

STATE OF SOUTH DAKOTA  
 DEPARTMENT OF TRANSPORTATION  
 PLANS FOR PROPOSED

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	IM 0299(62)206	1	30
Plotting Date: 04/08/2014			

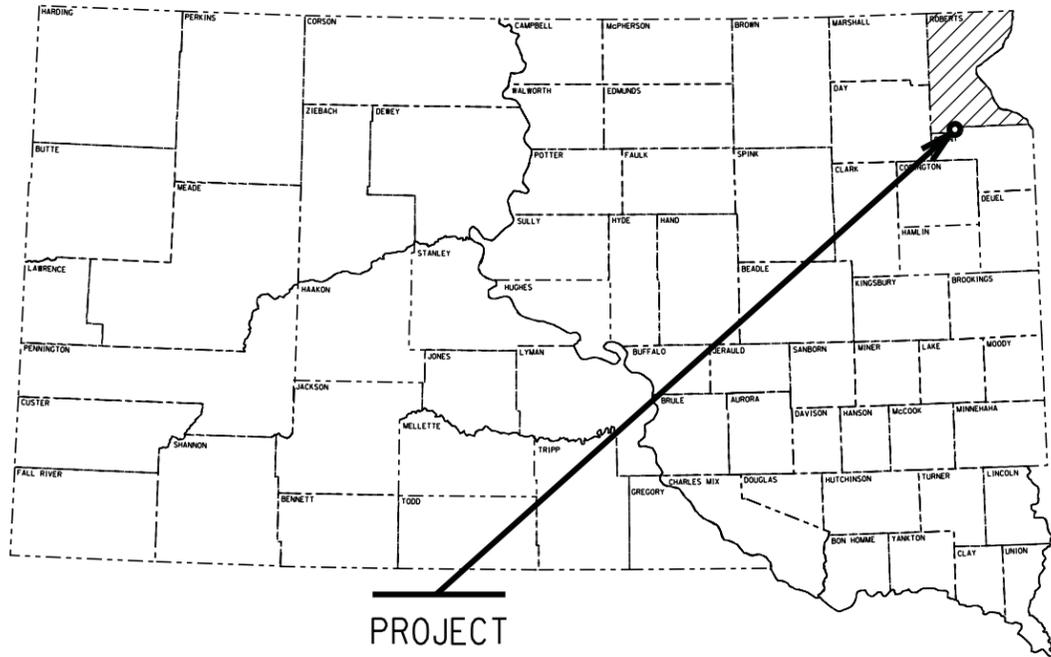
**PROJECT IM 0299(62)206**  
**INTERSTATE 29**  
**ROBERTS COUNTY**

BRIDGE PIER CAP REPAIR  
 PCN 03R3

INDEX OF SHEETS

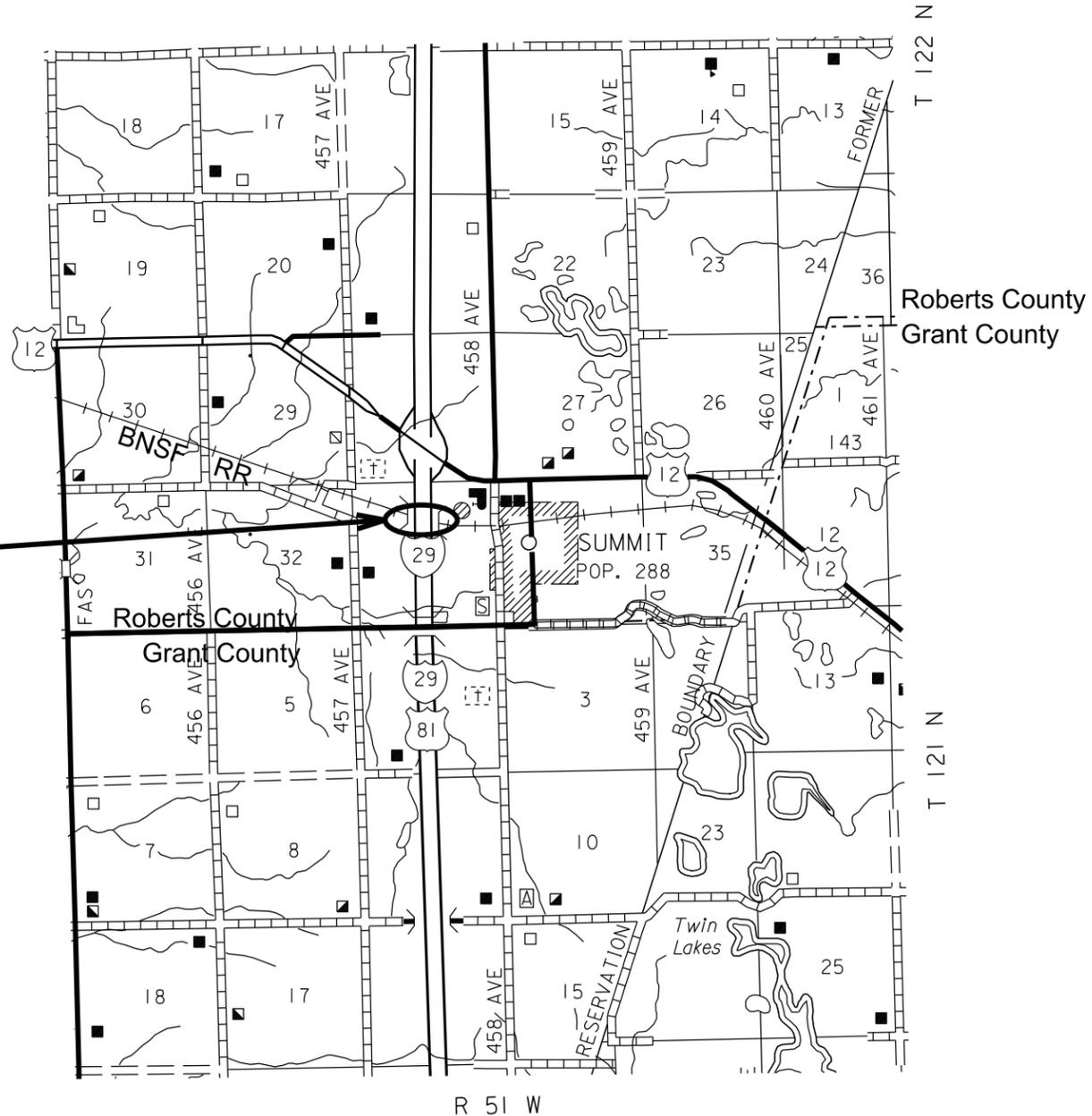
- Sheet 1 Title Sheet and Layout Map
- Sheet 2 Estimate of Quantities
- Sheet 3 Environmental Commitments
- Sheet 4 Plan Notes
- Sheet 5-7 Traffic Control
- Sheet 8-18 Pier Cap Repair Details for Str. No. 55-084-433
- Sheet 19-30 Pier Cap Repair Details for Str. No. 55-085-433

PLOT SCALE - 1:6000



PROJECT

**Project Location**  
 Str. No. 55-084-433  
 I-29 SB @ MRM 206.82  
 and  
 Str. No. 55-085-433  
 I-29 NB @ MRM 206.82



DESIGN DESIGNATION SB		DESIGN DESIGNATION NB	
ADT (2013)	3140	ADT (2013)	3140
ADT (2033)	4283	ADT (2033)	4283
DHV	548.2	DHV	548.2
D	51%	D	51%
T DHV	11.6%	T DHV	11.6%
T ADT	25.5%	T ADT	25.5%
V	70 MPH	V	70 MPH

STORM WATER PERMIT  
 (None Required)

6

PLOTTED FROM - TRAB17882

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# ESTIMATE OF QUANTITIES

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	IM 0299(62)206	2	30

## General and Traffic Control

## Str. No. 55-084-433 (Southbound Bridge)

Bid Item Number	Item	Quantity	Unit
009E0010	Mobilization	Lump Sum	LS
634E0010	Flagging	10	Hour
634E0100	Traffic Control	752	Unit
634E0120	Traffic Control, Miscellaneous	Lump Sum	LS
634E0420	Type C Advance Warning Arrow Panel	2	Each
634E0610	4" Temporary Pavement Marking Tape Type 2	3,800	Ft
998E0100	Railroad Protective Insurance	Lump Sum	LS

Bid Item Number	Item	Quantity	Unit
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E0550	Jack Superstructure, Steel Girder Bridge	Lump Sum	LS
412E0100	Bridge Repainting, Class I	Lump Sum	LS
460E0174	Concrete Patching Material, Miscellaneous	16.2	CuFt
460E0300	Breakout Structural Concrete	0.6	CuYd
460E8050	Composite Fabric Wrap, Concrete Repair	1,217	SqFt
480E5000	Galvanic Anode	11	Each

## Str. No. 55-085-433 (Northbound Bridge)

Bid Item Number	Item	Quantity	Unit
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E0550	Jack Superstructure, Steel Girder Bridge	Lump Sum	LS
412E0100	Bridge Repainting, Class I	Lump Sum	LS
460E0174	Concrete Patching Material, Miscellaneous	18.9	CuFt
460E0300	Breakout Structural Concrete	0.7	CuYd
460E8050	Composite Fabric Wrap, Concrete Repair	1,217	SqFt
480E5000	Galvanic Anode	18	Each

### SPECIFICATIONS

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

# ENVIRONMENTAL COMMITMENTS

STATE OF SOUTH DAKOTA	PROJECT	SHEET	TOTAL SHEETS
	IM 0299(62)206	3	30

## ENVIRONMENTAL COMMITMENTS

An Environmental Commitment is a measure that SDDOT commits to implement in order to avoid, minimize, and/or mitigate a real or potential environmental impact. Environmental commitments to various agencies and the public have been made to secure approval of this project. An agency mentioned below with permitting authority can influence a project if perceived environmental impacts have not been adequately addressed. Unless otherwise designated, the Contractor's primary contact regarding matters associated with these commitments will be the Project Engineer. These environmental commitments are not subject to change without prior written approval from the SDDOT Environmental Office. The environmental commitments associated with this project are as follows:

### COMMITMENT B: FEDERALLY THREATENED, ENDANGERED, AND PROTECTED SPECIES

#### COMMITMENT B4: BALD EAGLE

Bald eagles are known to occur in this area.

#### Action Taken/Required:

If a nest is observed within one mile of the project site, notify the Project Engineer immediately so that he/she can consult with the Environmental Office for an appropriate course of action.

### COMMITMENT E: STORM WATER

Construction activities constitute less than 1 acre of disturbance.

#### Action Taken/Required:

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.

### COMMITMENT H: WASTE DISPOSAL SITE

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

#### Action Taken/Required:

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.

### COMMITMENT I: 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.

#### Action Taken/Required:

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.

STATE OF SOUTH DAKOTA	PROJECT	SHEET NO.	TOTAL SHEETS
	IM 0299 ( 62 ) 206	4	30

Rev. 4-16-14 SLS

**SCOPE OF WORK**

Refer to the individual bridge plans for each structure for the Scope of Work.

**SEQUENCE OF OPERATIONS**

Work on each bridge shall be accomplished in phases. During the breakout of the concrete and concrete repair phases of work, traffic cannot be allowed above the work area. Once the jacking of the superstructure begins and until such time as the girders are properly returned to rest on the bearings, the lane above the work area shall be closed to traffic.

Once work starts the work shall be vigorously pursued to complete the work in the shortest amount of time necessary. Work shall be coordinated so as to cause the least amount of traffic interruption at each bridge site.

The following sequence of operations shall be adhered to. Any changes must be approved in writing by the Area Engineer prior to changes being made.

1. Install appropriate signing and lane closures prior to start of work.
2. Install the new diaphragm jacking frame and complete preparation work required to install the jacking system(s).
3. Jack superstructure and complete concrete pier cap repair for the first phase of work.
4. Switch traffic and complete the second phase of concrete pier cap repairs.
5. Complete the fiber reinforced epoxy composite wrap.
6. Complete the bridge repainting.
7. Complete project site cleanup.
8. Remove Project Signing.

**TRAFFIC CONTROL**

One lane of Traffic in each direction shall be maintained at all times. The Contractor shall maintain a minimum roadway width of 16 feet at all times.

Two Type III Barricades have been included in the Itemized List For Traffic Control for placement in each lane of traffic that is closed to traffic.

The Contractor's equipment will be required to enter and leave the project only at interchanges. Crossing of the median will not be allowed.

If interchange on-ramp traffic will encounter construction activity before reaching the "ROAD WORK AHEAD" and "RT or LT LANE CLOSED AHEAD" mainline signs, a "ROAD WORK AHEAD" sign and a "RT or LT LANE CLOSED AHEAD" sign shall be placed along the on-ramp before reaching mainline.

If interchange on-ramp traffic must enter an area with the driving lane (right hand 12') closed, the Contractor shall outline the last 200' of the on-ramp vehicle's path with channelizing devices, at 25' centers.

Channelizing devices (tubular markers) shall be placed on the shoulders of the roadway, as directed by the Engineer, to discourage traffic from driving on the shoulders of the roadway.

Removing, relocating, covering, salvaging and resetting of existing traffic control devices, including delineation, shall be the responsibility of the Contractor. Cost of this work shall be incidental to the various contract items unless otherwise specified in the plans. Delineators and signs damaged or lost shall be replaced by the Contractor at no cost to the State.

Storage of vehicles and equipment shall be as near the right-of-way line 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 to 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.

Work activities during non-daylight hours are subject to prior approval.

The bottom of signs on portable or temporary supports shall not be less than seven feet above the pavement in urban areas and one foot above the pavement in rural areas. Portable sign supports may be used as long as the duration is less than 3 days. If the duration is more than 3 days the signs shall be on fixed location, ground mounted, breakaway supports.

The Contractor shall provide documentation that all breakaway sign supports comply with FHWA NCHRP Report 350 or MASH crash-worthy requirements. The Contractor shall provide installation details at the preconstruction meeting for all breakaway sign support assemblies.

Traffic Control units, as shown in the Estimate of Quantities, are estimates. Contractor's operation may require adjustments in quantities, either more or less. Payment will be for those signs actually ordered by the Engineer and used.

**4" TEMPORARY PAVEMENT MARKING TAPE, TYPE 2**

The 4" Temporary Pavement Marking Tape Type 2 shall be used to mark the lane tapers as indicated by the Standard Plate 634.64.

Removable road markers may be used in place of the temporary pavement marking tape to mark the lane tapers.

An additional 200' of 4" Temporary Pavement Marking Tape Type 2 has been included in the Estimate of Quantities to be placed on the southbound lane ramp as the 900 foot long lane taper extends past the end point of the acceleration lane.

A maximum of 1 lane closure in each lane in each direction will be measured and paid for when determining the payment quantity for 4" Temporary Pavement Marking Tape Type 2.

**UTILITIES**

Utilities are not planned to be affected on this project. If utilities are identified near the improvement area through the SD One Call Process as required by South Dakota Codified Law 49-7A and Administrative Rule Article 20:25, the Contractor shall contact the Project Engineer to determine modifications that will be necessary to avoid utility impacts.

**PROJECT RESTORATION**

The Contractor shall be responsible for restoring any fence that may need to be removed to complete this project.

The Contractor shall be responsible for reseeding any areas where construction activities damaged the vegetative cover during the construction of this project. If reseeding is necessary the seed mixture to be used is the SDDOT Type C Permanent Seed Mixture. The Engineer shall have the final authority to determine if reseeding is necessary.

Type C Permanent Seed Mixture shall consist of the following:

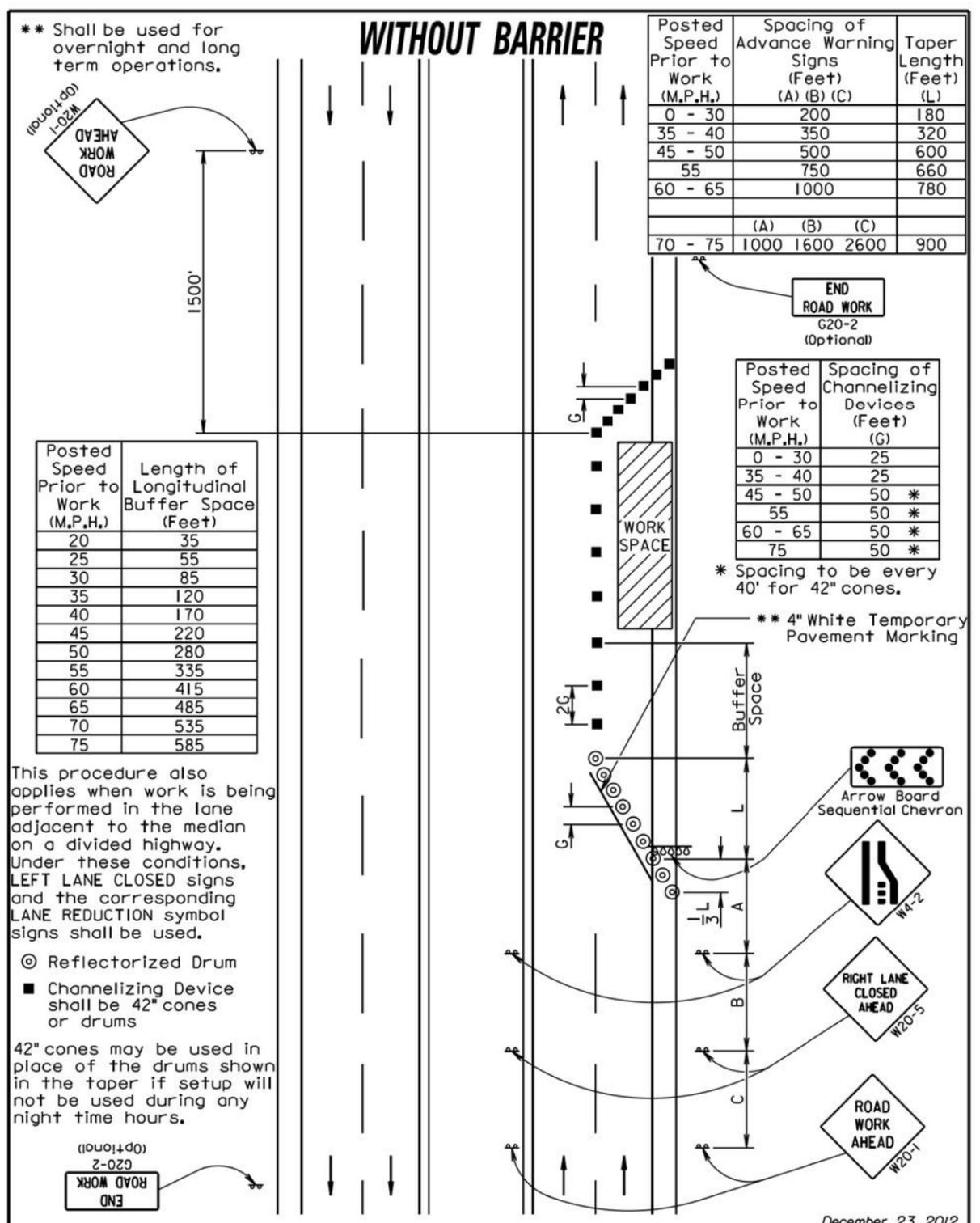
Grass Species	Variety	Pure Live Seed (PLS) (Pounds/Acre)
Western Wheatgrass	Flintlock, Rodan, Rosana	16
Canada Wildrye	Mandan	2
Total:		18

Any and all costs associated with restoration of the project sites shall be incidental to the various contract items.

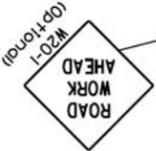
PLOT SCALE - 1:200

PLOT NAME - 2

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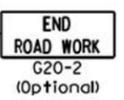


\*\* Shall be used for overnight and long term operations.



### WITHOUT BARRIER

Posted Speed Prior to Work (M.P.H.)	Spacing of Advance Warning Signs (Feet)			Taper Length (Feet) (L)
	(A)	(B)	(C)	
0 - 30	200			180
35 - 40	350			320
45 - 50	500			600
55	750			660
60 - 65	1000			780
	(A)	(B)	(C)	
70 - 75	1000	1600	2600	900



Posted Speed Prior to Work (M.P.H.)	Spacing of Channelizing Devices (Feet) (G)
0 - 30	25
35 - 40	25
45 - 50	50 *
55	50 *
60 - 65	50 *
75	50 *

\* Spacing to be every 40' for 42" cones.

\*\* 4" White Temporary Pavement Marking

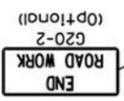
Posted Speed Prior to Work (M.P.H.)	Length of Longitudinal Buffer Space (Feet)
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485
70	535
75	585

This procedure also applies when work is being performed in the lane adjacent to the median on a divided highway. Under these conditions, LEFT LANE CLOSED signs and the corresponding LANE REDUCTION symbol signs shall be used.

⊙ Reflectorized Drum

■ Channelizing Device shall be 42" cones or drums

42" cones may be used in place of the drums shown in the taper if setup will not be used during any night time hours.



December 23, 2012

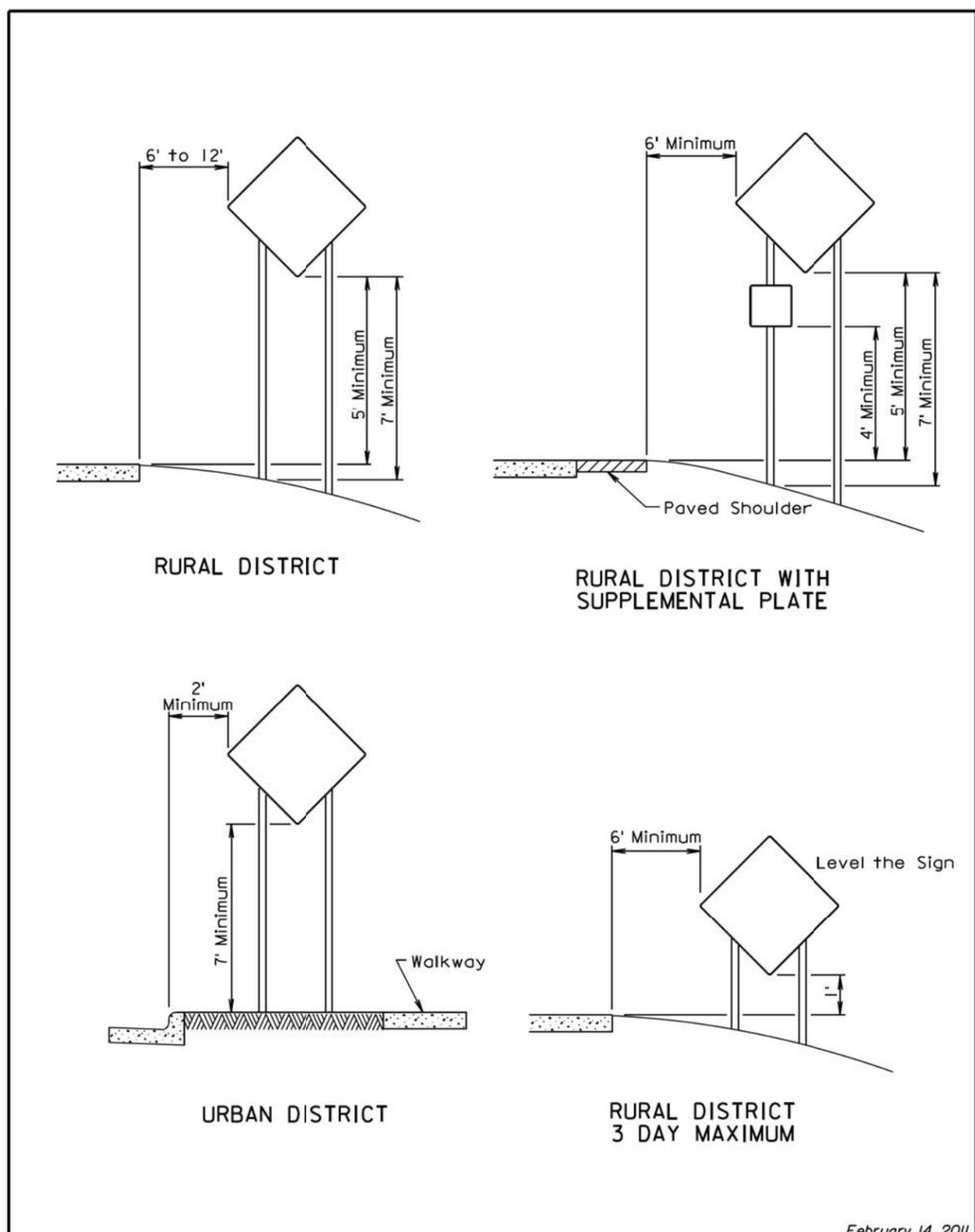
<b>S D D O T</b>	<b>GUIDES FOR TRAFFIC CONTROL DEVICES LANE CLOSURE WITHOUT BARRIER</b>	PLATE NUMBER <b>634.64</b>
	Published Date: 1st Qtr. 2014	Sheet 1 of 1

Plotting Date: 03/20/2014

PLOT SCALE - 1:200

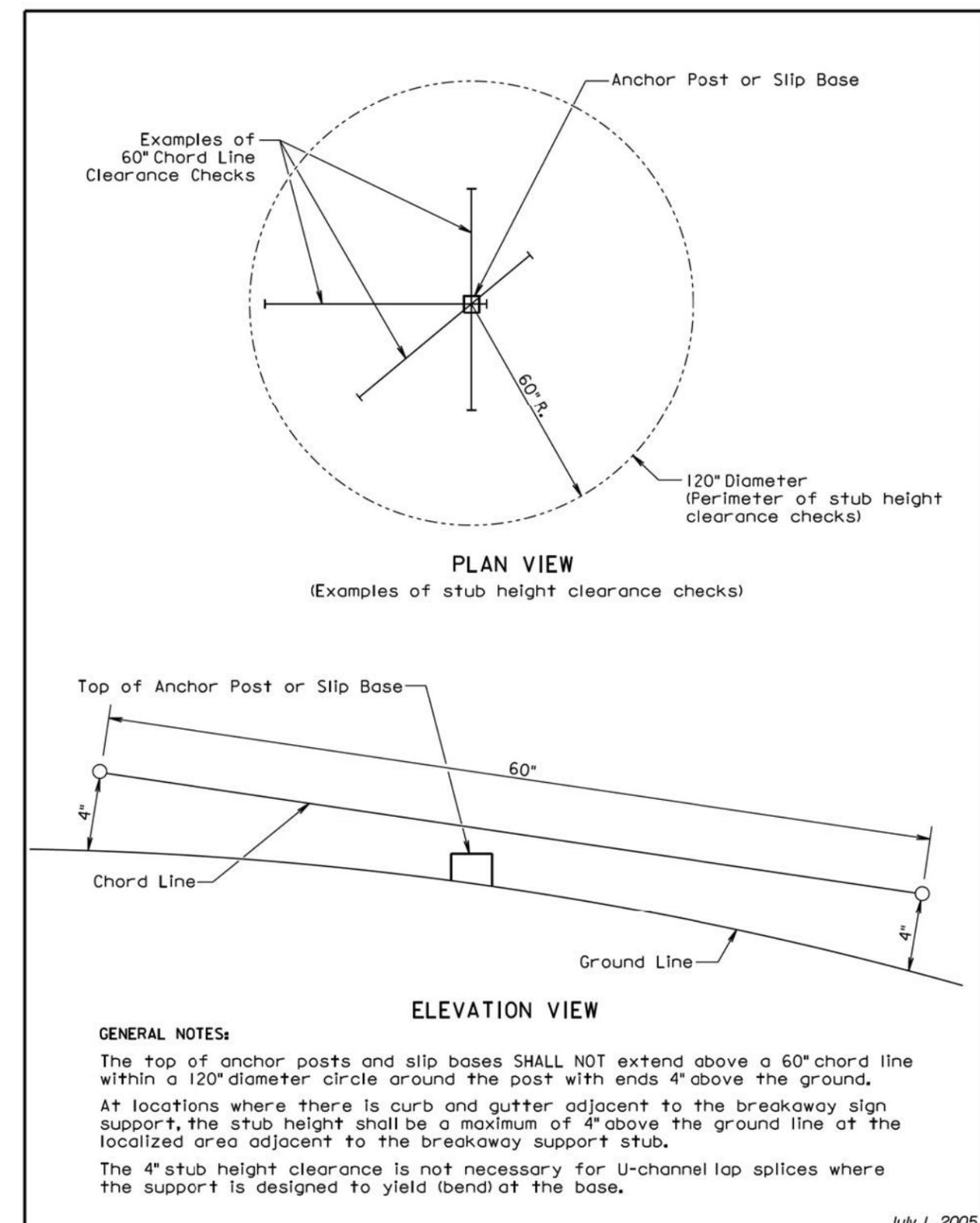
PLOT NAME - 3

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February 14, 2011

Published Date: 1st Qtr. 2014	S D D O T	CRASHWORTHY SIGN SUPPORTS (Typical Construction Signing)	PLATE NUMBER 634.85
			Sheet 1 of 1



July 1, 2005

Published Date: 1st Qtr. 2014	S D D O T	BREAKAWAY SUPPORT STUB CLEARANCE	PLATE NUMBER 634.99
			Sheet 1 of 1

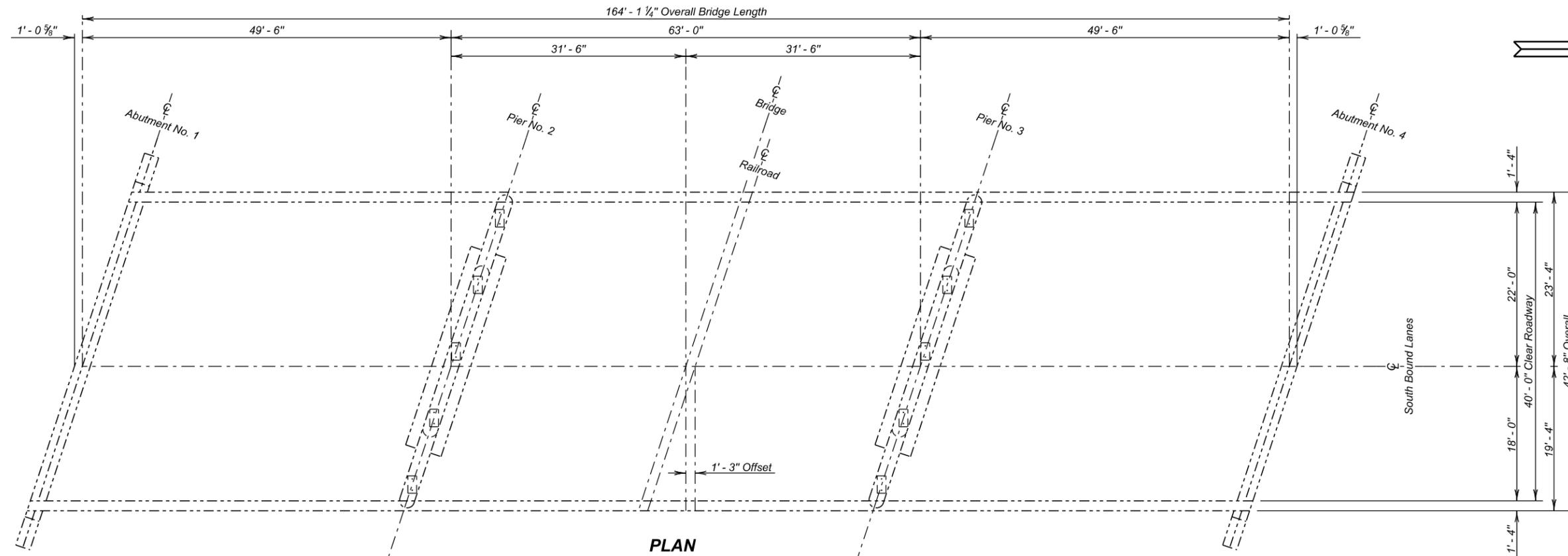
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**ITEMIZED LIST FOR TRAFFIC CONTROL**

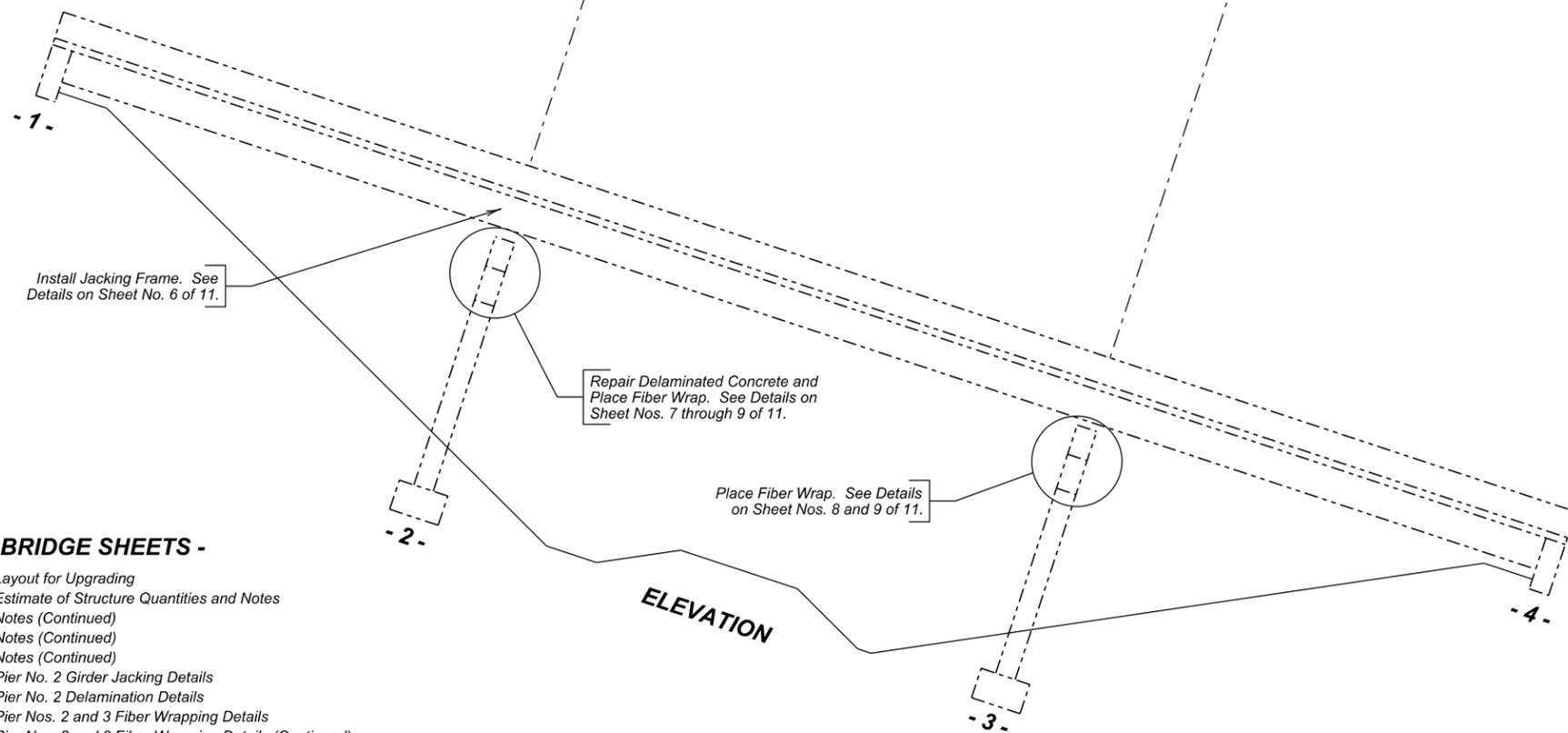
SIGN CODE	SIGN SIZE	DESCRIPTION	NUMBER REQUIRED	UNITS PER SIGN	UNITS
G20-2	48" x 24"	END ROAD WORK	2	24	48
W4-2	48" x 48"	LEFT OR RIGHT LANE ENDS (SYMBOL)	4	34	136
W20-1	48" x 48"	ROAD WORK ##### FT. OR AHEAD	5	34	170
W20-5	48" x 48"	LT. OR RT. LANE CLOSED ##### FT. OR AHEAD	5	34	170
W20-7	48" x 48"	FLAGGER (SYMBOL)	2	34	68
*****		TYPE III BARRICADE - 8 FT. SINGLE SIDED	4	40	160
<b>TOTAL UNITS</b>					<b>752</b>

If a sign is required on a project and not listed in the above inventory, the units per sign will be determined as follows:  
Signs 36" x 36" will be measured at 27 units each and signs 48" x 48" will be measured at 34 units each, otherwise:  
If a sign measures less than 25" high and 25" wide the units per sign will be computed as sign size (sq ft) x 3.  
If a sign measures between 23H" and 37H" the units per sign will be computed as sign size (sq ft) x 1.2 +15.

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	8	30



PLAN



ELEVATION

( SOUTH BOUND LANES )  
LAYOUT FOR UPGRADING

FOR  
164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE  
40' - 0" ROADWAY  
OVER RAILROAD  
STR. NO. 55-084-433  
PCN 03R3

18° 14' SKEW L.H.F.  
SEC. 33-T122N-R51W  
IM 0299(62)206

ROBERTS COUNTY  
S. D. DEPT. OF TRANSPORTATION

MARCH 2014

INDEX OF BRIDGE SHEETS -

- Sheet No. 1 - Layout for Upgrading
- Sheet No. 2 - Estimate of Structure Quantities and Notes
- Sheet No. 3 - Notes (Continued)
- Sheet No. 4 - Notes (Continued)
- Sheet No. 5 - Notes (Continued)
- Sheet No. 6 - Pier No. 2 Girder Jacking Details
- Sheet No. 7 - Pier No. 2 Delamination Details
- Sheet No. 8 - Pier Nos. 2 and 3 Fiber Wrapping Details
- Sheet No. 9 - Pier Nos. 2 and 3 Fiber Wrapping Details (Continued)
- Sheet No. 10 - Original Construction Plans
- Sheet No. 11 - Original Construction Plans

PLANS BY:  
OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SA01	DRAFTED BY KR
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Kevin N. Coeden  
BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	9	30

## ESTIMATE OF STRUCTURE QUANTITIES

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E0550	Jack Superstructure, Steel Girder Bridge	Lump Sum	LS
412E0100	Bridge Repainting, Class I	Lump Sum	LS
460E0174	Concrete Patching Material, Miscellaneous	16.2	CuFt
460E0300	Breakout Structural Concrete	0.6	CuYd
460E8050	Composite Fabric Wrap, Concrete Repair	1217	SqFt
480E5000	Galvanic Anode	11	Each

### SPECIFICATIONS

- Design Specifications: AASHTO Standard Specifications for Highway Bridges 17th Edition using Working Stress Design.
- Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2004 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.
- All Welding and Welding Inspection shall be in conformance with the AASHTO/AWS Bridge Welding Code D1.5M/D1.5:2010 unless otherwise noted in this plan set.

### 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 and are provided as information only. 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.

### NOTICE - LEAD BASED PAINT

Be advised that the paint on the steel surfaces of the existing structure is a paint containing lead. The Contractor should plan his/her operations accordingly, and inform his/her employees of the hazards of lead exposure.

### SCOPE OF BRIDGE WORK & SEQUENCE OF OPERATIONS

All work on this structure shall be accomplished with the traffic control shown in the plans. Alternate sequence of operations may be submitted by the Contractor for approval by the Engineer at the pre-construction meeting.

- Install jacking frame at Pier No. 2 for phase one of construction.
- Jack superstructure and temporarily support girders at locations requiring Pier Cap Repair below grout pads for phase one of construction.
- Repair deteriorated areas of Pier No. 2 as shown by the plans for phase one of construction.
- Switch traffic and repeat steps 1 through 3 for phase two of construction.
- Place composite fiber wrap on Pier Nos. 2 and 3 as shown in the plans.
- Paint all work affected areas.

### SHOP PLANS

Shop plans shall be required as specified by Section 410.3.A. of the Construction Specifications.

### COORDINATION WITH RAILROAD

- During repair of the piers, the Contractor shall not interfere with the operating railroad train movements. Construction activity must not take place within 25 ft. of the centerline track when train movements are occurring through the construction site and construction equipment shall be removed from this zone prior to arrival of any train. See Special Provision for Working on Railroad Company Right-of-Way.
- See Special Provision Regarding Railroad Protective Liability Insurance.

### CONCRETE BREAKOUT

- The existing pier caps shall be broken out to the limits shown on the plans. Breakout limits shall be defined with a 3/4" deep sawcut and to a minimum depth of 5" (unless specified otherwise in these plans), where practical, as approved by the Engineer. Reinforcing steel that is exposed and is scheduled for use in the new construction shall be cleaned and straightened to the satisfaction of the Engineer. Care shall be taken not to damage the existing reinforcing steel that is to be reused in the new construction during concrete breakout. Any reinforcing steel that is damaged during concrete breakout shall be replaced or repaired, as approved by the Engineer, by the Contractor at no cost to the Department.
- All broken out concrete shall be disposed of by the Contractor. Any disposal of discarded material shall be in accordance with the Environmental Commitments notes.
- The contract unit price per cubic yard for "Breakout Structural Concrete" shall include breaking out concrete, cleaning, straightening existing reinforcing steel and disposal of all broken out material.

### INSTALL NEW DIAPHRAGM JACKING FRAME

- To temporarily support the girders at Pier No. 2 a new jacking frame shall be installed.
- The new structural steel for the W14x53 section shall conform to ASTM A992. The new structural steel for the stiffeners shall conform to ASTM A36. All other new steel shall conform to ASTM A36.
- Cut lines defining the removal limits of the existing steel members shall be established using an air carbon arc process. See the air carbon arc notes for details.
- Welders shall be qualified in accordance with Section 410.3.D of the Construction Specifications.

- Approved welding processes are shielded metal arc welding (SMAW) and flux cored arc welding (FCAW). The following notes are based on the assumption that SMAW will be used. If the Contractor plans to use FCAW, he shall contact the Bridge Construction Engineer for any changes in requirements.
- An approved Welding Procedure Specification (WPS) will be required for this project, using the SMAW process and an approved E7018 electrode from Table 4.1 of the Bridge Welding Code. The proposed WPS's for this project shall be submitted on Form L-2, from Annex L of the Bridge Welding Code, to the Bridge Construction Engineer for approval at the Preconstruction Meeting.
- Preheat will be required. Preheat and interpass temperature requirements shall be in accordance with Clause 4.2 of the Bridge Welding Code. The minimum preheat and interpass temperature shall be 155° F as determined from Annex VIII of the Bridge Welding Code for high restraint conditions. Temperature indicating crayons shall be the minimum acceptable method for monitoring preheat and interpass temperatures.
- SMAW electrode atmospheric exposure requirements shall comply with Clause 4.5 of the Bridge Welding Code. Electrodes shall be purchased in hermetically sealed containers. If the container shows evidence of damage, the electrodes shall be dried in a drying oven for at least one hour at temperatures between 700 and 800 degrees F before they are used. Immediately after opening hermetically sealed container or removal of the electrodes from a drying oven, electrodes shall be stored in ovens at a temperature of at least 250 degrees F. Electrodes exposed to the atmosphere upon removal from drying or storage ovens or hermetically sealed containers shall be used within four hours maximum or redried at 450 to 550 degrees F for two hours minimum. Electrodes exposed to the atmosphere for periods less than four hours may be returned to a storage oven and maintained at a minimum of 250 degrees F for a minimum of four hours before reissue. Electrodes shall be redried no more than one time. Electrodes which have been wet shall not be used.
- Welding shall not be done when the ambient air temperature is 0° F or lower, or when steel surfaces are wet or exposed to rain, snow or high wind.
- Preparation of base metal shall be in accordance with Section 3 of the Code. Existing paint shall be removed a distance of four inches away from the weld, prior to welding.
- Weld cleaning shall be accomplished in accordance with Section 3.11 of the Code. Completed welds, and adjacent areas, shall be cleaned of all weld spatter, slag, smoke, and heat affected paint.

**ESTIMATE OF STRUCTURE QUANTITIES AND NOTES**  
FOR  
164' - 1 1/4" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-084-433

MARCH 2014

2 OF 11

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SA02	DRAFTED BY NP Kevin N. Boeden BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	10	30

**INSTALL NEW DIAPHRAGM JACKING FRAME (CONTINUED)**

- E7018 electrodes shall be used for tack welds. The size of tack welds shall not be greater than 5/16". Tack welds shall be positioned so they will be incorporated into, and re-melted by, the final weld. Tack welds shall be thoroughly cleaned prior to any weld placement.
- All costs associated with installing the jacking frame on the existing diaphragms including all materials, labor, welding, weld inspection and any incidentals necessary shall be incidental to the contract lump sum cost for "Structural Steel, Miscellaneous".

**AIR CARBON ARC PROCESS**

- All removal of existing welds called for by these plans shall be accomplished using the air carbon arc process unless noted otherwise by the plans.
- Lay out all cut lines on the steel surfaces, using a marker visible during the cutting process, before any air carbon arc cutting begins.
- When grinding to a specified shape is required after air carbon arc cutting, lay out the shape to grind to on the steel surface with a visible marker and grind to the lay out line. Radius all edges to accept paint.
- Extreme care shall be exercised during the cutting process so that absolutely no damage (such as nicks, gouges, splattering) to the surrounding metal shall occur.
- Grind all surfaces cut with the air carbon arc process to remove high carbon deposits, provide a smooth finish, and radius edges for painting.

**JACKING SUPERSTRUCTURE**

- Jacks shall be used to carry the girder reactions at Pier No. 2 during the time of pier cap repair. The intent of the jacking procedure is to transfer the girder reaction to the jack during the pier cap repair while keeping the vertical movement of the girder to the minimum amount necessary, as approved by the Engineer.
- The jack shall have a lock nut for mechanical load holding with hydraulic pressure released.
- The jack shall be able to safely support a load of 120 kips per girder at Pier No. 2 for the entire time required to repair the pier cap. Any girder supported by jacking shall not be allowed to transfer any portion of its load to the repaired portion of the pier cap until it has attained a minimum compressive strength of 2000 psi.
- Caution shall be exercised when transferring the girder reactions to and from the jacks to ensure that no damage to any of the existing structural components will occur due to the jacking procedure. Any damage to any of the structural components of the bridge caused by the jacking procedure will be repaired as approved by the Engineer at no cost to the Department.

- Each jack shall have a bearing plate at both ends of sufficient area and thickness to limit the bearing stress on the loaded area of concrete to not more than 1800 psi and to limit the bearing stress on the loaded area of steel to not more than 20,000 psi.
- The Contractor shall be required to submit a detailed set of plans outlining his jacking procedure to the Engineer a minimum of 30 days prior to use for review by the Bridge Construction Engineer. Included in this procedure will be the name of the jack used, the load monitoring method for the jack, and details of bearing plates used to limit the bearing stress on the concrete and steel.
- All costs for materials, labor, equipment and incidentals necessary to perform the vertical jacking as shown by these plans shall be included in the contract lump sum price for "Jack Superstructure, Steel Girder Bridge".

**PIER CAP REPAIR**

- After all loose concrete has been removed, the area shall be abrasive blasted and blown clean with clean, dry, oil-free compressed air at 90 psi.
- The concrete patching material used in pier cap patching applications shall be supplied as the following or an equivalent as approved by the Office of Bridge Design:

Vertical Patch  
Symons  
2400 Arthur Avenue  
Elk Grove Village, IL 60007  
Phone: (847) 298-3200  
Web site: [www.symons.com](http://www.symons.com)

Meadow-Patch 20  
W. R. Meadows, Inc.  
P.O. Box 338  
Hampshire, IL 60140-0338  
Phone: (847) 214-2100  
Web site: [www.wrmeadows.com](http://www.wrmeadows.com)

Speed Crete Red Line  
The Euclid Chemical Company  
19218 Redwood Rd.  
Cleveland, OH 44110  
Phone: (800) 321-7628  
Web site: [www.euclidchemical.com](http://www.euclidchemical.com)

The concrete patching material shall be extended with aggregate of the quality, size and gradation specified in the manufacturer's technical literature.

- The cost of concrete breakout including sawing, breaking out concrete, cleaning, straightening reinforcing steel and disposal of all broken out concrete shall be incidental to the unit price per cubic yard for "Breakout Structural Concrete".

- The bent caps shall be rebuilt to the dimensions of the original construction plans unless otherwise shown on the plans. When used, cap forms may be removed when the concrete attains a compressive strength of 2000 psi.
- All costs associated with accessing, furnishing, placing and finishing the concrete patching material including all equipment, labor and incidentals shall be incidental to the unit price per cubic foot for "Concrete Patching Material, Miscellaneous".

**GALVANIC ANODE**

- The Contractor shall furnish and place Galvanic anodes in the concrete repair areas specified in this plan set.
- The galvanic anodes shall be supplied as one of the following:
  - Galvashield XP+  
Vector Corrosion Technologies  
13312 N 56<sup>th</sup> St, Suite 102  
Tampa, FL 33617  
Phone: (813) 830-7566  
Website: [www.vector-corrosion.com](http://www.vector-corrosion.com)
  - Sentinel Silver  
Euclid Chemical Company  
19218 Redwood Road  
Cleveland, OH 44110  
Phone: (800) 321-7628  
Website: [www.euclidchemical.com](http://www.euclidchemical.com)
  - Sika Galvashield XP+  
Sika Corporation US  
201 Polito Avenue  
Lyndhurst, NJ 07071  
Phone: (800) 933-7452  
Website: <http://usa.sika.com>
- The anodes shall be placed in accordance with manufacturer's recommendations and as approved by the Engineer. The anodes have not been shown on the drawings. The Contractor shall provide shop drawings of the galvanic anode installation including locations of the individual anodes to the Office of Bridge Design.

**NOTES (CONTINUED)**

FOR

164' - 1 1/4" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-084-433

MARCH 2014

3 OF 11

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SA03	DRAFTED BY NP	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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**GALVANIC ANODE (CONTINUED)**

4. The anodes shall be placed with a minimum 3/4" cover and shall be set in Embedding Mortar per the manufacturer's recommendations. The anodes shall be fully encased in the concrete repair material. Where adequate cover does not exist, a concrete pocket shall be chipped out behind the anode to provide sufficient cover. The Contractor may need to chip around the reinforcing bar locally at the anode installation to make the electrical connection. The reinforcing steel at the connection location shall be cleaned per the manufacturer's recommendations to provide sufficient electrical connection and mechanical bond.
5. The electrical continuity of the electrical connections and reinforcing steel shall be confirmed per the manufacturer's recommendations.
6. The Contractor shall provide manufacturer's product literature and installation instructions to the Engineer 10 days prior to installation.
7. All costs associated with placing anodes including labor, equipment, materials and incidentals shall be included in the contract unit price per each for "Galvanic Anode".

**FIBER REINFORCED EPOXY COMPOSITE 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.
  - 1.2.2. Complete shop drawings shall be submitted for each installation of the composite system. The shop 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 1 year 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**

- 2.1 General Requirements:
  - 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 to avoid contact with moisture and at a temperature between 35°F and 100°F or in accordance to the manufacturer's requirements..
- 2.2 Material Properties:
  - 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  
8380 Miralani Drive  
San Diego, California 92126  
Tel: (858) 642-0694  
Fax: (858) 444-2982
  - 2.2.2 The Tyfo Fibrwrap System shall have the following materials:
    - 2.2.2.1 Composite fabric:  
SCH 41 fabric – carbon fabric  
SEH 51A fabric – glass 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 Finish Paint:  
Tyfo A or Tyfo U paint.

- 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 in primary fiber direction	60,000 psi	100,000 psi	D 3039
Ultimate Breaking Load, minimum in primary fiber direction	3,000 lb/in. width	4,000 lb/in. 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 Area of primary fibers	3 x 10 <sup>6</sup>	8 x 10 <sup>6</sup>	D 3039
Ultimate Tensile Strength At 90 degrees to Primary fibers, psi, minimum	3,000	1,000	D 3039
Visual Defects	Acceptance Level III	Acceptance Level III	D 2563

**3. CONSTRUCTION REQUIREMENTS**

- 3.1 Surface Preparation:
  - 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 can not 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.

**NOTES (CONTINUED)**

FOR  
164' - 1 1/4" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-084-433

MARCH 2014

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	12	30

**FIBER REINFORCED EPOXY COMPOSITE WRAP (CONTINUED)**

- 3.1.3 The Contractor shall remove all unsound and loose concrete in the area of the composite wrap prior to pier cap wrap placement. The Contractor will not be allowed to use any impact type breakout equipment larger than a 15 pound jack hammer for concrete removal. Any damaged reinforcing steel caused by the removal operation shall be repaired by the Contractor as approved by the Engineer at the Contractor's expense. The removal areas shall be built up to the original section using an epoxy grout supplied by the composite column wrap supplier which meets the strength of existing section. Surfaces of the repaired areas shall be smooth and free of voids or undulations that would prevent full contact with the composite column wrap system.
- 3.1.4 Concrete surfaces shall have all surface foreign materials, such as bird nests, dirt, etc., removed as approved by the Engineer. Stripping off well-adhered paint or concrete from pier cap surfaces is not required. One prime coat of the manufacturer's epoxy shall be applied prior to wrapping pier cap with the composite.
- 3.1.5 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.
- 3.2 Application Procedures
  - 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.
  - 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 certified applicator.

- 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.
- 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 repaired by removing and re-applying the 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 Composite Fabric Wrap, Concrete Repair. The plan quantity will be the basis of payment.

**5. BASIS OF PAYMENT**

"Composite Fabric Wrap, Concrete Repair" will be paid for at the contract unit price per square foot. Payment will be full compensation for labor, equipment, materials, and all incidental work required.

**BRIDGE REPAINTING, CLASS I**

1. The work affected areas for the Jacking Frame installation shall be painted in accordance with Section 412 of the Standard Specifications and in accordance with SSPC Standard PA1.
2. For informational purposes, 94 square feet of structural steel will require painting. The quantity shown includes the jacking frame and affected areas of the adjacent stiffeners. The quantity shown is for an area four inches on all sides of the welds.
3. Paint color

Top Coat - The paint color shall be an approved green color. Prior to ordering the paint, a paint chip of the green color shall be submitted to the Department for color approval.

Primer Coat - Color shall sharply contrast with the top coat.

**NOTES (CONTINUED)**

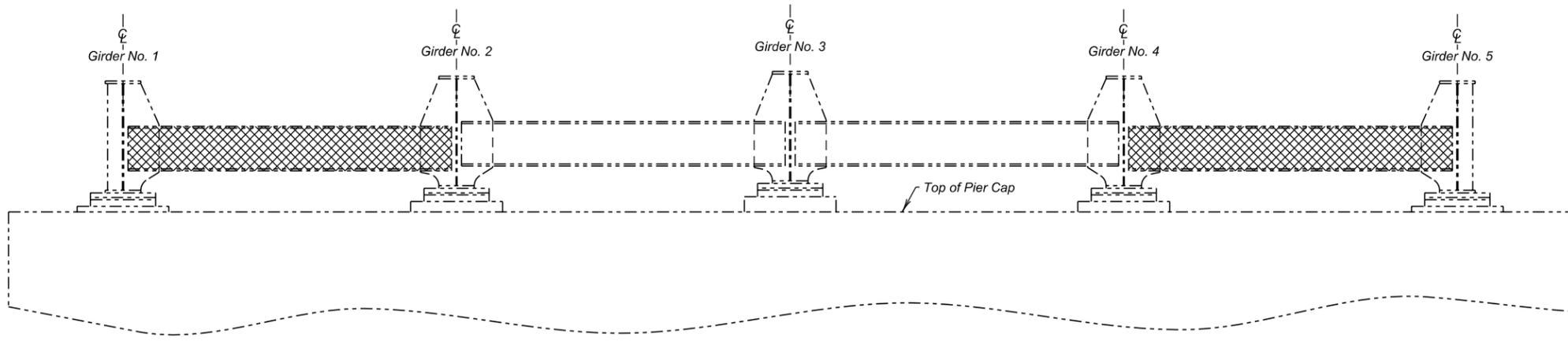
FOR  
164' - 1 ¼" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-084-433

MARCH 2014

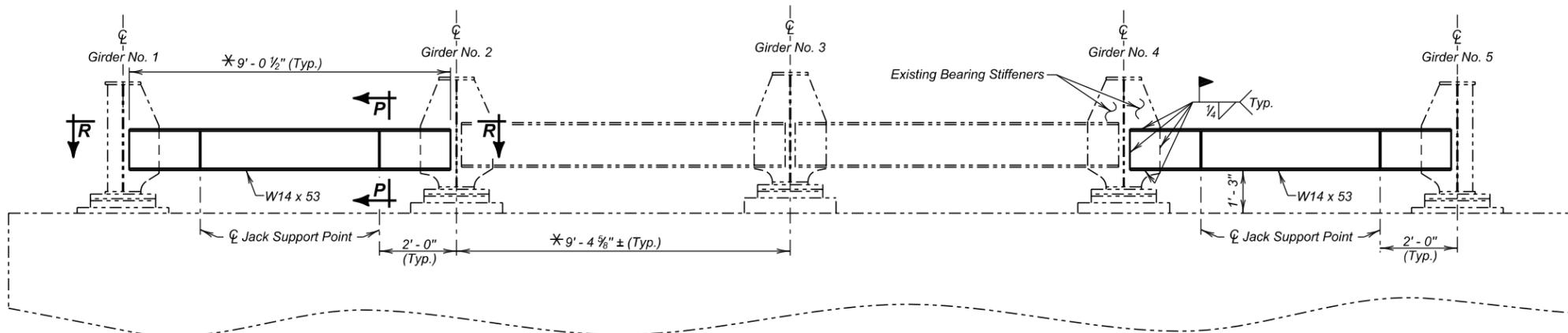
5 OF 11

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SA05	DRAFTED BY NP	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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**ELEVATION - PIER NO. 2**  
(Showing Removal)  
(Deck not Shown for Clarity)

Existing C Channels to be Removed by Air Carbon Arc.

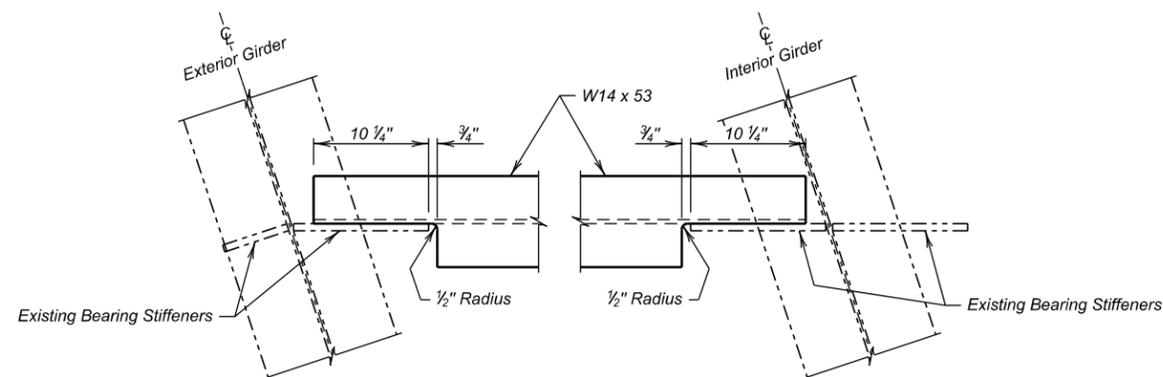


**ELEVATION - PIER NO. 2**  
(Showing New Jacking Frame)  
(Deck not Shown for Clarity)

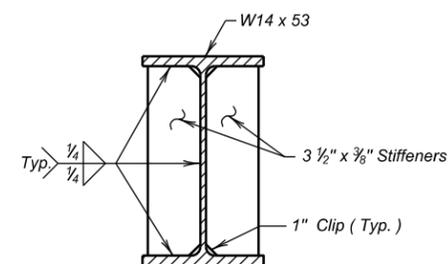
**ESTIMATED QUANTITIES**

ITEM	UNIT	QUANTITY
Jack Superstructure, Steel Girder Bridge	LS	Lump Sum
Structural Steel, Miscellaneous	LS	Lump Sum
Bridge Repainting, Class I	LS	Lump Sum

☆ For informational purposes, the total amount of structural steel for the jacking frames is 977 lbs.



**SECTION R - R**



**SECTION P - P**

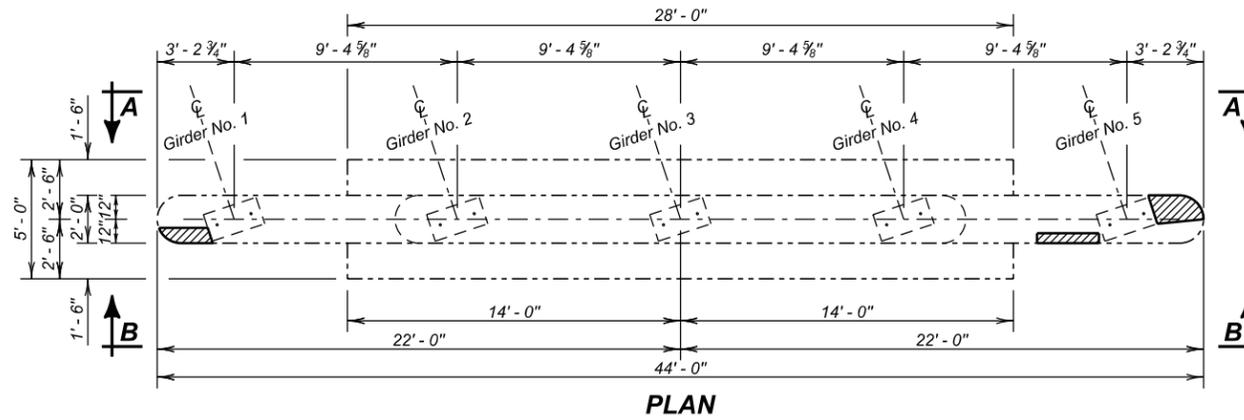
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**PIER NO. 2 GIRDER JACKING DETAILS**

FOR  
**164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE**  
40' - 0" ROADWAY  
OVER RAILROAD  
STR. NO. 55-084-433

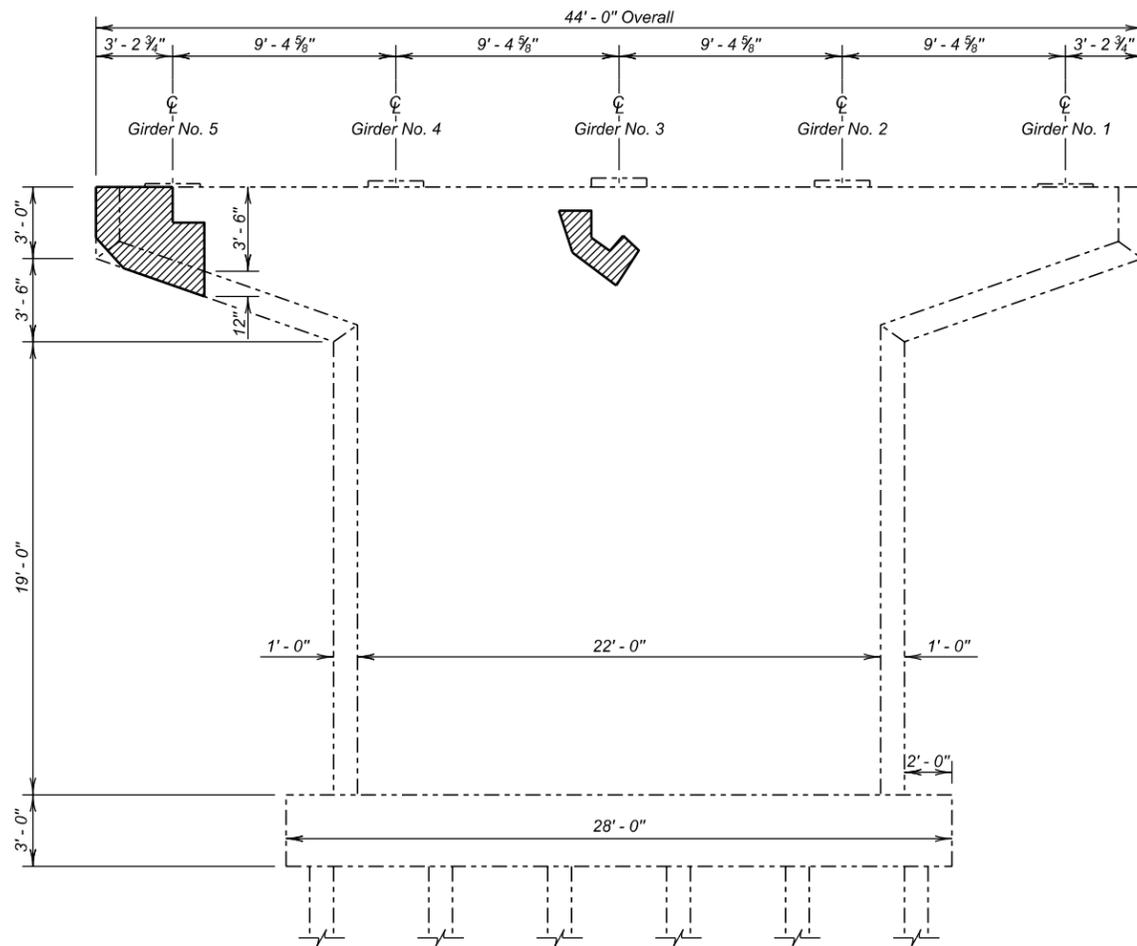
18° 14' SKEW L.H.F.  
SEC. 33-T122N-R51W  
IM 0299(62)206

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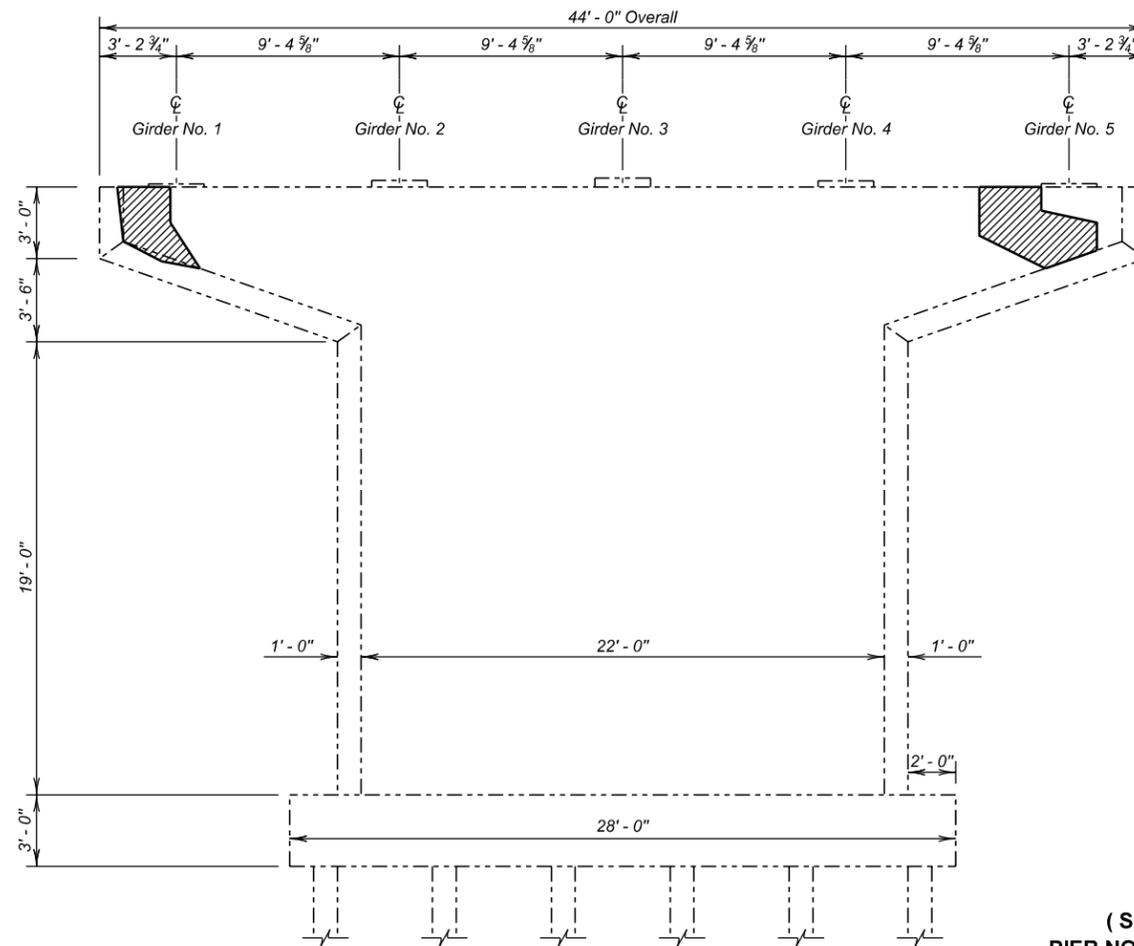
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	14	30



ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete Patching Material, Miscellaneous	Cu Ft	16.2
Breakout Structural Concrete	Cu Yd	0.6
Galvanic Anode	Each	11



**SECTION A - A**  
(NORTH FACE)



**SECTION B - B**  
(SOUTH FACE)

( SOUTH BOUND LANES )  
PIER NO. 2 DELAMINATION DETAILS

FOR  
164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE  
40' - 0" ROADWAY  
OVER RAILROAD  
STR. NO. 55-084-433

18° 14' SKEW L.H.F.  
SEC. 33-T122N-R51W  
IM 0299(62)206

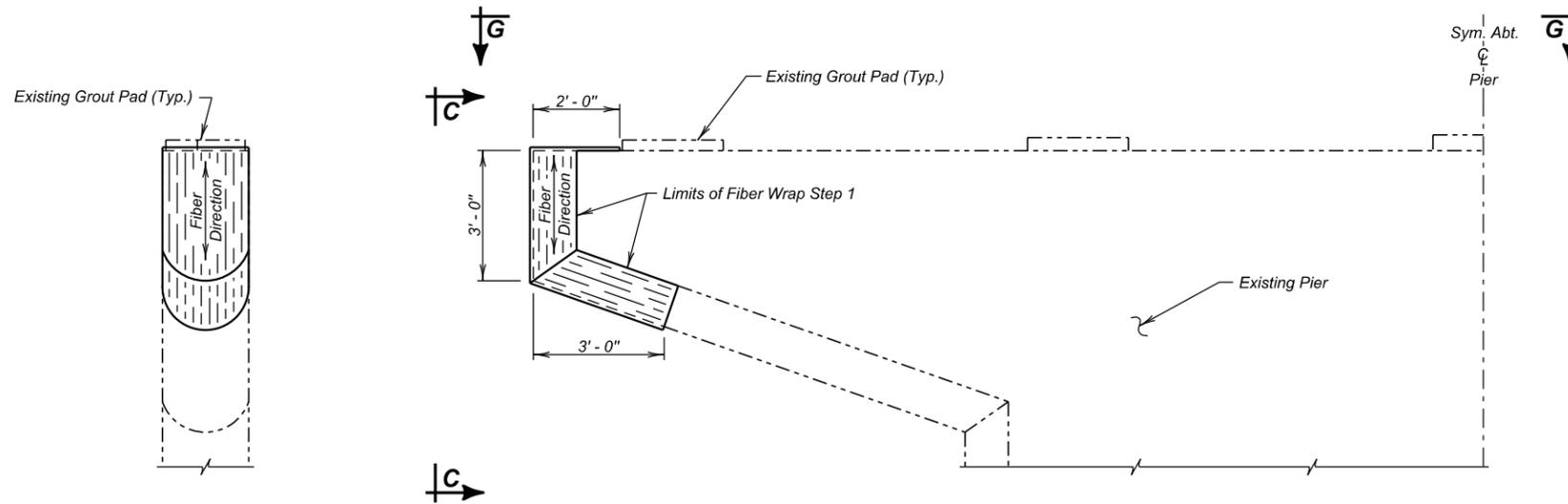
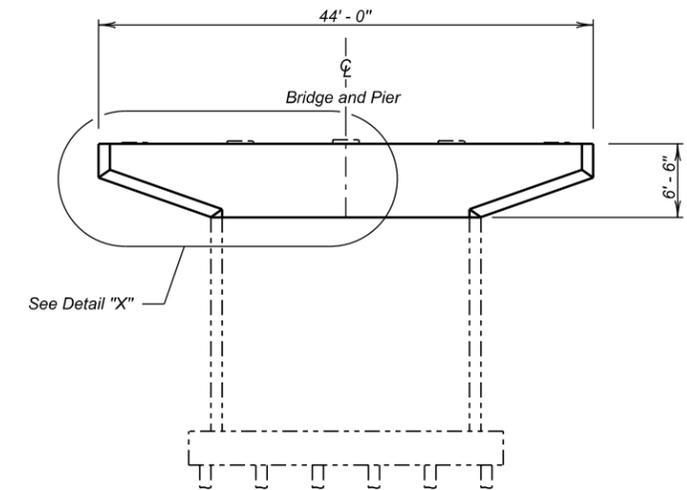
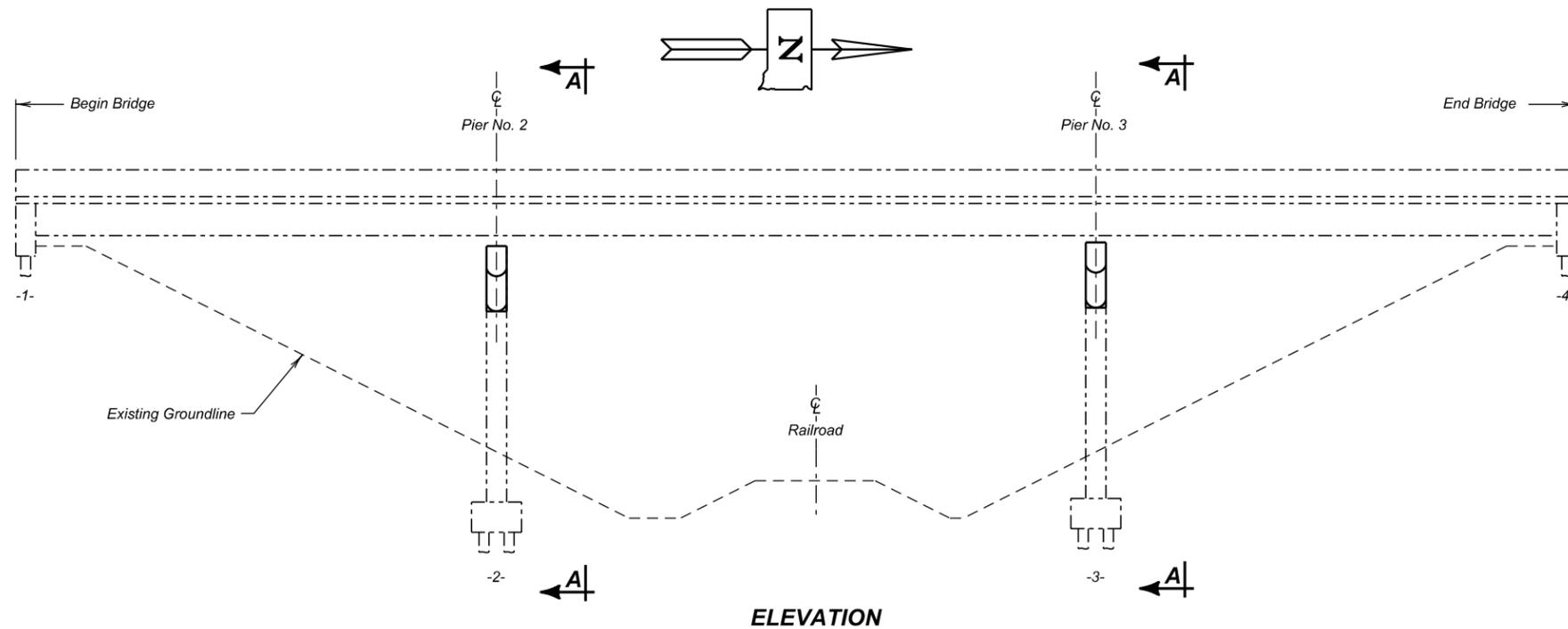
**LEGEND -**

Shaded areas indicate locations concrete removal and patching.

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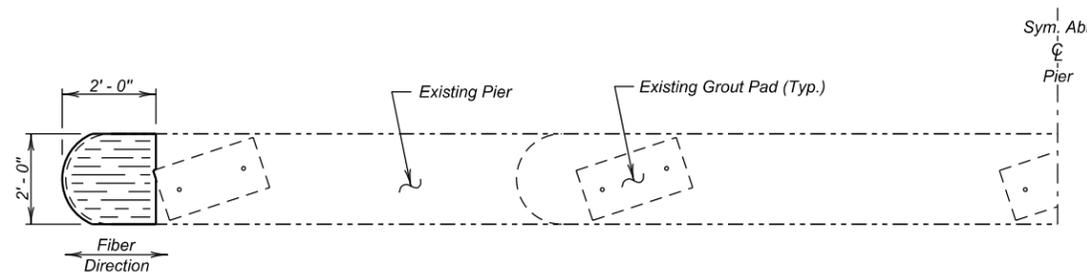
DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3RA07	DRAFTED BY KR	<i>Kevin N. Coeden</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	15	30



**VIEW C - C**  
(Fiber Wrap - Step 1)

**VIEW G - G**  
(Fiber Wrap - Step 1)



**LEGEND -**

Indicates limits and fiber direction of Composite Fiber Wrap.

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Composite Fabric Wrap, Concrete Repair	SqFt	1217

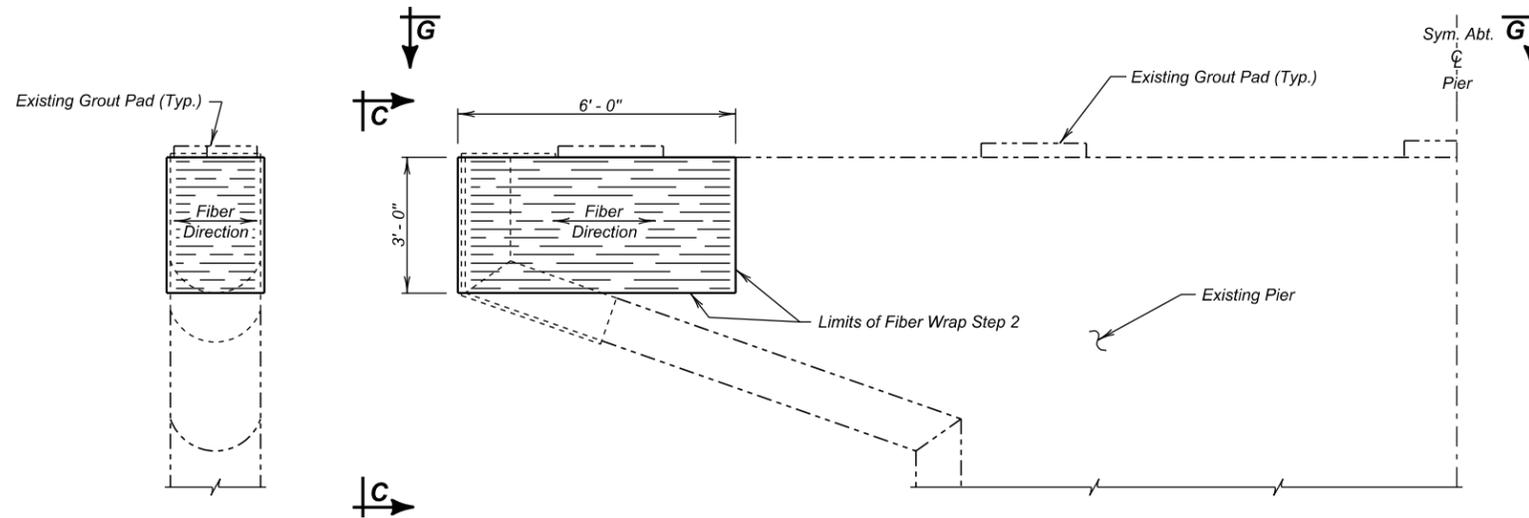
( SOUTH BOUND LANES )  
**PIER NOS. 2 AND 3 FIBER WRAPPING DETAILS**  
 FOR  
**164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE**  
 40' - 0" ROADWAY  
 OVER RAILROAD  
 STR. NO. 55-084-433

18° 14' SKEW L.H.F.  
 SEC. 33-T122N-R51W  
 IM 0299(62)206

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 S. D. DEPT. OF TRANSPORTATION  
 MARCH 2014

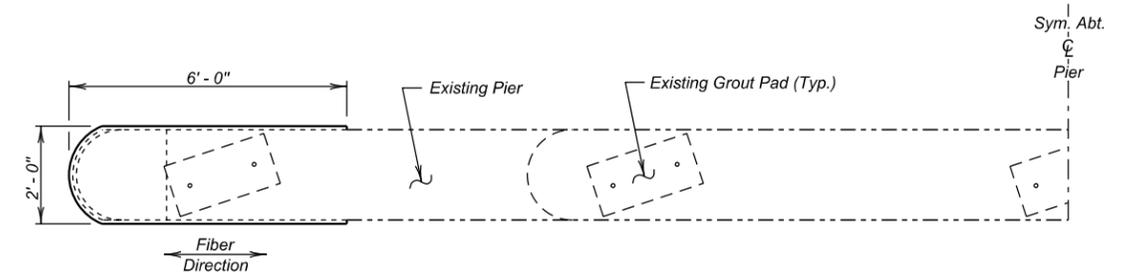
DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3RA08	DRAFTED BY KR	<i>Kevin N. Goeden</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	16	30

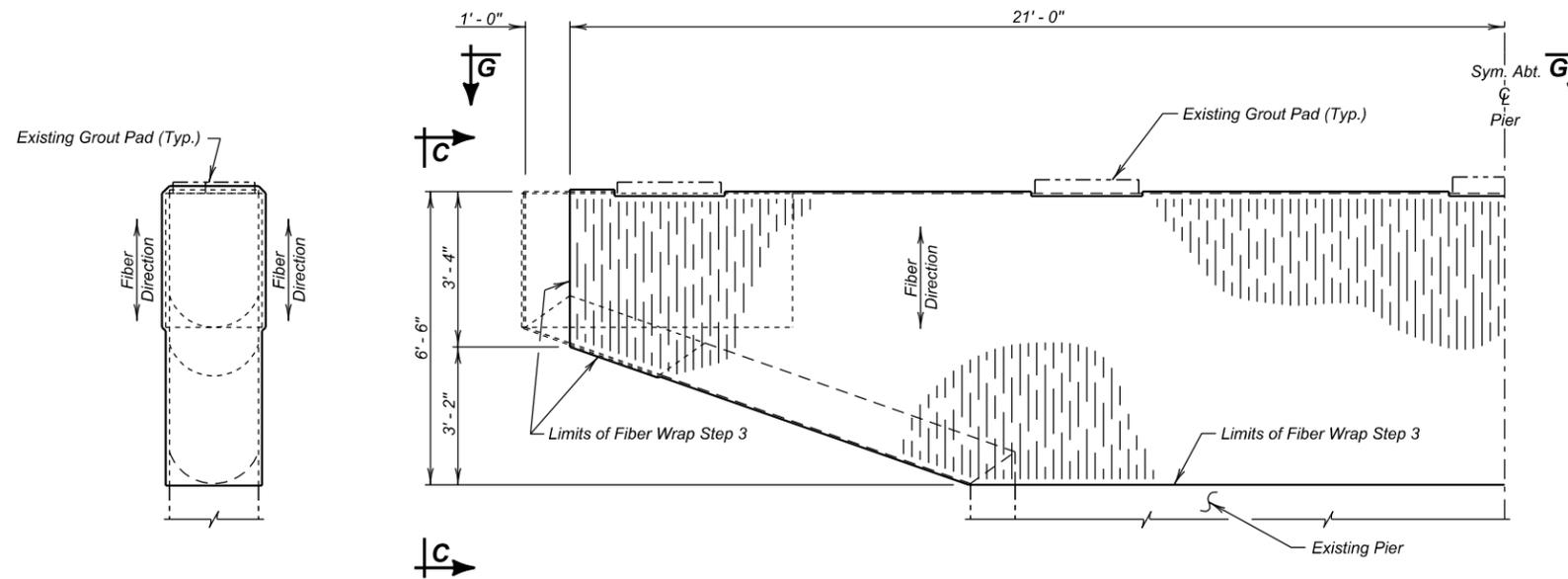


**VIEW C - C**  
(Fiber Wrap - Step 2)

**DETAIL "X"**  
(Fiber Wrap - Step 2)

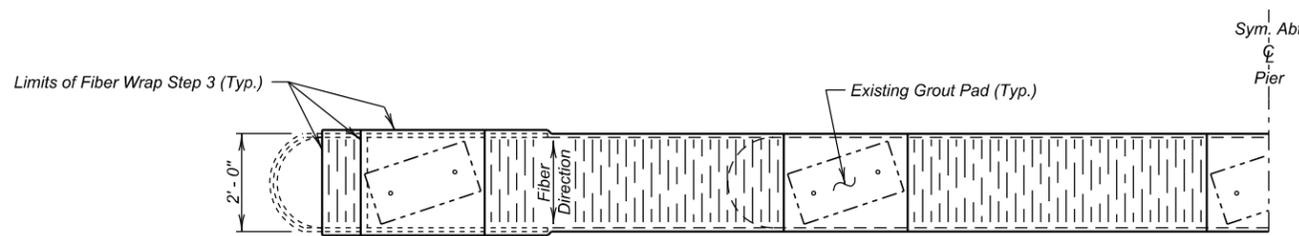


**VIEW G - G**  
(Fiber Wrap - Step 2)



**VIEW C - C**  
(Fiber Wrap - Step 3)

**DETAIL "X"**  
(Fiber Wrap - Step 3)



**VIEW G - G**  
(Fiber Wrap - Step 3)

**LEGEND -**

 Indicates limits and fiber direction of Composite Fiber Wrap.

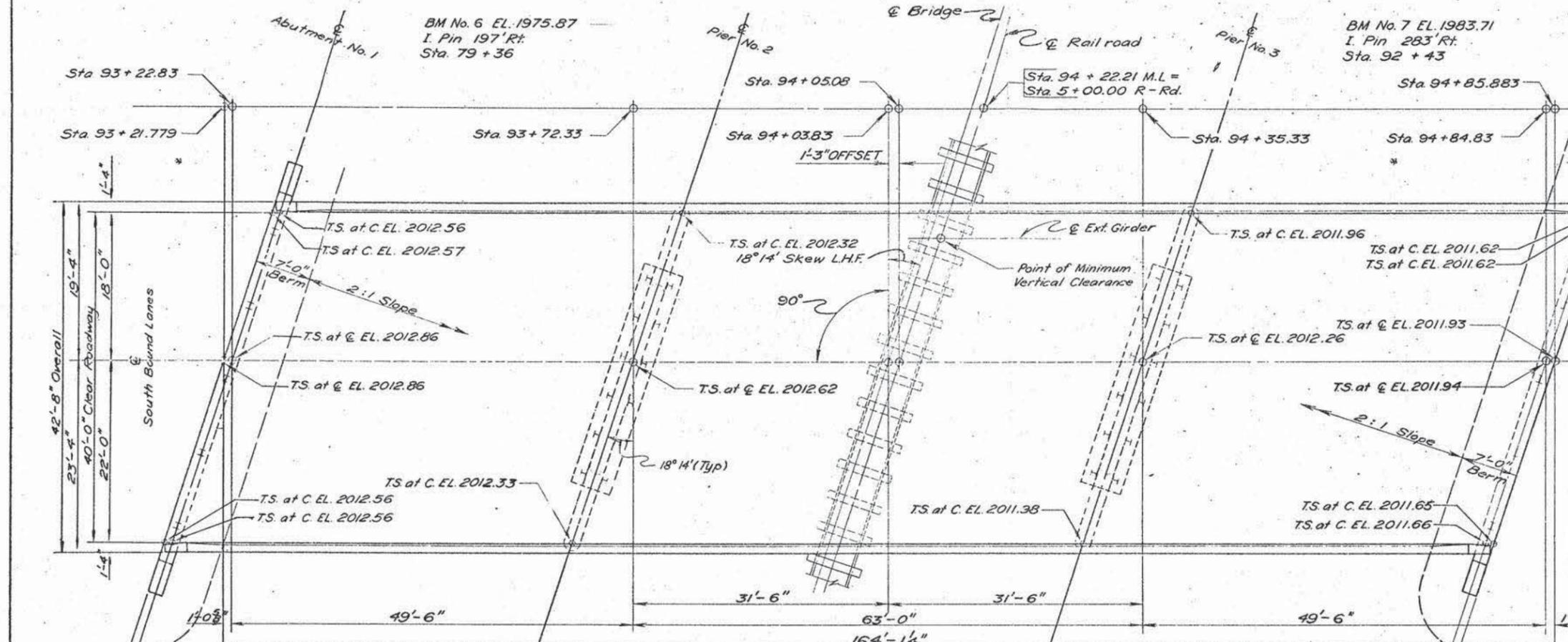
( SOUTH BOUND LANES )  
**PIER NOS. 2 AND 3 FIBER WRAPPING DETAILS (CONTINUED)**  
 FOR  
**164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE**  
 40' - 0" ROADWAY  
 OVER RAILROAD  
 STR. NO. 55-084-433

18° 14' SKEW L.H.F.  
 SEC. 33-T122N-R51W  
 IM 0299(62)206

ROBERTS COUNTY  
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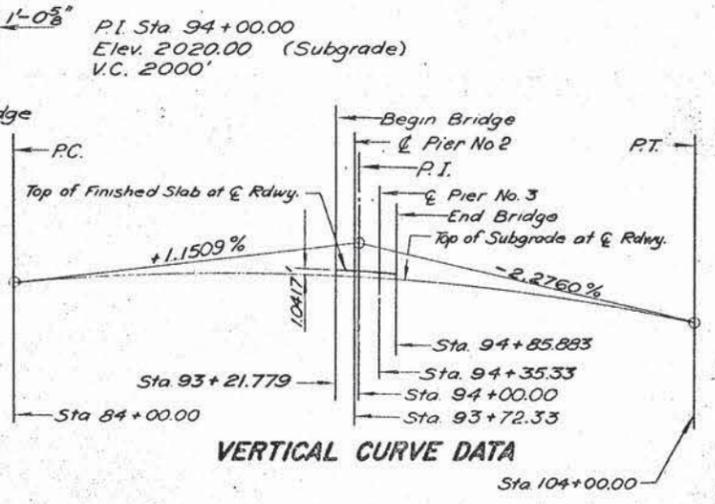
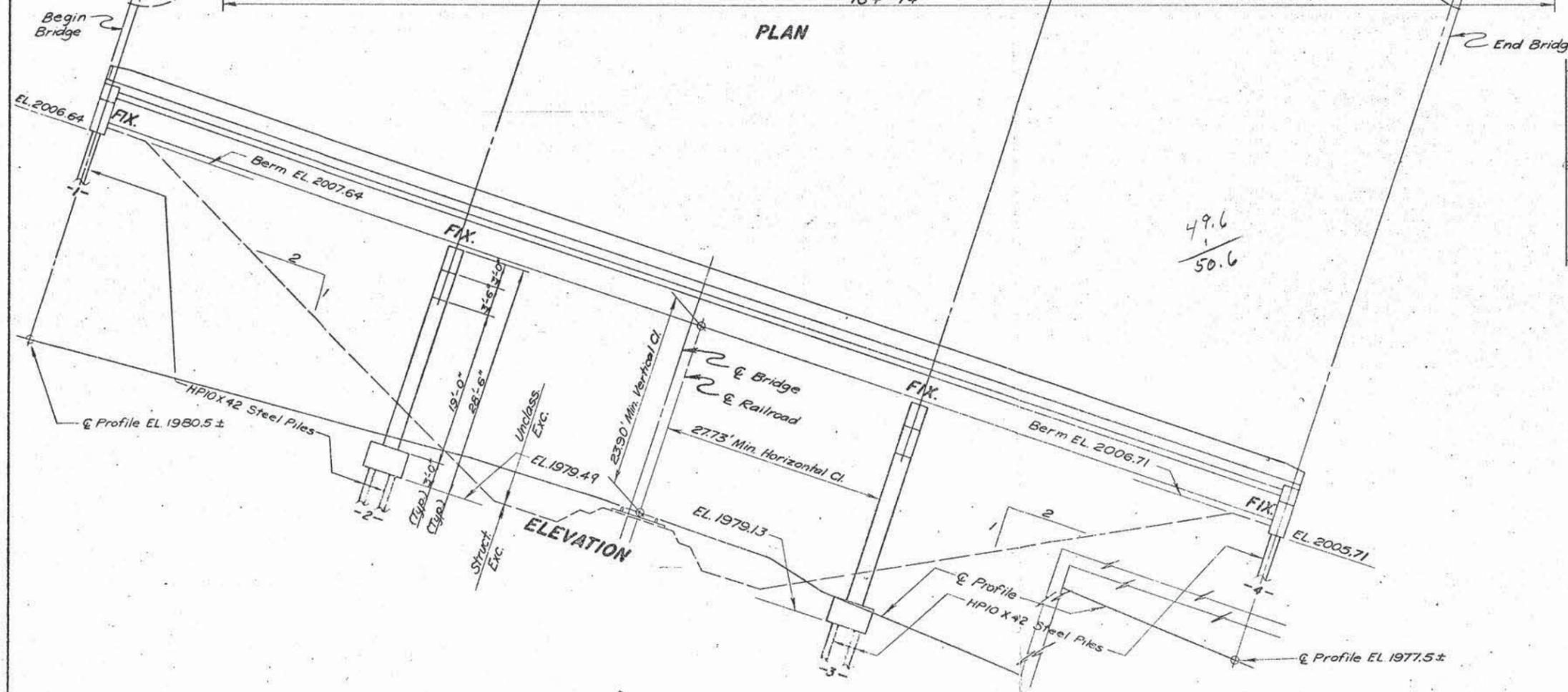
DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3RA09	DRAFTED BY KR	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	17	30



**NOTE:**  
T.S. at C. EL = Top of Slab at Curb Elevation  
T.S. at Q. EL = Top of Slab at Centerline Roadway Elevation

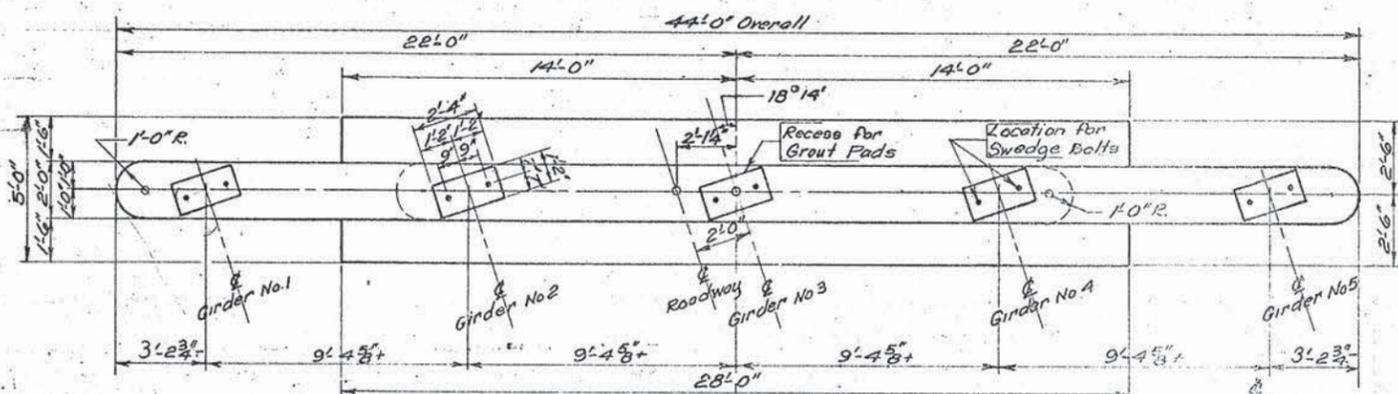
### ORIGINAL CONSTRUCTION PLANS



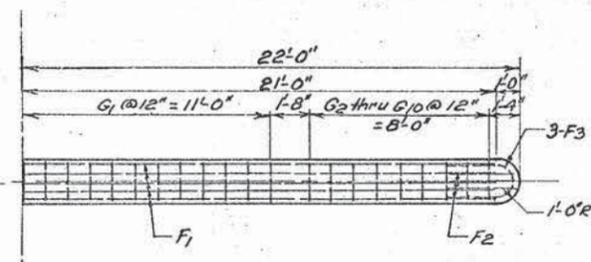
(SOUTH BOUND LANES)  
GENERAL DRAWING  
FOR  
**164'-1 1/4" CONT. COMP GIRDER BRIDGE**  
40'-0" ROADWAY 18°14' SKEW L.H.F.  
OVER C.M.S.T.P. & P.R.R. SEC. 33 - T122N - R51W  
STA. 93 + 21.779 TO 94 + 85.883 I-29-9(20)205(PT)  
STR. NO. 55 - 084 - 433 HS20-44 (& ALT.)  
ROBERTS COUNTY  
S. D. DEPT. OF TRANSPORTATION  
DIVISION OF HIGHWAYS  
SEPT. 1975

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	G.I.	B.W.W.	K.C. Wilson BRIDGE ENGINEER

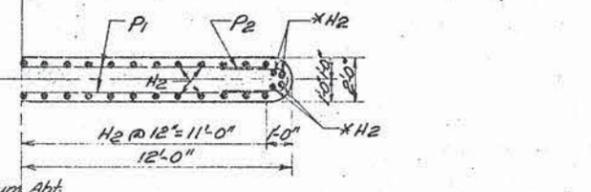
# ORIGINAL CONSTRUCTION PLANS



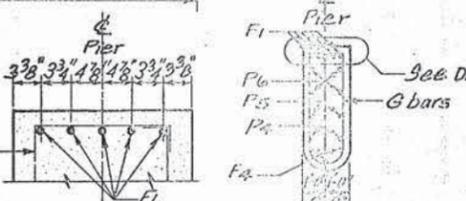
PLAN



SEC. B-B

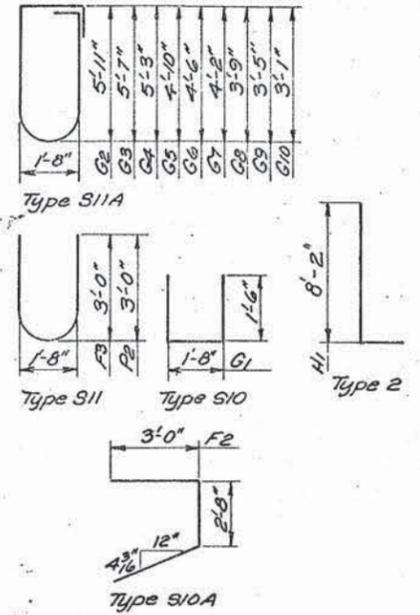


SEC. C-C



DETAIL 'Y'

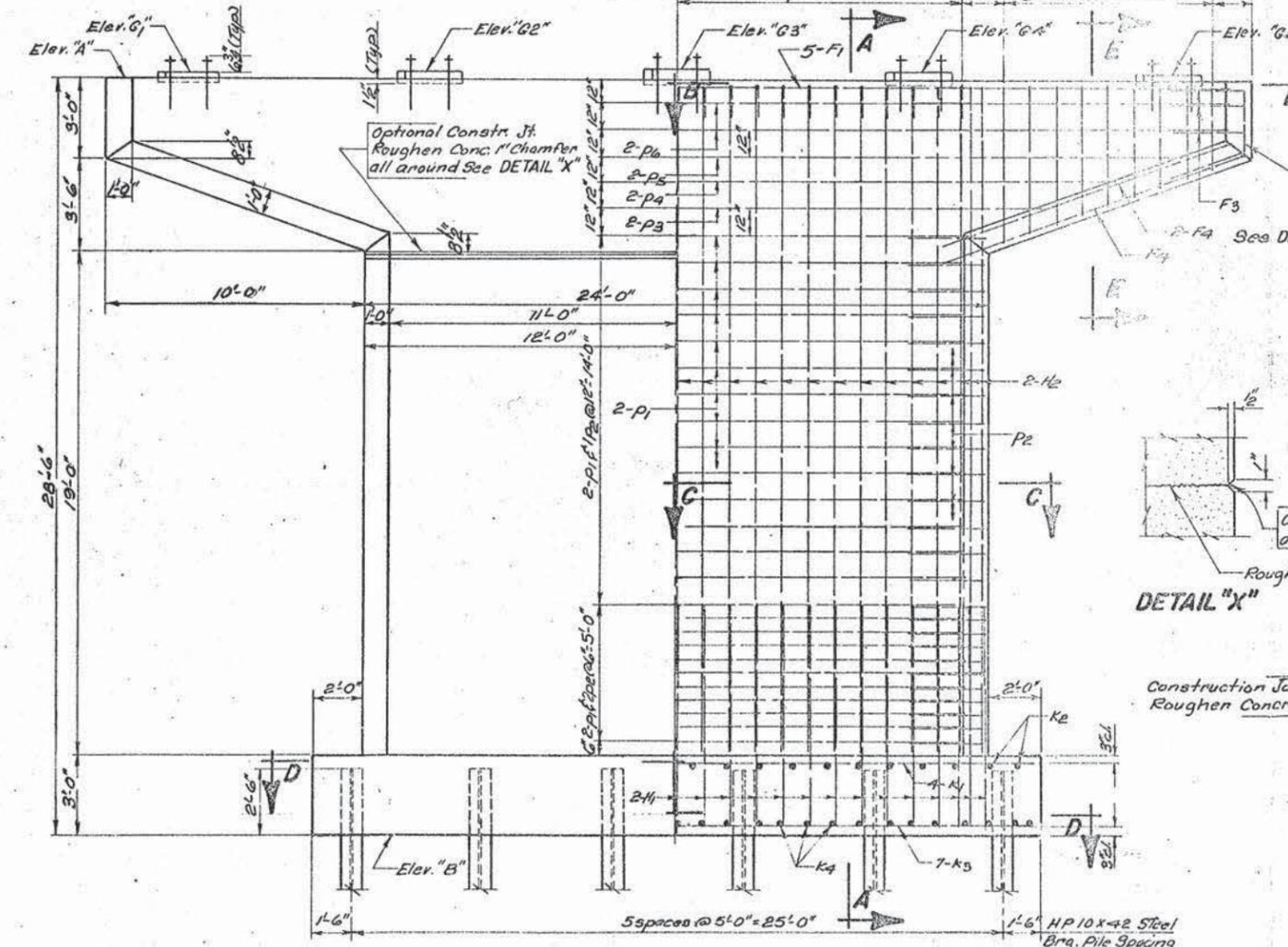
REINFORCING SCHEDULE					Banding Details	
BAR	No.	Size	Length	Type		
F1	5	10	42'-0"	Str.		
F2	6	5	7'-9"	S10A		
F3	6	6	7'-0"	S11		
F4	6	4	12'-0"	Str.		
G1	23	5	4'-8"	S10		
G2	2	5	15'-5"	S11A		
G3	2	5	14'-9"			
G4	2	5	14'-1"			
G5	2	5	13'-4"			
G6	2	5	12'-7"			
G7	2	5	11'-11"			
G8	2	5	11'-1"			
G9	2	5	10'-5"			
G10	2	5	9'-9"	S11A		
H1	54	10	9'-2"	2		
H2	54	10	25'-2"	Str.		
K1	4	4	27'-8"			
K2	22	4	4'-8"			
K3	7	5	27'-8"			
KA	29	5	4'-8"			
P1	50	4	22'-0"	Str.		
P2	50	4	7'-0"	S11		
P3	2	4	26'-3"	Str.		
P4	2	4	32'-1"			
P5	2	4	37'-10"			
P6	4	4	42'-0"	Str.		



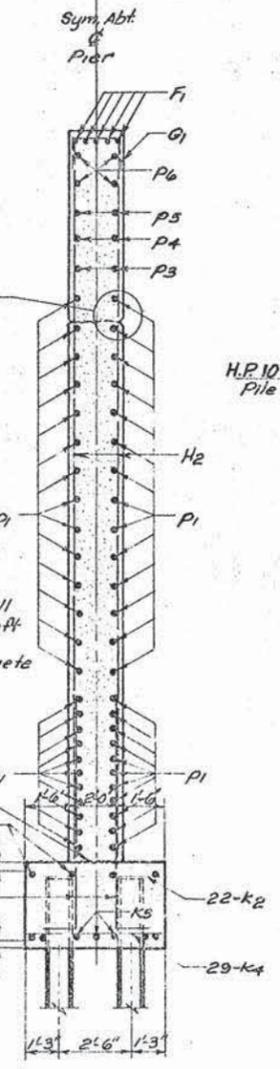
NOTE: All dimensions are out to out of bars.

ESTIMATED QUANTITIES							
ITEM	Concrete	Reinforcement	Structure Excavation	Furnish Steel	Drive Steel	Furnish Steel Piles	Drive Steel Piles
UNIT	Cu Yd.	Lb.	Cu Yd.	L.F.	L.F.	L.F.	L.F.
Pier No. 2	68.0	11,084	70	1655' - 53"	1855' - 53"	11848' - 528'	11848' - 528'
Pier No. 3	68.0	11,084	65	1455' - 55"	1455' - 55"	11850' - 550'	11850' - 550'

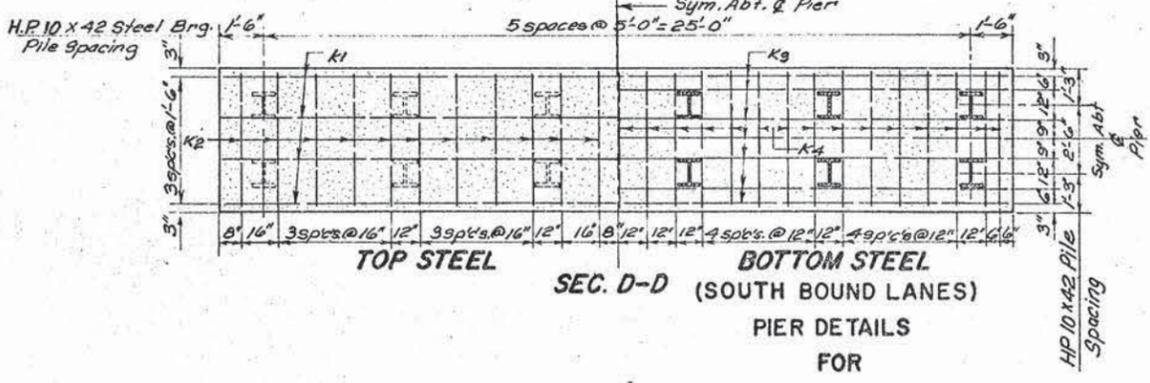
\*Includes 0.1 cu. Yds. for Grout Pads.  
\*Structure Excavation per foot of depth equals 9.2 cu. Yds.



ELEVATION



SEC. A-A



TOP STEEL  
BOTTOM STEEL  
SEC. D-D (SOUTH BOUND LANES)  
PIER DETAILS FOR

TABLE OF ELEVATIONS

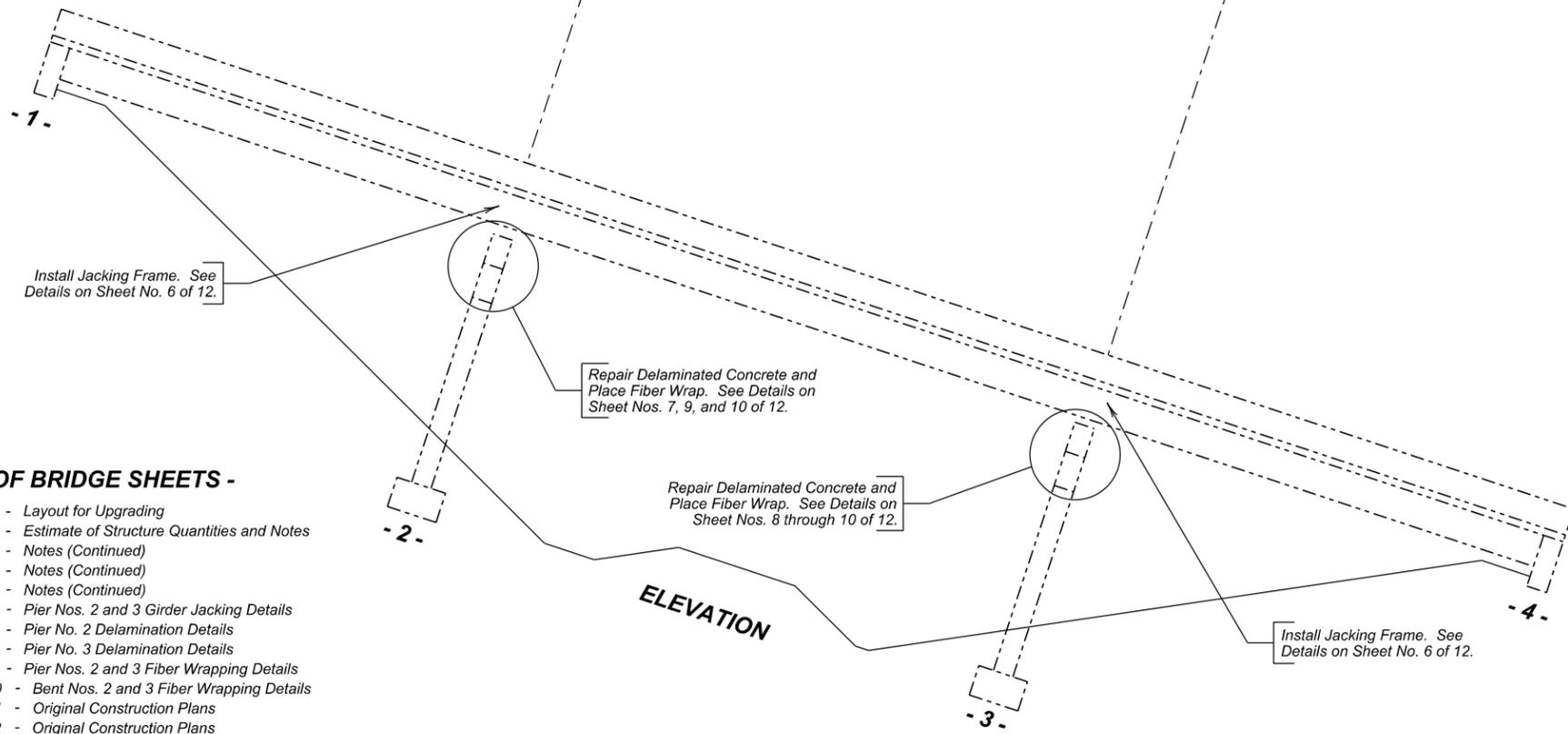
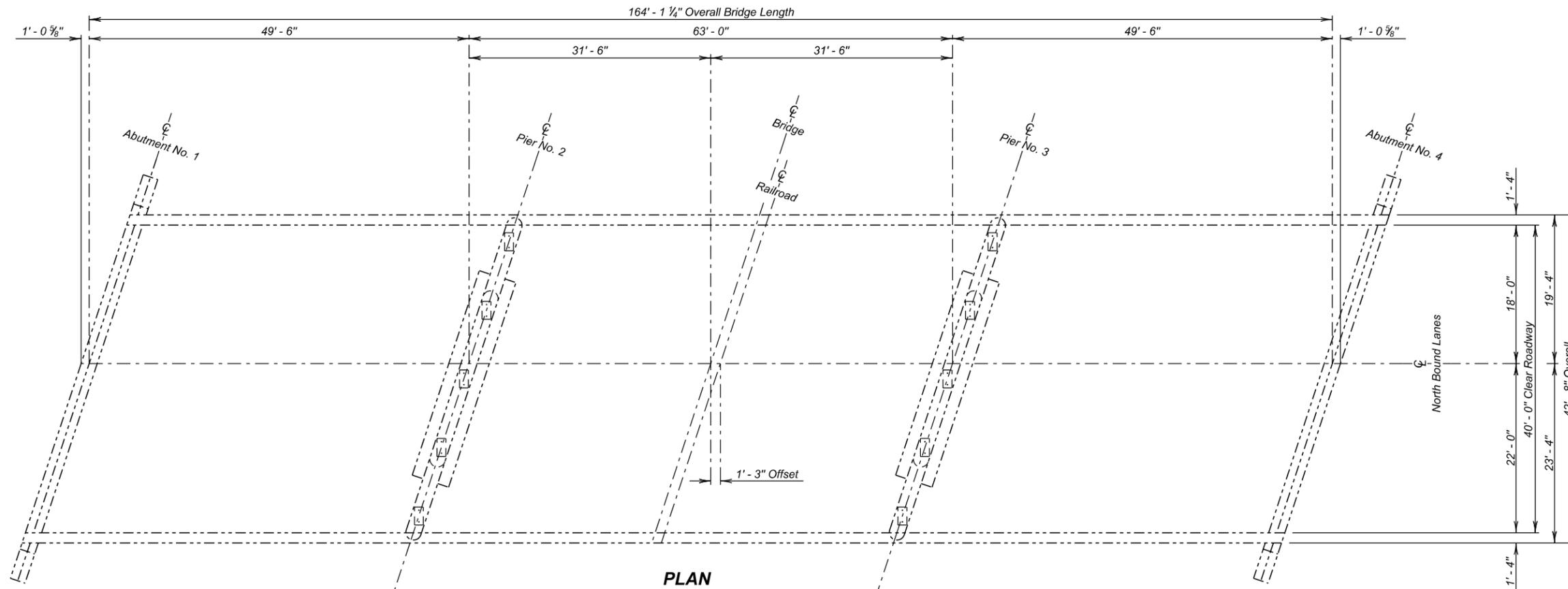
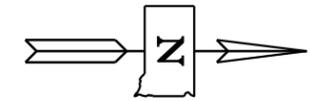
Point	Pier No. 2	Pier No. 3
Elev. 'A'	2007.99	2007.63
Elev. 'B'	1979.49	1979.13
Elev. 'C'	2008.119	2007.755
Elev. 'G2'	2008.268	2007.907
Elev. 'G3'	2008.357	2007.999
Elev. 'G4'	2008.238	2007.884
Elev. 'G5'	2008.120	2007.768

**164'-14" CONT. COMP. GIRDER BRIDGE**  
 40'-0" ROADWAY  
 OVER C.M. ST. P. & P.R.R.  
 STA. 93+21.779 TO 94.+85.883  
 STR. NO. 55-084-433

18° 14' SKEW L.H.F.  
 SEC. 33-T122N-R51W  
 I-29-9(20)205(PT)  
 HS20-44 (& ALT.)

ROBERTS COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 SEPT. 1975

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	19	30



**INDEX OF BRIDGE SHEETS -**

- Sheet No. 1 - Layout for Upgrading
- Sheet No. 2 - Estimate of Structure Quantities and Notes
- Sheet No. 3 - Notes (Continued)
- Sheet No. 4 - Notes (Continued)
- Sheet No. 5 - Notes (Continued)
- Sheet No. 6 - Pier Nos. 2 and 3 Girder Jacking Details
- Sheet No. 7 - Pier No. 2 Delamination Details
- Sheet No. 8 - Pier No. 3 Delamination Details
- Sheet No. 9 - Pier Nos. 2 and 3 Fiber Wrapping Details
- Sheet No. 10 - Bent Nos. 2 and 3 Fiber Wrapping Details
- Sheet No. 11 - Original Construction Plans
- Sheet No. 12 - Original Construction Plans

**( NORTH BOUND LANES )  
LAYOUT FOR UPGRADE**

FOR  
**164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE**  
 40' - 0" ROADWAY 18° 14' SKEW L.H.F.  
 OVER RAILROAD SEC. 33-T122N-R51W  
 STR. NO. 55-085-433 IM 0299(62)206  
 PCN 03R3

ROBERTS COUNTY  
 S. D. DEPT. OF TRANSPORTATION

MARCH 2014

1 OF 12

PLANS BY:  
 OFFICE OF BRIDGE DESIGN, SOUTH DAKOTA DEPARTMENT OF TRANSPORTATION

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SB01	DRAFTED BY KR	<i>Kevin N. Coeden</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	20	30

## ESTIMATE OF STRUCTURE QUANTITIES

ITEM NO.	DESCRIPTION	QUANTITY	UNIT
410E0030	Structural Steel, Miscellaneous	Lump Sum	LS
410E0550	Jack Superstructure, Steel Girder Bridge	Lump Sum	LS
412E0100	Bridge Repainting, Class I	Lump Sum	LS
460E0174	Concrete Patching Material, Miscellaneous	18.9	CuFt
460E0300	Breakout Structural Concrete	0.7	CuYd
460E8050	Composite Fabric Wrap, Concrete Repair	1217	SqFt
480E5000	Galvanic Anode	18	Each

### SPECIFICATIONS

- Design Specifications: AASHTO Standard Specifications for Highway Bridges 17th Edition using Working Stress Design.
- 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.
- All Welding and Welding Inspection shall be in conformance with the AASHTO/AWS Bridge Welding Code D1.5M/D1.5:2010 unless otherwise noted in this plan set.

### 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 and are provided as information only. 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.

### NOTICE - LEAD BASED PAINT

Be advised that the paint on the steel surfaces of the existing structure is a paint containing lead. The Contractor should plan his/her operations accordingly, and inform his/her employees of the hazards of lead exposure.

### SCOPE OF BRIDGE WORK & SEQUENCE OF OPERATIONS

All work on this structure shall be accomplished with the traffic control shown in the plans. Alternate sequence of operations may be submitted by the Contractor for approval by the Engineer at the pre-construction meeting.

- Install jacking frames at Pier Nos. 2 and 3 for phase one of construction.
- Jack superstructure and temporarily support girders at locations requiring Pier Cap Repair below grout pads for phase one of construction.
- Repair deteriorated areas on Pier Nos. 2 and 3 as shown by the plans for phase one of construction.
- Switch traffic and repeat steps 1 through 3 for phase two of construction.
- Place composite fiber wrap on Pier Nos. 2 and 3 as shown in the plans.
- Paint all work affected areas.

### SHOP PLANS

Shop plans shall be required as specified by Section 410.3.A. of the Construction Specifications.

### COORDINATION WITH RAILROAD

- During repair of the piers, the Contractor shall not interfere with the operating railroad train movements. Construction activity must not take place within 25 ft. of the centerline track when train movements are occurring through the construction site and construction equipment shall be removed from this zone prior to arrival of any train. See Special Provision for Working on Railroad Company Right-of-Way.
- See Special Provision Regarding Railroad Protective Liability Insurance.

### CONCRETE BREAKOUT

- The existing pier caps shall be broken out to the limits shown on the plans. Breakout limits shall be defined with a 3/4" deep sawcut and to a minimum depth of 5" (unless specified otherwise in these plans), where practical, as approved by the Engineer. Reinforcing steel that is exposed and is scheduled for use in the new construction shall be cleaned and straightened to the satisfaction of the Engineer. Care shall be taken not to damage the existing reinforcing steel that is to be reused in the new construction during concrete breakout. Any reinforcing steel that is damaged during concrete breakout shall be replaced or repaired, as approved by the Engineer, by the Contractor at no cost to the Department.
- All broken out concrete shall be disposed of by the Contractor. Any disposal of discarded material shall be in accordance with the Environmental Commitments notes.
- The contract unit price per cubic yard for "Breakout Structural Concrete" shall include breaking out concrete, cleaning, straightening existing reinforcing steel and disposal of all broken out material.

### INSTALL NEW DIAPHRAGM JACKING FRAME

- To temporarily support the girders at Pier Nos. 2 and 3 a new jacking frame shall be installed.
- The new structural steel for the W14x53 section shall conform to ASTM A992. The new structural steel for the stiffeners shall conform to ASTM A36. All other new steel shall conform to ASTM A36.
- Cut lines defining the removal limits of the existing steel members shall be established using an air carbon arc process. See the air carbon arc notes for details.
- Welders shall be qualified in accordance with Section 410.3.D of the Construction Specifications.

- Approved welding processes are shielded metal arc welding (SMAW) and flux cored arc welding (FCAW). The following notes are based on the assumption that SMAW will be used. If the Contractor plans to use FCAW, he shall contact the Bridge Construction Engineer for any changes in requirements.
- An approved Welding Procedure Specification (WPS) will be required for this project, using the SMAW process and an approved E7018 electrode from Table 4.1 of the Bridge Welding Code. The proposed WPS's for this project shall be submitted on Form L-2, from Annex L of the Bridge Welding Code, to the Bridge Construction Engineer for approval at the Preconstruction Meeting.
- Preheat will be required. Preheat and interpass temperature requirements shall be in accordance with Clause 4.2 of the Bridge Welding Code. The minimum preheat and interpass temperature shall be 155° F as determined from Annex VIII of the Bridge Welding Code for high restraint conditions. Temperature indicating crayons shall be the minimum acceptable method for monitoring preheat and interpass temperatures.
- SMAW electrode atmospheric exposure requirements shall comply with Clause 4.5 of the Bridge Welding Code. Electrodes shall be purchased in hermetically sealed containers. If the container shows evidence of damage, the electrodes shall be dried in a drying oven for at least one hour at temperatures between 700 and 800 degrees F before they are used. Immediately after opening hermetically sealed container or removal of the electrodes from a drying oven, electrodes shall be stored in ovens at a temperature of at least 250 degrees F. Electrodes exposed to the atmosphere upon removal from drying or storage ovens or hermetically sealed containers shall be used within four hours maximum or redried at 450 to 550 degrees F for two hours minimum. Electrodes exposed to the atmosphere for periods less than four hours may be returned to a storage oven and maintained at a minimum of 250 degrees F for a minimum of four hours before reissue. Electrodes shall be redried no more than one time. Electrodes which have been wet shall not be used.
- Welding shall not be done when the ambient air temperature is 0° F or lower, or when steel surfaces are wet or exposed to rain, snow or high wind.
- Preparation of base metal shall be in accordance with Section 3 of the Code. Existing paint shall be removed a distance of four inches away from the weld, prior to welding.
- Weld cleaning shall be accomplished in accordance with Section 3.11 of the Code. Completed welds, and adjacent areas, shall be cleaned of all weld spatter, slag, smoke, and heat affected paint.

**ESTIMATE OF STRUCTURE QUANTITIES AND NOTES**  
FOR  
164' - 1 1/4" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-085-433

MARCH 2014

2 OF 12

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SB02	DRAFTED BY NP Kevin N. Boeden	BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	21	30

**INSTALL NEW DIAPHRAGM JACKING FRAME (CONTINUED)**

- E7018 electrodes shall be used for tack welds. The size of tack welds shall not be greater than 5/16". Tack welds shall be positioned so they will be incorporated into, and re-melted by, the final weld. Tack welds shall be thoroughly cleaned prior to any weld placement.
- All costs associated with installing the jacking frame on the existing diaphragms including all materials, labor, welding, weld inspection and any incidentals necessary shall be incidental to the contract lump sum cost for "Structural Steel, Miscellaneous".

**AIR CARBON ARC PROCESS**

- All removal of existing welds called for by these plans shall be accomplished using the air carbon arc process unless noted otherwise by the plans.
- Lay out all cut lines on the steel surfaces, using a marker visible during the cutting process, before any air carbon arc cutting begins.
- When grinding to a specified shape is required after air carbon arc cutting, lay out the shape to grind to on the steel surface with a visible marker and grind to the lay out line. Radius all edges to accept paint.
- Extreme care shall be exercised during the cutting process so that absolutely no damage (such as nicks, gouges, splattering) to the surrounding metal shall occur.
- Grind all surfaces cut with the air carbon arc process to remove high carbon deposits, provide a smooth finish, and radius edges for painting.

**JACKING SUPERSTRUCTURE**

- Jacks shall be used to carry the girder reactions at Pier Nos. 2 and 3 during the time of pier cap repair. The intent of the jacking procedure is to transfer the girder reaction to the jack during the pier cap repair while keeping the vertical movement of the girder to the minimum amount necessary, as approved by the Engineer.
- The jack shall have a lock nut for mechanical load holding with hydraulic pressure released.
- The jack shall be able to safely support a load of 120 kips per girder at Pier Nos. 2 and 3 for the entire time required to repair the pier cap. Any girder supported by jacking shall not be allowed to transfer any portion of its load to the repaired portion of the pier cap until it has attained a minimum compressive strength of 2000 psi.
- Caution shall be exercised when transferring the girder reactions to and from the jacks to ensure that no damage to any of the existing structural components will occur due to the jacking procedure. Any damage to any of the structural components of the bridge caused by the jacking procedure will be repaired as approved by the Engineer at no cost to the Department.

- Each jack shall have a bearing plate at both ends of sufficient area and thickness to limit the bearing stress on the loaded area of concrete to not more than 1800 psi and to limit the bearing stress on the loaded area of steel to not more than 20,000 psi.
- The Contractor shall be required to submit a detailed set of plans outlining his jacking procedure to the Engineer a minimum of 30 days prior to use for review by the Bridge Construction Engineer. Included in this procedure will be the name of the jack used, the load monitoring method for the jack, and details of bearing plates used to limit the bearing stress on the concrete and steel.
- All costs for materials, labor, equipment and incidentals necessary to perform the vertical jacking as shown by these plans shall be included in the contract lump sum price for "Jack Superstructure, Steel Girder Bridge".

**PIER CAP REPAIR**

- After all loose concrete has been removed, the area shall be abrasive blasted and blown clean with clean, dry, oil-free compressed air at 90 psi.
- The concrete patching material used in pier cap patching applications shall be supplied as the following or an approved equivalent as approved by the Office of Bridge Design:

Vertical Patch  
Symons  
2400 Arthur Avenue  
Elk Grove Village, IL 60007  
Phone: (847) 298-3200  
Web site: [www.symons.com](http://www.symons.com)

Meadow-Patch 20  
W. R. Meadows, Inc.  
P.O. Box 338  
Hampshire, IL 60140-0338  
Phone: (847) 214-2100  
Web site: [www.wrmeadows.com](http://www.wrmeadows.com)

Speed Crete Red Line  
The Euclid Chemical Company  
19218 Redwood Rd.  
Cleveland, OH 44110  
Phone: (800) 321-7628  
Web site: [www.euclidchemical.com](http://www.euclidchemical.com)

The concrete patching material shall be extended with aggregate of the quality, size and gradation specified in the manufacturer's technical literature.

- The cost of concrete breakout including sawing, breaking out concrete, cleaning, straightening reinforcing steel and disposal of all broken out concrete shall be incidental to the unit price per cubic yard for "Breakout Structural Concrete".

- The bent caps shall be rebuilt to the dimensions of the original construction plans unless otherwise shown on the plans. When used, cap forms may be removed when the concrete attains a compressive strength of 2000 psi.
- All costs associated with accessing, furnishing, placing and finishing the concrete patching material including all equipment, labor and incidentals shall be incidental to the unit price per cubic foot for "Concrete Patching Material, Miscellaneous".

**GALVANIC ANODE**

- The Contractor shall furnish and place Galvanic anodes in the concrete repair areas specified in this plan set.
- The galvanic anodes shall be supplied as one of the following:
  - Galvashield XP+  
Vector Corrosion Technologies  
13312 N 56<sup>th</sup> St, Suite 102  
Tampa, FL 33617  
Phone: (813) 830-7566  
Website: [www.vector-corrosion.com](http://www.vector-corrosion.com)
  - Sentinel Silver  
Euclid Chemical Company  
19218 Redwood Road  
Cleveland, OH 44110  
Phone: (800) 321-7628  
Website: [www.euclidchemical.com](http://www.euclidchemical.com)
  - Sika Galvashield XP+  
Sika Corporation US  
201 Polito Avenue  
Lyndhurst, NJ 07071  
Phone: (800) 933-7452  
Website: <http://usa.sika.com>
- The anodes shall be placed in accordance with manufacturer's recommendations and as approved by the Engineer. The anodes have not been shown on the drawings. The Contractor shall provide shop drawings of the galvanic anode installation including locations of the individual anodes to the Office of Bridge Design.

**NOTES (CONTINUED)**

FOR

164' - 1 ¼" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-085-433

MARCH 2014

3 OF 12

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SB03	DRAFTED BY NP	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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**GALVANIC ANODE (CONTINUED)**

4. The anodes shall be placed with a minimum 3/4" cover and shall be set in Embedding Mortar per the manufacturer's recommendations. The anodes shall be fully encased in the concrete repair material. Where adequate cover does not exist, a concrete pocket shall be chipped out behind the anode to provide sufficient cover. The Contractor may need to chip around the reinforcing bar locally at the anode installation to make the electrical connection. The reinforcing steel at the connection location shall be cleaned per the manufacturer's recommendations to provide sufficient electrical connection and mechanical bond.
5. The electrical continuity of the electrical connections and reinforcing steel shall be confirmed per the manufacturer's recommendations.
6. The Contractor shall provide manufacturer's product literature and installation instructions to the Engineer 10 days prior to installation.
7. All costs associated with placing anodes including labor, equipment, materials and incidentals shall be included in the contract unit price per each for "Galvanic Anode".

**FIBER REINFORCED EPOXY COMPOSITE 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.
  - 1.2.2. Complete shop drawings shall be submitted for each installation of the composite system. The shop 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 1 year 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**

- 2.1 General Requirements:
  - 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 to avoid contact with moisture and at a temperature between 35°F and 100°F or in accordance to the manufacturer's requirements.
- 2.2 Material Properties:
  - 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  
8380 Miralani Drive  
San Diego, California 92126  
Tel: (858) 642-0694  
Fax: (858) 444-2982
  - 2.2.2 The Tyfo Fibrwrap System shall have the following materials:
    - 2.2.2.1 Composite fabric:  
SCH 41 fabric – carbon fabric  
SEH 51A fabric – glass 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 Finish Paint:  
Tyfo A or Tyfo U paint.

- 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 in primary fiber direction	60,000 psi	100,000 psi	D 3039
Ultimate Breaking Load, minimum in primary fiber direction	3,000 lb/in. width	4,000 lb/in. 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 Area of primary fibers	3 x 10 <sup>6</sup>	8 x 10 <sup>6</sup>	D 3039
Ultimate Tensile Strength At 90 degrees to Primary fibers, psi, minimum	3,000	1,000	D 3039
Visual Defects	Acceptance Level III	Acceptance Level III	D 2563

**3. CONSTRUCTION REQUIREMENTS**

- 3.1 Surface Preparation:
  - 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 can not 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.

**NOTES (CONTINUED)**

FOR  
164' - 1 1/4" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-085-433

MARCH 2014

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	23	30

**FIBER REINFORCED EPOXY COMPOSITE WRAP (CONTINUED)**

- 3.1.3 The Contractor shall remove all unsound and loose concrete in the area of the composite wrap prior to pier cap wrap placement. The Contractor will not be allowed to use any impact type breakout equipment larger than a 15 pound jack hammer for concrete removal. Any damaged reinforcing steel caused by the removal operation shall be repaired by the Contractor as approved by the Engineer at the Contractor's expense. The removal areas shall be built up to the original section using an epoxy grout supplied by the composite column wrap supplier which meets the strength of existing section. Surfaces of the repaired areas shall be smooth and free of voids or undulations that would prevent full contact with the composite column wrap system.
- 3.1.4 Concrete surfaces shall have all surface foreign materials, such as bird nests, dirt, etc., removed as approved by the Engineer. Stripping off well-adhered paint or concrete from pier cap surfaces is not required. One prime coat of the manufacturer's epoxy shall be applied prior to wrapping pier cap with the composite.
- 3.1.5 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.
- 3.2 Application Procedures
- 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.
- 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 certified applicator.
- 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.
- 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 repaired by removing and re-applying the 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 Composite Fabric Wrap, Concrete Repair. The plan quantity will be the basis of payment.

**5. BASIS OF PAYMENT**

"Composite Fabric Wrap, Concrete Repair" will be paid for at the contract unit price per square foot. Payment will be full compensation for labor, equipment, materials, and all incidental work required.

**BRIDGE REPAINTING, CLASS I**

- The work affected areas for the Jacking Frame installation shall be painted in accordance with Section 412 of the Standard Specifications and in accordance with SSPC Standard PA1.
- For informational purposes, 188 square feet of structural steel will require painting. The quantity shown includes the jacking frame and affected areas of the adjacent stiffeners. The quantity shown is for an area four inches on all sides of the welds.
- Paint color

Top Coat - The paint color shall be an approved green color. Prior to ordering the paint, a paint chip of the green color shall be submitted to the Department for color approval.

Primer Coat - Color shall sharply contrast with the top coat.

**NOTES (CONTINUED)**

FOR

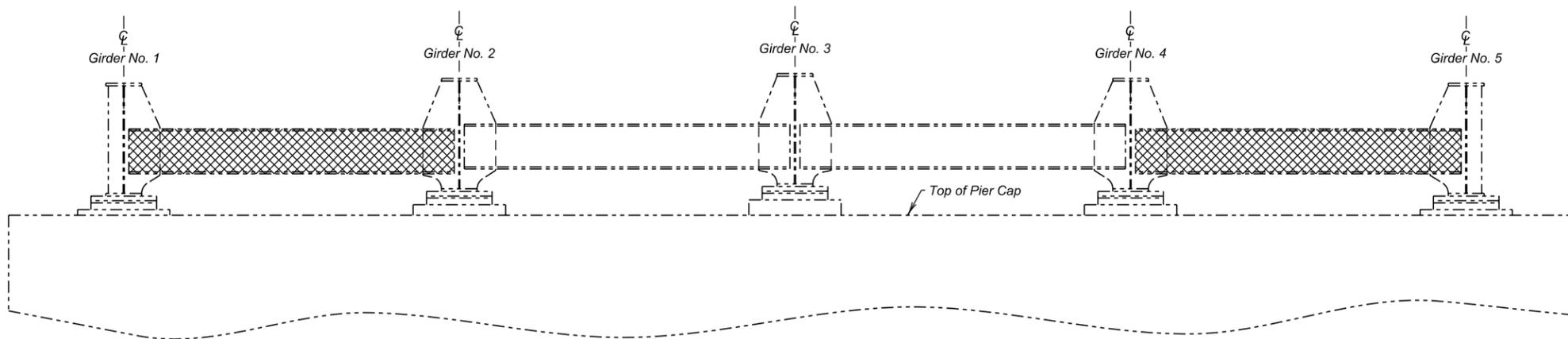
164' - 1 ¼" CONT. COMP. GIRDER BRIDGE

STR. NO. 55-085-433

MARCH 2014

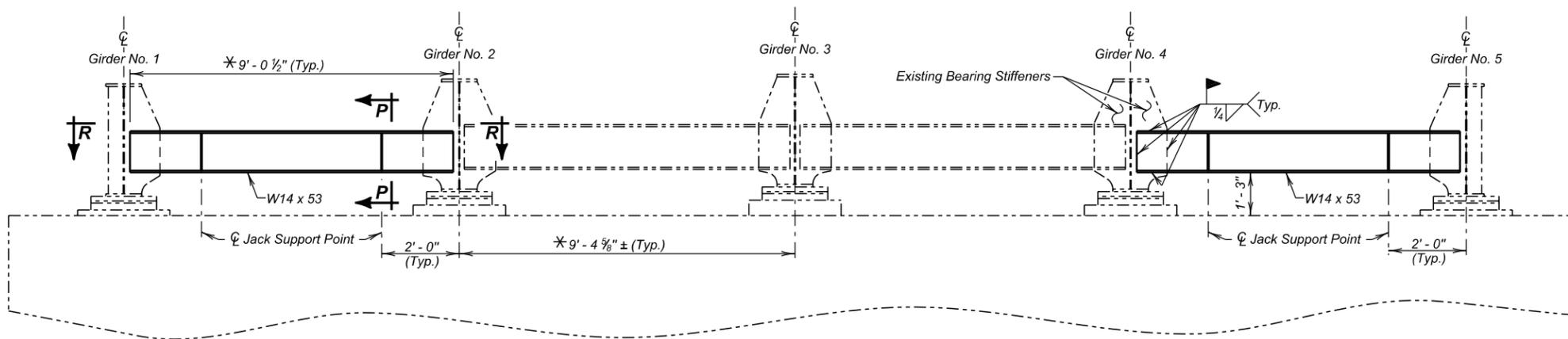
5 OF 12

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SA05	DRAFTED BY NP Kevin N. Boeden BRIDGE ENGINEER
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**ELEVATION - PIER NOS. 2 AND 3**  
(Showing Removal)  
(Deck not Shown for Clarity)

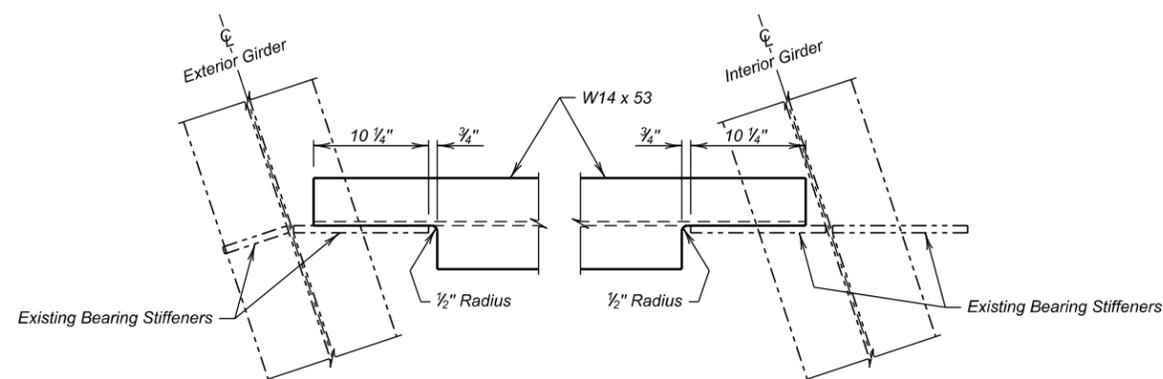
Existing C Channels to be Removed by Air Carbon Arc.



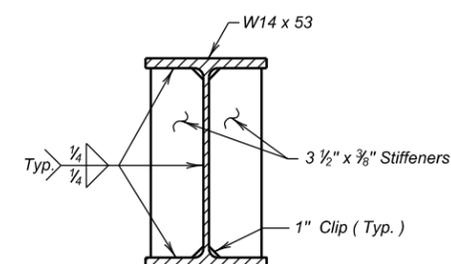
**ELEVATION - PIER NOS. 2 AND 3**  
(Showing New Jacking Frame)  
(Deck not Shown for Clarity)

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Jack Superstructure, Steel Girder Bridge	LS	Lump Sum
Structural Steel, Miscellaneous	LS	Lump Sum
Bridge Repainting, Class I	LS	Lump Sum

☆ For informational purposes, the total amount of structural steel for the jacking frames is 1954 lbs.



**SECTION R - R**



**SECTION P - P**

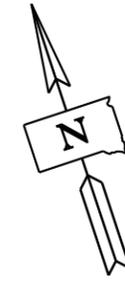
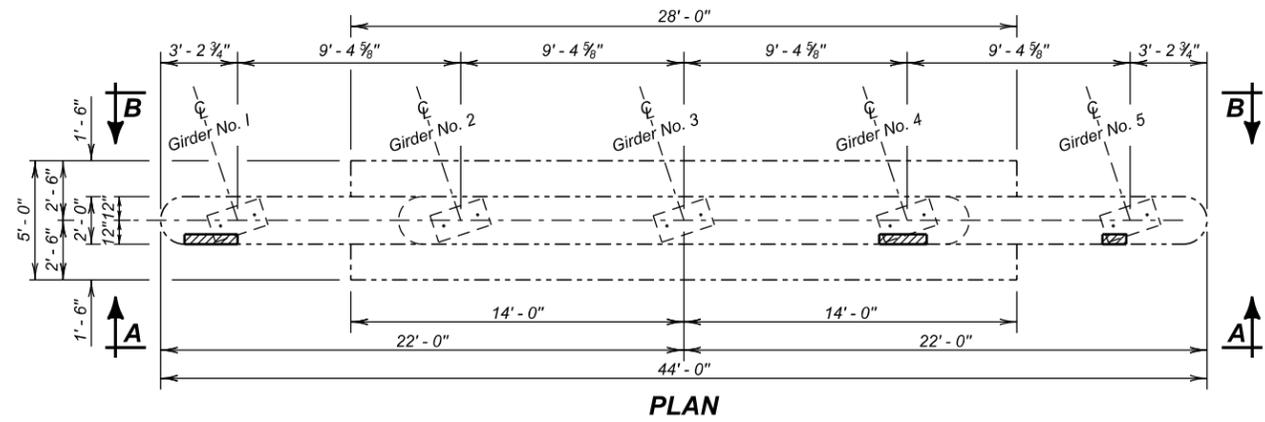
( NORTH BOUND LANES )  
PIER NOS. 2 AND 3 GIRDER JACKING DETAILS

FOR  
164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE  
40' - 0" ROADWAY  
OVER RAILROAD  
STR. NO. 55-085-433

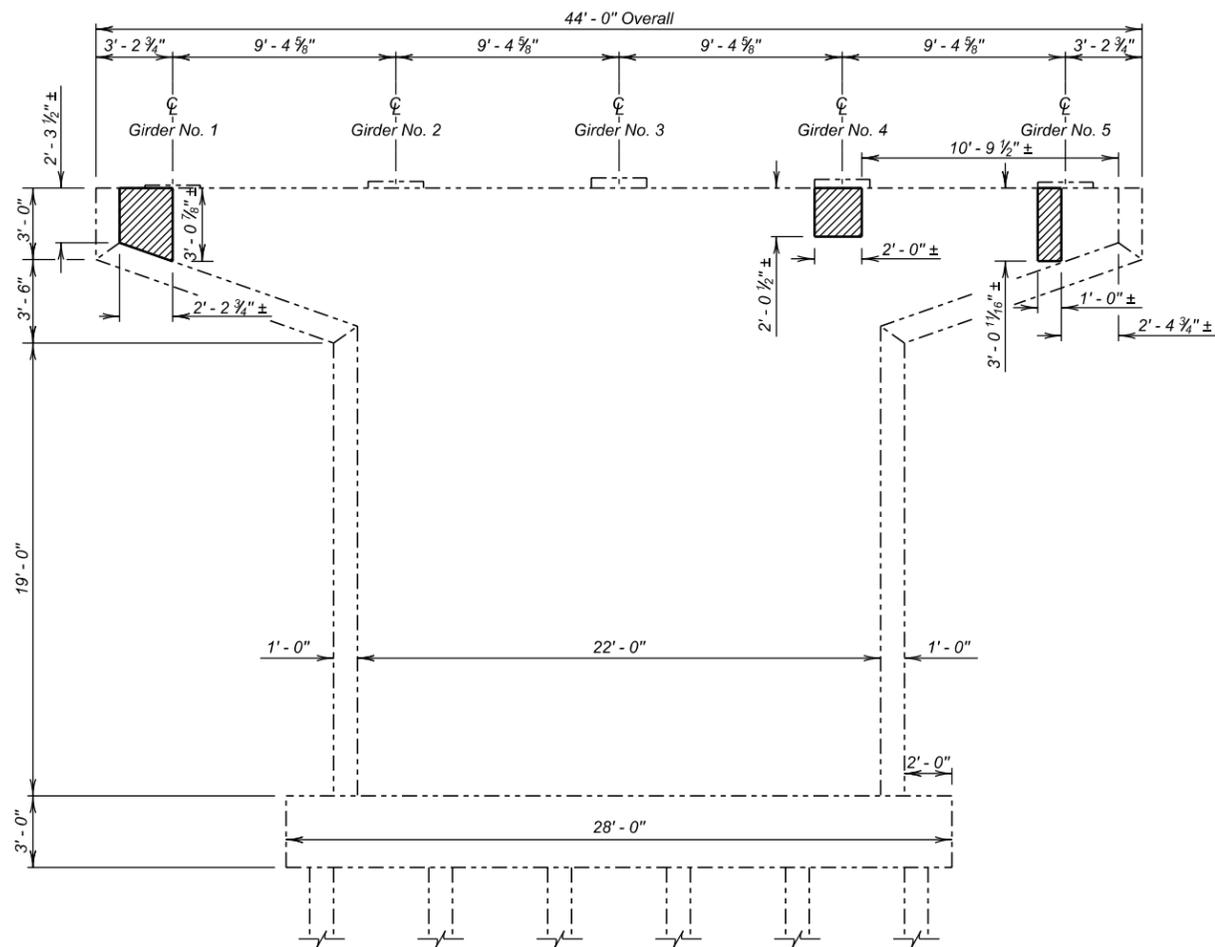
18° 14' SKEW L.H.F.  
SEC. 33-T122N-R51W  
IM 0299(62)206

ROBERTS COUNTY  
S. D. DEPT. OF TRANSPORTATION  
MARCH 2014

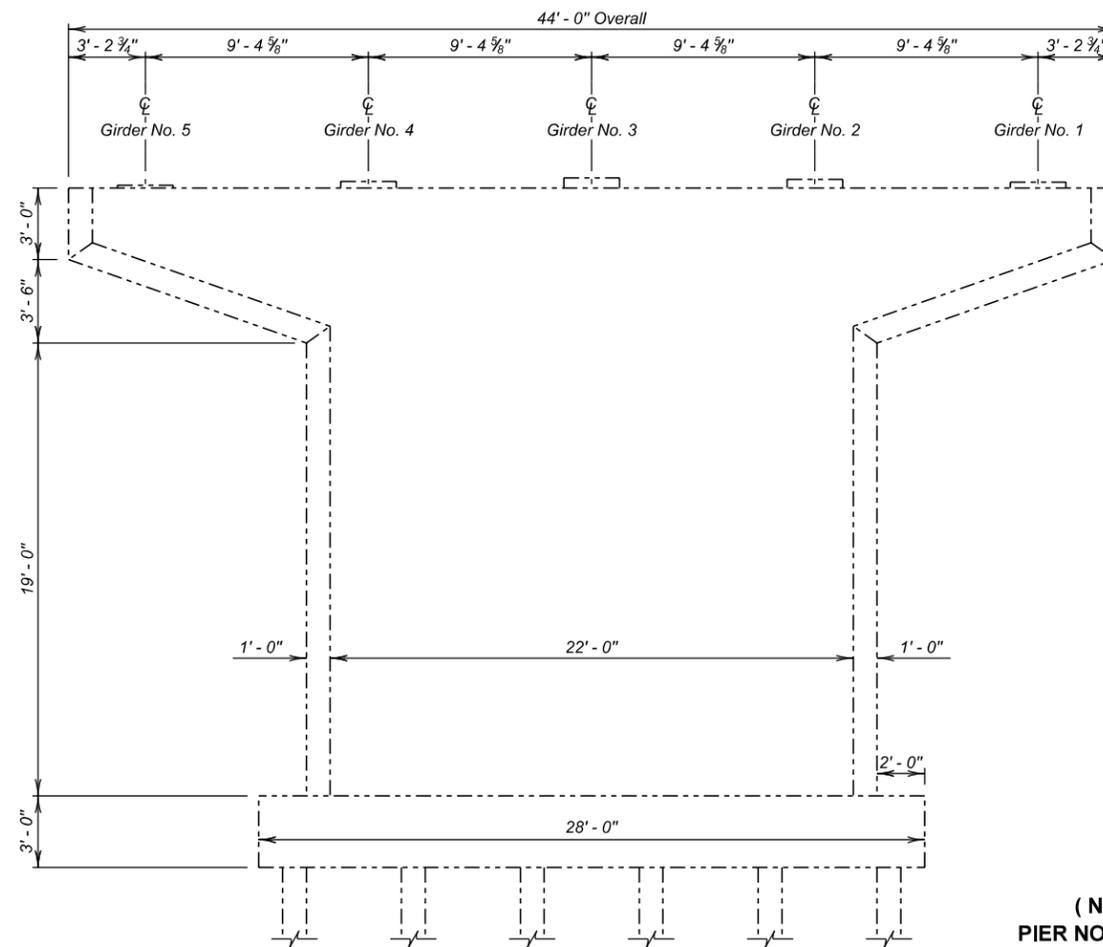
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	25	30



ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete Patching Material, Miscellaneous	Cu Ft	5.5
Breakout Structural Concrete	Cu Yd	0.2
Galvanic Anode	Each	8



**SECTION A - A**  
(SOUTH FACE)



**SECTION B - B**  
(NORTH FACE)

( NORTH BOUND LANES )  
PIER NO. 2 DELAMINATION DETAILS

FOR  
164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE  
40' - 0" ROADWAY  
OVER RAILROAD  
STR. NO. 55-085-433

18° 14' SKEW L.H.F.  
SEC. 33-T122N-R51W  
IM 0299(62)206

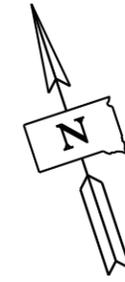
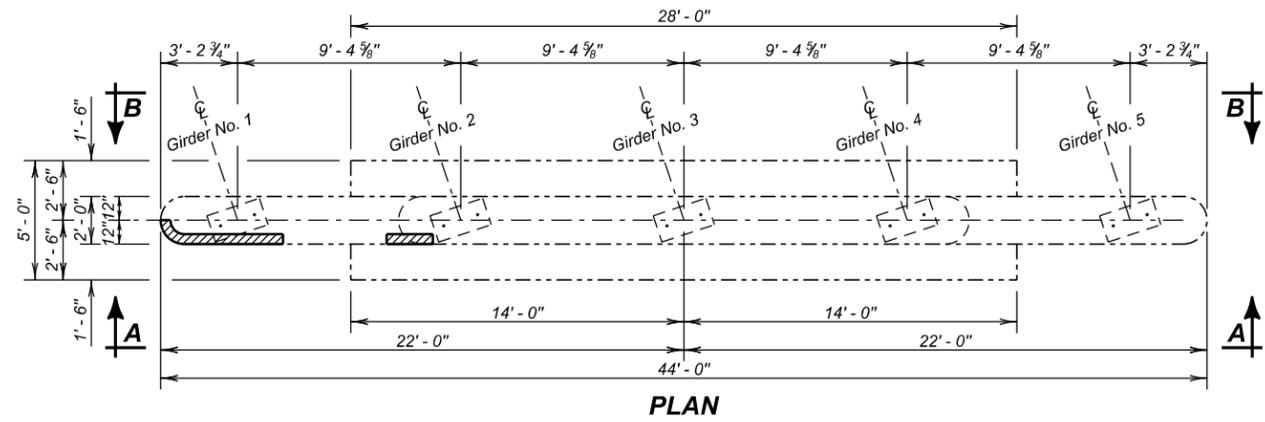
**LEGEND -**

Shaded areas indicate locations concrete removal and patching.

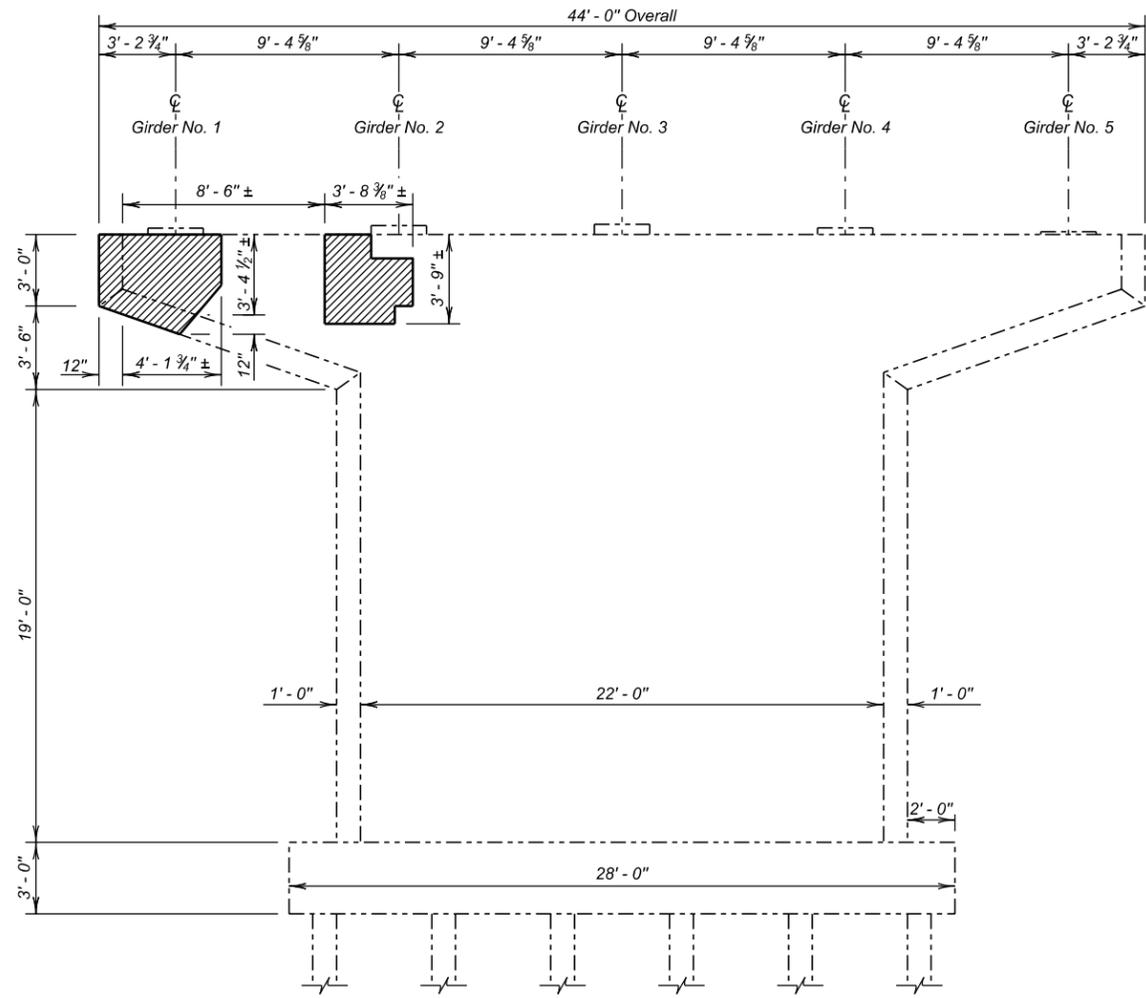
ROBERTS COUNTY  
S. D. DEPT. OF TRANSPORTATION  
MARCH 2014

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SB07	DRAFTED BY KR	<i>Kevin N. Goeden</i> BRIDGE ENGINEER
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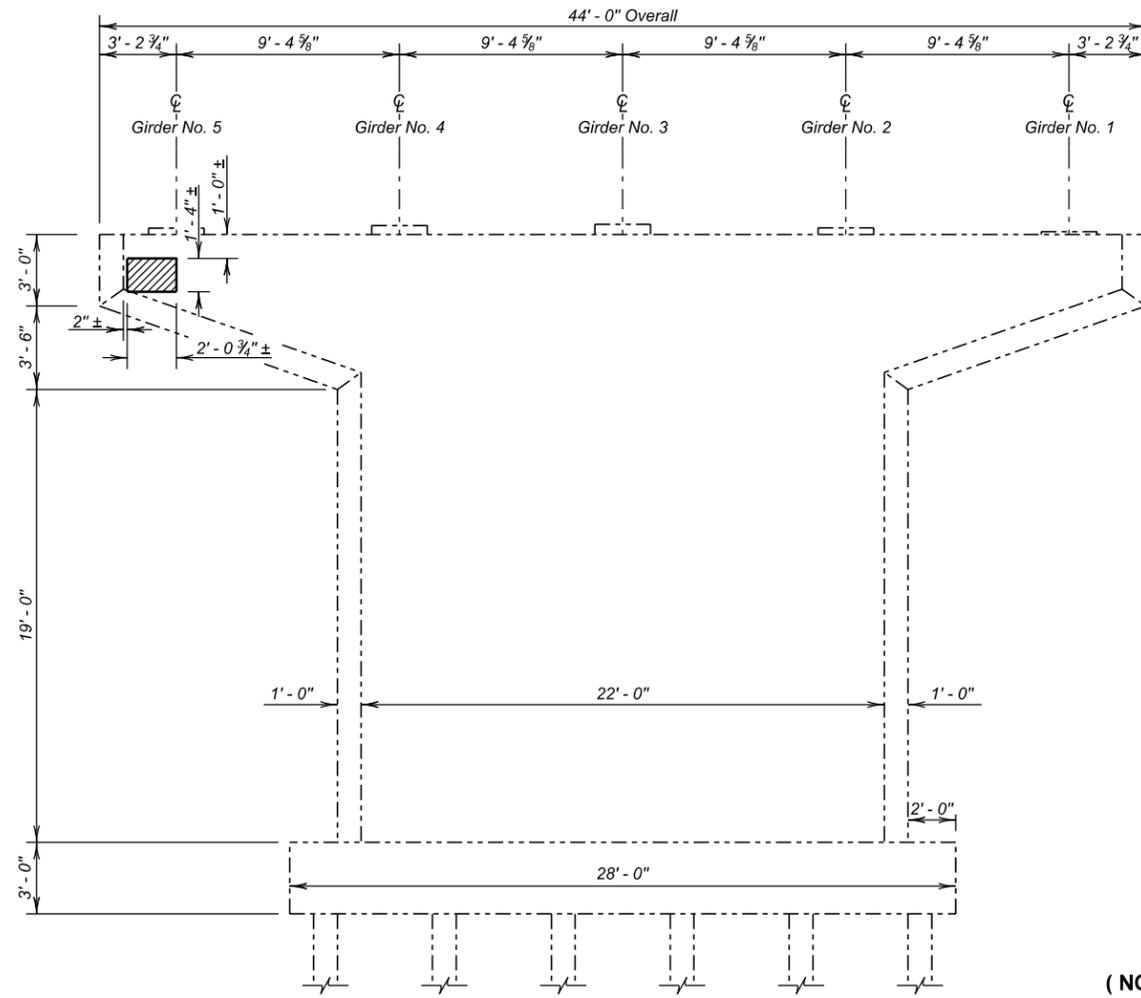
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	26	30



ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Concrete Patching Material, Miscellaneous	Cu Ft	13.4
Breakout Structural Concrete	Cu Yd	0.5
Galvanic Anode	Each	10



**SECTION A - A**  
(SOUTH FACE)



**SECTION B - B**  
(NORTH FACE)

( NORTH BOUND LANES )  
PIER NO. 3 DELAMINATION DETAILS

FOR  
164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE  
40' - 0" ROADWAY  
OVER RAILROAD  
STR. NO. 55-085-433

18° 14' SKEW L.H.F.  
SEC. 33-T122N-R51W  
IM 0299(62)206

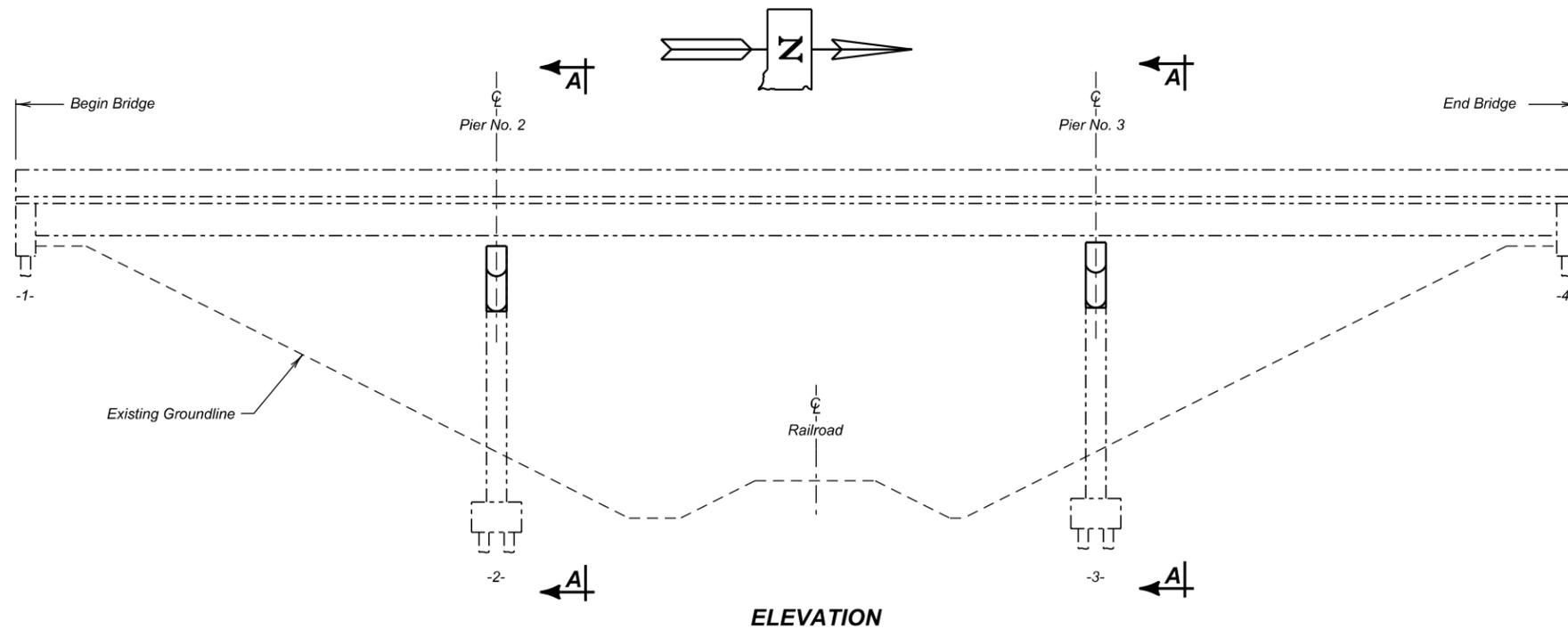
**LEGEND -**

Shaded areas indicate locations concrete removal and patching.

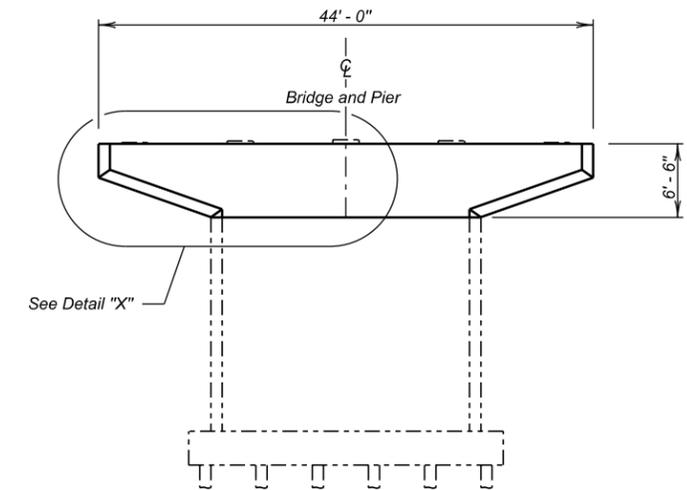
ROBERTS COUNTY  
S. D. DEPT. OF TRANSPORTATION  
MARCH 2014

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3SB08	DRAFTED BY KR	<i>Kevin N. Goeden</i> BRIDGE ENGINEER
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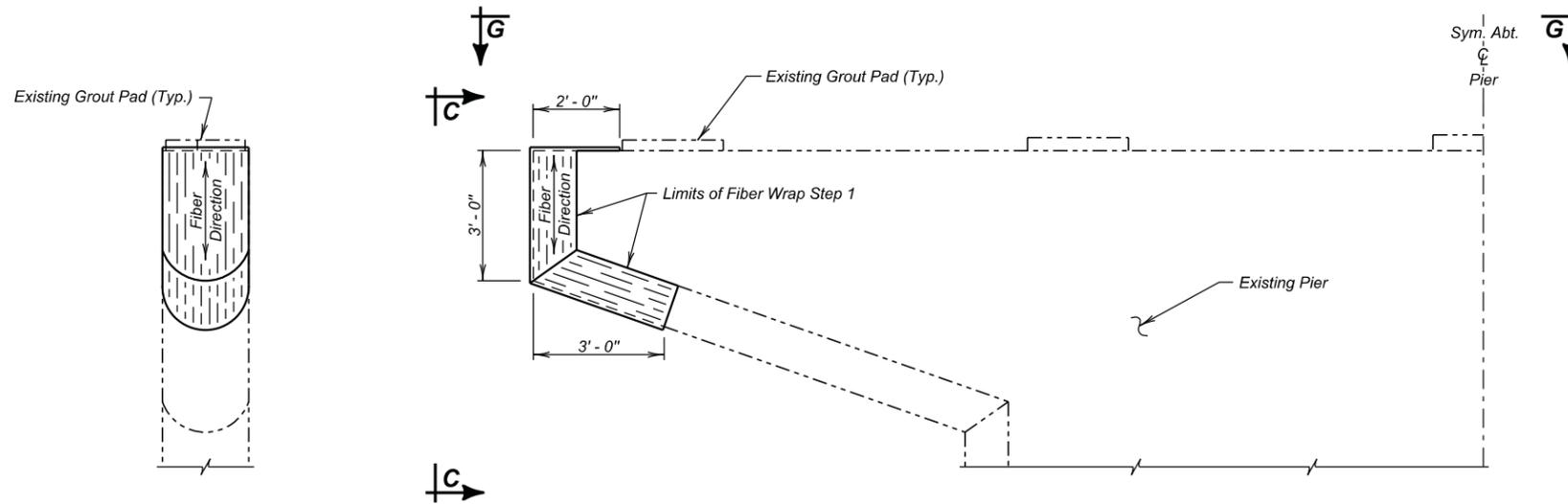
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	27	30



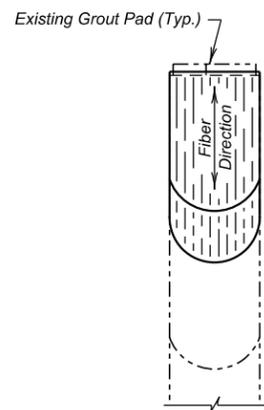
**ELEVATION**



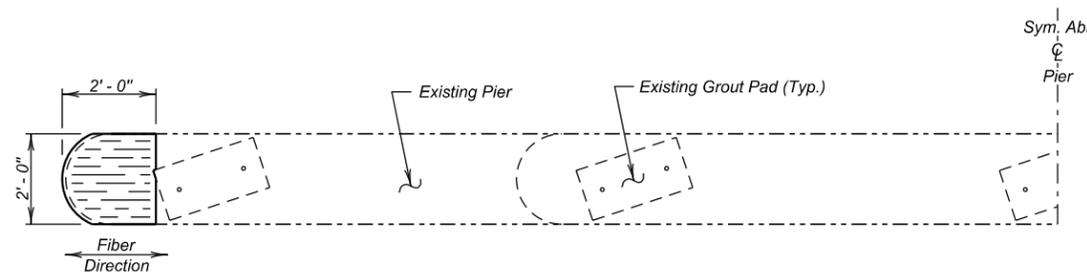
**SECTION A - A**  
(North Face of Pier Shown - South Face Similar by Rotation)



**DETAIL "X"**  
(Fiber Wrap - Step 1)



**VIEW C - C**  
(Fiber Wrap - Step 1)



**VIEW G - G**  
(Fiber Wrap - Step 1)

**LEGEND -**

 Indicates limits and fiber direction of Composite Fiber Wrap.

ESTIMATED QUANTITIES		
ITEM	UNIT	QUANTITY
Composite Fabric Wrap, Concrete Repair	SqFt	1217

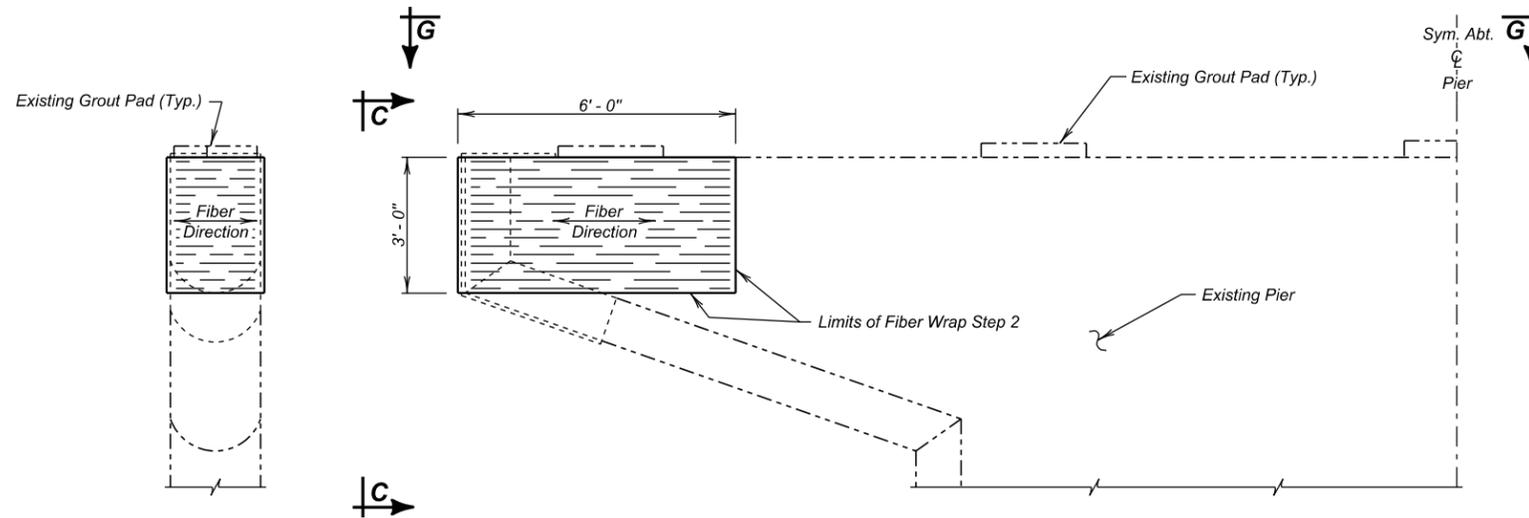
( SOUTH BOUND LANES )  
**PIER NOS. 2 AND 3 FIBER WRAPPING DETAILS**  
 FOR  
**164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE**  
 40' - 0" ROADWAY  
 OVER RAILROAD  
 STR. NO. 55-085-433

18° 14' SKEW L.H.F.  
 SEC. 33-T122N-R51W  
 IM 0299(62)206

ROBERTS COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 MARCH 2014

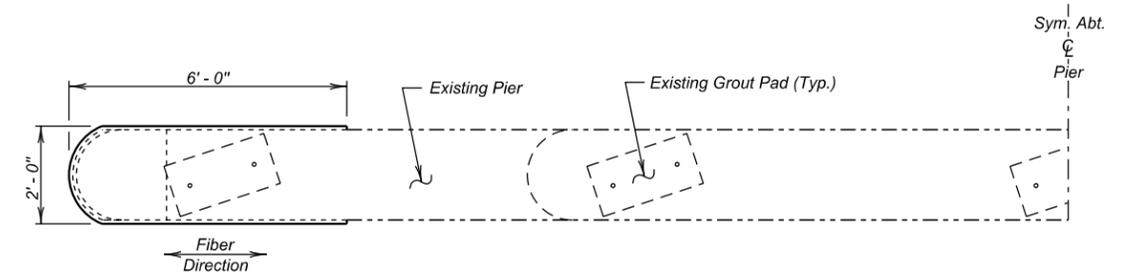
DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3RB09	DRAFTED BY KR	<i>Kevin N. Goeden</i> BRIDGE ENGINEER
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STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	28	30

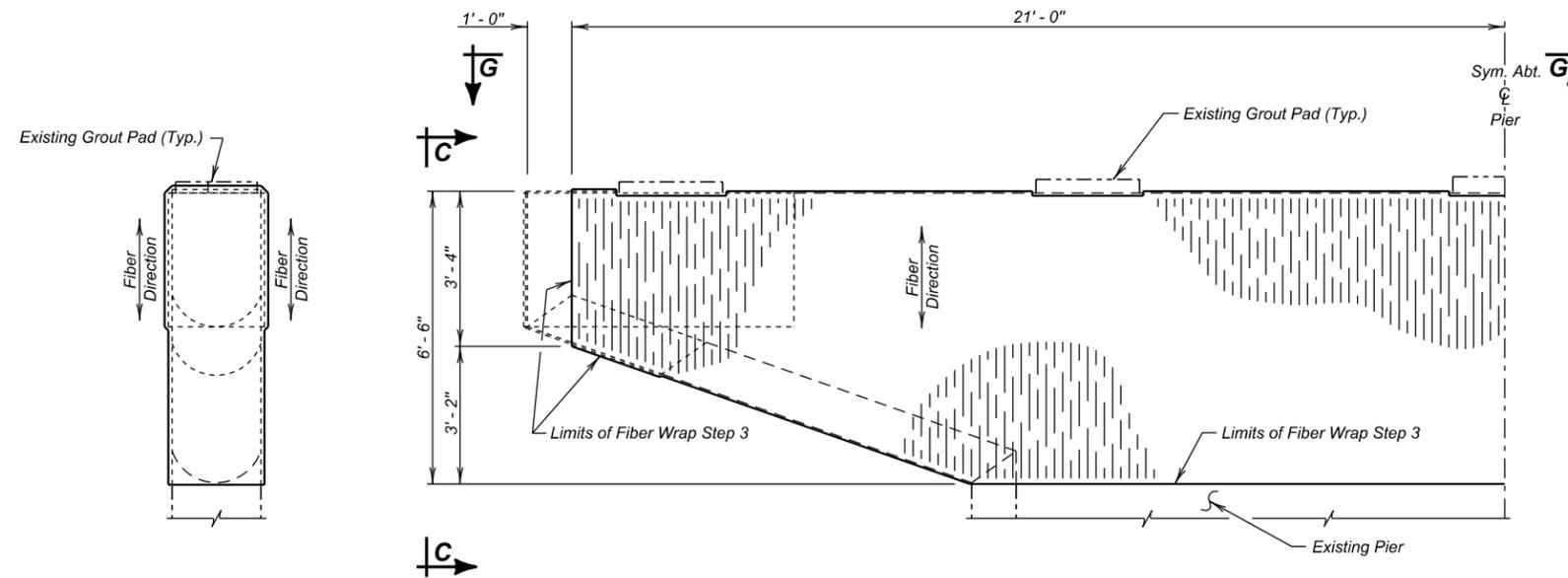


**VIEW C - C**  
(Fiber Wrap - Step 2)

**DETAIL "X"**  
(Fiber Wrap - Step 2)

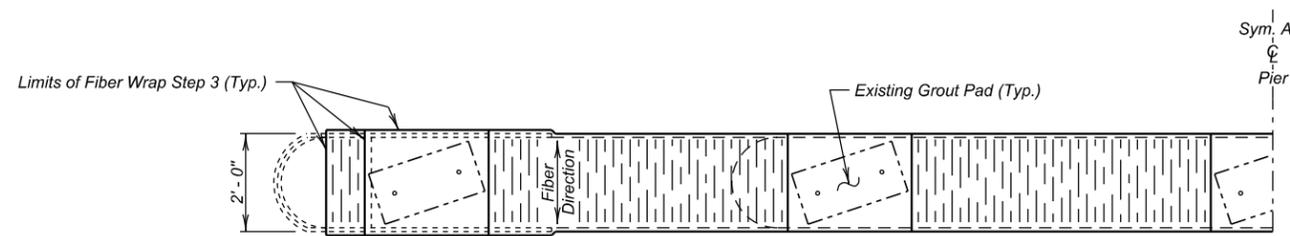


**VIEW G - G**  
(Fiber Wrap - Step 2)



**VIEW C - C**  
(Fiber Wrap - Step 3)

**DETAIL "X"**  
(Fiber Wrap - Step 3)



**VIEW G - G**  
(Fiber Wrap - Step 3)

**LEGEND -**

 Indicates limits and fiber direction of Composite Fiber Wrap.

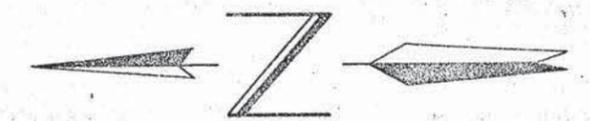
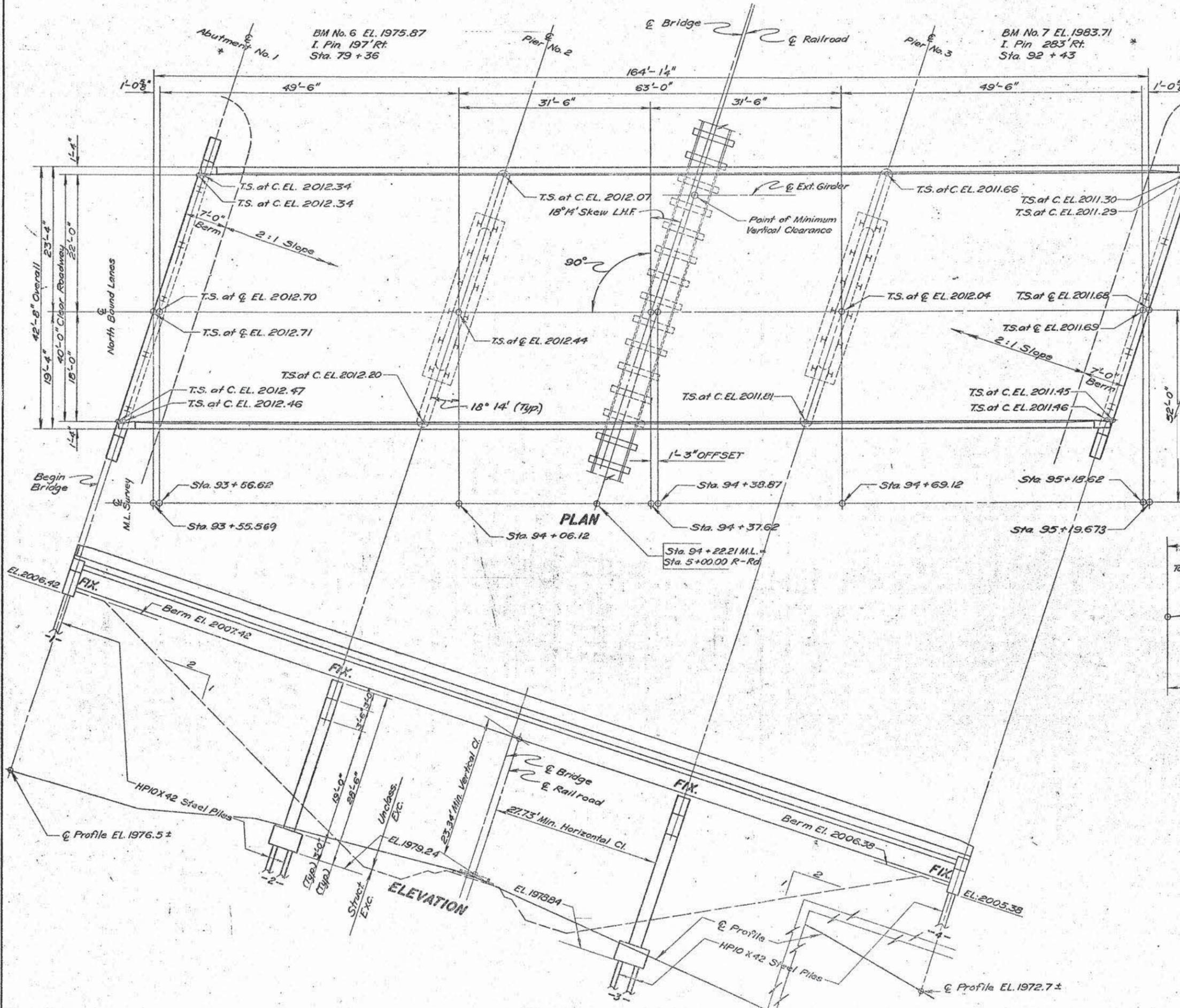
( SOUTH BOUND LANES )  
**PIER NOS. 2 AND 3 FIBER WRAPPING DETAILS (CONTINUED)**  
 FOR  
**164' - 1 1/4" CONT. COMPOSITE GIRDER BRIDGE**  
 40' - 0" ROADWAY  
 OVER RAILROAD  
 STR. NO. 55-085-433

18° 14' SKEW L.H.F.  
 SEC. 33-T122N-R51W  
 IM 0299(62)206

ROBERTS COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 MARCH 2014

DESIGNED BY NP ROBT03R3	CK. DES. BY KSK 03R3RB10	DRAFTED BY KR	<i>Kevin N. Boeden</i> BRIDGE ENGINEER
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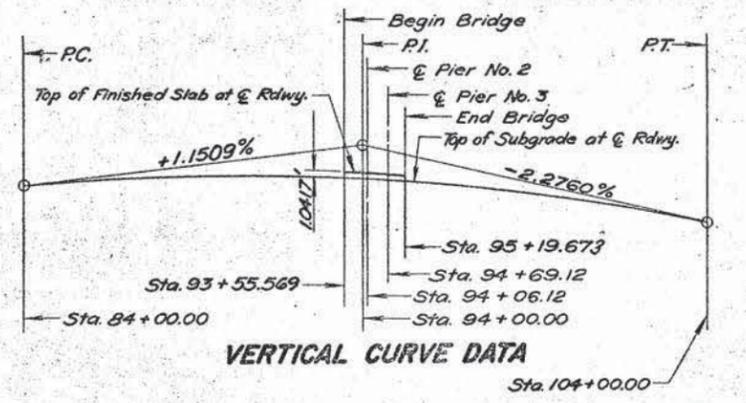
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	29	30



**NOTE:**  
 T.S. at C. EL. = Top of Slab at Curb Elevation  
 T.S. at Q. EL. = Top of Slab at Centerline Roadway Elevation

**ORIGINAL CONSTRUCTION PLANS**

P.I. Sta. 94+00.00  
 Elev. 2020.00 (Subgrade)  
 V.C. 2000'



(NORTH BOUND LANES)  
 GENERAL DRAWING  
 FOR

**164'-1 1/4" CONT. COMP GIRDER BRIDGE**  
 40'-0" ROADWAY  
 OVER C.M.S.T.P. & P.R.R.  
 STA. 93 + 55.569 TO 95 + 19.673  
 STR. NO. 55 - 085 - 433

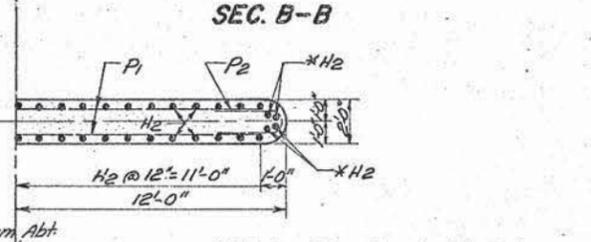
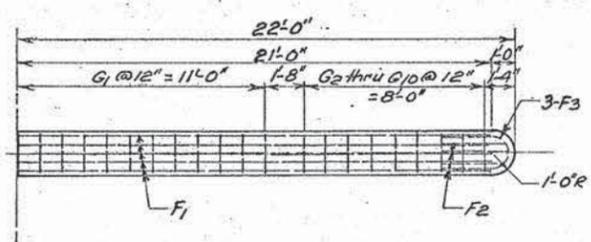
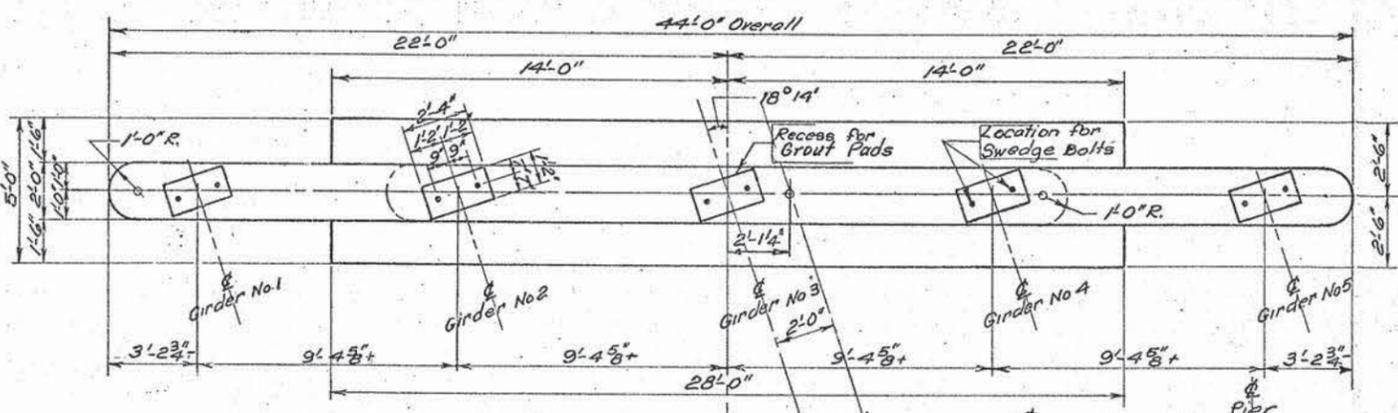
18°14' SKEW L.H.F.  
 SEC. 33 - T122N - R51W  
 I 29-9(20)205(PT.)  
 HS20-44  
 (& ALT.)

ROBERTS COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 SEPT. 1975

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	G.T.	G.W.R.	H.C. Wilson BRIDGE ENGINEER

# ORIGINAL CONSTRUCTION PLANS

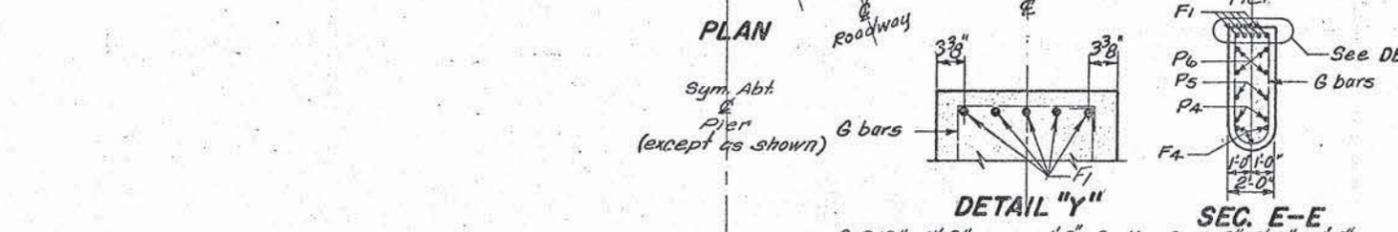
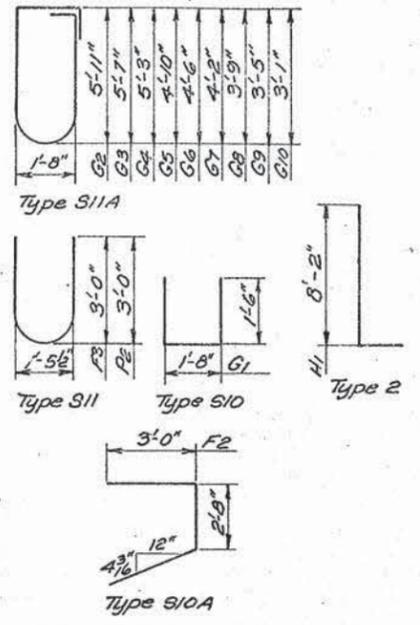
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	IM 0299(62)206	30	30



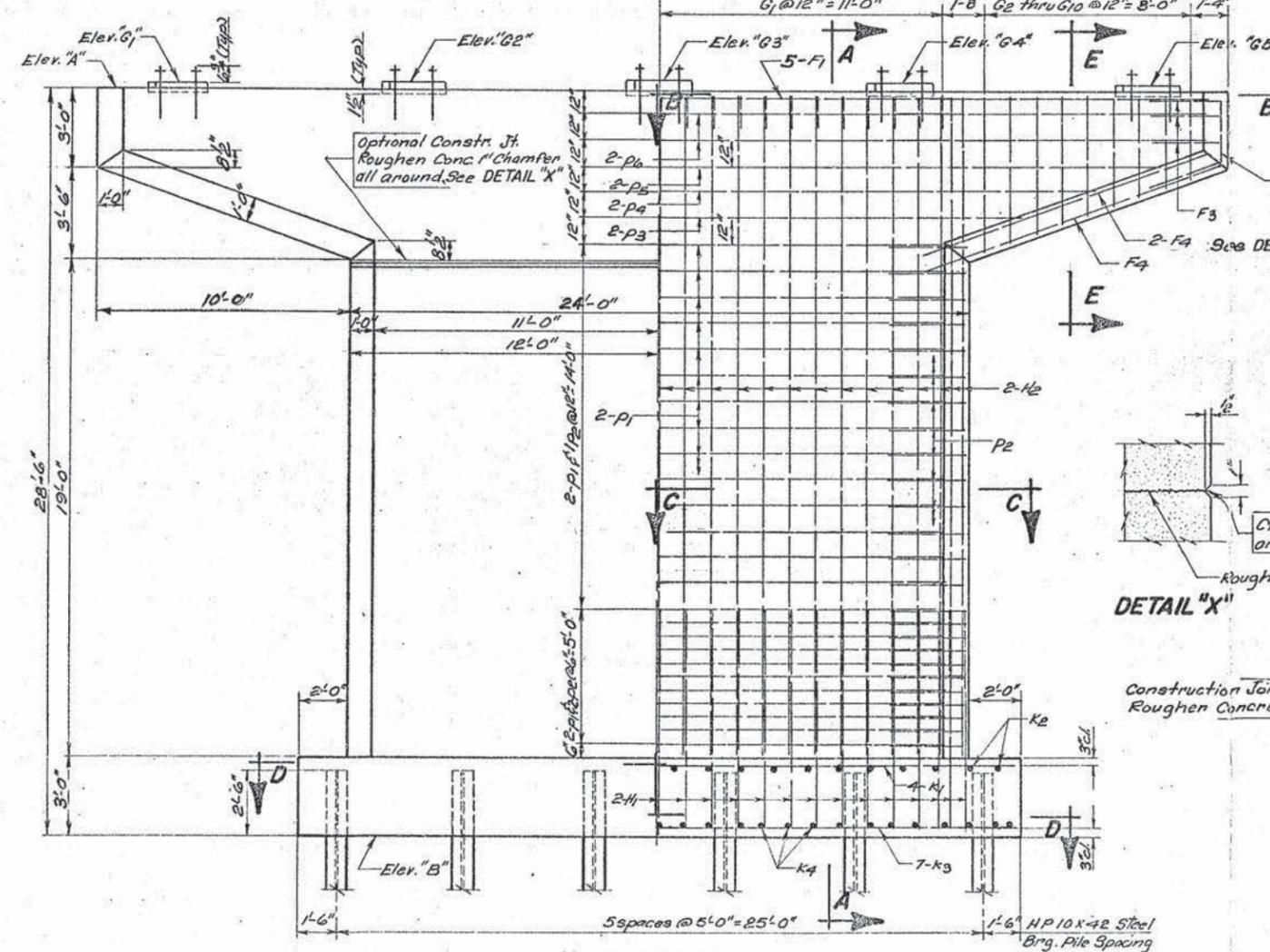
### REINFORCING SCHEDULE (For One Pier)

MK	No.	Size	Length	Type
F1	5	10	42'-0"	Str.
F2	6	5	7'-9"	S10A
F3	6	6	7'-0"	S11
F4	6	4	12'-0"	Str.
G1	23	5	4'-8"	S10
G2	2	5	15'-5"	S11A
G3	2	5	14'-9"	
G4	2	5	14'-1"	
G5	2	5	13'-4"	
G6	2	5	12'-7"	
G7	2	5	11'-11"	
G8	2	5	11'-1"	
G9	2	5	10'-5"	
G10	2	5	9'-9"	S11A
H1	54	10	9'-2"	2
H2	54	10	25'-2"	Str.
K1	4	4	27'-8"	
K2	22	4	4'-8"	
K3	7	5	27'-8"	
K4	29	5	4'-8"	
P1	50	4	22'-0"	Str.
P2	50	4	7'-0"	S11
P3	2	4	26'-3"	Str.
P4	2	4	32'-1"	
P5	2	4	37'-10"	
P6	4	4	42'-0"	Str.

NOTE: All dimensions are out to out of bars.

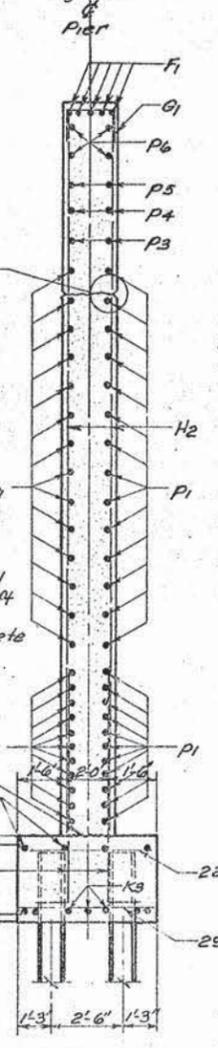


DETAIL 'Y'



ELEVATION

SEC. E-E

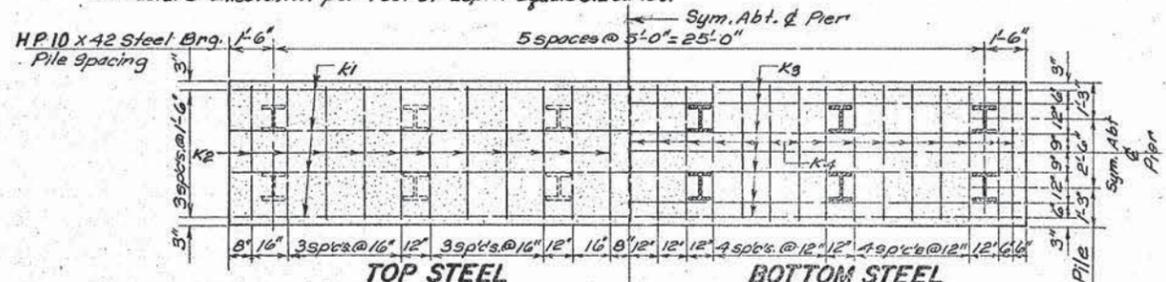


SEC. A-A

### ESTIMATED QUANTITIES

ITEM	Class 'A' Reinforcement Concrete Bridge	Structure Excavation	Furnish Steel HP 10x42	Drive Steel Test Piles HP 10x42	Furnish Steel Piles HP 10x42	Drive Steel Piles HP 10x42
UNIT	Cu. Yd.	Lb.	Cu. Yd.	L.F.	L.F.	L.F.
Pier No. 2	6,600	11,084	70	1,653'-53"	1,653'-53"	1,194'-8"
Pier No. 3	6,800	11,084	65	1,655'-55"	1,655'-55"	1,194'-8"

\*Includes 0.1 cu. Yds. For Grout Pads.  
\*Structure Excavation per foot of depth equals 9.2 cu. Yds.



TOP STEEL BOTTOM STEEL SEC. D-D (NORTH BOUND LANES)

### TABLE OF ELEVATIONS

Point	Pier No. 2	Pier No. 3
Elev. 'A'	2007.74	2007.34
Elev. 'B'	1979.24	1978.84
Elev. 'G1'	2007.864	2007.462
Elev. 'G2'	2008.015	2007.616
Elev. 'G3'	2008.166	2007.770
Elev. 'G4'	2008.109	2007.717
Elev. 'G5'	2007.992	2007.603

164'-1 1/4" CONT. COMP. GIRDER BRIDGE  
 40'-0" ROADWAY 18° 14' SKEW L.H.F.  
 OVER C.M. ST. P. & P.R.R. SEC. 33-T122N-R51W  
 STA. 93+55.569 TO 95+19.673 I-29-9(20)205(P.T.)  
 STR. NO. 55-085-433 HS20-44 (8 ALT.)  
 ROBERTS COUNTY  
 S. D. DEPT. OF TRANSPORTATION  
 DIVISION OF HIGHWAYS  
 SEPT. 1975

DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED
	Ed.L.	GA	M.C. Wilson

BRIDGE ENGINEER