

STATE OF	PROJECT	SHEET	TOTAL SHEETS
SOUTH DAKOTA	090 E-468	1	12
Plotting Date:	08/30/2013		

INDEX OF SHEETS

Sheet	No.	1:	Title and Index
Sheets	No.	2:	Estimate and Notes
Sheets	No. 3 -	9:	Structure Sheets
Sheet	No.	10:	Traffic Control
Sheets	No. 11 -	12:	Standard Plates

ESTIMATE OF QUANTITIES

Bid Item Number	ltem	Quantity	Unit
009E0010	Mobilization	Lump Sum	LS
460E8000	Column Fiber Wrap	1	Each
634E0100	Traffic Control	255	Unit
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
634E0420	Type C Advance Warning Arrow Panel	1	Each

SPECIFICATIONS

Standard Specifications for Roads & Bridges, 2004 Edition and Required Provisions, Supplemental Specifications and/or Special Provisions as included in the Proposal.

SEQUENCE OF OPERATION

- 1. Using standard plate 634.64 close driving lane of EB I-90. Begin repair of column.
- 2. At the end of each day's work all traffic control devices shall be pulled off the roadway and taken down and traffic shall be opened to two lanes.
- 3. Complete repair of column and return traffic to normal on I-90.

STORM WATER

At a minimum and regardless of project size, appropriate erosion and sediment control measures must be installed to control the discharge of pollutants from the construction site.

COLUMN FIBER WRAP

Column Fiber Wrap is designated as a "specialty item" and the cost of this item shall be deducted from the total cost before computing the percentage of subletting as per Section 8.1 of the Standard Specifications.

WASTE DISPOSAL SITE

The Contractor shall furnish a site(s) for the disposal of construction and/or demolition debris generated by this project.

Construction and/or demolition debris may not be disposed of within the State ROW.

The waste disposal site(s) shall be managed and reclaimed in accordance with the following from the General Permit for Highway, Road, and Railway Construction/Demolition Debris Disposal Under the South Dakota Waste Management Program issued by the Department of Environment and Natural Resources.

The waste disposal site(s) shall not be located in a wetland, within 200 feet of surface water, or in an area that adversely affects wildlife, recreation, aesthetic value of an area, or any threatened or endangered species, as approved by the Project Engineer.

If the waste disposal site(s) is located such that it is within view of any ROW, the following additional requirements shall apply:

- 1. Construction and/or demolition debris consisting of concrete, asphalt concrete, or other similar materials shall be buried in a trench completely separate from wood debris. The final cover over the construction and/or demolition debris shall consist of a minimum of 1 foot of soil capable of supporting vegetation. Waste disposal sites provided outside of the State ROW shall be seeded in accordance with Natural Resources Conservation Service recommendations. The seeding recommendations may be obtained through the appropriate County NRCS Office. The Contractor shall control the access to waste disposal sites not within the State ROW through the use of fences, gates, and placement of a sign or signs at the entrance to the site stating "No Dumping Allowed".
- 2. Concrete and asphalt concrete debris may be stockpiled within view of the ROW for a period of time not to exceed the duration of the project. Prior to project completion, the waste shall be removed from view of the ROW or buried and the waste disposal site reclaimed as noted above.

The above requirements will not apply to waste disposal sites that are covered by an individual solid waste permit as specified in SDCL 34A-6-58, SDCL 34A-6-1.13, and ARSD 74:27:10:06.

Failure to comply with the requirements stated above may result in civil penalties in accordance with South Dakota Solid Waste Law, SDCL 34A-6-1.31.

All costs associated with furnishing waste disposal site(s), disposing of waste, maintaining control of access (fence, gates, and signs), and reclamation of the waste disposal site(s) shall be incidental to the various contract items.

HISTORICAL PRESERVATION OFFICE CLEARANCES

The SDDOT has obtained concurrence with the State Historical Preservation Office (SHPO or THPO) for all work included within the project limits and all designated option borrow sites provided within the plans.

All earth disturbing activities not designated within the plans require review of cultural resources impacts. This work includes, but is not limited to: staging areas, borrow sites, waste disposal sites, and all material processing sites.

The Contractor shall arrange and pay for a cultural resource survey and/or records search. The Contractor has the option to contact the state Archaeological Research Center (ARC) at 605-394-1936 or another qualified archaeologist, to obtain either a records search or a cultural resources survey. A record search might be sufficient for review; however, a cultural resources survey may need to be conducted by a qualified archaeologist.

The Contractor shall provide ARC with the following: a topographical map or aerial view on which the site is clearly outlined, site dimensions, project number, and PCN. If applicable, provide evidence that the site has been previously disturbed by farming, mining, or construction activities with a landowner statement that artifacts have not been found on the site.

The Contractor shall submit the records search or cultural resources survey report and if the location of the site is within the current geographical or historic boundaries of any South Dakota reservation to SDDOT Environmental Engineer, 700 East Broadway Avenue, Pierre, SD 57501-2586 (605-773-3180). SDDOT will submit the information to the appropriate SHPO/THPO. Allow **30 Days** from the date this information is submitted to the Environmental Engineer for SHPO/THPO review.

If evidence for cultural resources is uncovered during project construction activities, then such activities shall cease and the Project Engineer shall be immediately notified. The Project Engineer will contact the SDDOT Environmental Engineer in order to determine an appropriate course of action.

SHPO/THPO review does not relieve the Contractor of the responsibility for obtaining any additional permits and clearances for staging areas, borrow sites, waste disposal sites, or material processing sites that affect wetlands, threatened and endangered species, or waterways. The Contractor shall provide the required permits and clearances to the Project Engineer at the preconstruction meeting.

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ELEVATION

INDEX OF BRIDGE SHEETS -

- Sheet No. 1 Layout for Repair
- Sheet No. 2 Estimate of Structure Quantities and Notes
- Sheet No. 3 Notes (Continued)
- Sheet No. 4 Notes (Continued)
- Sheet No. 5 Column Repair at Bent No. 2 Sheet Nos. 6 and 7 - Original Construction plans

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				E Bridge 12'- 0" 12'- 0"	24' - 0" Clear Roadway		
			LAY	OUT FOR R	EPAIR		
	254 24' - 0' OVER STR. 1 PCN I3	' - C ' RO/ I-90 NO. 5 33N)" CONT ADWAY 52-540-275 PEN S. D. DEP	NINGTON C T. OF TRAN AUGUST 20	GIRDER SEC. 24/19 OUNTY ISPORTATIO	BRID 0-T2N-R 0° \$ 090	GE 9/10E 5KEW E-468 OF 7
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ESTIMATE OF STRUCTURE QUANTITIES

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
460E8000	Column Fiber Wrap	1	Each

SPECIFICATIONS

Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2004 Edition and Required Provisions, Supplemental Specifications and/or Special Provisions as included in the Proposal.

DETAILS AND DIMENSIONS OF EXISTING BRIDGE

All details and dimensions of the existing bridge, contained in these plans, are based on the original construction plans and shop plans. It is the Contractor's responsibility to inspect and verify the actual field conditions and any necessary as-built dimensions affecting the satisfactory completion of the work required for this project.

SCOPE OF BRIDGE WORK & SEQUENCE OF OPERATIONS

All work on this structure shall be accomplished with the traffic control shown elsewhere in the plans.

Place the column fiber wrap on traffic impacted west column at Bent No. 2.

FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP

1. GENERAL

- 1.1 The Fiber Reinforced Epoxy Composite system shall be installed by a Contractor certified by the manufacturer in writing. Certified applicator shall have a minimum of two years experience in performing composite retrofits with wet lay-up systems.
- 1.2 Submittals required by the Contractor
 - 1.2.1. The Contractor shall furnish the Manufacturer's product data, specifications and recommended application procedures showing compliance with the project requirements in writing to the Engineer at the preconstruction meeting. The material provided shall show testing information to demonstrate 10,000 hour system durability including 100% humidity, ozone, alkali soil, salt water, and 140° F testing on the actual composite to be used. Durability testing shall be demonstrated for the effects of ultraviolet light and freeze/thaw. The composite supplier will also make available large-scale test results from independent testing laboratories to demonstrate system performance.

FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP (CONT.)

- 1.2.2. As-built drawings shall be submitted for each installation of 2.2 Material Properties: the composite system. The as-built drawings shall contain details of the number and thickness of layers, joint and end details, number location and type of sheet anchors and structure locations where the material is to be applied. 1.2.5 A list of a minimum of one hundred (100) completed
- composite strengthening projects completed with the manufacturer's composite system. The list should include at a minimum, the dates of work, type, description and amount of work performed.
- 1.2.6 A list of a minimum of five (5) completed composite strengthening projects performed by the certified applicator. The list should include at a minimum, 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. In addition, provide the names of the applicator's key personnel (superintendent and assistant) who will perform the actual work. The superintendent and assistant shall have a minimum experience of 1year involvement in directing projects such as this.
- 1.2.7. The Department shall have the right to approve or reject the personnel qualifications as submitted. The Engineer may suspend the work if the Contractor substitutes an unauthorized composite system or unauthorized personnel for authorized personnel during construction.

2. MATERIALS

- General Requirements: 2.1
 - 2.1.1 Design the composite system to achieve the structural performance shown on the structural drawings.
 - 2.1.2 Deliver epoxy materials in factory-sealed containers with the manufacturer's labels intact and legible with verification of date of manufacture and shelf life.
 - 2.1.3 Store materials in a protected area at a temperature between 35°F and 100°F.
 - 2.1.4. Products shall be stored according to the manufacturer's requirements and shall avoid contact with moisture.

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FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP (CONT.)

2.2.1 The system to be applied shall be the following or an approved equal as determined by the Office of Bridge Design. An approved equal shall need to satisfy all of the system requirements shown in 2.2.3.:

> Tyfo Fibrwrap System supplied by the Fyfe Company 6044 Cornerstone Court West, Suite C San Diego, California 92121-4730 Tel: (619) 642-0694 Fax: (619) 642-0947

2.2.2 The Tyfo Fibrwrap System shall have the following materials:

- 2.2.2.1 Composite fabric: SCH 41 fabric – carbon and aramid hybrid fabric SHE 51 fabric – glass and aramid hybrid fabric
- 2.2.2.2 Epoxy saturant: Tyfo S epoxy to be combined with the fabric to form the Tyfo Fiberwrap composite.
- 2.2.2.3 Primer/Filler: Tyfo WS thickened epoxy for protective seal coat and filling voids.
- 2.2.2.4 Anchorage: Tyfo Anchors to be used at termination points of bands which do not encase an element.
- 2.2.2.5 Finish Paint: Tyfo A or Tyfo U paint.

ESTIMATE OF STRUCTURE QUANTIES AND NOTES FOR 254' – 0" CONT. COMP. GIRDER BRIDGE

Str. No. 52-540-275

AUGUST 2013

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FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP (CONT.)

2.2.3 The cured composite system shall conform to the following requirements:

Property	Glass Composite Requirement	Carbon Composite Requirement	ASTM Test Method
Ultimate Tensile Strength, minimum	60,000	100,000	
in primary fiber direction	psi	psi	D 3039
Ultimate Breaking Load, minimum	3,000 lb/in.	4,000 lb/in.	
in primary fiber direction	width	width	D 3039
% Tensile Strength Retained after:			
7 days exposure at 100% humidity	90	90	
3,000 hours exposure to ozone	90	90	
3,000 hours exposure to alkali	90	90	
3,000 hours exposure to salt water	90	90	
3,000 hours exposure at 140° F	90	90	
Elongation:			D 3039
Percent, Minimum	1.7	0.8	
Percent, Maximum	4	1.7	
Tensile Modulus, psi, minimum			
Based on cross sectional	3 x 10 ⁶	8 x 10 ⁶	D 3039
Area of primary fibers			
Ultimate Tensile Strength			
At 90 degrees to	3,000	1,000	D 3039
Primary fibers, psi, minimum			
Visual Defects	Acceptance	Acceptance	D 2563
	Level III	Level III	

3. CONSTRUCTION REQUIREMENTS

Surface Preparation: 3.1

- 3.1.1 The surface to receive composite shall be free from fins, sharp edges and protrusions that will cause voids behind the installed composite or that, in the opinion of the Engineer, will damage the fibers. Existing uneven surfaces and voids to receive composite shall be filled with epoxy filler or other material approved by the Engineer (small pinholes or micro-bubbles in concrete surface or resin, do not require special detailing). The contact surfaces shall have no free moisture on them at the time of application. If moisture cannot be avoided, use the manufacturer's suggested wet prime epoxy.
- 3.1.2 Round off sharp and chamfered corners to a radius of 1 inch (+0.25") by means of grinding or forming with the system's thickened epoxy. Variations in the radius along the edge shall not exceed 1/2" for every 12" of length.

FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP (CONT.)

- 3.1.3 Column surfaces shall have all surface foreign materials, such as bird nests, dirt, splattered concrete from the traffic impact, etc., removed as approved by the Engineer. It is anticipated that up to 10% of the column surface is covered with splattered concrete. One prime coat of the manufacturer's epoxy shall be applied prior to wrapping columns with the composite.
- 3.1.4 For surfaces which do not allow complete encasement with the composite system, surfaces shall be prepared for bonding by means of abrasive blasting or grinding to achieve a 1/16" minimum amplitude. All contact surfaces shall then be cleaned by hand or compressed air. One prime coat of the manufacturer's epoxy shall be applied and allowed to cure for a minimum of one hour. Prior to the application of the saturated fabric, fill any uneven surfaces with the manufacturer's thickened epoxy. Provide anchorage as detailed on the construction drawings.

Application Procedures 3.2

- 3.2.1 Fiber wrap material shall not be applied until all surface preparation work is complete and all patching materials have cured for a minimum of 10 days.
- 3.2.2 Verify ambient and concrete temperatures. No work shall proceed if the temperature of the concrete surface being repaired is less than 35 ° F or greater than 100 ° F. The temperature of the epoxy components shall be between 35° F and 100° F at the time of mixing or as specified on the component labels.
- 3.2.3 Prepare the epoxy matrix by combining components at a weight (or volume) ratio specified on the manufacturer's labeled units, with an allowable tolerance of + 10%. The components of epoxy resin shall be mixed with a mechanical mixer until uniformly mixed, typically 5 minutes at 400-600 rpm. Components which have exceeded their shelf life or pot life (as designated on the material label) shall not be used.

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FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP (CONT.)

3.2.4 Saturation of the fabric shall be performed and monitored according to manufacturer's specified fiber-resin ratio. A previously calibrated saturator can be used to achieve the specified ratio. Fabric shall be completely saturated prior to application to contact surface in order to assure complete impregnation of fabric. Saturation shall be supervised and checked by the properly trained representative of the installer.

3.2.5 Both the epoxy resin and fabric shall be measured accurately, combined, and deposited uniformly at the rates shown on the approved working drawings and per manufacturer's recommendations. The composite system shall be comprised of fibers completely saturated with epoxy resin per proper ratio.

3.2.6 Quality control procedures: Record batch numbers for fabric and epoxy used each day, and note locations of installation. Measure square footage of fabric and volume of epoxy used each day. Complete report and submit to the Engineer.

3.2.8 Protect the areas adjacent to the application from splatter, drips and over runs.

3.2.9 Apply saturated fabric to concrete surface using methods that produce a uniform, constant tensile force that is distributed across the entire width of fabric. Gaps between composite bands may not exceed 1/2 inch in width in the fabric's transverse joint unless otherwise noted on the project drawings. A lap length of at least 6 inches is required at all necessary over-laps in the longitudinal direction of the fabric.

3.2.10 Using a roller or hand pressure, insure proper orientation of fibers, release or roll out entrapped air, and ensure that each individual layer is firmly bedded and adhered to the preceding layer or substrate.

3.2.11 Apply a final coat of thickened epoxy. Detail all fabric edges, including butt splice, termination points, and jacket edges, with epoxy.

NOTES (CONTINUED) FOR 254' – 0" CONT. COMP. GIRDER BRIDGE

Str. No. 52-540-275

AUGUST 2013

DESIGNED BY	CK. DES. BY	DRAFTED BY:	1/ · $1/$ ·
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FIBER REINFORCED EPOXY COMPOSITE COLUMN WRAP (CONT.)

- 3.2.12 If the system incorporates structural fasteners, the limitations, detailing and location must be verified with the composite system manufacturer.
- 3.2.13 The completed installation shall be allowed to cure in ambient conditions. Epoxy curing temperatures shall be maintained in the temperature range designated for the formulation used. The temperature cure ranges and times will be supplied by the manufacturer. The composite system shall be protected from contract by moisture, damage and debris for a minimum of 24 hours after placement.
- 3.2.14 Paint the finished surfaces of the composite system with a paint system approved by the manufacturer and the Office of Bridge Design. Paint shall not be applied within the first 24 hours of placement. After the 24 hour cure period paint can be applied when the composite system achieves a tacky surface where a light finger touch results in no transfer of epoxy to the finger but still exhibits a tacky feeling. From this time, until 72 hours later, two finish coats of the approved paint system shall be applied. If the paint system is applied after 72 hours, the surface must be roughened by sanding or brush blasting to break the gloss finish for the application of the paint system. Dust and residue shall be removed prior to application of paint coats. The color of the finished coat of paint shall match the color of the adjacent concrete as approved by the Engineer.
- 3.2.15 All defects (including bubbles, delaminations, and fabric tears) spanning more than 5% of the surface area shall be repaired. Small defects (on the order of 6" diameter) shall be injected or back filled with epoxy. Bubbles less than 12" in diameter shall be repaired by injecting with epoxy. Two small holes shall be drilled into the bubble to allow injection of the epoxy and escape of entrapped air. Bubbles and delaminations greater than 12" in diameter shall be required number of layers of the composite and the required finish coatings. All repair procedures shall be subject to the approval of the Engineer.

4. METHOD OF MEASUREMENT

Measurement will not be made for Column Fiber Wrap. The plan quantity will be the basis of payment.

5. BASIS OF PAYMENT

Column Fiber Wrap will be paid for at the contract unit price per each. Payment will be full compensation for labor, equipment, materials, and all incidental work required.

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	NOTES (CONTINUED)						
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TRAFFIC CONTROL – GENERAL NOTES

- 1. Requests to deviate from the sequence of operations shall be submitted in writing to the Engineer for review. Approval of an alternate sequence of operations will only be allowed when the proposed changes meet with the Department's intent for traffic control and sequencing of the work. An alternate sequence shall be submitted for review a minimum of one week prior to potential implementation.
- 2. Unless otherwise stated in these plans, no work will be allowed during hours of darkness. Hours of darkness are defined, as ½ hour after sunset until ½ hour before sunrise.
- 3. Storage of vehicles and equipment shall be as near the right-of-way as possible. Contractor's employees should mobilize at a location off the right-of-way and arrive at the work sites in a minimum number of vehicles necessary to perform the work. Indiscriminate driving and parking of vehicles within the right-of-way will not be permitted. Any damage of the vegetation, surfacing, embankment, delineators, and existing signs resulting from such indiscriminate use shall be repaired and/or restored by the Contractor, at no expense to the State, and to the satisfaction of the Engineer.
- 4. The quantity of Signs paid for will be for the greatest number of installations per sign in place at any one time regardless of the number of set-ups on the project.
- 5. Any delineators and signs damaged or lost shall be replaced by the Contractor at no cost to the State.
- 6. All materials and equipment shall be stored a minimum distance of 30' from the traveled way during nonworking hours.
- 7. The Contractor shall provide documentation that all breakaway sign supports comply with FHWA NCHRP 350 or MASH crash-worthy requirements. The Contractor shall provide installation details at the preconstruction meeting for all breakaway sign support assemblies.
- 8. The Contractor shall be required to have a person available 24 hour/day, 7 days/week to maintain traffic control devices. The name and cellular telephone number of this individual shall be given to the Engineer at the preconstruction meeting.
- 9. Vehicles working in traffic or alongside traffic shall be equipped with a flashing amber light visible from all directions. The amber light shall be mounted on the uppermost part of the contractor's vehicle. Lights must have peak intensity within the range of 40 to 400 candelas and must flash at 75 ± 15 flashes per minute. Vehicle flasher/hazard lights are not acceptable. All haul trucks shall be equipped with a second flashing amber light that is visible from the backside of the haul truck. The costs for the flashing amber lights amber lights shall be incidental to the various related contract bid items.

TRAFFIC CONTROL – GENERAL NOTES (CONTINUED)

- 10. All construction operations shall be conducted in the general direction of traffic movement.
- 11. If there is a discrepancy between the traffic control plans, standard plates, and the MUTCD whichever is more stringent shall be used, as determined by the Engineer.
- 12. If the contractor chooses to remove and reset guardrail to access the work site, guardrail must be installed prior to restoring traffic to their respective lanes. The guardrail shall be reconnected to posts and block at the end of each work shift. No additional payment for this work shall be made. Costs to remove and reset guardrail shall be incidental to various contract items.
- 13. Temporary Road Markers shall be used for lane closure tapers or lane shift tapers during hours of darkness. Temporary Road Markers used for tapers and shifts will not be measured for payment and will be incidental to the contract lump sum price for Traffic Control, Miscellaneous.
- 14. Drums are required in all lane closure tapers.
- 15. Lane closures shall be removed if no work will occur for 3 days or longer.

INVENTORY OF TRAFFIC CONTROL DEVICES

SIGN CODE	SIGN SIZE	DESCRIPTION	NUMBER REQUIRED	UNITS PER SIGN	UNITS
G20-2	36" x 18"	END ROAD WORK	1	17	17
W4-2	48" x 48"	LEFT OR RIGHT LANE ENDS (SYMBOL)	2	34	68
W20-1	48" x 48"	ROAD WORK #### FT. OR AHEAD	3	34	102
W20-5	48" x 48"	LT. OR RT. LANE CLOSED #### FT. OR AHEAD	2	34	68

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