guarantee shall cover all labor and materials required by the Department to satisfactorily repair and replace the wearing surface. Transmit a copy of this agreement to the Office of Bridge Maintenance.

519.4 Measurement

519.4.1 Surface Preparation:

Measure the area of the concrete surface acceptably repaired and blast cleaned prior to installation of the overlay in square yards (meters) computed from surface measurements taken to the nearest 0.1 foot (30mm). Do not measure the blast cleaning of any longitudinal or transverse construction joints or vertical surfaces for payment.

519.4.2 Epoxy Polymer Overlay:

Measure the area of the concrete surface acceptably overlaid with polymer and broadcast spread crushed aggregate in square yards (meters) computed from surface measurements taken to the nearest 0.1 foot (30mm).

519.5 Payment

519.5.1 Surface Preparation:

Surface preparation is paid for by the square yard (meter) of the concrete surface acceptably repaired and blast cleaned prior to installation of the overlay. Payment includes all expenses associated with removal of existing concrete, repair and blast cleaning operations.

519.5.2 Epoxy Polymer Overlay:

Epoxy polymer overlay is paid for by the square yard (meter) of the concrete surface overlaid, complete in place and accepted, provided, however, that the specified minimum overlay thickness requirement is met. The individual layers necessary to attain the specified thickness will not be paid for individually. Payment includes all labor and material cost, procurement, handling, hauling and processing, coring for thickness verification, guarantee, and includes all equipment, tools, labor, and incidentals necessary to complete the work.

Payment will be made under:

Item No. 519	Surface Preparation	Per square yard (meter)
Item No. 519	Concrete Overlay	Per square yard (meter)

Item No. 519-0515 Surface Preparation per Square Yard (Meter)

Item No. 519-0530 Polymer Overlay per Square Yard (Meter)

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
SPECIAL PROVISION
ORION DRIVE OVER PEACHTREE CREEK FORK
DEKALB COUNTY

Section 528 – Epoxy Pressure Injection of Concrete Cracks

528.1 General Description

This work consists of labor, material, equipment, and services necessary for repairing concrete cracks. The Plans will specify or the Engineer will determine the extent of repair. The work shall comply with the Specifications including Special Provisions where applicable.

528.1.01 Definitions

General Provisions 101 through 150.

528.1.02 Related References

A. Standard Specifications

Section 886—Epoxy Resin Adhesives

B. Referenced Documents

General Provisions 101 through 150

528.1.03 Submittals

General Provisions 101 through 150.

528.2 Materials

Ensure epoxy used for crack repair complies with the requirements of Section 886, Type V epoxy adhesive.

Ensure epoxy used for sealing cracks at the surface is strong enough to withstand injection pressures up to 250 psi (2 MPa).

528.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

528.3 Construction Requirements

528.3.01 Personnel

General Provisions 101 through 150.

528.3.02 Equipment

A. Injection Equipment

Ensure that dispensing equipment for the injection complies with the following performance requirements:

- Self-monitor pressures of 250 psi (2 MPa) for extended periods under flow.
- Maintain a ratio of accuracy of one percent at the required pressures.
- Mix in-line using a static mixing head.

When using screen wire, wire brushes, or other elements for mixing, provide independent certification that the material is mixing thoroughly at the flow rate and temperatures for the job. Also demonstrate that the unit will not dispense resin if the material line is blocked on the supply or dispense side of the system.

528.3.03 Preparation

Before repairing the cracks specified on the Plans, prepare the concrete surfaces next to the cracks by exposing clean and sound concrete.

The exact procedures for exposing clean and sound concrete shall be the Contractor's option and responsibility. However, the procedures must comply with any traffic handling and construction sequencing requirements for the Project.

528.3.04 Fabrication

General Provisions 101 through 150.

528.3.05 Construction

Seal concrete cracks as follows:

1. After preparing the concrete surfaces, seal the cracks at the surface with epoxy.
Port spacing, location, and port type shall be the Contractor's option and responsibility.
2. If the voids are not thoroughly penetrated, use the following procedure:
 - a. Wet core on 8 in (200 mm) centers the holes that are 1/2 in (13 mm) diameter and 3/4 in (19 mm) to 1 in (25 mm) depth.
 - b. Insert into the cored holes to the full depth copper or plastic tubes 1/2 in (13 mm) diameter and notched at the base.
 - c. Seal the circumference of the ports at the surface.
 - d. Inject the epoxy at a constant pressure not to exceed 250 psi (2 MPa) for at least 10 minutes or until penetration occurs.
3. After the injection operation is complete, clean the sealed cracks to the original concrete surface.
4. Remove nipple devices and surface sealers over the injection holes.

528.3.06 Quality Acceptance

General Provisions 101 through 150.

528.3.07 Contractor Warranty and Maintenance

General Provisions 101 through 150.

528.4 Measurement

Epoxy pressure injection of concrete cracks is measured for payment by linear foot of crack repaired, and includes all materials, equipment and labor necessary to complete the work.

528.4.01 Limits

General Provisions 101 through 150.

528.5 Payment

Epoxy pressure injection of concrete cracks as specified above is paid for at the Contract Unit price bid per linear foot. Such payment is full compensation for furnishing all equipment, labor and materials and performing the work in accordance with the Plans and Specifications. Payment will be made under:

Item No. 528	Epoxy Pressure Injection of Concrete Cracks	Per linear foot
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528.5.01 Adjustments

General Provisions 101 through 150.

OFFICE OF MAINTENANCE

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
SPECIAL PROVISION
ORION DRIVE OVER PEACHTREE CREEK FORK
DEKALB COUNTY

Section 590 – Fiber Reinforced Polymer (FRP) Composite Material

590.1 General Description

This work consists of furnishing and installing Fiber Reinforced Polymer (FRP) composite material systems for structural strengthening of reinforced concrete bridge components. These systems generally consist of prefabricated, composite carbon fiber reinforced polymer (CFRP) fabrics applied in one (1) layer or multiple layers, externally bonded to concrete with high strength structural epoxy adhesives used to strengthen structural elements. Furnish all materials, tools, equipment, transportation, necessary storage, access, labor and supervision required for the proper application of the composite systems.

It is the Contractor's responsibility to visit each site prior to bidding for the project to determine the scope of work. It is the Contractor's responsibility to determine surface preparation, crack repair and spall repair limits.

590.1.01 Definitions

General Provisions 101 through 150.

ACI: American Concrete Institute

ICC: International Code Council

ICRI: International Concrete Repair Institute

590.1.02 Related References

A. Standard Specifications

Section 109 - Measurement and Payment

B. Referenced Documents

ACI 440.2R-17

ASTM C1583

ASTM D3039

ASTM D4541

ICC ES Acceptance Criteria (AC125)

ICRI CSP - 5 – Guideline No. 03732

590.1.03 Submittal Requirements

Submit seven (7) complete sets of information to the Engineer for review. Submit complete shop drawings, design calculations, and product data that includes the information listed below.

A. Furnish shop drawings that include the following:

Section 590 – Fiber Reinforced Polymer (FRP) Composite Material

1. Details of the number, thickness, and orientation of reinforcing layers proposed at each location to be strengthened.
 2. Locations of splices, joints and corresponding lap lengths.
 3. A proposed sequence of construction, including traffic control, for each location to be strengthened.
 4. A list of materials to be used.
 5. Installation instructions that include details of the order and direction of placement for each reinforcing strip.
 6. Certification of all drawings and by a Professional Engineer registered in the state of Georgia.
- B. Submit design calculations for alternate CFRP systems that include the following:
1. Detailed calculations for the proposed CFRP system showing that the strengthened elements meet the capacity requirements shown on the plans. Submit design calculations for the composite system, certified by a Professional Engineer registered in the state of Georgia, for approval by the engineer of record. Develop design calculations to meet the requirements set forth in ACI 440 and considering the design modulus and area of the composite to be installed. Design the cured composite system according to the manufacturer's published data and materials certifications.
 2. Calculations and analysis for carbon fiber bond development length, bond transfer stress, carbon fiber delamination, anchorage requirements, and all other calculations required to design the specified system.
 3. Develop design calculations to meet the requirements set forth in the ICC ES Acceptance Criteria (AC125), based on tension forces and strain limits.
 4. Independent test data confirming material properties used in the design calculations, including ultimate stress, modulus of elasticity, and ultimate strain as per ASTM D3039.
- C. Product data information for the proposed primer, putty, adhesive, epoxy, carbon fiber, and protective coating including the following:
1. Product data indicating product standards, physical and chemical characteristics, technical specifications, limitations, installation instructions, and general manufacturer's recommendations regarding each material.
 2. Test information on the epoxy indicating a three (3) year track record of successful commercial performance with CFRP concrete strengthening, confirmed with four (4) actual installations. Include specifications data for standard, summer, and winter installations.
 3. Test information on the carbon fiber reinforcement indicating a three (3) year track record of successful commercial performance with CFRP concrete strengthening confirmed with four (4) actual installations.
 4. Test information on the combination of the proposed CFRP fabric and epoxy when used together as a system. Include a three (3) year track record of successful commercial performance confirmed with four (4) actual installations.
 5. Manufacturer's recommendations for system components and installation procedures.
 6. Certification from the system manufacturer of the material and section properties for the supplied material.
 7. Written verification from the system manufacturer that the applicators have received the required certifications and training for CFRP installation.
 8. Sample of the finished coating showing color and texture to be approved by the Engineer.

Approval of the above by the Engineer does not relieve the Manufacturer and Contractor of responsibility for the performance of the CFRP concrete strengthening system used.

590.1.04 Contractor Qualifications

Submit to the Engineer for approval, written certification from the Manufacturer documenting installer's past experience and training in the installation of the manufacturer's system. Provide quality control procedures in compliance with the Manufacturer's installation requirements for concrete strengthening systems. Employ or retain for the duration of the contract a full-time, on site Project Manager with technical knowledge of CFRP concrete strengthening systems that has successfully completed three (3) installations on similar strengthening projects. The Project Manager is to attend the Pre-Construction Conference and provide a demonstration or presentation on the FRP application to the . Submit the following information to the Engineer for review and approval 30 days prior to beginning work on the project:

Section 590 – Fiber Reinforced Polymer (FRP) Composite Material

- A. Proof of certification by the Manufacturer.
- B. Proof of five (5) year Manufacturer's warranty.
- C. Resume of proposed Project Manager.
- D. A list of three (3) strengthening projects completed by the Project Manager, including the dates of work, type, description and amount of work performed, and the name and telephone number of a contact person at the agency or company for which the work was completed.

The engineer of record reserves the right to approve or reject the personnel qualifications as submitted. Use only personnel that have been approved for CFRP installation by the engineer. The engineer may suspend the work if the contractor substitutes unauthorized personnel for authorized personnel during construction.

590.2 Materials

CFRP Systems considered for use under this specification are listed below.

Manufacturer

Fyfe Co. LLC
6310 Nancy Ridge Dr, Suite 103
San Diego, CA 92121
Tel: (858) 642-0694, Fax: (858) 642-0947

System

TYFO® Fibrwrap® Systems

Sika Corporation
201 Polito Avenue
Lyndhurst, NJ 07071
Tel: (201) 933-8800, Fax: (201) 933-6225

SikaWrap Hex Systems

BASF Building Systems
889 Valley Park Drive
Shakopee, Minnesota 55379
Tel: (800) 433-9517

Masterbrace FRP Fabric

Simpson Strong-Tie Company, Inc.
5956 W. Las Positas Blvd.,
Pleasanton, CA 94588
Tel: (800) 999-5099, Fax: (925) 847-1597

CSS Composite Strengthening Systems

All requirements for materials defined in this Special Provision must be met prior to final approval for installation. Provide primer epoxy, epoxy adhesive, and finish coating which is compatible with the system provided. Match finished coat colors with the existing concrete color. Obtain approval from the Engineer of the finished coat color and texture prior to installation.

590.2.01 Delivery, Storage, and Handling

Georgia Department of Transportation Standard Specifications, General Provisions 101 through 150.

Use only the CFRP concrete repair system components delivered in their original, unopened containers clearly marked with the manufacturer's name, product identification, and batch numbers. Use only epoxy materials delivered in factory-sealed containers with the manufacturer's labels intact and legible with verification of date of manufacture and shelf life. Store and handle the various components of the FRP system in a manner as recommended by the manufacturer. Store all materials in a protected area at a temperature between 50°F and 100°F, avoiding contact with moisture.

590.3 Construction Requirements

Section 590 – Fiber Reinforced Polymer (FRP) Composite Material

590.3.01 Personnel

Georgia Department of Transportation Standard Specifications, General Provisions 101 through 150. Provide a Project Manager meeting the requirements specified in 590.1.04.

590.3.02 Equipment

Georgia Department of Transportation Standard Specifications, General Provisions 101 through 150.

During and after FRP installation, furnish a safety belt and a lift truck, bucket truck, snooper truck, or scaffolding to the engineer's satisfaction to inspect the surface preparation and FRP installation.

590.3.03 Construction

Install the CFRP concrete repair system using an installer trained and licensed by the manufacturer in installing the specified system. Install the CFRP concrete repair system in accordance with the manufacturer's recommendation and the following:

- A. Surface Preparation:
 - 1. Apply CFRP materials to surfaces that are clean, sound, and free from frost and all other contaminants. Remove dust, grease, curing compounds, waxes, impregnations, foreign particles, and other bond inhibiting materials by blast cleaning or equivalent mechanical means. Remove from the surface to receive CFRP all fins, sharp edges and protrusions that will cause voids behind the installed CFRP or that, in the opinion of the Engineer, will damage the CFRP. Remove freestanding moisture from the contact surfaces prior to application.
 - 2. Inject all cracks larger than 0.010 inch with epoxy as per Section 528 of the Georgia Standard Specifications.
 - 3. Repair spalls in concrete surfaces in accordance with Section 521 of the Georgia Standard Specifications.
 - 4. Fill uneven surfaces with an approved epoxy mortar. No more than 1/8 inch per foot concave deviation from plane is allowed on the surface.
 - 5. At the direction of the Engineer, verify the strength of the concrete after surface preparation by random pull-off testing (ASTM C1583/1583M). Minimum tensile strength is 200 psi with concrete substrate failure.
 - 6. Round all corners and edges to a minimum radius of 3/4". Do not exceed 1/2" for every 12" of length variation in the radius along the edge.
 - 7. Prepare surfaces for bonding by means of abrasive blasting or grinding to achieve a 1/16" minimum aggregate amplitude (International Concrete Repair Institute CSP 5 – Guideline No. 03732). Clean all contact surfaces with broom or compressed air.
 - 8. Cost for surface preparation is included in the price bid for FRP installation.
- B. Epoxy Adhesive:
 - 1. Ensure that the ambient temperature and temperature of the epoxy components are in accordance with the manufacturer's recommendations at the time of mixing.
 - 2. Do not use components that have exceeded their shelf life.
 - 3. Mix only the quantity of epoxy that can be used within its pot life.
 - 4. Cure epoxy according to manufacturer's recommendations.
- C. Application of Carbon Fiber Reinforcing Fabric:
 - 1. Place carbon fiber reinforcing fabric according to design dimensions.
 - 2. Apply carbon fiber reinforcing fabric to surface by hand placement. Press the reinforcing to the substrate using a hard roller (rubber or steel) to assure both proper bond and uniform elevation.
 - 3. Inspect the reinforcing immediately after application to ensure that any entrapped air is released before the epoxy sets. Clean excess epoxy from installed reinforcing strips and adjacent areas.
 - 4. Protect carbon fiber reinforcing fabric from rain and moisture for a period as specified by the manufacturer or until the epoxy cures.
- D. Painting of Finished Surface:
 - 1. Apply two coats of UV resistant paint to surface of repaired areas.
 - 2. Obtain approval of color and texture from the Engineer prior to installation.

Section 590 – Fiber Reinforced Polymer (FRP) Composite Material

590.3.03 Field Quality Control

A. Installers:

Submit the following report to the Engineer and system manufacturer: Square footage and location of reinforcing fabric, volume of epoxy adhesive and batch numbers installed each day

B. Field Inspection:

All aspects of preparation, mixing, and application of materials are subject to field inspection, including the following:

- a. Material container labels
- b. Surface Preparation
- c. Application of primer to prepared surface
- d. Mixing of epoxy adhesive
- e. Application of epoxy adhesive
- f. Application of carbon fiber reinforcing fabric
- g. Curing of epoxy adhesive

Provide access and ensure that the on-site field inspector is present during and immediately following application of the composite reinforcing strips to perform a complete field inspection of the composite system. Closely monitor the mixing of all epoxy adhesive components for proper ratios and adherence to manufacturer's recommendations.

Repair defects identified by inspections at no additional cost to the Department. Submit repair procedures for approval by the Engineer prior to start of repair.

C. Field Testing:

1. Utilize areas adjacent to the application areas, having similar substrate consistency and environmental conditions as the application areas, for field testing.
2. Apply the composite reinforcing system to the testing area in a manner identical to the application area, including surface preparation, adhesive application, fabric application, and final product.
3. Perform a bond strength test according to ASTM C1583/1583M to ensure a bond strength >200psi per design requirements.

D. Laboratory Testing:

1. Record lot numbers of carbon fiber reinforcing fabric and epoxy adhesive used, along with location of installation. A "sample batch" of cured composite consists of two 12 inch long "samples". Take a minimum of two "sample batches" daily during the composite application. Test "Samples" at random, at owner's discretion and cost.
2. Test samples using ASTM D3039. Follow ASTM procedures and manufacturer's published testing methods during testing. Use only pre-qualified testing laboratories.
3. Make testing results available within 3 weeks of sample submission. Provide average values, based on nominal layer thickness, of the ultimate tensile strength, tensile modulus, and percent elongation

590.3.04 Quality Acceptance

Certification from the manufacturer, showing that the carbon fiber installation conforms to their requirements, is required in accordance with Subsection 106.05 of the Specifications. Transfer to the Department the manufacturer's five-year warranty on each installation. In addition to other causes, adhesive failure of the material supplied, delamination of the reinforcing fabric, or material failure due to weathering or UV deterioration are just cause for a warranty claim.

590.3.05 Contractor Warranty and Maintenance

Georgia Department of Transportation Standard Specifications, General Provisions 101 through 150.

Section 590 – Fiber Reinforced Polymer (FRP) Composite Material

Provide a warranty in writing, for a period of sixty (60) months after successful completion and acceptance of the project, for all CFRP concrete strengthening work against defective material and workmanship. Furnish the written warranty to the Department for approval prior to installation of the proposed CFRP system. The warranty is subject to transfer from the Department to the County.

590.4 Measurement

Fiber Reinforced Polymer (Carbon) is measured for payment by the square yard of concrete bridge component surface area strengthened with installed CFRP system.

The CFRP system consists of the following: One (1) or more layers of strengthening materials with all necessary items to bond the fabric to the concrete and finish paint constitutes an FRP system.

The FRP system includes payment for the following:

1. Equipment (including a “flotation device” or temporary platform on waterway bridges).
2. Work platform.
3. Bucket truck or snooper truck with Personal Protective Equipment.
4. Materials and work necessary for surface preparation and containment of spent materials.
5. Spall repair, crack repair, finish coating and any incidental items necessary to complete the work
6. Collection, storage, and disposal of spent materials, water, and slurry generated by abrasive blasting
7. Repair of defects identified by inspections.

590.4.01 Limits

Georgia Department of Transportation Standard Specifications, General Provisions 101 through 150.

590.5 Payment

Fiber Reinforced Polymer (Carbon) is paid for at the Contract Unit price per square yard of concrete bridge component surface area strengthened with the CFRP system. Payment of Fiber Reinforced Polymer (Carbon) is for furnishing and installing the FRP concrete strengthening system according to the plans, specifications, and manufacturer's recommendations. Surface preparation, spall repair, crack repair, finish coating and any incidental items necessary to complete the work are included in the price bid for Fiber Reinforced Polymer (Carbon).

Payment will be made under:

Item No. 590	Fiber Reinforced Polymer (Carbon), Bridge No - _____	Per square yard
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590.5.01 Adjustments

Georgia Department of Transportation Standard Specifications, General Provisions 101 through 150.

DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA
SPECIAL PROVISION
ORION DRIVE OVER PEACHTREE CREEK FORK
DEKALB COUNTY

Section 150 – Traffic Control

Delete Section 150.6 and add the following:

150.6 Special Conditions

- A.** Detours necessary to maintain traffic shall be submitted for approval by the Engineer at least twenty (20) days prior to implementation of the detour. All detours shall be furnished, installed and maintained in accordance with Georgia Standard Specifications, applicable Georgia Standards and the MUTCD. The Contractor shall submit a work plan that shows how the work will be accomplished within the specified work time. Standby equipment shall be provided to ensure the completion of the work by the specified time. Cost for this work shall be included in the price bid for Traffic Control..

B. Bridge No 1 – Orion Drive over Peachtree Creek Fork

The Contractor may close and detour Orion Drive over Peachtree Creek Fork for a maximum of one (1) weekend from 9:00 PM Friday to 5:00 AM Monday for the deck Polymer Overlay installation.