



Wisconsin Department of Transportation

April 12, 2023

**Division of Transportation Systems
Development**

Bureau of Project Development
4822 Madison Yards Way, 4th Floor South
Madison, WI 53705

Telephone: (608) 266-1631
Facsimile (FAX): (608) 266-8459

NOTICE TO ALL CONTRACTORS:

Proposal #30: 2715-03-73
Various Bridge Locations
STH 59 & USH 18
VAR HWY
Waukesha County

Letting of May 9, 2023

This is Addendum No. 01, which provides for the following:

Special Provisions:

Added Special Provisions	
Article No.	Description
33	Fiber Wrap Reinforcing Non-Structural, Item SPV.0165.01

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractor.

Sincerely,

Mike Coleman

Proposal Development Specialist
Proposal Management Section

ADDENDUM NO. 01

2715-03-73

April 12, 2023

Special Provisions

33. Fiber Wrap Reinforcing Non-Structural, Item SPV.0165.01.

A Description

This special provision describes providing non-structural protection using externally bonded, high-strength, fiber reinforced polymer (FRP) composite/epoxy resin systems field-applied per the details shown on the plans.

B Materials

Furnish a glass or carbon composite fabric that is a continuous unidirectional filament woven fabric with a primary fiber of electrical (E) glass or carbon, respectively.

Use a two-component, solvent-free with 0% Volatile Organic Compound (VOC) epoxy that is supplied by the manufacturer. Polyester resin shall not be allowed as a substitute for epoxy resin. Deliver epoxy materials in factory sealed containers with the manufacturer's labels intact and legible with verification of the date of manufacture and shelf life.

The protective top coating shall be concrete gray in color and match the color of the adjacent unwrapped concrete. Protective top coating shall be vapor permeable and UV resistant.

The use of more than one FRP system in an application is not permitted. All components, including primer, putty, filler, protective coating, and other materials, shall be compatible with the FRP system.

Store products in a protected area at a temperature between 40°F and 100°F with no moisture contact, no UV exposure, protected from dirt, chemicals, and physical damage, and according to the manufacturer's requirements. Do not use components exceeding their shelf lives.

Provide the following to the engineer:

- The manufacturer's data sheet indicating physical, mechanical and chemical characteristics of all materials used in the FRP system including the primer, putty, resin, saturant, fibers, and top coating.
- The manufacturer's Material Safety Data Sheets (MSDS) for all materials used.
- The manufacturer's instructions for installation and repair, including information on lap details if required.
- The manufacturer's storage and handling requirements of all materials.

Supplied composite fabric and epoxy resin products must have a minimum of ten installations. Furnish proof of successful installations including date of construction and owner references. Furnish certified test reports including 1000 hour tests for 140°F, water, and salt water.

C Construction

C.1 Certified Applicators

Installers shall have a minimum of three years of experience performing similar FRP composite strengthening and be trained and certified by the manufacturer of the supplied FRP composite/epoxy resin system being used. Submit a list of completed surface bonded FRP composite strengthening projects completed with the manufacturer's FRP composite system in the past three years. The list shall include a minimum of 10 projects with the proposed FRP system, the dates when work was performed, general description of work, quantity of work and owner references. Provide written verification from the FRP composite manufacturer that the applicator has received the required training and is a certified installer by the FRP manufacturer.

C.2 Surface Preparation

Remove spalled and loose concrete.

Grind uneven surfaces or protrusions until smooth. Any corners or edges shall be rounded over to a minimum radius of 1/2-inch. This requirement also applies to beveled edges which must be ground smooth to eliminate sharp spots.

Per standard spec 509, treat any areas of active corrosion of the reinforcement and patch the concrete surface so as to restore it to its original dimensions. When patching the concrete substrate, remove defective concrete down to sound concrete; the extents of the area to be removed and patched shall be 1/2-inch beyond the boundary of the distress on all sides. If there is a loss of bond between the reinforcing steel and the concrete, remove the surrounding concrete to a depth equal to the greater of 3/4-inch or the maximum aggregate size plus 1/4-inch. If surface repair is performed, allow patches to cure a minimum of 10 days before FRP application or until the surface moisture is less than 4%. This work to be paid for under separate bid items per the plans.

Epoxy inject cracks in the concrete larger than 0.25 mm in width at least 24 hours prior to FRP installation. Seal cracks smaller than 0.25 mm in width in aggressive environments at the direction of the engineer. This work to be paid for under a separate bid item per the plans.

Preserve and utilize the required existing reinforcing steel, and blast clean, realign, and retie as the engineer directs. If additional reinforcement is required, use grade 60 steel conforming to AASHTO M31 and standard spec 505.2. Repair damage to existing, epoxy-coated reinforcement conforming to 509.3.1.

The concrete surface shall be clean, and free of any material that could interfere with bonding, such as dirt, grease, wax, etc. The surface must also be free of moisture with a maximum moisture content of 4%. Immediately prior to bonding, all contact surfaces shall receive a final cleaning by hand or oil-free compressed air to remove any residual dust, powder residue or laitance.

C.3 Installation

A minimum of two layers are required.

Place FRP only under the following conditions or per manufacturer's recommendation:

- Ambient temperature and the temperature of the epoxy resin components shall be between 55°F and 90°F during the entire application process.
- Relative humidity less than 85%.
- Surface temperature more than 5°F above the dew point.
- Moisture level of all contact surfaces, included patched areas, less than 4% unless the resin has been specifically formulated for wet applications.

Unless directed otherwise by the engineer, install the FRP after all dead loads have been applied to the bridge. Do not install FRP while the component being repaired is subjected to live loads.

Apply, per manufacturer's instructions, a system-compatible putty as required to fill uneven surfaces or recesses. Depending on the manufacturer, this putty may be applied before or after the primer.

Apply the primer coat uniformly to the substrate using a roller or trowel. Primed and puttied surface shall be protected from all contaminants (i.e., dust, moisture, etc.) prior to the application of the fiber wrap.

Mix the components of the epoxy resin with a mechanical mixer and apply the epoxy resin uniformly to the fiber at a rate that ensures complete saturation of the fabric. Apply saturating resin uniformly to the prepared substrate. Begin resin application within one hour after the batch has been mixed. Use all resin within the pot life as specified by the manufacturer.

Apply the fabric per manufacturer's recommendation. Handle fiber wraps in a manner to maintain fiber straightness and prevent fiber damage. Any kinks, folds, or severe waviness will not be accepted. Use rollers

or hand pressure to remove any air trapped between the fabric and the concrete, or between fabric plies. Rolling must be parallel to the direction of the fibers to avoid fiber misalignment or damage. Do not use metal serrated rollers because they can damage the FRP fabric.

Stagger the joints between layers so that a continuous sheet in one layer will span the joints of the sheets in the layer below. If multiple layers cannot all be placed in one day, defer to the manufacturer to determine the extent of the cure and surface preparation required for the previously placed layers required before proceeding. If required, laps shall be per manufacturer's instructions, with a minimum edge lap of 6 inches and a minimum end lap of 12 inches. Laps should be staggered between layers.

Cover the final layer of fabric with a coat of epoxy that produces a uniform finished surface per manufacturer's instructions.

Cure per manufacturer's instructions. The FRP system shall be protected from weather, large temperature variations, moisture, sand, dust, and other foreign particles during curing. Do not allow the system to be subjected to live loads until it is completely cured. Defer to manufacturer's instructions regarding the degree of cure which must be achieved before additional dead loads can be applied to the wrapped member.

An additional protective coating is required to protect the fibers from the elements, specifically UV radiation, and to give the final aesthetic effect. Install protective coating per manufacturer's instructions after the field inspection described in section C.4.2 has been conducted. To prepare the FRP surface to receive the coating, clean and roughen the exterior surfaces of the composite wrap using a light abrasive after the final epoxy coat is completely polymerized. The abrasive shall be of the appropriate hardness to roughen the surface without damaging the fibers. Remove all dust, dirt, and other bond inhibiting materials and dry all cleaned and roughened surfaces.

C.4 Testing and Acceptance

C.4.1 Records and Sampling

The contractor shall record the following information for each installation:

- Date, time, and specific location of installation.
- Surface preparation methods.
- Widths and lengths of cracks not injected with epoxy.
- Material information including product used, fiber and resin lot/batch numbers, mixture ratios, mixing times, etc.
- Ambient temperature, relative humidity, and general weather observations at the beginning and end of each installation.
- Concrete surface temperature, concrete moisture content, and surface cleanliness.
- Number of FRP layers used and fiber orientation of each layer.
- Square footage of fabric and volume of epoxy used each day.

C.4.2 Field Testing

In the presence of the engineer, the contractor will conduct a visual and acoustic sounding inspection to test for defects such as voids, delaminations, external cracks, chips, cuts, loose fibers, external abrasions, blemishes, foreign inclusions, depressible raised areas, or fabric wrinkles. Conduct this inspection after the FRP is cured but before the protective coating is applied.

In the presence of the engineer, the contractor will conduct a visual inspection of the protective coating for damage including but not limited to cracking, crazing, blisters, peeling, or external abrasions. Conduct this inspection after placement and cure of the protective coating.

If any defects are found, they must be repaired as detailed in C.4.3, or removed and replaced.

C.4.3 Required Remediation

Inject or back fill any small voids or bubbles (1-1/2" diameter or less) with epoxy. If five or more such voids are found in an area smaller than 10 square feet, submit a proposed remediation procedure subject to the acceptance of the engineer.

Voids or delaminated areas greater than 3" in diameter or an equivalent rectangular area shall be reported to the engineer. Proposed remediation procedure(s) for addressing these areas are subject to the acceptance of the engineer.

D Measurement

The department will measure Fiber Wrap Reinforcing Non-Structural by the square foot acceptably completed.

E Payment

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0165.01	Fiber Wrap Reinforcing Non-Structural	SF

Payment for Fiber Wrap Reinforcing Non-Structural is full compensation for preparing required submittals, cleaning the surfaces of elements to be confined, furnishing, transporting, handling, and installing the fabric, finish coat of epoxy, the final protective coating system, field testing, and required remediation. No extra measurement or payment will be made for overlap areas.

Repairing damage to existing reinforcement is incidental to this item.
SPV.0165.01 (20200501)

END OF ADDENDUM

