STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468 P 0016(110)59	E1	E40

FOR BIDDING PURPOSES ONLY

Section E: Structure Plans

INDEX OF SHEETS

SECTION E - ESTIMATE OF STRUCTURE QUANTITIES

PCN i6YH

Str. No. 52-308-411

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
541E0100	High Strength Fiber Tension Reinforcement Retrofit	12.8	Ft

PCN 0A46

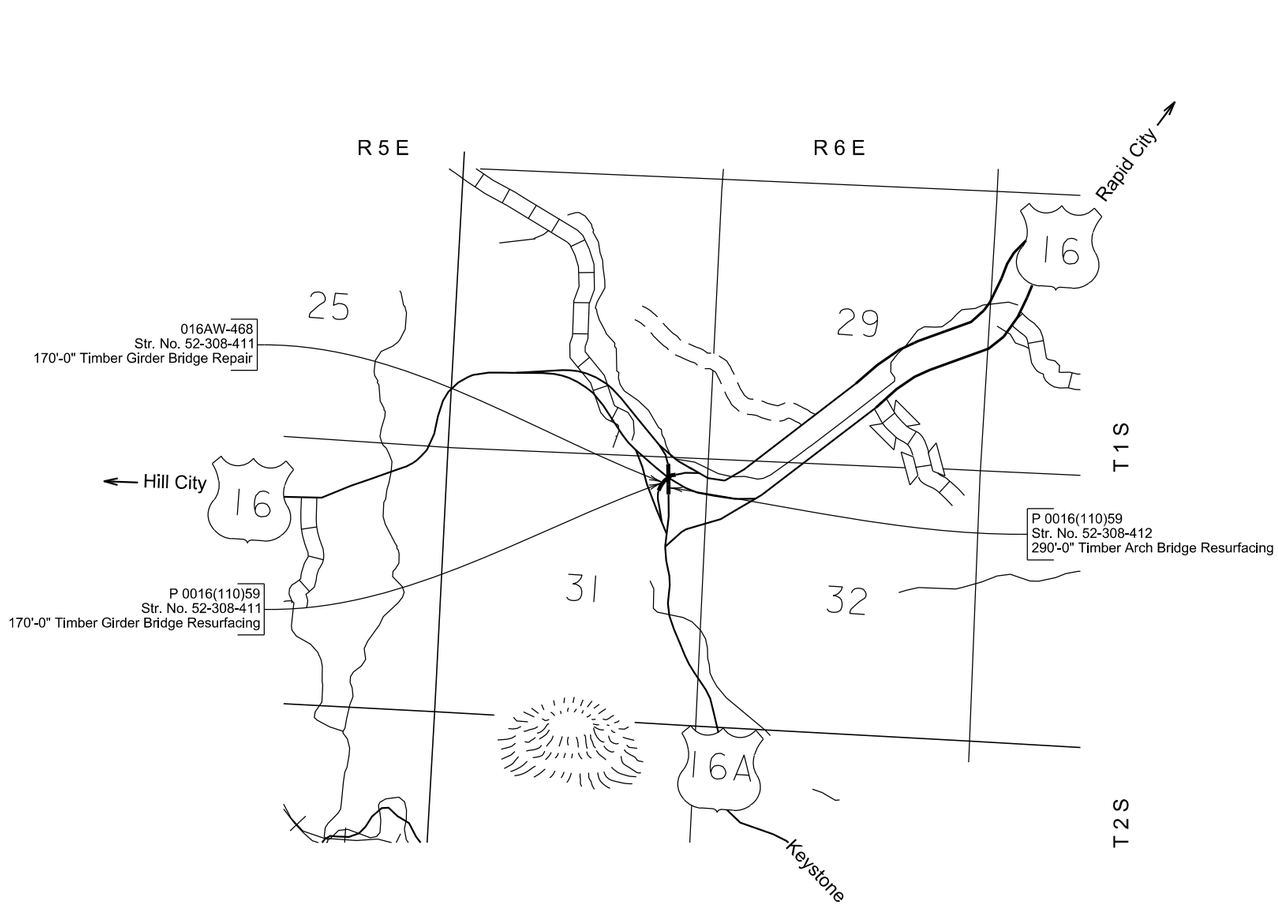
Str. No. 52-308-411

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3310	Bridge Elevation Survey	Lump Sum	LS
320E2701	Asphalt Concrete Bridge Deck Overlay	520.0	Sq Yd
320E7510	Asphalt Bridge Joint	52	Ft
332E0010	Cold Milling Asphalt Concrete	520	Sq Yd

PCN 0A46

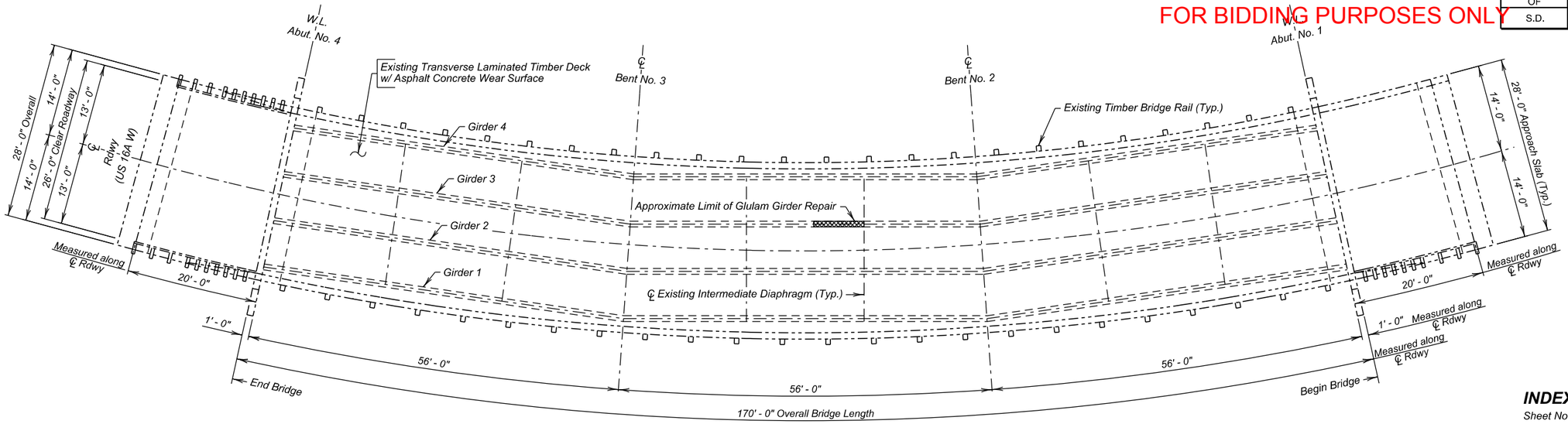
Str. No. 52-308-412

BID ITEM NUMBER	ITEM	QUANTITY	UNIT
009E3310	Bridge Elevation Survey	Lump Sum	LS
320E2701	Asphalt Concrete Bridge Deck Overlay	866.7	Sq Yd
320E7510	Asphalt Bridge Joint	52	Ft
332E0010	Cold Milling Asphalt Concrete	867	Sq Yd

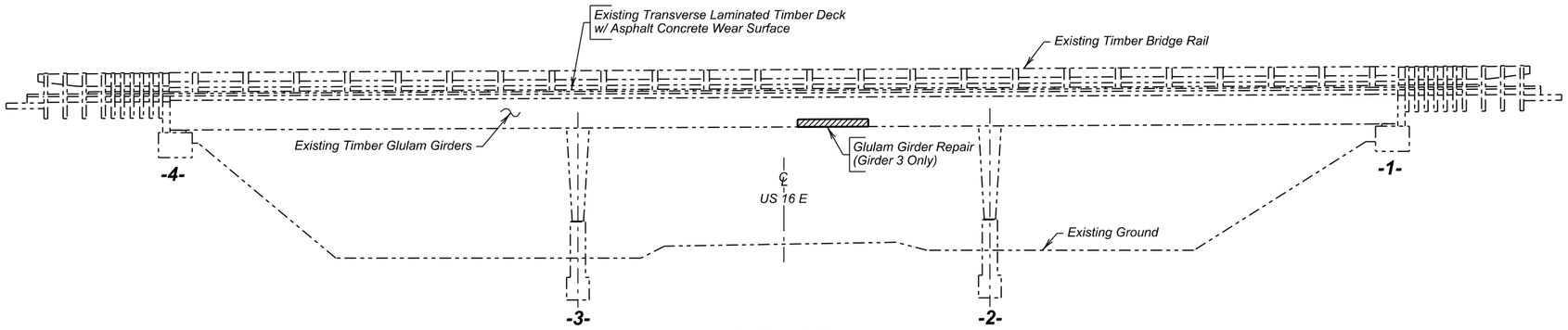


FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E2	E40



PLAN



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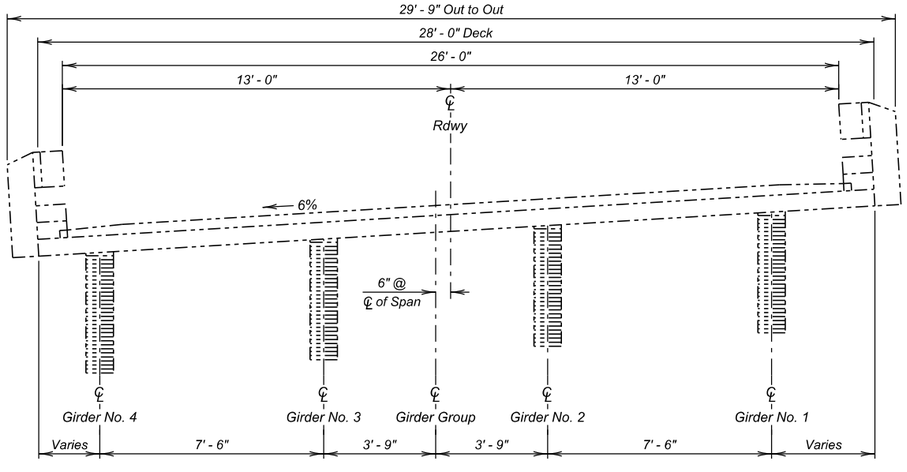
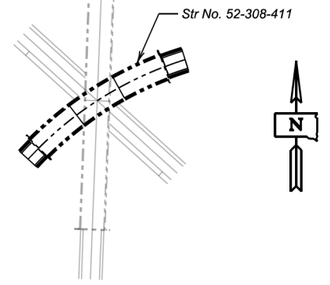


TYPICAL SECTION

INDEX OF BRIDGE SHEETS-



LAYOUT

PLANS BY :
ALFRED BENESCH & CO.

LAYOUT FOR UPGRADING AND TYPICAL DECK SECTION
FOR
170' - 0" TIMBER GIRDER BRIDGE

26'- 0" ROADWAY — 0° SKEW
OVER US 16 E — SEC. 31-T1S-R6E
STR. NO. 52-308-411 — sb 016AW-468
PCN i6YH

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

1 OF 14

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENNi6YH	i6YHAB01		BRIDGE ENGINEER

ESTIMATE OF STRUCTURE QUANTITIES

DESCRIPTION	QUANTITY	UNIT	REMARKS
High Strength Fiber Tension Reinforcement Retrofit	12.8	Ft	See Special Provision

SPECIFICATIONS FOR BRIDGE

1. Design Specifications of Timber Deck — AASHTO LRFD Bridge Design Specifications, 2014 Edition with 2015 and 2016 interims, and ANSI/AWC NDS-2012 National Design Specification for Wood Construction.

2. Design Specifications of Timber Girders - AASHTO Standard Specifications for Highway Bridges 17th Edition using Allowable Stress Design and ICC ES Legacy Report PFC-6046.

3. Construction Specifications. South Dakota Standard Specifications for Roads and Bridges, 2025 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

DESIGN MATERIAL STRENGTHS

Glulam Timber — Coastal Douglas Fir L-2
Fbo = 1.450 ksi
Fvo = 0.230 ksi

DETAILS AND DIMENSIONS OF EXISTING BRIDGE

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

SHOP PLANS

Shop plans will be required as specified by the Construction Specifications.

The fabricator will submit shop plans in accordance with the Construction Specifications. Send shop plan submittals to Alfred Benesch & Company, 200 S. 21st Street Suite 300, Lincoln, NE 68510 (abuettner@benesch.com). After review, corrections (if necessary), and approval by Alfred Benesch & Company, the Office of Bridge Design will review the submittals, authorize fabrication, arrange for fabrication inspection, and distribute the shop drawings.

BRIDGE LAYOUT AND ORIENTATION

The original construction plans have been provided at the end of these Repair Plans. The Contractor is to be aware that the bridge layout has been revised to current practices and is opposite of what is shown in the original construction plans. This includes girder, abutment, bent, bracing, strut, and span numbering. The Contractor will record notes, as-built drawings, and maintenance manual according to the new layout as shown in these Repair Plans.

MECHANICAL FASTENERS

1. All fasteners will be hot dipped galvanized in accordance with ASTM F2329.

2. All lag screws will conform to ANSI/ASME B18.2.1, Square and Hex Bolts and Screws-Inch Series.

3. All lag screws used on this project are to be inner-thread. Lag screws are to be installed in two-stage, pre-drilled pilot holes consisting of a lead hole to accommodate the threaded portion of the screw and a counterbore to accommodate the shank. The lead hole will have a depth equal to the screw penetration to the thread shoulder (not including the tip) and a diameter equal to 75% of the root diameter. The counterbore will have a depth equal to the penetration of the shank and a diameter equal to the shank size.

4. All lag screws will be installed by turning with a wrench, not driving with a hammer. Lubricant such as grease (petroleum based, not water based) will be used to facilitate insertion and prevent damage to the lag screw. For Fiber-Reinforced-Plastic Tensile Reinforcement installation, lag screws must be torqued according to the Fiber-Reinforced-Plastic Tensile Reinforcement installation works schedule.

5. The head of each lag screw will bear on a steel side plate or a flat washer.

6. Washers will be standard cut washers with dimensions complying with ANSI/ASME B18.21.1 and hot-dipped galvanized in compliance with ASTM F2329. Where timber washers are specified, utilize standard malleable cast iron timber washers, cast in accordance with ASTM A47.

7. The cost of furnishing and installing the Mechanical Fasteners will be incidental to the contract unit price per foot for High Strength Fiber Tension Reinforcement Retrofit.

TIMBER SPECIFICATIONS

1. Unless noted otherwise, glulam timber for backer boards for tensile reinforcement are to be Coastal Region Douglas Fir (CRDF), in grades and layup combinations specified on these drawings.

2. Backer boards for tensile reinforcing is to be ANSI/AITC Grade L1 laminating stock.

3. All timber elements are to be incised and pressure preservative treated in accordance with AWPA Standards U1 and T1. All machining (e.g. cutting and drilling) is to be completed prior to preservative treatment.

4. Timber is to be treated with copper naphthenate preservative in hydrocarbon solvent.

5. Incisions are to be minimum 1/16" wide x 5/8" long x 5/8" deep.Incisions are to be spaced at max. 6" o.c. parallel to grain, in rows at max 1" o.c. perpendicular to grain; adjacent rows are to be offset 3" parallel to grain.

6. If field-cutting is anticipated, timber should be pre-drilled with treatment holes to increase depth of preservative penetration. Holes are to be 3/16" diameter, and spaced as specified above for incising. Treatment holes are to extend at least 5/8" beyond the anticipated cut depth.

7. All machining is to be completed prior to preservative treatment. Field drilling or cutting not shown on these plans is not allowed.

8. All field-drilled holes and cut surfaces are to be treated with copper naphthenate field preservative in hydrocarbon solvent. End grain is to be coated with Anchorseal™ or approved equivalent wood sealer consisting of an aqueous emulsion of paraffin wax, with optional propylene glycol anti-freeze. Field treat and seal to saturation/refusal in accordance with the manufacturer's recommendations.

9. Treat surfaces as soon as possible after drilling or cutting. Ensure surfaces are clean and free of sawdust or debris prior to treating.

10. Store preservatives and sealers in conformance with the manufacturer's recommendations. The Contractor will take care to prevent spills of preservatives and sealers. Clean spills in accordance with the manufacturer's recommendations and to the satisfaction of the Engineer.

11. The cost of Preservative treatment, incising and field treatment will be incidental to the contract unit price per foot for High Strength Fiber Tension Reinforcement Retrofit.

Registered Professional Engineer
REG NO. 13271
AARON M. BUETTNER
SOUTH DAKOTA
29 Sep 2025

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES
FOR
170'-0" TIMBER GIRDER BRIDGE

STR. NO. 52-308-411

APRIL 2025

DESIGNED BY:	DRAWN BY:	CHECKED BY:	
MJK	NTF	ZZJ	BRIDGE ENGINEER
PENNi6YH	I6YHAB02		

FOR BIDDING PURPOSES ONLY

HIGH STRENGTH FIBER TENSION REINFORCEMENT RETROFIT

1. High strength fiber tension reinforcement will consist of Fiber Reinforced Plastic Panels pre-bonded to lumber backer boards. Materials and fabrication will comply with ICC ES Evaluation Report #6046, ANSI-117, and the following specifications. ICC ES Evaluation Report #6046 is available from the SDDOT Office of Bridge Design by request.

Reinforcement Type	STE (ksi)	MOE (ksi)	MOE (ksi)	Panel Thickness
ARP	143	11,600		0.07”
GARP	35	8,000	8,000	0.05”

2. Lumber for backer boards will be Coast Region Douglas Fir (CRDF) L1 grade laminating stock (ANSI/AITC Combination 5). Backer will be in continuous lengths; splices will be structural finger joints complying with tension-zone strength requirements. Ultimate tensile capacity will be minimum 5200 psi (5th percentile lower exclusion limit, 75% confidence interval). Manufacturer will comply with ANSI-190 and ANSI-117.

3. Lumber will be incised and pressure treated according to preservative treatment specifications in these drawings. Machining and gluing will be completed prior to preservative treatment.

4. FRP will be bonded to lumber backer with structural epoxy adhesive complying with the specifications in these drawings.

5. Lumber is to be planed to remove surface defects and fiber panel is to be cross-sanded prior to gluing. Epoxy is to be spread on both surfaces. Lumber and FRP are to be clamped together with a minimum pressure of 130 psi to ensure a proper glue-line.

6. Quality control samples will be collected from the glue-line of each element. Bond line testing will be conducted by a third-party quality assurance agency, including the following tests:
   - ANSI T110 - Cyclic Delamination
   - ANSI T107 - Wet and Dry Shear

7. Results will be provided to the EOR and SDDOT for review. The Engineer will provide a response to the Contractor within 14 business days after receiving the results and analysis submittal.

8. Retrofits will be cut to length, countersinks and pilot holes for lag screws will be drilled after the glue has cured and prior to preservative treatment.

9. Tensile retrofits are to be installed on the bottom face of the girders, where indicated on the drawings.

10. In Span 2, the bottom of girders exhibit impact damage from an over-height vehicle. Impact damage will be repaired using a gap filling, structural epoxy for use in repairing structural timber members. Complete impact damage repairs after installation of new reinforcement and backer board. In this sequence, the new reinforcement and backer board will serves as the bottom dam for the epoxy repair of the impact damage. Install the epoxy according to the manufacturer’s recommendations. See Girder Repair Details (B) for Epoxy Injection at Impact Damage Locations repairs. All costs for repairing impact damage will be incidental to the contract unit price per linear foot for High Strength Fiber Tension Reinforcement.

11. At the Contractor's option, the impact damage repairs can be completed before installation of the new reinforcement and backer board. In this sequence, a bottom plywood dam will need to be used to form the bottom surface of the epoxy repair.

12. Tensile retrofits are to be bonded to the girders using structural epoxy adhesive according to the specifications in these drawings. Required clamping pressure is to be achieved using lag screws. Initial torquing of lag screws will be 125 ft-lb. Screws will be periodically re-torqued until all screws reach min. 225 ft-lb. See Girder Repair Details (A) and Girder Repair Details (B) for additional installation procedures.

13. Two weeks prior to removal Contact SDDOT Office of Bridge Design to schedule on site review of the removals. Removals will be to the satisfaction of the Bridge Construction Engineer.

14. The cost of removing portions of the existing backer board and gluelam, as well as furnishing and installing the High Strength Fiber Tension Reinforcement Retrofit will be paid at the contract unit price per foot, including all materials, tools and incidentals necessary to complete the work.

EPOXY ADHESIVE SPECIFICATIONS

1. Glued timber members and fiber reinforcements are to be bonded with a two-part, structural epoxy adhesive designed for use on timber in wet-service conditions. Epoxy adhesives are to be mixed and applied in accordance with the manufacturer’s specifications.

2. Surfaces must be clean and free of surface residues (e.g. solvents from preservative treating) prior to gluing. Plane timber surfaces flat to accommodate epoxy adhesive. Avoid scoring or gouging; undulation is acceptable on a maximum 12 inch cycle. Sanding, grinding, or other abrasive methods of removing the existing coatings or wood are not permitted.

3. The epoxy will be uniformly applied to both mating surfaces. Elements are to be clamped or screwed together during gluing, with adequate pressure to ensure a proper glue-line thickness. Target thickness of epoxy glue-lines is 0.001 inch to 0.004 inch, with a maximum thickness of 0.010 inch. Some glue squeeze-out is expected at all edges; periodically re-tighten clamps or screws as needed to maintain pressure until epoxy is cured.

4. The Contractor will take measures to ensure that the epoxy does not begin to gel before the surfaces have been joined and proper clamping pressure is achieved.

5. The cost of furnishing and applying the epoxy adhesive will be incidental to the contract unit price per foot for High Strength Fiber Tension Reinforcement Retrofit.

6. The gap filling epoxy used for epoxy injection will be tinted to match the color of the existing glulam girder. The tinting compound used to color the epoxy will be approved for use by the gap filling epoxy manufacturer.

Registered Professional Engineer
REG NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
31 Jul 2025

NOTES (CONTINUED)
FOR
170’-0” TIMBER GIRDER BRIDGE

STR. NO. 52-308-411
APRIL 2025

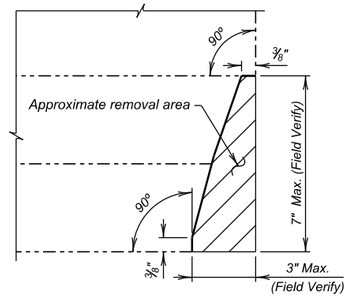
DESIGNED BY:	DRAWN BY:	CHECKED BY:	
MJK	NTF	ZZJ	
PENNi6YH	I6YHAB03		BRIDGE ENGINEER

FOR BIDDING PURPOSES ONLY

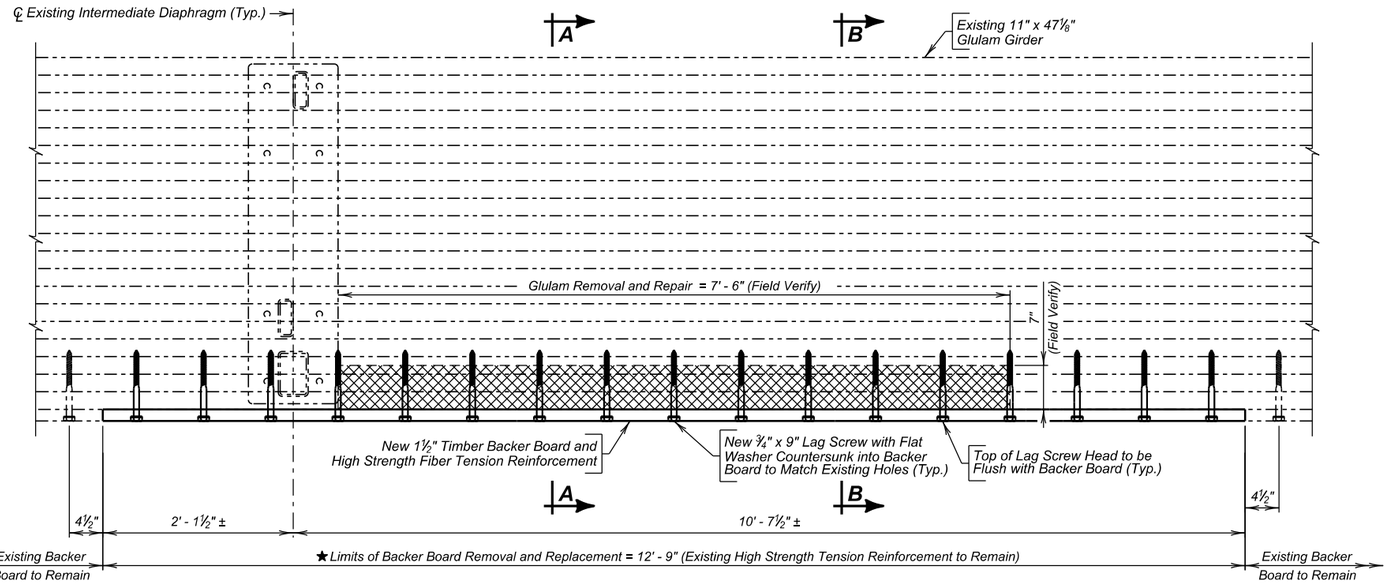
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E5	E40

GIRDER 3 BACKER BOARD REMOVAL
(Showing Backer Board Removal Only)

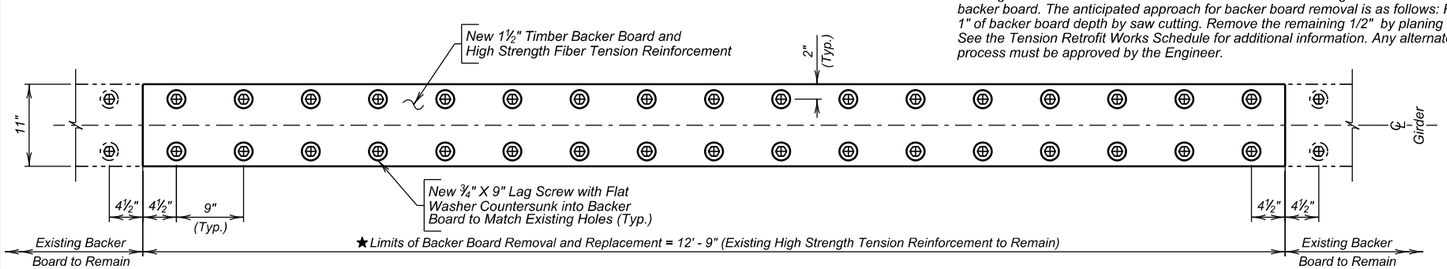
GIRDER 3 GLULAM REMOVAL
(Showing Gluelam Removal Only)



GLULAM REMOVAL DETAIL



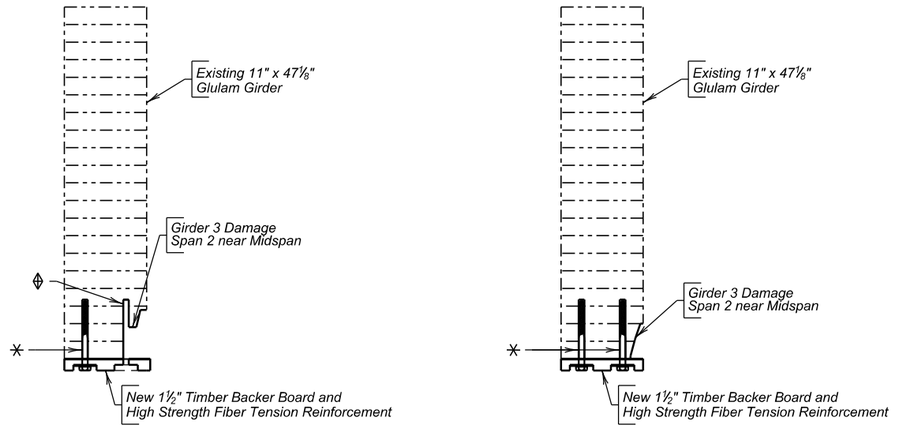
GIRDER ELEVATION (GIRDER 3 ONLY)



NOTE: Field verify lag screw locations prior to pre-drilling backer board

GIRDER UNDERSIDE PLAN (GIRDER 3 ONLY)

★ *Existing tension reinforcement to remain is bonded to both the glulam beam and the existing backer board. The anticipated approach for backer board removal is as follows: Remove up to 1" of backer board depth by saw cutting. Remove the remaining 1/2" by planing and sanding. See the Tension Retrofit Works Schedule for additional information. Any alternate removal process must be approved by the Engineer.*



✳ *Install epoxy wood dowel prior to pre-drilling and installing new ¾" Lag Screw*
◈ *Omit dowel and lag screw at locations where removal extends into the existing lag screw hole. Plug open hole in backer board to maintain pressure. Predrill and install lag screw after the epoxy has cured.*

SECTION A - A

SECTION B - B

GIRDER 3 REPAIR DETAILS (A)

FOR

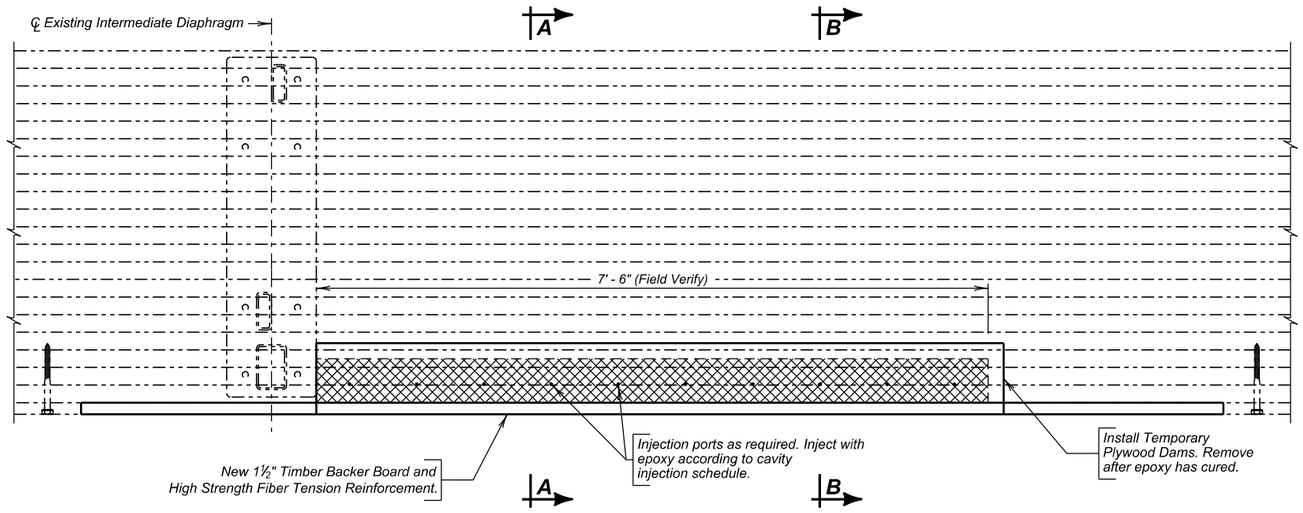
170' - 0" TIMBER GIRDER BRIDGE

26'- 0" ROADWAY — 0° SKEW
OVER US 16 E — SEC. 31-T1S-R6E
STR. NO. 52-308-411 — sb 016AW-468

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

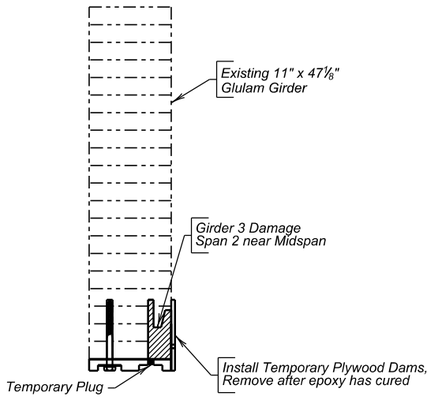
DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENNI6YH	i6YHAB04		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E6	E40

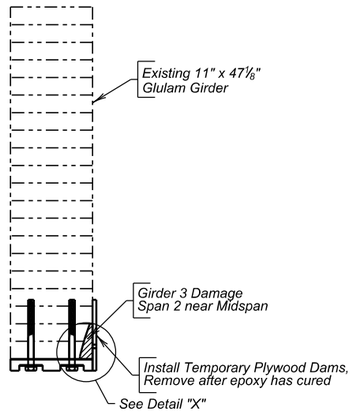


NOTE: Lag screws not shown for clarity.

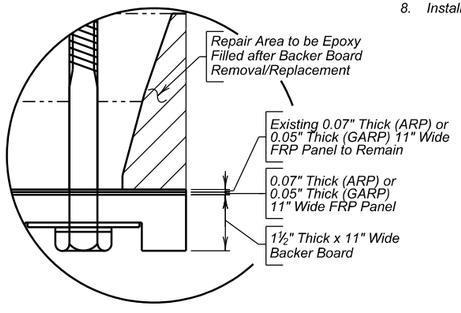
EPOXY INJECTION AT IMPACT DAMAGE LOCATIONS



SECTION A - A



SECTION B - B



DETAIL "X"

TENSION RETROFIT WORKS SCHEDULE:

1. *Carefully cut and remove all splinters and other loose fibers from damaged locations on the glulam beam with minimal impacts to surrounding sound timber. Remove existing backer plate and lag screws within the limits shown in the plans.Take care not to damage the existing tension reinforcement which is to remain. Lag screw holes will be filled with wood dowels set in epoxy compound. In the cases where damage extends within the lag screw hole, the dowel will be omitted and the damaged hole will be filled during the epoxy injection.*
2. *Confirm access requirements.*
3. *Locate, organize, and count installation materials required. Ensure extra screws and washers are available if needed during installation.*
4. *Check equipment and tools. Have drill motor and bits on stand-by in the event new holes are required to replace "spun-out" lag screws. Ensure fluid levels. Turn on and test equipment prior to mixing epoxy.*
5. *Place a small amount of oil-based lubricant on threads of lag bolts. Do not get lubricant on glue surfaces. Do not use water based lubricant.*
6. *Dry place reinforcement in position on girder and use as template to drill pilot holes working from center out. Test lag screw torgue and use the maximum torque attainable in the dry fit before gluing. The target is 225 ft-lbs or greater. If the torque value that the wood can hold is less than 148 ft-lbs call the Engineer for direction on how to proceed. Blow debris from pilot holes with compressed air.*
7. *Do not add preservative treatment or sealer to pilot holes to prevent contamination of the retrofit bond.*
8. *Provide touch-up planing on girder as required, and sand the reinforcing fiber panel prior to application of adhesive. The reinforcing fiber panels will be cross sanded at 45 degrees (60 degree maximum) to the long axis using 60 grit sandpaper. No gouges or scores are acceptable. Hand sand small shinny patches with sanding block and 60 grit sand paper in cross section direction.*
9. *Stage work station away from moisture and potential contaminants. If raining, extreme care will be taken to ensure epoxy does not receive moisture.*
10. *Check moisture content readings on glue surfaces to receive epoxy. Do not proceed with retrofit if surface moisture content is above 20%.*
11. *Use structural epoxy adhesive mixed in accordance with Manufacturer's specifications.*
12. *Spread mixed epoxy on both glue faces (reinforcing fiber and existing timber). Squeeze out should be no larger than a 1/4" bead and no smaller than 1/8".*
13. *Place reinforcement in position. Drive the center lag screw first until it is in contact with washer. Do not use impact guns to torque screw.*
14. *Continue driving remaining screws working from the center out, unless otherwise specified.*
15. *Torque lag screws using torque wrench to 175 ft-lbs. Start torquing screws at the center of the reinforcement and work toward each end. Return to the starting point and re-torque to 225 ft-lbs. Re-torque all screws every 15 minutes until all screws click without turning. All screws must be torqued in every pass; if any screws turns freely, another pass must be made, retorquing all screws. Omit lag screws where damage extends into the existing lag screw hole until the epoxy injection has been placed and has cured.*

EPOXY INJECTION WORKS SCHEDULE:

1. *Prepare the surface for epoxy as specified by the Manufacturer's recommendations.*
2. *Install temporary plywood dam, with polyethylene sheeting to act as a bond breaker, across th impact damage cavity. Injection ports will be spaced at 8" O.C. max. The Contractor will determine the required number and spacing of injection ports required to adequately fill the cavity. Size ports so injection nozzle will seal tightly against hole to ensure pressure build up.*
3. *Starting from large end of cavity and working toward small end, inject cavity with gap-filling structural epoxy using pressurized pneumatic gun.*
4. *When epoxy begins to flow out of the next hole, plug first hole with bung to maintain pressure and continue to next hole.*
5. *On last hole, inject nozzle until has back flow. Hold shoulder tight against girder to maintain pressure and ensure epoxy flows into cracks.*
6. *Remove temporary plywood dams after epoxy has cured according to Manufacturer's recommendations.*
7. *Provide touch-up planing to the cured epoxy. No gouges or scores are acceptable.*
8. *Install remaining lag screws which were omitted for epoxy fill repair.*

Registered Professional Engineer
REG NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
31 Jul 2025

GIRDER 3 REPAIR DETAILS (B)

FOR

170' - 0" TIMBER GIRDER BRIDGE

26'- 0" ROADWAY — 0° SKEW
OVER US 16 E — SEC. 31-T1S-R6E
STR. NO. 52-308-411 — sb 016AW-468

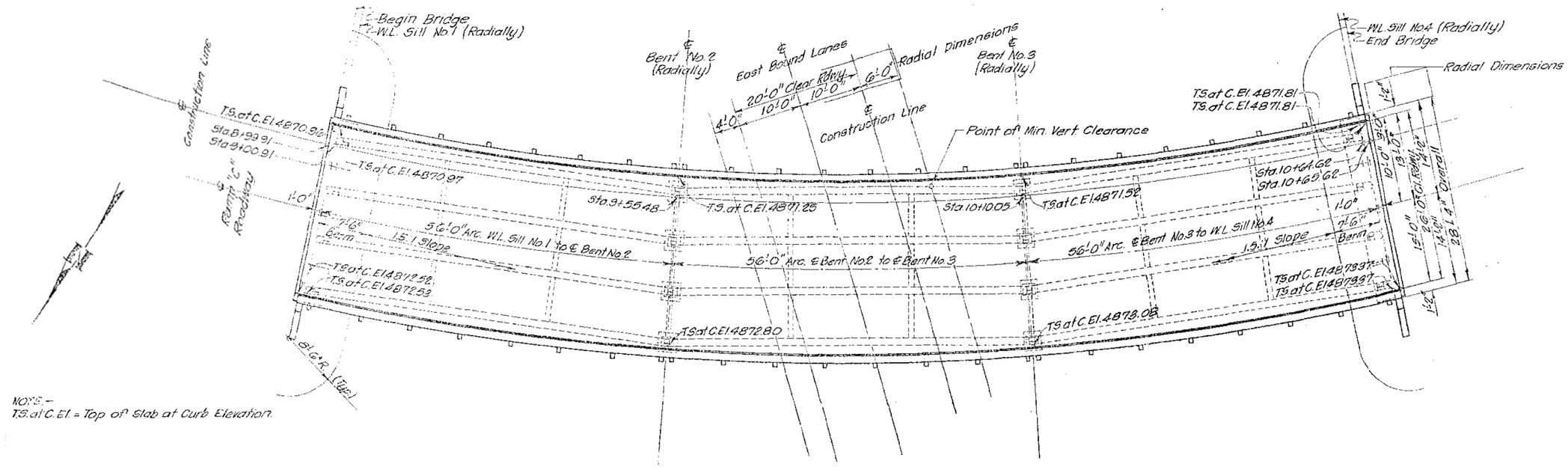
PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

5 OF 14

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENNI6YH	i6YHAB05		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E7	E40

FOR BIDDING PURPOSES ONLY

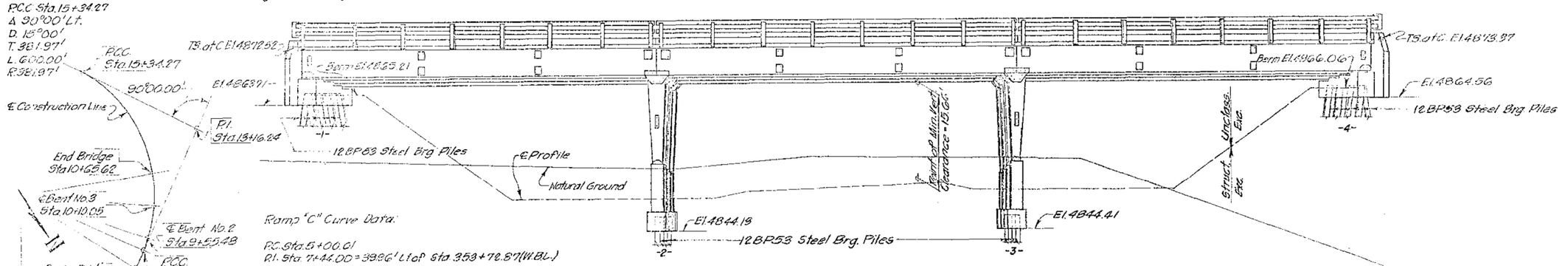


NOTE –
T.S. at C. El. = Top of Slab at Curb Elevation.

PLAN

Ramp "C" Curve Data:

P.C.C. Sta. 9+34.27
P.I. Sta. 13+16.24 = 277.41' Rt. of Sta. 1+01.83 (Keystone Survey)
P.C.C. Sta. 15+34.27
Δ 90°00' Lt.
D. 15°00'
T. 381.97'
L. 600.00'
R. 381.97'

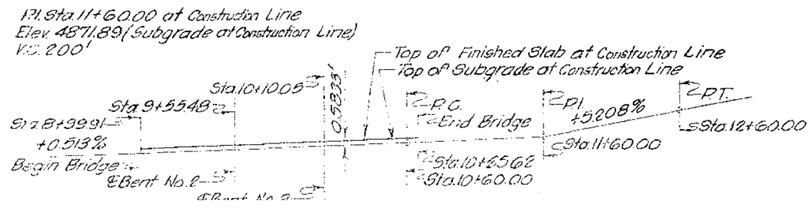


ELEVATION

Ramp "C" Curve Data:

P.C. Sta. 5+00.01
P.I. Sta. 7+44.00 = 3886' Lt. of Sta. 353+76.87 (W.B.L.)
P.C.C. Sta. 9+34.27
Δ 65°08.30' Lt.
D. 15°00'
T. 243.99'
L. 434.26'
R. 381.97'

CONSTRUCTION LINE HORIZONTAL CURVE DATA



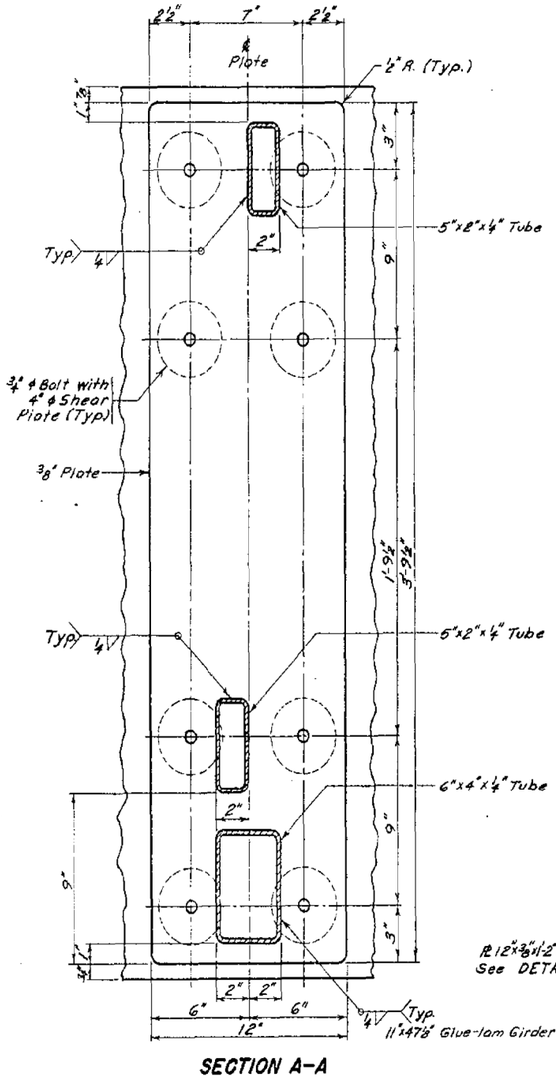
RAMP "C"
GENERAL DRAWING
FOR
170'-0" TIMBER GIRDER BRIDGE
26'-0" ROADWAY
OVER E.B.L.-U.S. NO. 16 SEC. 31-T1S-R6E
STA. 8+99.91 TO 10+65.62 FOI7-1(9)
PENNINGTON COUNTY
SOUTH DAKOTA HS20-44
DEPARTMENT OF HIGHWAYS
AUGUST 1966 6 OF 14

-X901-

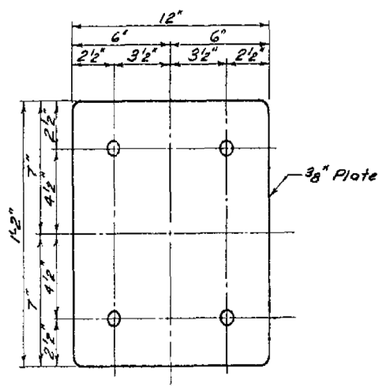
ORIGINAL CONSTRUCTION PLANS

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E8	E40

FOR BIDDING PURPOSES ONLY



SECTION A-A



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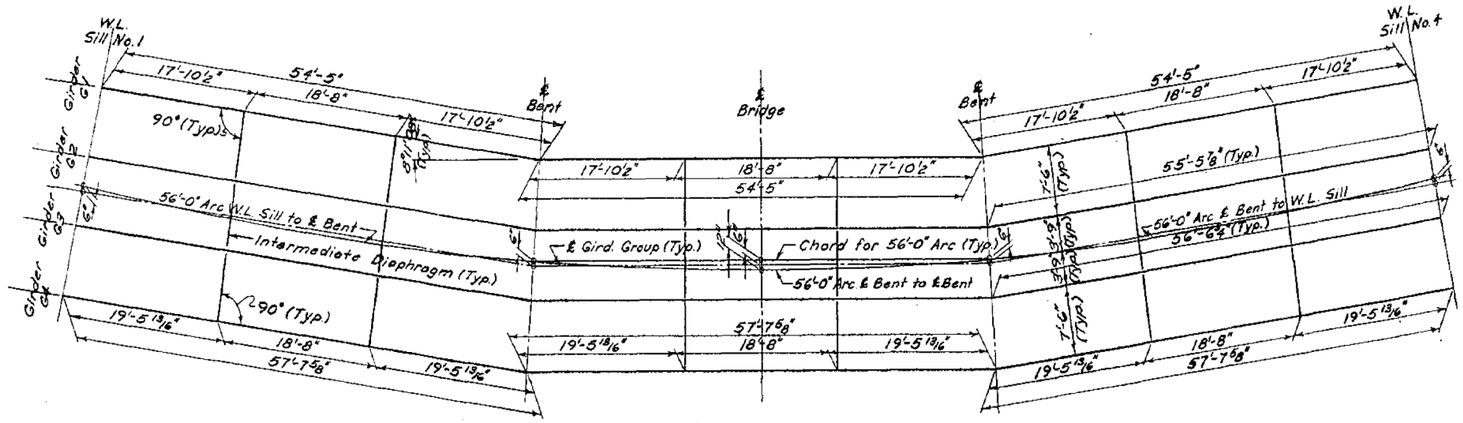
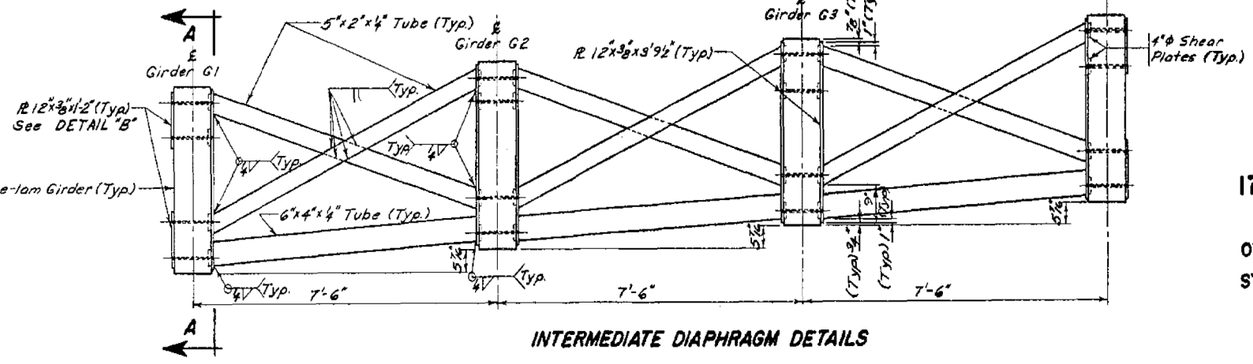


GIRDER & INTERMEDIATE DIAPHRAGM LAYOUT



INTERMEDIATE DIAPHRAGM DETAILS

RAMP "C"

GIRDER LAYOUT AND DIAPHRAGM DETAILS

FOR

170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY

OVER E.B.L.-U.S. NO.16 SEC. 31-T1S-R6E

STA. 8+99.91 TO 10+65.62 F017-1(9)

PENNINGTON COUNTY

SOUTH DAKOTA HS 20-44

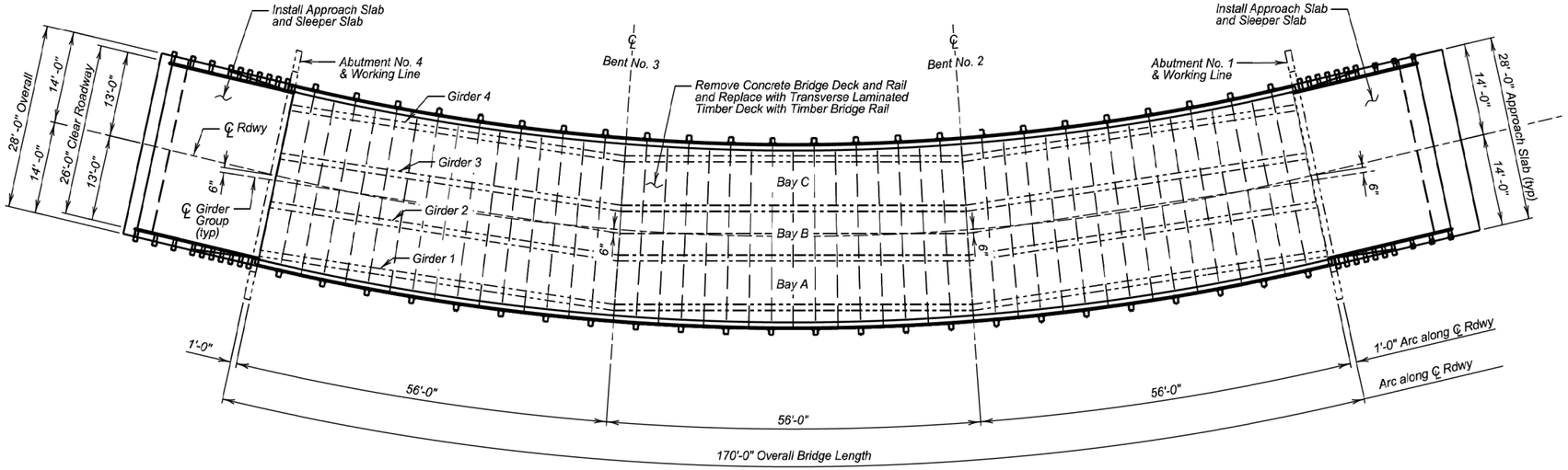
DEPARTMENT OF HIGHWAYS

AUGUST 1966 (7) OF (14)

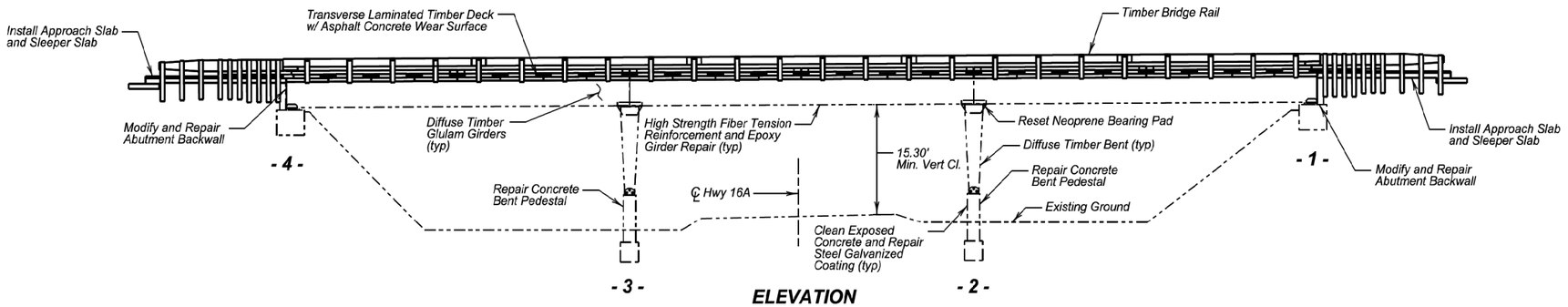
ORIGINAL CONSTRUCTION PLANS

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E9	E40

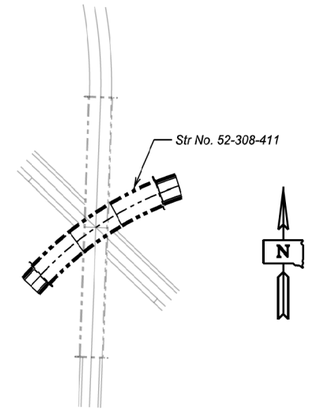
FOR BIDDING PURPOSES ONLY



PLAN



ELEVATION



LAYOUT

-X201-

INDEX OF BRIDGE SHEETS

GENERAL DRAWING

FOR

170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20
PCN 04FU	

PENNINGTON COUNTY

S. D. DEPT. OF TRANSPORTATION

FEBRUARY 2020

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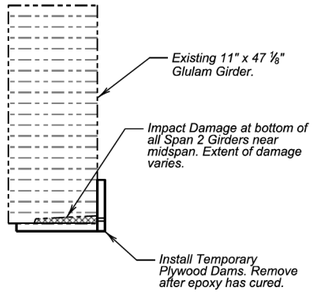
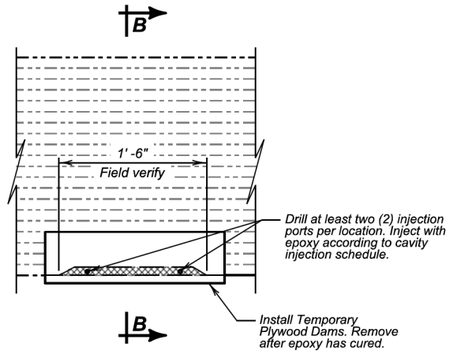
ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY

TYPICAL GIRDER DAMAGE



SECTION B-B



EPOXY INJECTION AT IMPACT DAMAGE LOCATIONS

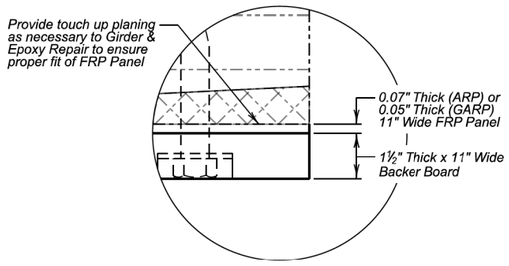
EPOXY INJECTION WORKS SCHEDULE:

1. *Carefully cut and remove all splinters and other loose fibers from damaged locations with minimal impacts to surrounding sound timber. Prepare the surface for epoxy as specified by the manufacturer's recommendations.*
2. *Install Temporary Plywood Dams across each Impact Damage cavity. Drill at least two (2) access ports per cavity, at maximum 8" O.C. Size ports so injection nozzle will seal tightly against hole to ensure pressure build up.*
3. *Starting from large end of cavity and working toward small end, inject cavity with Gap-Filling Structural Epoxy using pressurized pneumatic gun.*
4. *When epoxy begins to flow out of next hole, plug first hole with bung to maintain pressure and continue to next hole.*
5. *On last hole, inject until nozzle has back flow. Hold shoulder tight against girder to maintain pressure and ensure epoxy flows intc cracks.*
6. *Remove temporary plywood dams after epoxy has cured according to manufacturer's recommendations.*
6. *Provide touch-up planing to the cured epoxy to be flush with the girder to allow for proper bonding of the reinforced fiber panels. No gouges or scores are acceptable.*

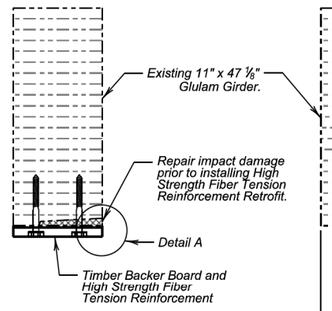
TENSION RETROFIT WORKS SCHEDULE

1. *Complete Epoxy Injection at Impact Damage Locations work and allow epoxy to cure according to the manufacturer's recommendations prior to beginning Tension Retrofit work.*
2. *Tension retrofit installation shall be qualified and monitored by a third party quality assurance agency with ICC Evaluation Service certification.*
3. *Confirm access requirements.*
4. *Finish plane the glue surface of the girder. Planing quality shall be monitored by qualified technician. Avoid unnecessary scour.*
5. *Locate, organize, and count installation materials required. Ensure extra screws and washers are available if needed during installation.*
6. *Check equipment and tools. Have drill motor and bits on stand-by in the event new holes are required to replace "spun-out" lag screws. Ensure fluid levels. Turn on and test equipment prior to mixing epoxy.*
7. *Place a small amount of oil-based lubricant on threads of lag bolts. Do not get lubricant on glue surfaces. Do not use water based lubricant.*
8. *Dry place reinforcement in position on girder and use as template to drill pilot holes working from the center out. Test lag screw torque and use the maximum torque attainable in the dry fit before gluing. The target is 225 ft-lbs or greater. If the torque value that the wood can hold is less than 148 ft-lbs call the Engineer for direction on how to proceed. Blow debris from pilot holes with compressed air.*

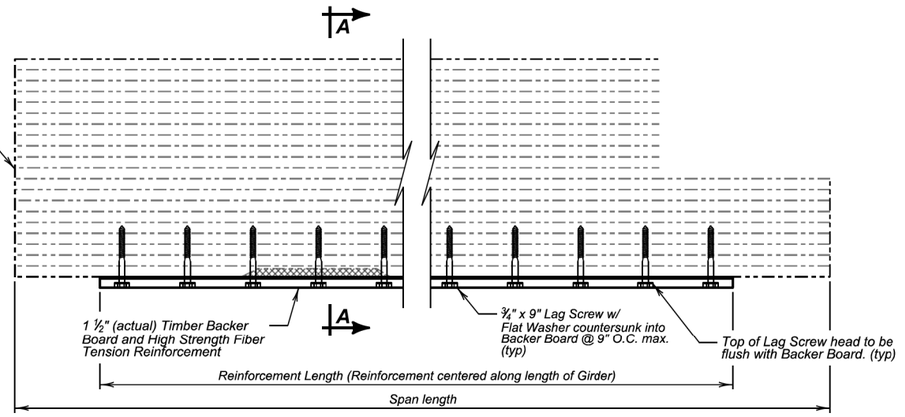
   Note: Do not add preservative treatment or sealer to pilot holes to prevent contamination of the retrofit bond.
9. *Provide touch-up planing on girder as required, and sand the reinforcing fiber panel prior to application of adhesive. The reinforcing fiber panels shall be cross sanded at 45 degrees (60 degrees maximum) to the long axis using 60 grit sandpaper. No gouges or scores are acceptable. Hand sand small shiny patches with sanding block and 60 grit sand paper in cross direction.*
10. *Stage work station away from moisture and potential contaminants. If raining, extreme care shall be taken to ensure epoxy does not receive moisure.*
11. *Check moisture content readings on glue surfaces to receive epoxy. Do not proceed with retrofit if surface moisture content is above 20%.*
12. *Use structural epoxy adhesive mixed in accordance with manufacturer's specifications.*
13. *Spread mixed epoxy on both glue faces (reinforcing fiber and existing timber). Squeeze out should be no larger than a ¼" bead and no smaller than ⅛".*
14. *Place reinforcement in place. Drive the center lag screw first to touching washer. Do not use impact guns to torque screw.*
15. *Continue driving remaining screws working from the center out, unless otherwise specified.*
16. *Torque lag screws using torque wrench to 175 ft-lbs. Start torquing screws at the center of the reinforcement and work toward each end. Return to the starting point and re-torque to 225 ft-lbs. Re-torque all screws every 15 minutes until all screws click without turning. All screws must be torqued in every pass; if any screw turns freely, another pass must be made, retorquing all screws.*



DETAIL A

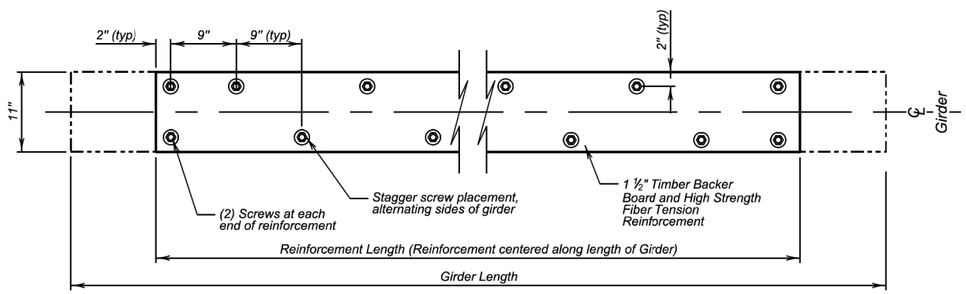


SECTION A-A



GIRDER ELEVATION

HIGH STRENGTH FIBER TENSION REINFORCEMENT RETROFIT			
Span	**Girder**	**Girder Length**	**Reinforcement Length**
1	1	57 '-7⅞"	49' -0"
	2	56' -6¾"	48' -0"
	3	55' -5⅞"	47' -0"
	4	54' -5"	46' -0"
2	1	57' -7⅞"	49' -0"
	2	56' -6¾"	48' -0"
	3	55' -5⅞"	47' -0"
	4	54' -5"	46' -0"
3	1	57' -7⅞"	49' -0"
	2	56' -6¾"	48' -0"
	3	55' -5⅞"	47' -0"
	4	54' -5"	46' -0"



GIRDER UNDERSIDE PLAN

HIGH STRENGTH FIBER TENSION
REINFORCEMENT RETROFIT DETAILS
FOR

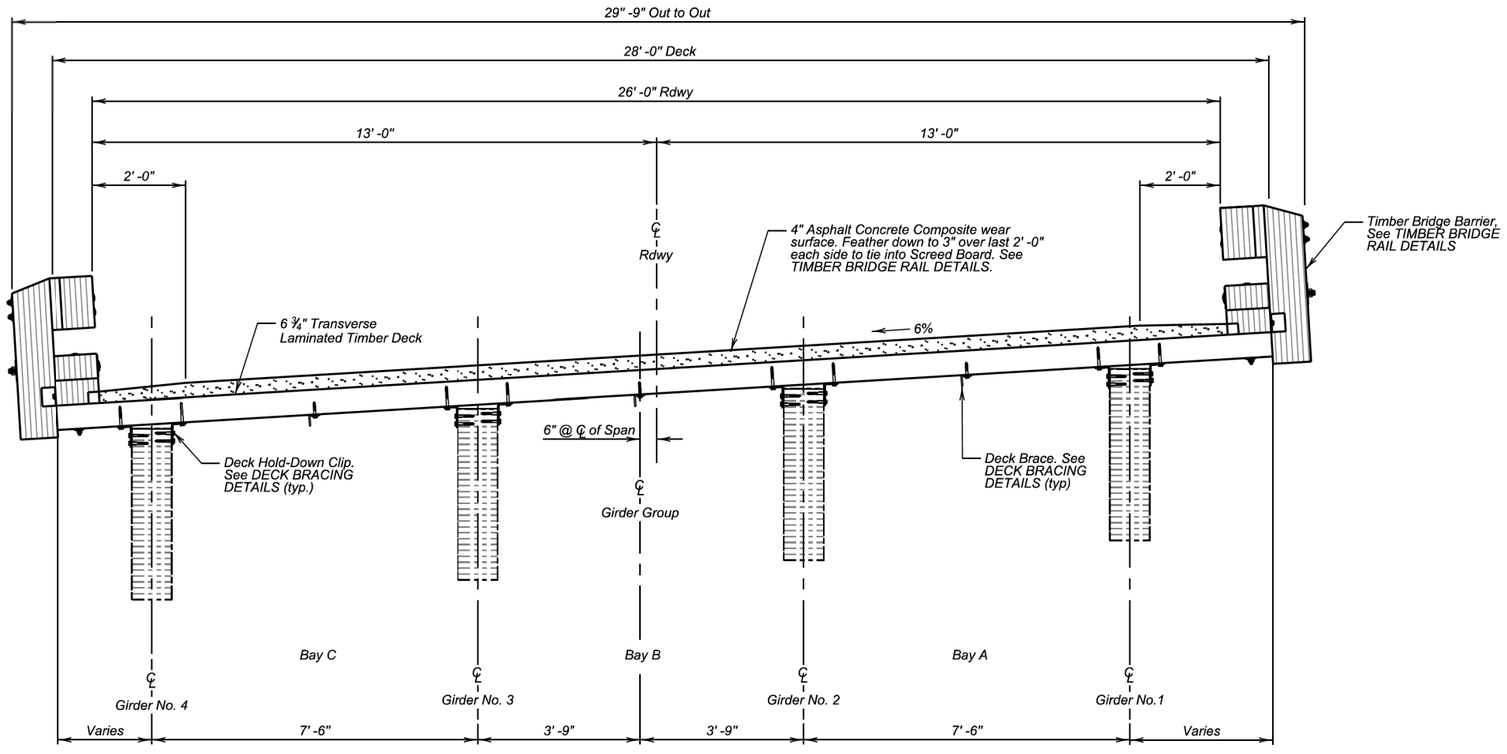
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



TYPICAL SECTION

TYPICAL DECK SECTION
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

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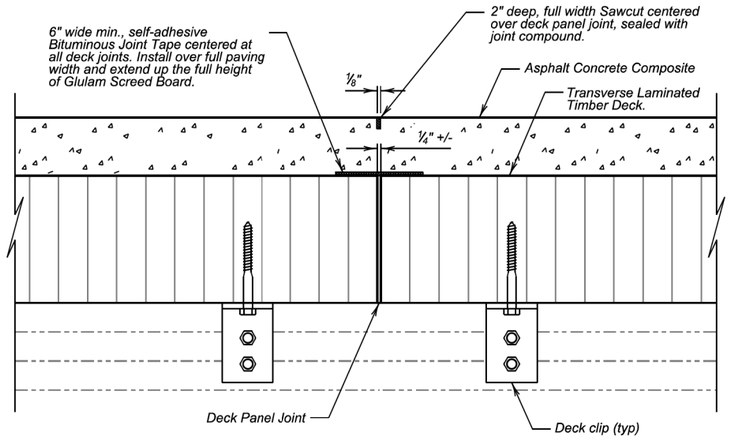
ORIGINAL CONSTRUCTION PLANS

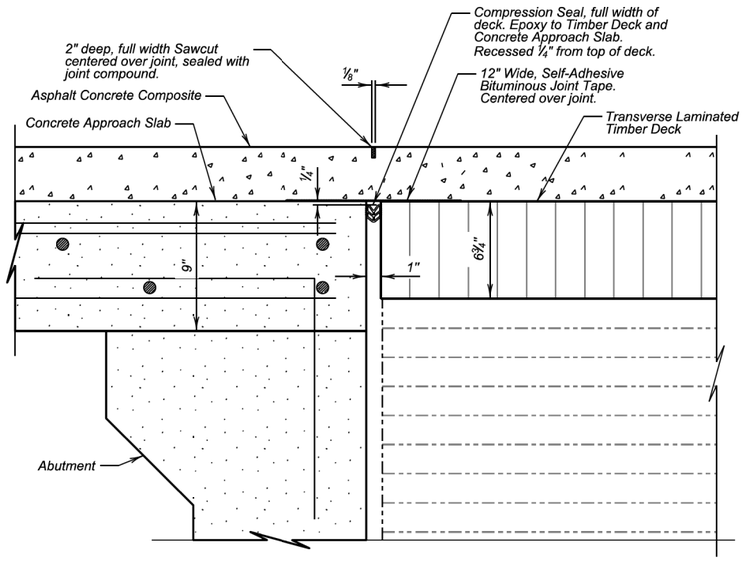


TYPICAL DECK JOINT

NOTE

1. *Install the bituminous joint tape, including laps if necessary, according to the manufacturer's recommendations.*
2. *Cost of bituminous joint tape, sawcut, and sealing of bituminous joints is incidental to the bid item Asphalt Concrete Composite. No additional payment will be made.*

COMPRESSION SEAL	
Location	***Length ft***
Abutment No. 1	*28*
Abutment No. 4	*28*



DECK JOINT AT APPROACH SLAB

DECK JOINT DETAILS
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-T1S-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
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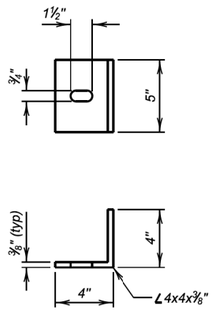
ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



POST BRACE

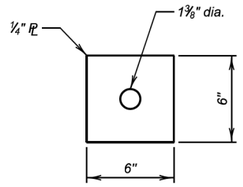
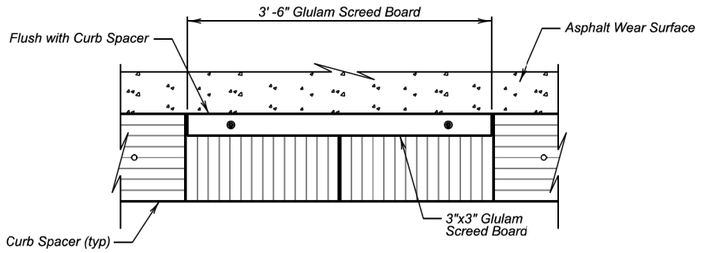


PLATE WASHER

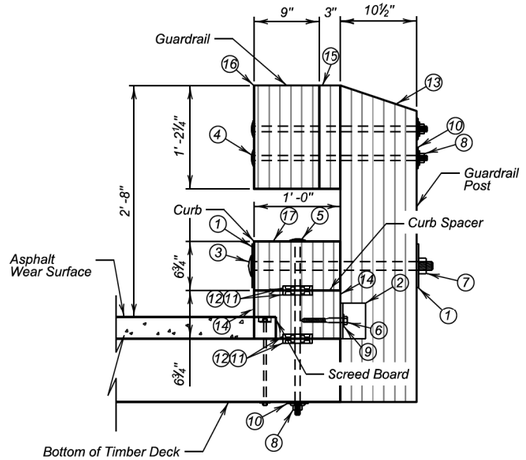


SECTION B-B

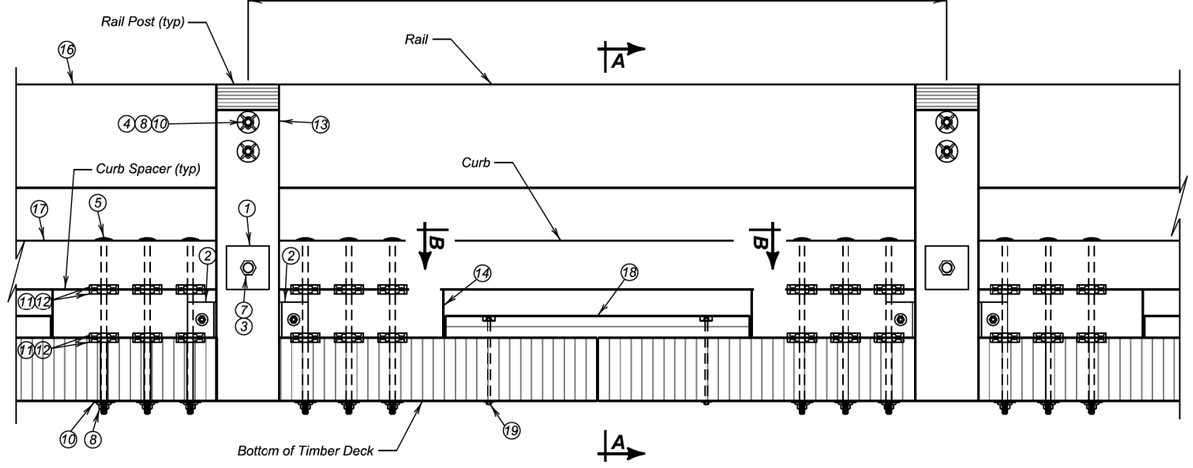
NOTE

Cost of Glulam Screed Board is incidental to the bid item Timber Bridge Rail. No additional payment will be made.

TIMBER BRIDGE RAIL SPLICE	
PARTS FOR FABRICATION:	
ITEM	
①	6" x 6" x ¼" Plate Washer
②	4" x 4" x ⅜" x 5" Long - Post Brace
ITEM	
③	1 ¼" x 25" Timber Bolt (No Lugs)
④	¾" x 24" Timber Bolt
⑤	¾" x 22" or 24" Timber Bolt
⑥	⅝" x 6" Lag Screw
⑦	1 ¼" Hex Nut
⑧	¾" Hex Nut
⑨	⅝" Flat Washer
⑩	¾" Maleable Iron Washer
⑪	Shear Plate - 4" dia. for ¾" Bolt
⑫	#10 x ¾" Wood Screw
⑲	⅝" Dia. x 10" Long Bolt
TIMBER:	
ITEM	
⑬	Rail Post - (GLB 8 ¾" x 10 ½" x 3'-5 ¾")
⑭	Curb Spacer - (GLB 6 ¾" x 1'-0" x 4'-6")
⑮	Post Spacer - (GLB 1'-2 ¼" x 3" x 8 ¾")
⑯	Rail - (GLB 1'-2 ¾" x 9")
⑰	Curb - (GLB 6 ¾" x 1'-0")
⑱	Screed Board (GLB 3" x 3" x 3' -6")



SECTION A-A



ELEVATION - TIMBER BRIDGE RAIL

TIMBER BRIDGE RAIL DETAILS
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

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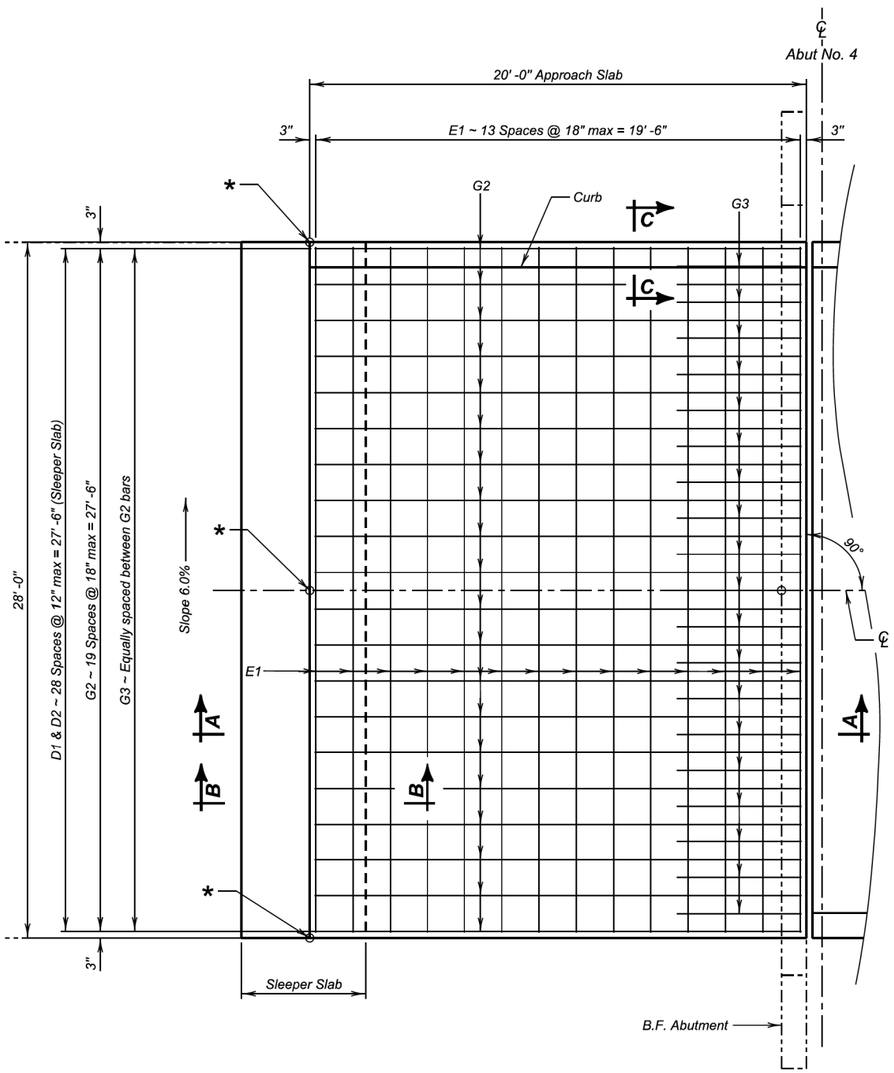
ORIGINAL CONSTRUCTION PLANS

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	016AW-468	E14	E40

FOR BIDDING PURPOSES ONLY

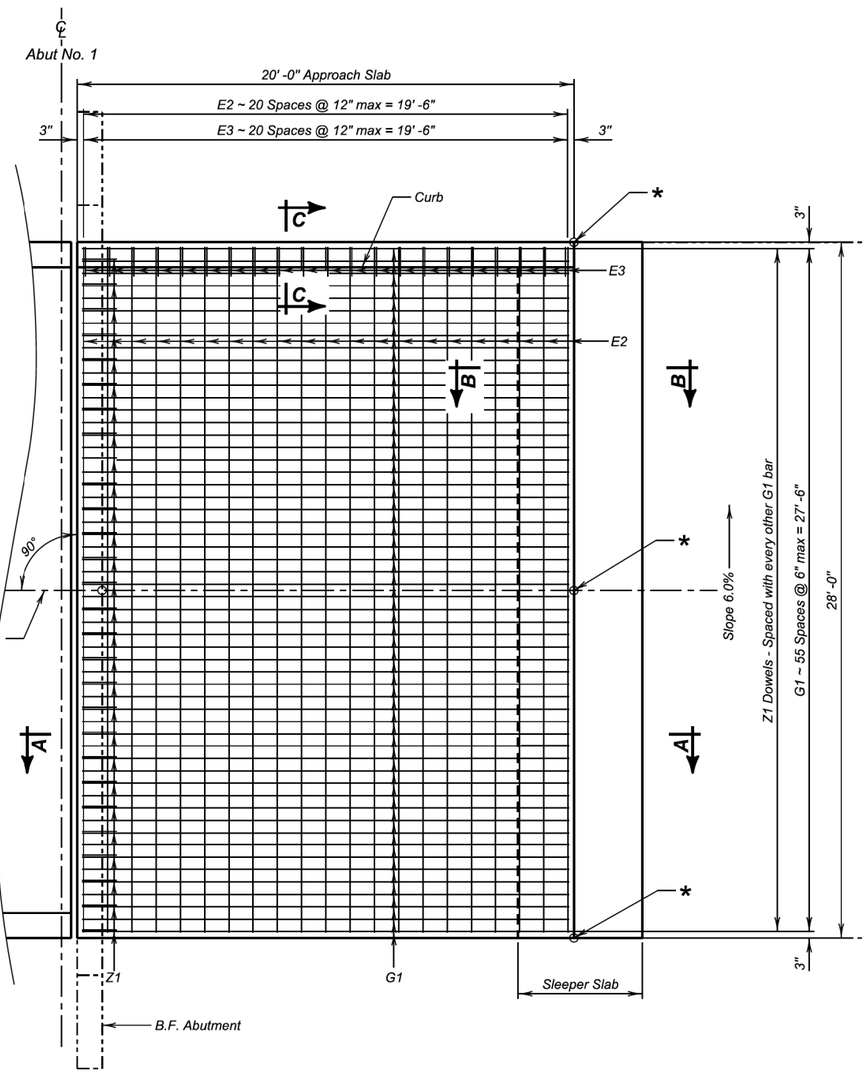
* *Elevations may need to be adjusted for a smooth ride from the final bridge deck elevations to final pavement elevations. Elevations will be taken and adjusted in the field during construction.*



PLAN - AT ABUTMENT NO. 4

(Top Steel)

(Similar at Abutment No. 1)



PLAN - AT ABUTMENT NO. 1

(Bottom Steel)

(Similar at Abutment No. 4)

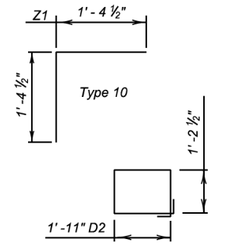
REINFORCING SCHEDULE

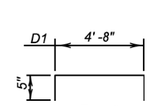
(For Two Approach Slabs and Two Sleeper Slabs)

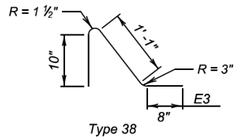
Mk.	No.	Size	Length	Type
Sleeper Slabs				
C1	24	5	27' - 6"	Str.
D1	116	4	5' - 6"	2
D2	29	4	6' - 11"	T2
Approach Slabs				
E1	42	4	27' - 6"	Str.
E2	42	6	27' - 6"	Str.
E3	42	4	3' - 0"	38
G1	112	8	19' - 6"	Str.
G2	42	4	19' - 6"	Str.
G3	38	4	5' - 0"	Str.
Z1*	42	4	2' - 9"	10

NOTES:
All Bars to be Epoxy Coated.
All dimensions are out to out of bars.
**Install Dowel in Concrete*

Bending Details







ESTIMATED QUANTITIES

(For Two Approach Slabs and Two Sleeper Slabs)

ITEM	UNIT	QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	125
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	32
Install Dowel in Concrete	Each	56

1. 32.3 Cu. Yds. Concrete in Approach Slab.
2. 9684 Lbs. Epoxy Coated Re-Steel in Approach Slab.
3. 8.0 Cu. Yds. Concrete in Sleeper Slab.
4. 1388 Lbs. Epoxy Coated Re-Steel in Sleeper Slab.

Items 1 thru 4 are approximate quantities contained in the above bid items and are for information only.

APPROACH SLAB PLAN
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62 — P016A(08)59
STR. NO. 52-308-411 — HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
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ORIGINAL CONSTRUCTION PLANS

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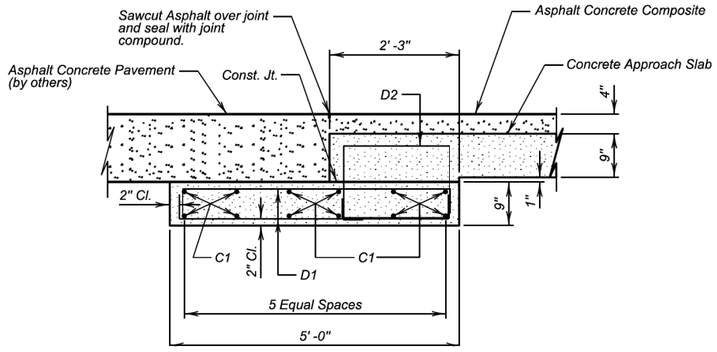
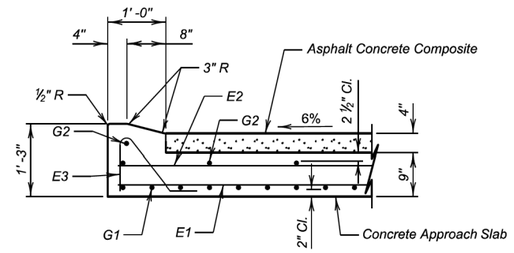
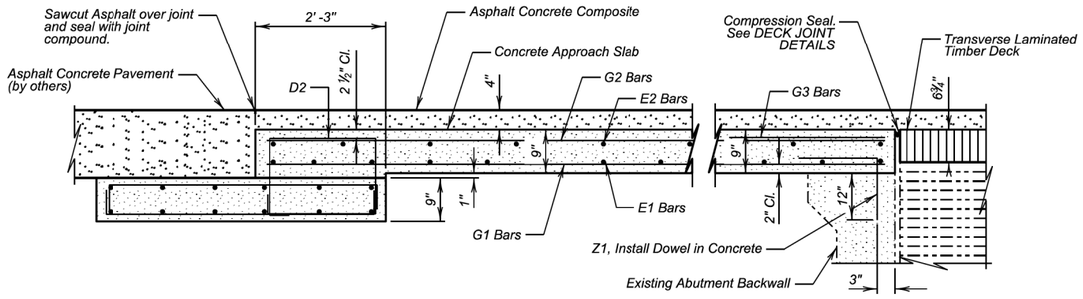


SECTION B-B
SLEEPER SLAB AT ABUTMENT



SECTION C-C
CURB DETAIL



SECTION A-A
APPROACH SLAB AT ABUTMENT

APPROACH SLAB DETAILS
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
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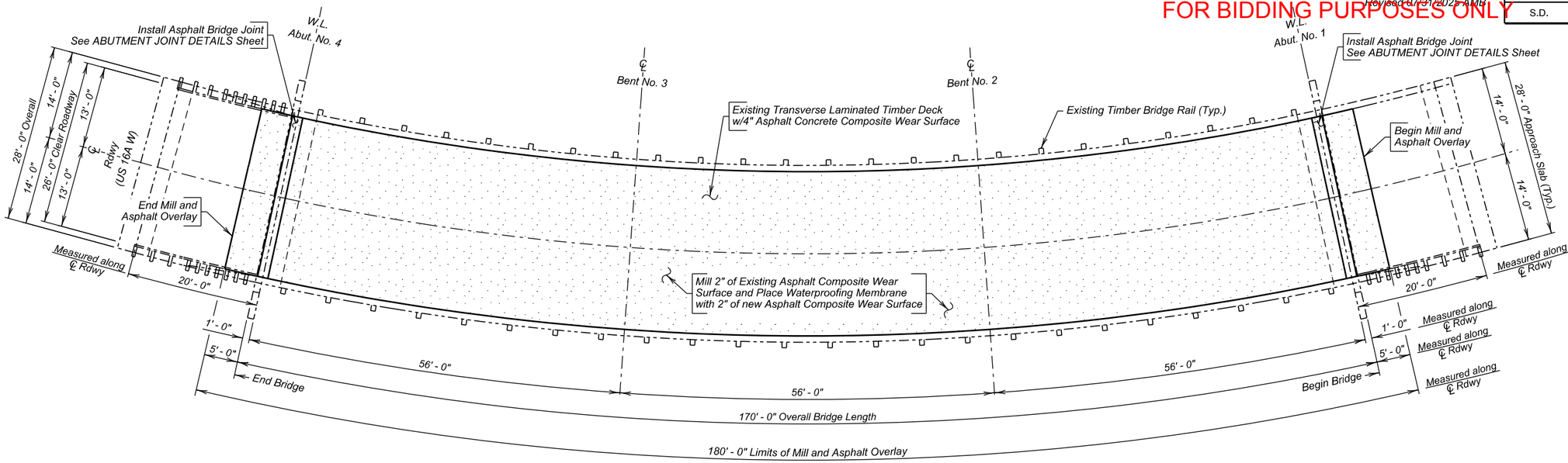
PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

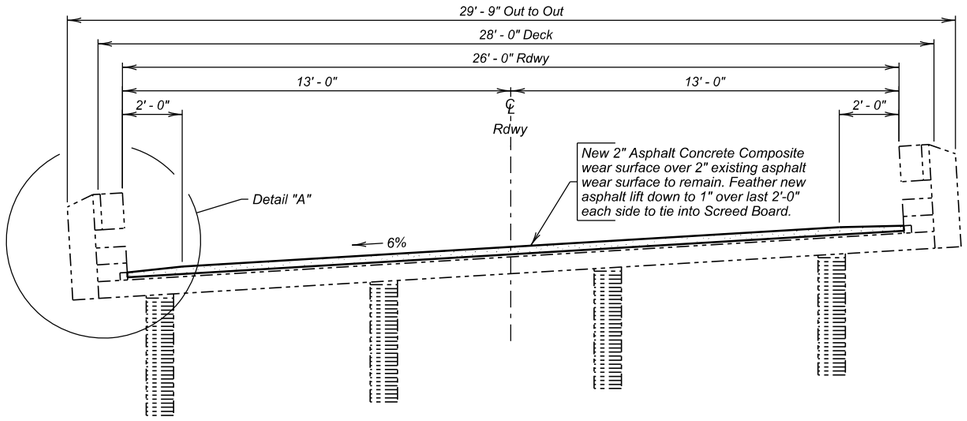
ORIGINAL CONSTRUCTION PLANS

Revised 07/31/2025 AMB

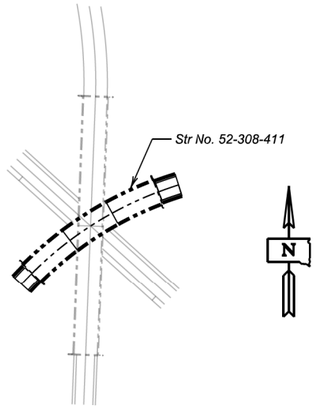
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E16	E40



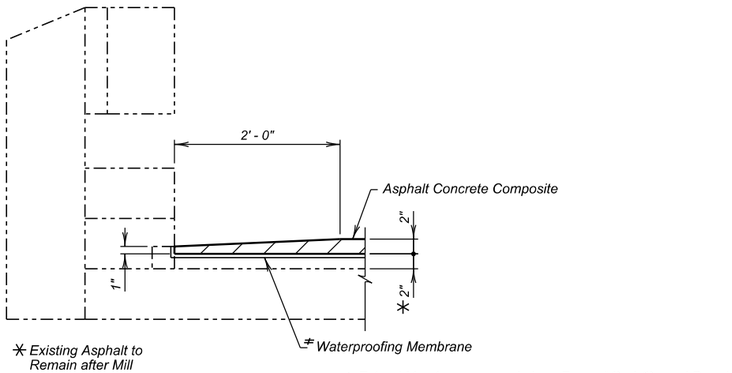
PLAN



TYPICAL SECTION



LAYOUT



DETAIL "A"

≠ Extend Membrane upward along Face of Curb/Screed Board

INDEX OF BRIDGE SHEETS-

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Cold Milling Asphalt Concrete	Sq. Yd.	520.0
Asphalt Concrete Bridge Deck Overlay	Sq. Yd.	520.0

Registered Professional Engineer
REG NO.
13271
AARON M. BUETTNER
SOUTH DAKOTA
31 Jul 2025

PLANS BY :
ALFRED BENESCH & CO.

LAYOUT FOR UPGRADING AND TYPICAL DECK SECTION
FOR
170' - 0" TIMBER GIRDER BRIDGE

26'- 0" ROADWAY — 0° SKEW
OVER US 16 E — SEC. 31-T1S-R6E
STR. NO. 52-308-411 — P 0016(110)59
PCN 0A46

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

1 OF 12

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENN0A46	0A46AB01		BRIDGE ENGINEER

ESTIMATE OF STRUCTURE QUANTITIES

DESCRIPTION	QUANTITY	UNIT	REMARKS
Bridge Elevation Survey	Lump Sum	LS	
Asphalt Concrete Bridge Deck Overlay	520.0	Sq Yd	See Special Provision and Notes
Asphalt Bridge Joint	52	Ft	
Cold Milling Asphalt Concrete	520	Sq Yd	See Special Provision and Notes

SPECIFICATIONS FOR BRIDGE

Construction Specifications. South Dakota Standard Specifications for Roads and Bridges, 2025 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

DETAILS AND DIMENSIONS OF EXISTING BRIDGE

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

SCOPE OF BRIDGE WORK & SEQUENCE OF OPERATIONS

1. Mill 2" of the existing asphalt composite wear surface. Take care to ensure that mill depths are accurate. It is imperative that the underlying timber deck not be damaged during the milling operation.
2. Install bridge plate at abutment joints.
3. Place single component, hot applied elastomeric membrane over the entire milled surface.
4. Apply asphalt binder over single component, hot applied elastomeric membrane.
5. Seat a nonwoven polypropylene paving fabric into the single component, hot applied elastomeric membrane.
6. Place 2" thick asphalt composite wear surface.
7. Complete full-depth asphalt overlay removal as necessary at abutments and install asphalt bridge joint.

BRIDGE LAYOUT AND ORIENTATION

The original construction plans have been provided at the end of the Overlay Plans. The Contractor is to be aware that the bridge layout has been revised to current practices and is opposite of shown in the original construction plans. This includes girder, abutment, bent, bracing, strut, and span numbering. The Contractor will record notes and as-built drawings according to the new layout as shown in the Overlay Plans.

ASPHALT BRIDGE JOINT AT ABUTMENT

1. The asphalt overlay at the abutment expansion joints will be removed to the top of the membrane and to the width indicated in the plans. Take care not to damage the membrane sheet during the asphalt removal process. The asphalt and aggregate joint system as noted on the plans will be placed in this removal area. The asphalt bridge joint system shall be one of the approved types for Asphalt Growth & Asphalt Bridge Joint.
2. The intent is to place an asphalt and aggregate joint system in the bridge deck with a uniform thickness of 4 inches.
3. Milling and placement of the new asphalt overlay will be completed prior to placing the Asphalt Bridge Joint.
4. The costs of removing the asphalt overlay and membrane material as well as furnishing and placing all material for the joint system including the bridge plate, all labor, equipment, tools, materials and any incidentals necessary to complete the work satisfactorily will be paid for at the contract price per foot for "Asphalt Bridge Joint."

BRIDGE ELEVATION SURVEY FOR ASPHALT CONCRETE BRIDGE DECK OVERLAY

The Contractor will take bridge deck elevation shots at the locations shown by Table of Elevations. The Contractor will take an elevation reading at these locations on the milled asphalt surface prior to any placement of the asphalt concrete bridge deck overlay. After the Asphalt Concrete Deck Overlay is in-place the Contractor will take an elevation reading at these locations on the finished asphalt concrete surface. The elevations will be used to determine the as-built thickness of the asphalt concrete bridge deck overlay.

The elevations to be recorded in these tables will be based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAV88). The Engineer will provide the Contractor with a description, elevation and location of the nearest benchmark that has a NAVD88 established elevation for the Contractor's use. The benchmark shown in the plans has not been tied to the NAVD88. The Contractor will be responsible for establishing a NAVD88 elevation for the benchmark provided in the plans. All costs associated with obtaining the NAVD88 elevations at the locations shown in the table and for the benchmark shown in the plans, including all equipment, labor and any incidentals required will be included in the contract lump sum price for "Bridge Elevation Survey

ASHPALT CONCRETE BRIDGE DECK OVERLAY

1. An asphalt concrete overlay system shall be placed on the bridge deck. The system shall consist of the following components:

   A single component, hot applied, elastomeric membrane placed over the entire milled asphalt surface.

   A performance graded (PG) binder as set forth in Section 890 of the Standard Specifications. The performance grade shall be PG 70-34.

   A nonwoven polypropylene paving fabric seated into the single component, hot applied, elastomeric membrane.

   Section 324 will apply except that a Class G, Type 1 asphalt concrete overlay will be specified and the asphalt binder used in the mixture will be PG 64-34 or PG 70-34. Thickness shall be as indicated in the details.

2. The material for the single component, hot applied, elastomeric membrane shall be Roadsaver 221 as manufactured by:

   Crafco, Inc.
   6165 W Detroit Street
   Chandler, AZ 85226
   Telephone No. 602-276-0406
   www.crafco.com.

   The membrane material shall be sprayed or spread to a uniform thickness at the application temperature recommended by the manufacturer. After cooling, it shall form a tough resilient membrane, well bonded to the milled asphalt surface.

3. The nonwoven polypropylene paving fabric shall be Petromat MPV500 as manufactured by:

   TenCate Geosynthetics Americas (A Solmax Company)
   365 South Holland Drive
   Pendergrass, GA 30567
   Telephone No. 706-693-2226
   www.tencategeo.us

   The nonwoven polypropylene paving fabric may be furnished either in rolls or sheets. Upon installation, the material shall be free of visible external defects, such as holes, ragged or untrue edges, breaks, cracks, tears, protuberances, and indentations.

Registered Professional Engineer
REG NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
29 Sep 2025

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES
FOR
170'-0" TIMBER GIRDER BRIDGE

STR. NO. 52-308-411
APRIL 2025

DESIGNED BY:	DRAWN BY:	CHECKED BY:	
MJK	NTF	ZZJ	
PENN0A46	0A46AB02		BRIDGE ENGINEER

FOR BIDDING PURPOSES ONLY

ASHPALT CONCRETE BRIDGE DECK OVERLAY CONT.

4. There is an existing asphalt concrete overlay on the bridge deck. The existing overlay shall be milled to a depth of 2” (except that within 2’-0” of the rail, the mill depth shall be transitioned to 1” as shown in the plans), and any protrusions or irregularities over ¼” shall be corrected by mechanical means. Prior to applying the single component, hot applied, elastomeric membrane, all dust and loose material shall be removed from the deck with compressed air. Water shall not be used to clean the deck. Areas not to be coated with the single component, hot applied, elastomeric membrane shall be protected using masking tape, roll paper, roofing felt paper or other materials suitable to protect the surfaces.

5. Work shall not be performed during wet weather conditions, nor when the deck and ambient air temperatures are below 50° F. The deck surface shall be thoroughly dry at the time of the installation of the single component, hot applied, elastomeric membrane.

6. The single component, hot applied, elastomeric membrane shall be applied to the prepared deck surface at a uniform minimum rate necessary to achieve an applied thickness of 90-110 mils (1 mil = 0.001 inch). During application the thickness may be measured by the Engineer. Lack of reasonably uniform application shall be cause for termination of the work until remedial measures are taken. Primer, if required, and membrane shall be placed up the curb faces for a height of two inches above the plan thickness of Type 1 Class G Asphalt Concrete Overlay. No vehicles, including mechanical spreaders, shall be allowed to operate on the bare membrane.

   Any openings or gaps on the downslope edge of the deck shall be plugged as necessary to prevent the membrane material or the Asphalt Binder from running down the edge of the deck.

7. As soon as practical, but in all cases no later than 24 hours after membrane application, the nonwoven polypropylene paving fabric shall be placed from gutter line to gutter line. Prior to placing the paving fabric, the PG 70-34 binder shall be applied to the top of the elastomeric membrane at a uniform coverage of approximately 0.23 gallons per square yard. The Asphalt Binder shall be applied for the full width of the bridge deck from gutter line to gutter line. Asphalt Binder, once sprayed on the deck, is not permitted to be pushed or relocated by hand in any way.

   The nonwoven polypropylene paving fabric shall be laid parallel to the centerline of the bridge and shall be placed on the surface while the Asphalt Binder is still tacky. The paving fabric shall be butted together at longitudinal and transverse joints. Overlapping will not be permitted. The maximum allowable space between adjoining sections of paving fabric shall be one inch. Following placement of paving fabric, a bead of compatible mastic or hot applied membrane shall be applied where the paving fabric contacts the curbs, and in cracks between adjoining sections that are apart by more than 3/8 inch. The bead shall fill the void preventing water from entering at this point. The completed membrane with the paving fabric shall be subject to the approval of the Engineer prior to the placement of the Type 1 Class G Asphalt Concrete Overlay. The Contractor shall be responsible for maintaining the condition of the membrane and paving fabric system on the bridge deck until covered with the Type 1 Class G Asphalt Concrete to the thickness required by the plans and specifications. Only rubber-tired vehicles necessary for construction shall be allowed on the paving fabric.

8. The Type 1 Class G Asphalt Concrete shall be placed, spread and compacted, in accordance with the specifications with the following modifications: A tack or prime coat shall not be used on the top surface of the nonwoven polypropylene paving fabric. The asphalt concrete shall be dumped directly into the laydown machine hopper. After filling the hopper, the truck shall pull forward and shall not be in contact with the lay-down machine while it is moving. Dumping the mixture onto the deck ahead of the lay-down machine shall not be permitted. The asphalt concrete shall be spread and rolled in such a manner that the membrane and paving fabric will not be damaged. The minimum temperature of the asphalt concrete at the time compaction begins shall be 250°F. To assure this temperature, the mixing discharge temperature may be up to 30°F higher than the job-mix formula. The use of vibratory rollers, with the vibrator on, will not be permitted. A minimum percent compaction is not specified, however compaction shall be accomplished to the satisfaction of the Engineer. The Contractor shall exercise extreme care when placing the paver and/or miscellaneous equipment on the completed membrane with paving fabric. Any damage to the paving fabric and/or membrane caused by the asphalt application shall be repaired or replaced as directed by the Engineer at no cost to the Department.

   The deck shall be paved with asphalt within 14 days of fabric placement or as approved by the Engineer.

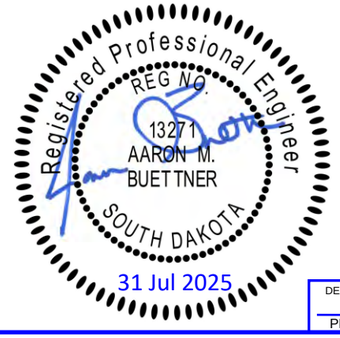
   It is not advisable to pave the deck the same day as the membrane placement, unless during cooler temperatures, 75°F or less. Overnight cure of the membrane with paving fabric has been shown to help solidify the binder to reduce impacts of operating paving equipment on the membrane with paving fabric.

   The only traffic permitted on the deck after the membrane with paving fabric is placed shall be the necessary workers and equipment to place the asphalt overlay.

   The contractor may be required to use a blotting sand on top of the paving fabric to prevent the paving fabric from adhering to asphalt paving equipment, as determined by the Engineer. The material shall be blotted and then broomed to remove any excess sand.

9. Install the single component, hot applied, elastomeric membrane and the nonwoven polypropylene paving fabric under the on-site supervision of a third-party representative from each respective manufacturer. The representative must not be employed by the contractor, subcontractor or installer. The representative must be on site for the full duration of the installation and testing, and during placement of the asphalt overlay. Do not substitute the manufacturer's representative listed in the submittal without prior written approval from the Engineer.

10. All costs associated with furnishing and installing the asphalt overlay system on the bridge deck including the cost of the single component, hot applied, elastomeric membrane; the Asphalt Binder; the nonwoven polypropylene paving fabric and the Type 1 Class G Asphalt Concrete shall be included in the price bid per square foot for ASPHALT CONCRETE BRIDGE DECK OVERLAY. The cost shall include all equipment, labor and incidentals required to adequately install the Asphalt Concrete Overlay system on the Bridge Deck.



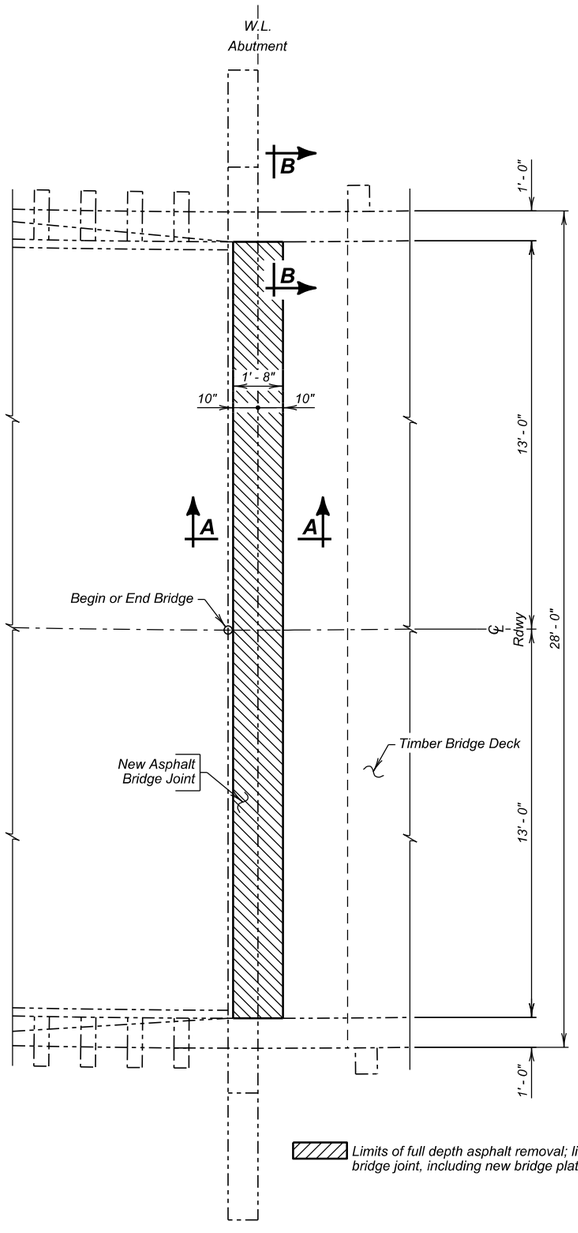
NOTES (CONTINUED)
FOR
170’-0” TIMBER GIRDER BRIDGE

STR. NO. 52-308-411

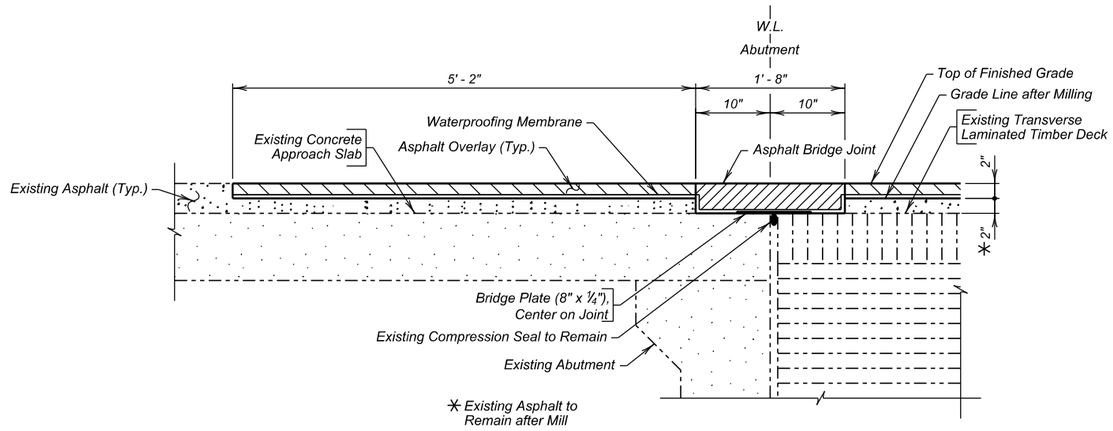
APRIL 2025

DESIGNED BY:	DRAWN BY:	CHECKED BY:	
MJK	NTF	ZZJ	BRIDGE ENGINEER
PENN0A46	0A46AB03		

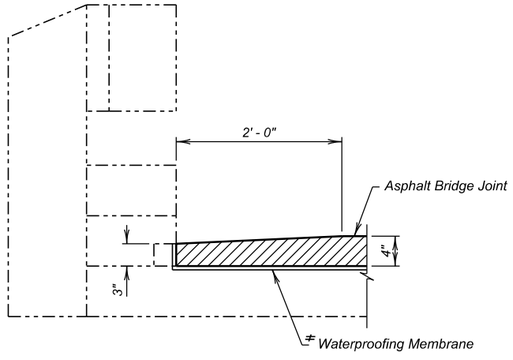
FOR BIDDING PURPOSES ONLY



PLAN



SECTION A - A



SECTION B - B

≠ Extend Membrane upward along Face of Curb/Screed Board

ESTIMATED QUANTITIES
(For Two Approach Slabs)

ITEM	UNIT	QUANTITY
Asphalt Bridge Joint	Ft.	52

Registered Professional Engineer
REG NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
31 Jul 2025

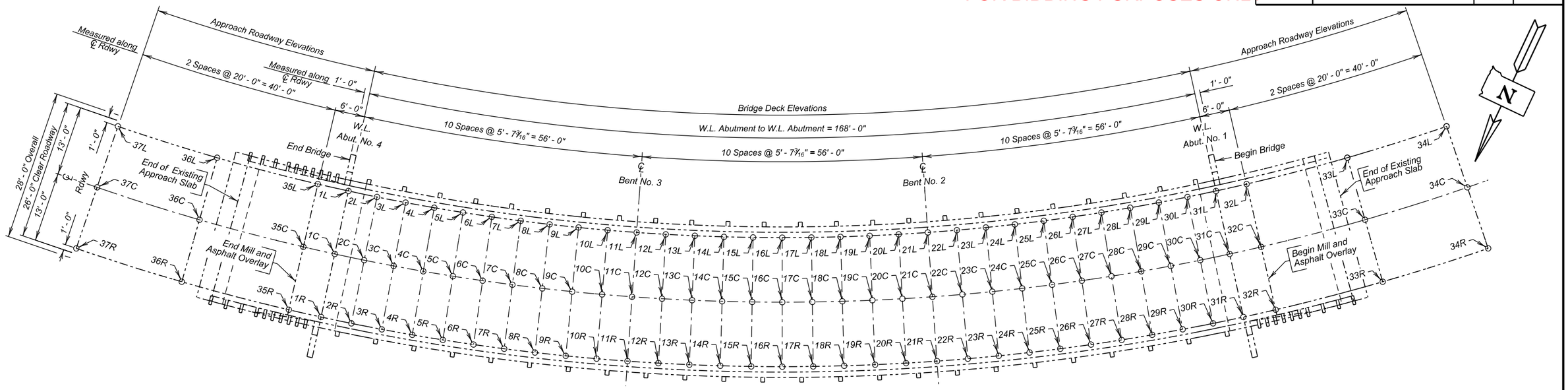
ABUTMENT JOINT DETAILS
FOR
170' - 0" TIMBER GIRDER BRIDGE
26'- 0" ROADWAY — 0° SKEW
OVER US 16 E — SEC. 31-T1S-R6E
STR. NO. 52-308-411 — P 0016(110)59

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	BRIDGE ENGINEER
PENN0A46	0A46AB03		

FOR BIDDING PURPOSES ONLY

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E20	E40



PLAN

Table of As-Built Elevations - Bridge Deck

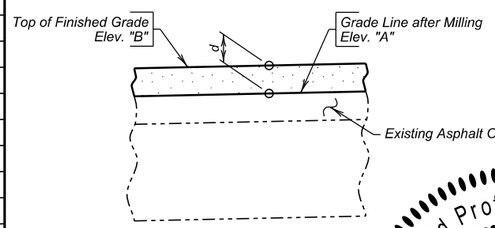
Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d
1L				1C				1R			
2L				2C				2R			
3L				3C				3R			
4L				4C				4R			
5L				5C				5R			
6L				6C				6R			
7L				7C				7R			
8L				8C				8R			
9L				9C				9R			
10L				10C				10R			
11L				11C				11R			
12L				12C				12R			
13L				13C				13R			
14L				14C				14R			
15L				15C				15R			
16L				16C				16R			
17L				17C				17R			
18L				18C				18R			
19L				19C				19R			
20L				20C				20R			
21L				21C				21R			
22L				22C				22R			
23L				23C				23R			
24L				24C				24R			
25L				25C				25R			
26L				26C				26R			
27L				27C				27R			
28L				28C				28R			
29L				29C				29R			
30L				30C				30R			
31L				31C				31R			

Table of As-Built Elevations - Approach Roadway

Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d
32L				32C				32R			
33L				33C				33R			
34L				34C				34R			
35L				35C				35R			
36L				36C				36R			
37L				37C				37R			

Table of Elevations - Bridge Survey Markers

Location	Station - Offset	Elevation
Begin Bridge		
End Bridge		



ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Bridge Elevation Survey	L.S.	Lump Sum

NOTE:
The Contractor will be responsible for producing the As - Built Elevation Survey soon after construction is complete and before the bridge is opened to traffic. The As- Built Elevations of the Bridge will be based on the Geodetic Survey North American Vertical Datum of 1988 and will be taken and recorded at the locations shown by the tables on this sheet. The completed tables will be given to the Engineer who will forward a copy to the Office of Bridge Design and the Region Office.

Registered Professional Engineer
REG. NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
31 Jul 2025

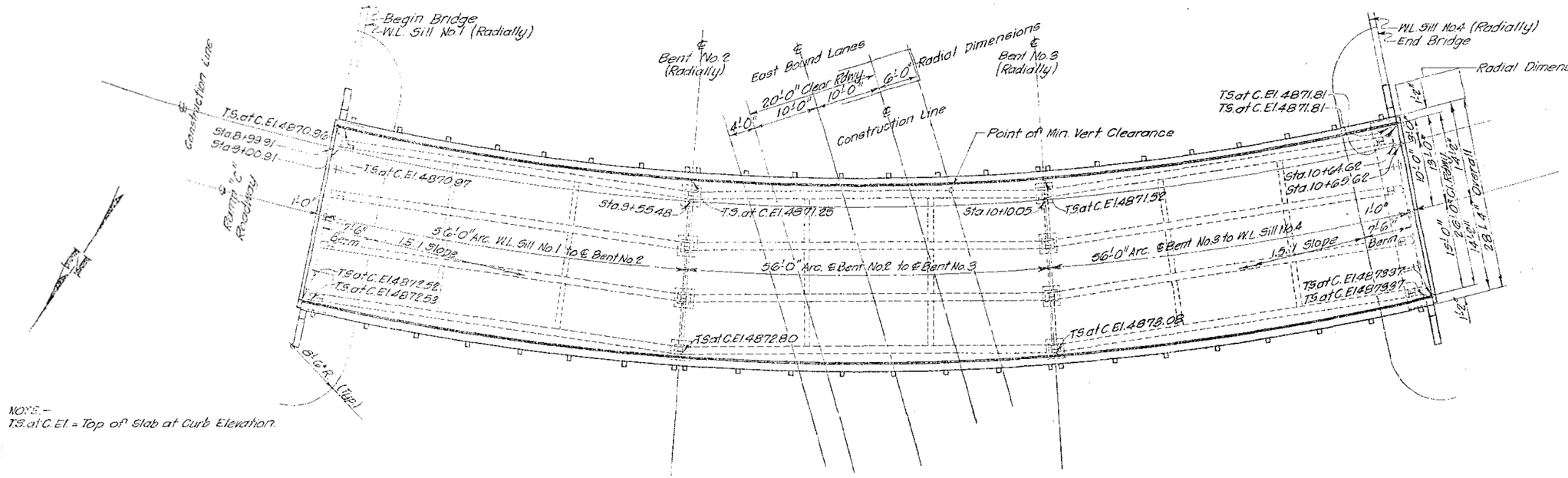
AS-BUILT ELEVATION SURVEY
FOR
170' - 0" TIMBER GIRDER BRIDGE
26'- 0" ROADWAY — 0° SKEW
OVER US 16 E — SEC. 31-T1S-R6E
STR. NO. 52-308-411 — P 0016(110)59

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENN0A46	0A46AB04		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E21	E40

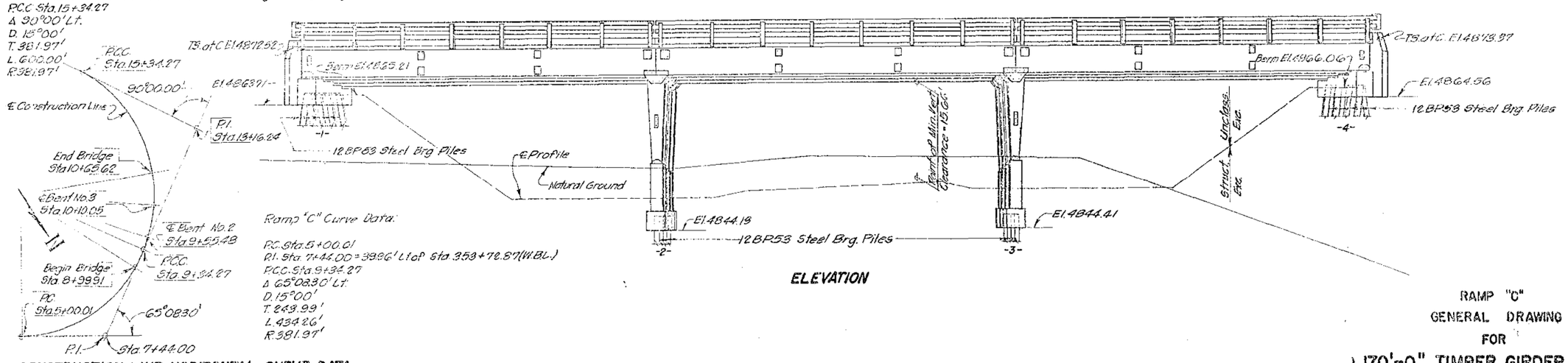
FOR BIDDING PURPOSES ONLY



PLAN

Ramp "C" Curve Data:

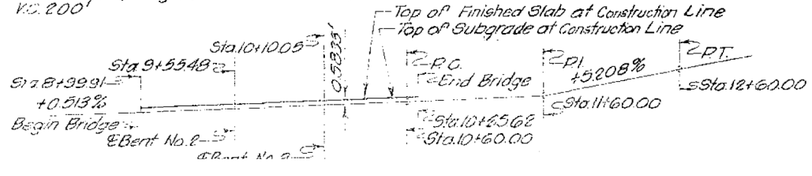
P.C.C. Sta. 9+34.27
P.I. Sta 13+16.24 = 2774.1' Rt. of Sta. 1+07.83 (Keystone Survey)
P.C.C. Sta. 15+34.27
Δ 90°00' Lt.
D. 15°00'
T. 381.97'
L. 600.00'
R. 381.97'



ELEVATION

CONSTRUCTION LINE HORIZONTAL CURVE DATA

P.I. Sta 11+60.00 at Construction Line
Elev. 4871.89 (Subgrade at Construction Line)
V.C. 200'



RAMP "C"
GENERAL DRAWING
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY

OVER E.B.L.-U.S. NO. 16 SEC. 31-T1S-R6E

STA. 8+99.91 TO 10+65.62 FOI7-1(9)

PENNINGTON COUNTY

SOUTH DAKOTA HS20-44

DEPARTMENT OF HIGHWAYS

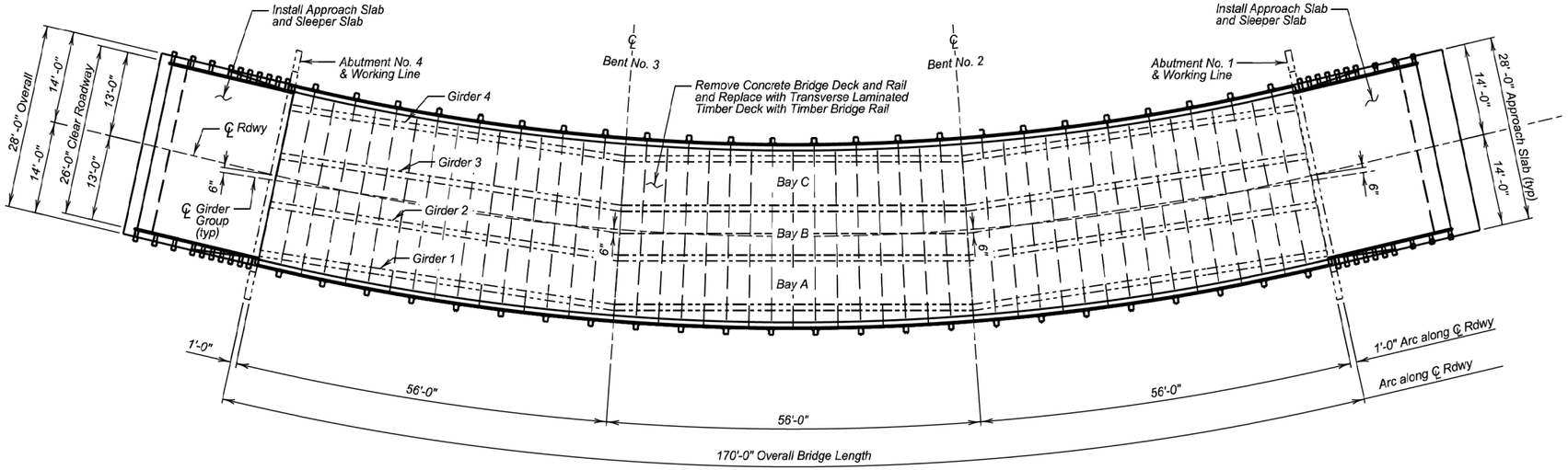
AUGUST 1966 6 OF 12

-X901-

ORIGINAL CONSTRUCTION PLANS

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E22	E40

FOR BIDDING PURPOSES ONLY



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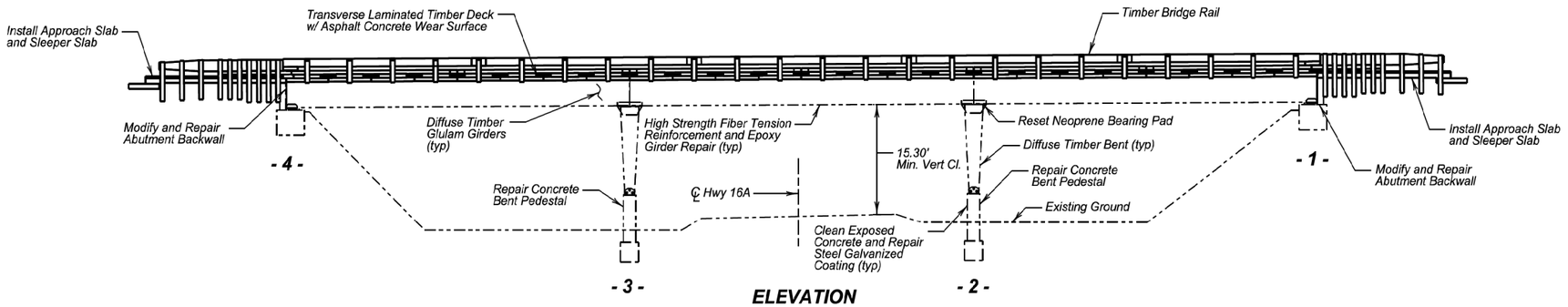


ELEVATION

LAYOUT

-X201-

INDEX OF BRIDGE SHEETS

GENERAL DRAWING

FOR

170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20
PCN 04FU	

PENNINGTON COUNTY

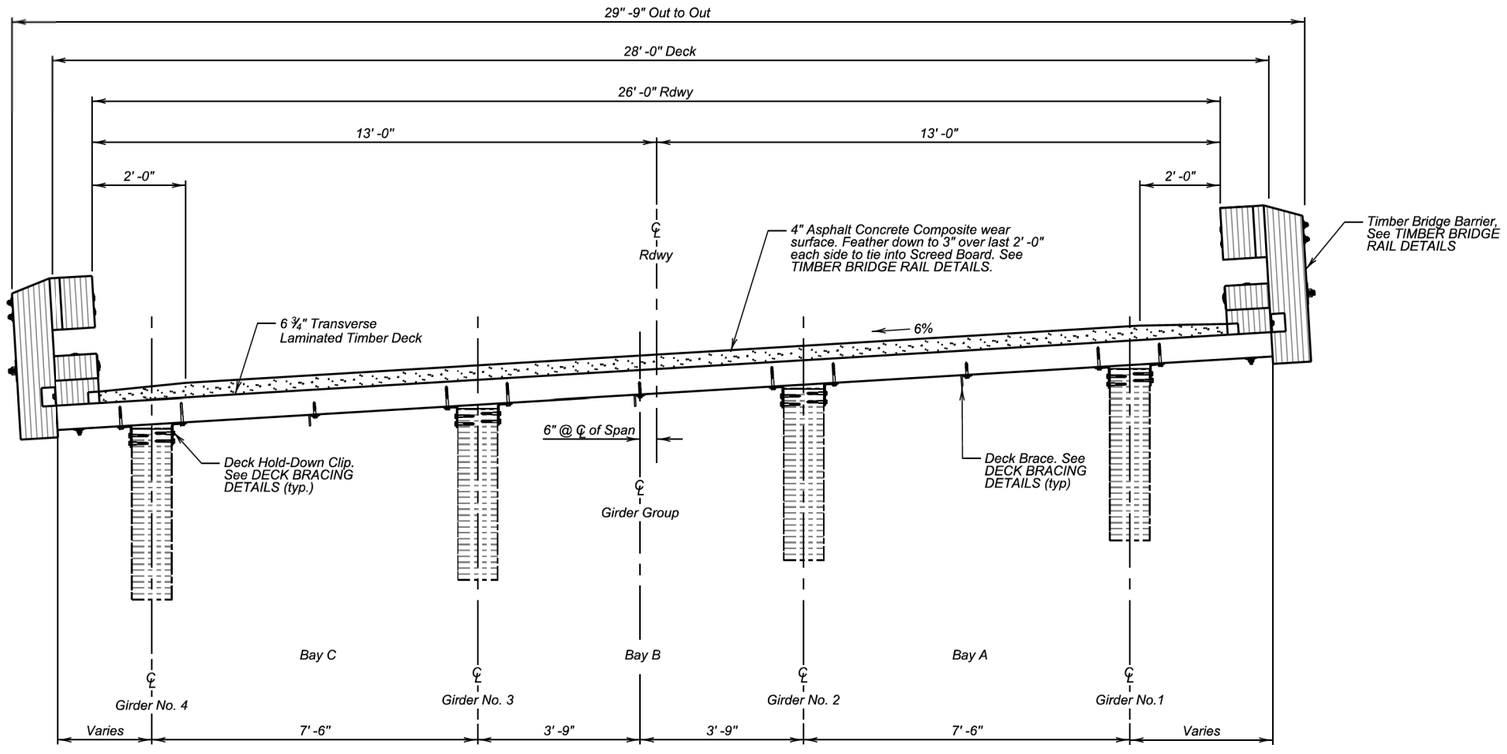
S. D. DEPT. OF TRANSPORTATION

FEBRUARY 2020

7 OF 12

ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



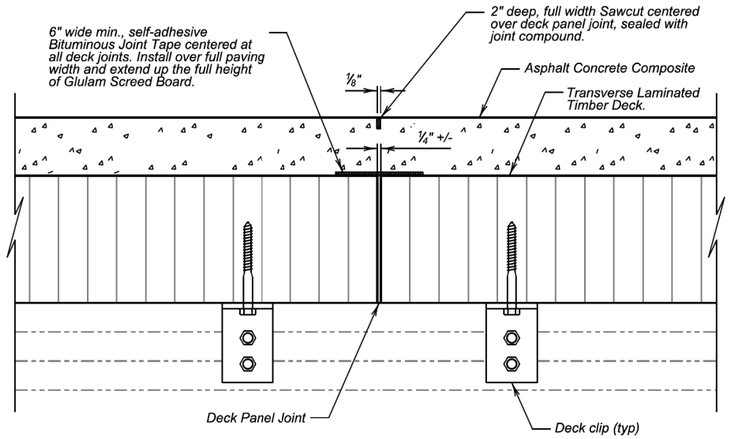
TYPICAL SECTION

TYPICAL DECK SECTION
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

ORIGINAL CONSTRUCTION PLANS

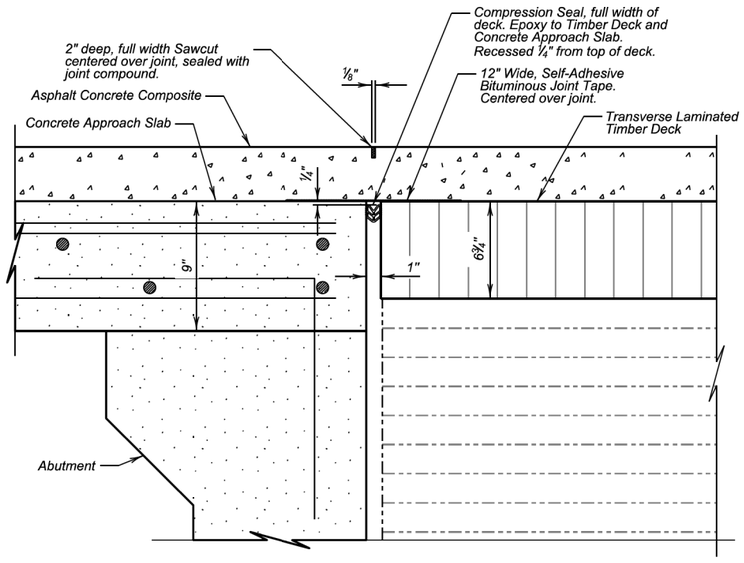


TYPICAL DECK JOINT

NOTE

1. *Install the bituminous joint tape, including laps if necessary, according to the manufacturer's recommendations.*
2. *Cost of bituminous joint tape, sawcut, and sealing of bituminous joints is incidental to the bid item Asphalt Concrete Composite. No additional payment will be made.*

COMPRESSION SEAL	
Location	***Length ft***
Abutment No. 1	*28*
Abutment No. 4	*28*



DECK JOINT AT APPROACH SLAB

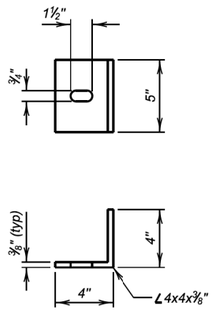
DECK JOINT DETAILS
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-T1S-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



POST BRACE

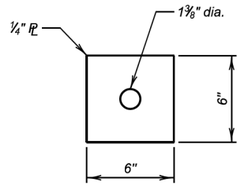
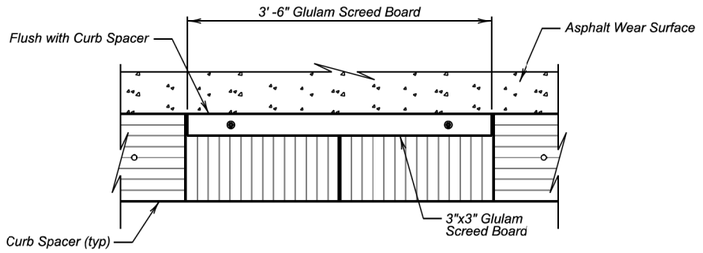


PLATE WASHER

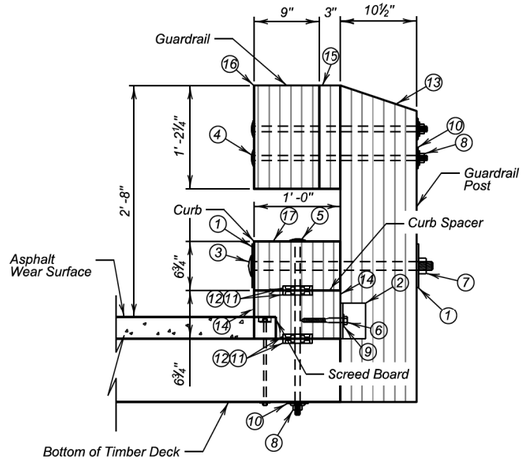


SECTION B-B

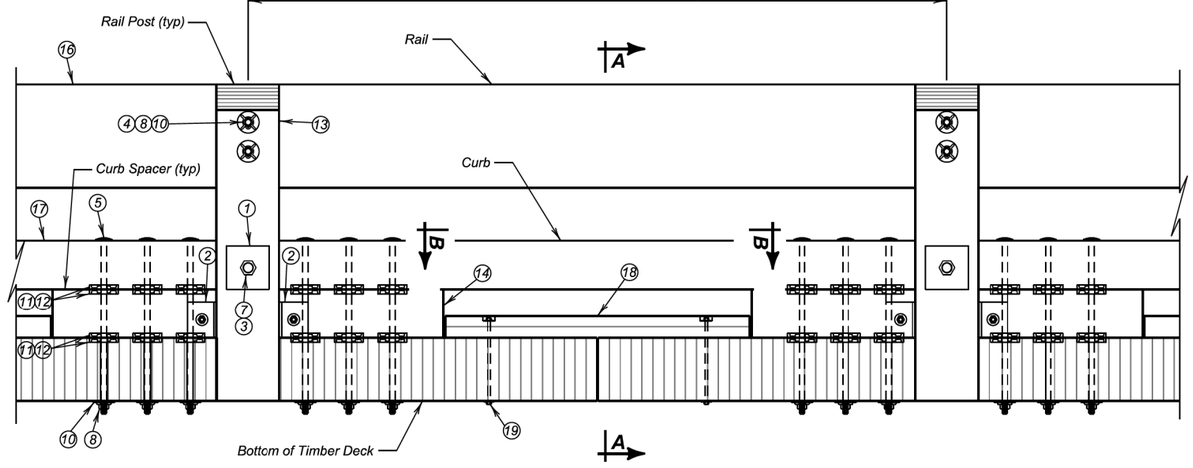
NOTE

Cost of Glulam Screed Board is incidental to the bid item Timber Bridge Rail. No additional payment will be made.

	TIMBER BRIDGE RAIL SPLICE
	PARTS FOR FABRICATION:
	ITEM
①	6" x 6" x ¼" Plate Washer
②	4" x 4" x ⅜" x 5" Long - Post Brace
	ITEM
③	1 ¼" x 25" Timber Bolt (No Lugs)
④	¾" x 24" Timber Bolt
⑤	¾" x 22" or 24" Timber Bolt
⑥	⅝" x 6" Lag Screw
⑦	1 ¼" Hex Nut
⑧	¾" Hex Nut
⑨	⅝" Flat Washer
⑩	¾" Maleable Iron Washer
⑪	Shear Plate - 4" dia. for ¾" Bolt
⑫	#10 x ¾" Wood Screw
⑲	⅝" Dia. x 10" Long Bolt
	TIMBER:
	ITEM
⑬	Rail Post - (GLB 8 ¾" x 10 ½" x 3'-5 ¾")
⑭	Curb Spacer - (GLB 6 ¾" x 1'-0" x 4'-6")
⑮	Post Spacer - (GLB 1'-2 ¼" x 3" x 8 ¾")
⑯	Rail - (GLB 1'-2 ¾" x 9")
⑰	Curb - (GLB 6 ¾" x 1'-0")
⑱	Screed Board (GLB 3" x 3" x 3' -6")



SECTION A-A



ELEVATION - TIMBER BRIDGE RAIL

TIMBER BRIDGE RAIL DETAILS
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

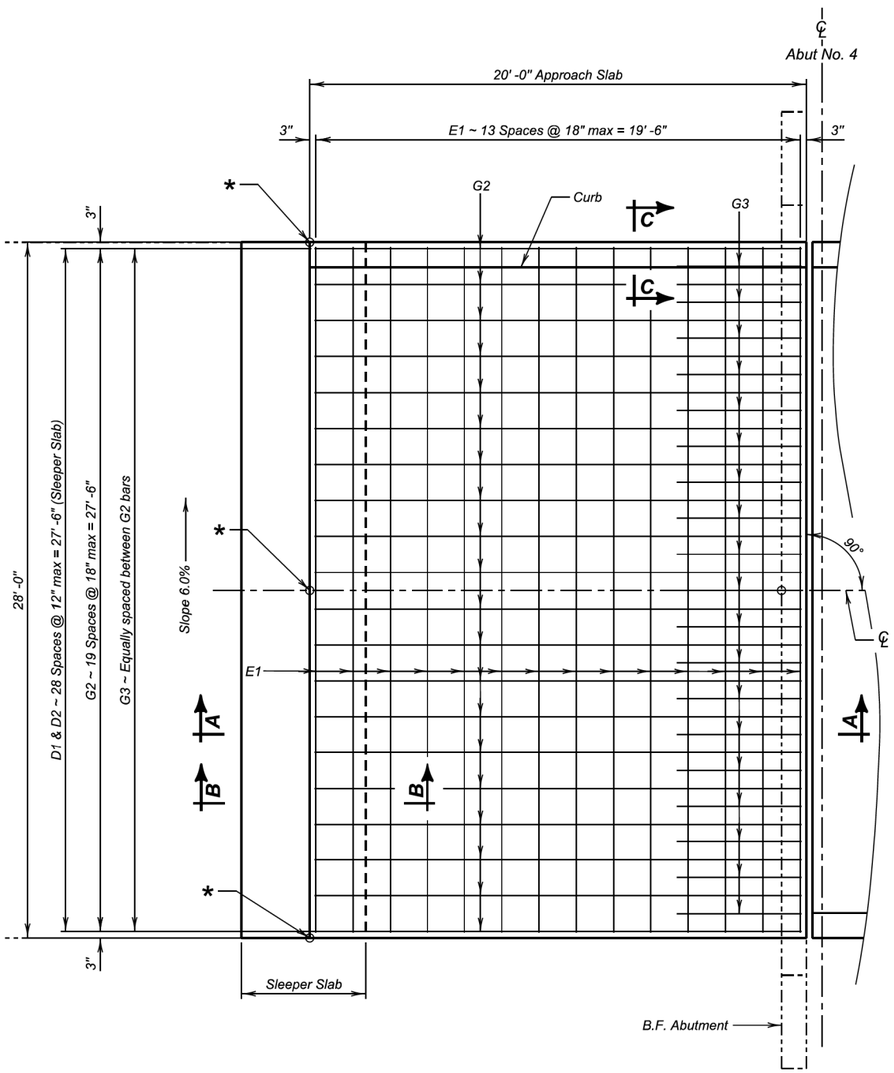
PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

ORIGINAL CONSTRUCTION PLANS

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E26	E40

FOR BIDDING PURPOSES ONLY

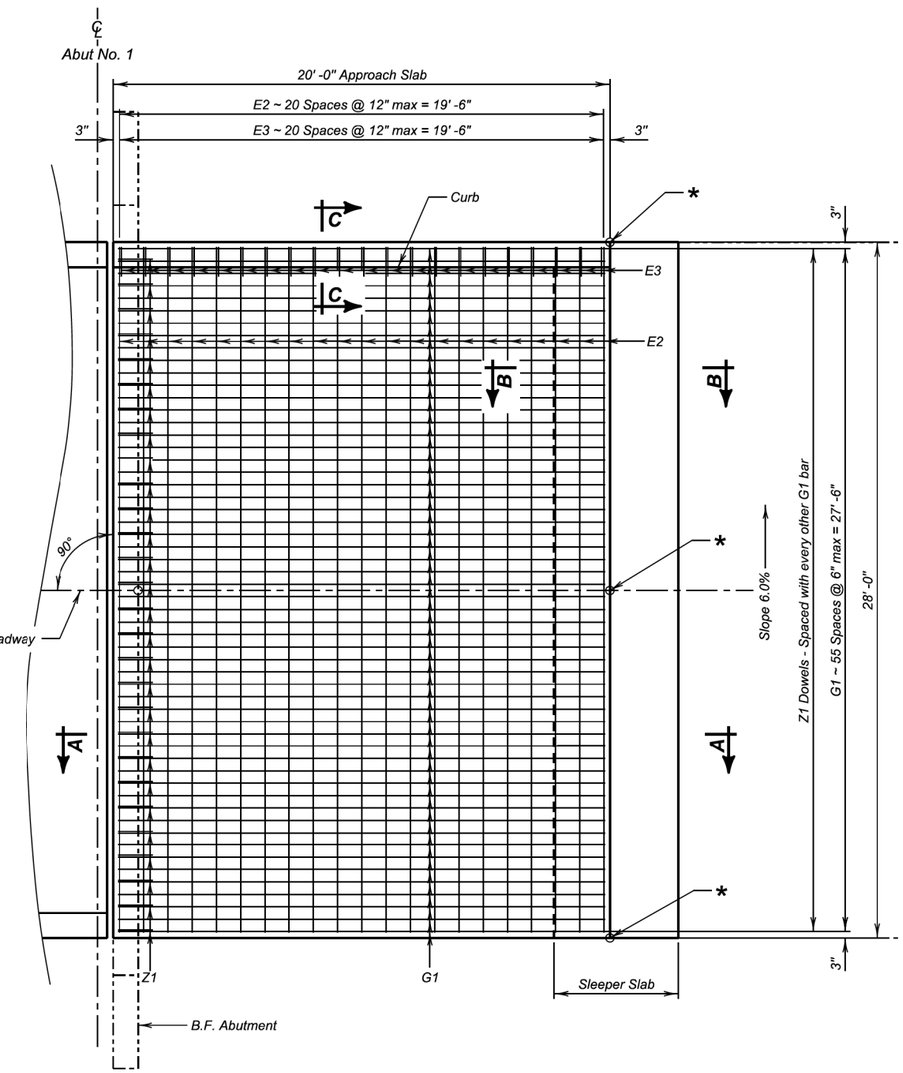
* *Elevations may need to be adjusted for a smooth ride from the final bridge deck elevations to final pavement elevations. Elevations will be taken and adjusted in the field during construction.*



PLAN - AT ABUTMENT NO. 4

(Top Steel)

(Similar at Abutment No. 1)



PLAN - AT ABUTMENT NO. 1

(Bottom Steel)

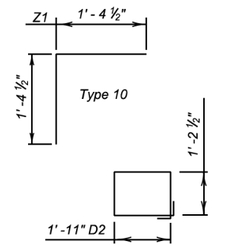
(Similar at Abutment No. 4)

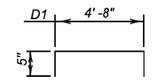
REINFORCING SCHEDULE

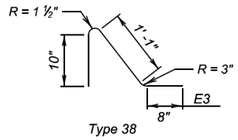
(For Two Approach Slabs and Two Sleeper Slabs)

Mk.	No.	Size	Length	Type
Sleeper Slabs				
C1	24	5	27' - 6"	Str.
D1	116	4	5' - 6"	2
D2	29	4	6' - 11"	T2
Approach Slabs				
E1	42	4	27' - 6"	Str.
E2	42	6	27' - 6"	Str.
E3	42	4	3' - 0"	38
G1	112	8	19' - 6"	Str.
G2	42	4	19' - 6"	Str.
G3	38	4	5' - 0"	Str.
Z1*	42	4	2' - 9"	10

NOTES:
All Bars to be Epoxy Coated.
All dimensions are out to out of bars.
**Install Dowel in Concrete*







ESTIMATED QUANTITIES

(For Two Approach Slabs and Two Sleeper Slabs)

ITEM	UNIT	QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	125
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	32
Install Dowel in Concrete	Each	56

1. 32.3 Cu. Yds. Concrete in Approach Slab.
2. 9684 Lbs. Epoxy Coated Re-Steel in Approach Slab.
3. 8.0 Cu. Yds. Concrete in Sleeper Slab.
4. 1388 Lbs. Epoxy Coated Re-Steel in Sleeper Slab.

Items 1 thru 4 are approximate quantities contained in the above bid items and are for information only.

APPROACH SLAB PLAN
FOR
170'-0" TIMBER GIRDER BRIDGE

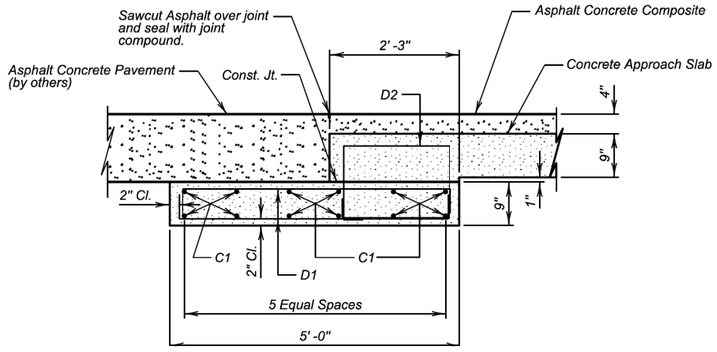
26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62 — P016A(08)59
STR. NO. 52-308-411 — HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

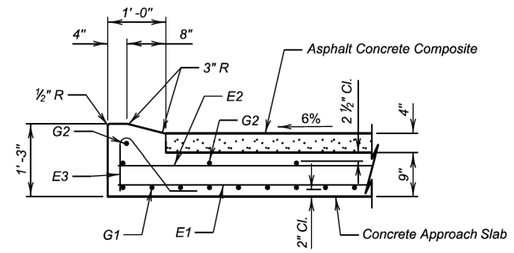
11 OF 12

ORIGINAL CONSTRUCTION PLANS

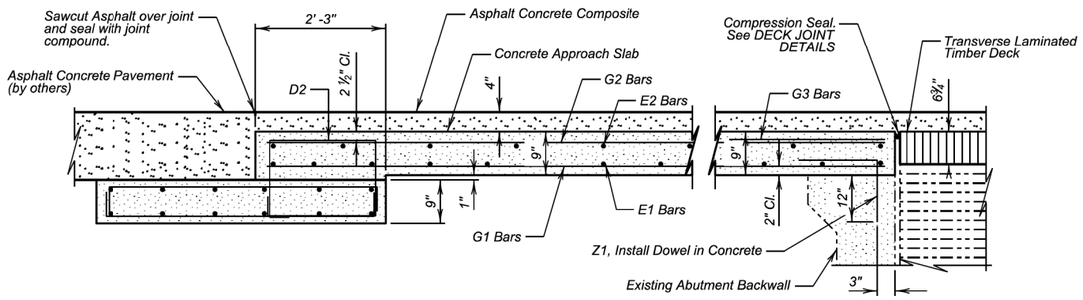
FOR BIDDING PURPOSES ONLY



SECTION B-B
SLEEPER SLAB AT ABUTMENT



SECTION C-C
CURB DETAIL



SECTION A-A
APPROACH SLAB AT ABUTMENT

APPROACH SLAB DETAILS
FOR
170'-0" TIMBER GIRDER BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 8+99.91 TO 10+65.62	P016A(08)59
STR. NO. 52-308-411	HS-20

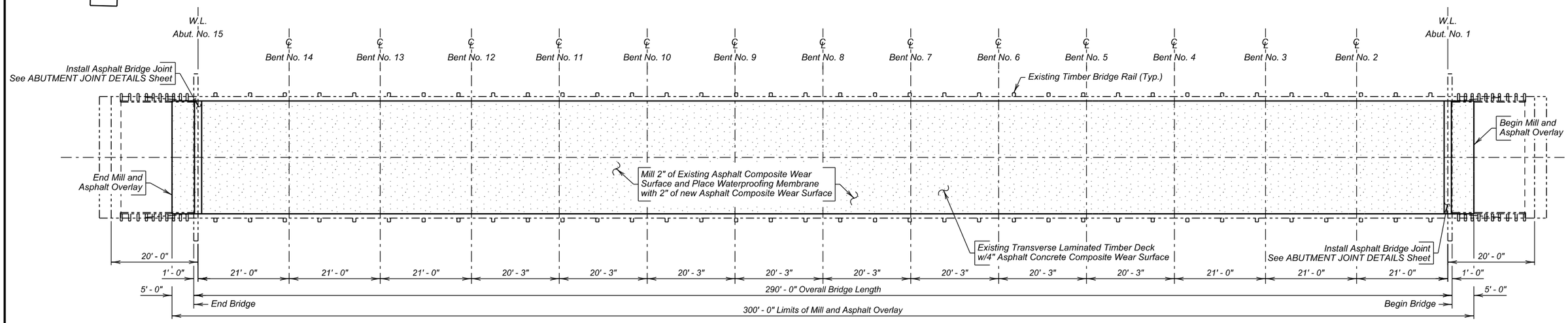
PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

12 OF 12

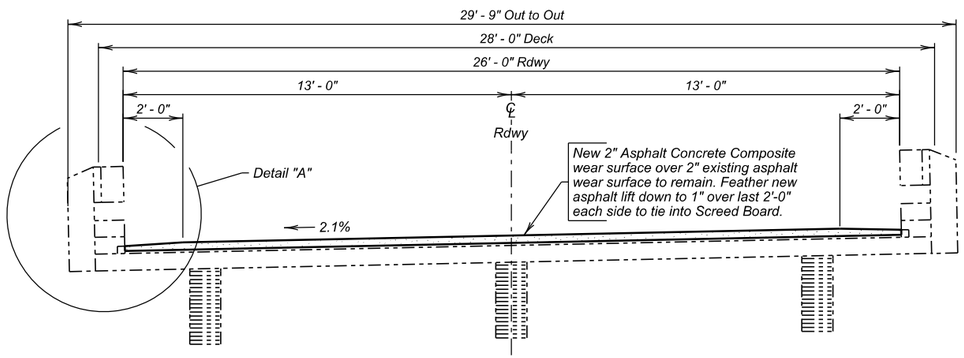
ORIGINAL CONSTRUCTION PLANS

Revised 07/31/2025 AMB

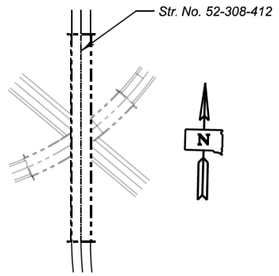
FOR BIDDING PURPOSES ONLY



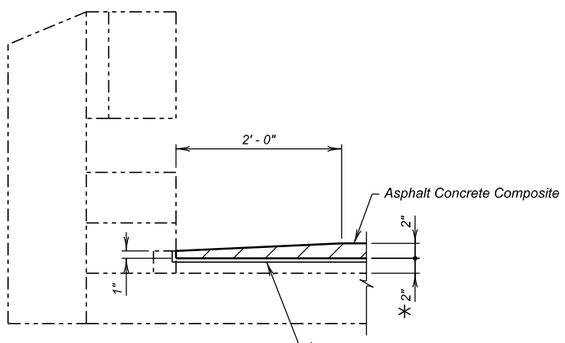
PLAN



TYPICAL SECTION



LAYOUT



DETAIL "A"

≠ Extend Membrane upward along Face of Curb/Screed Board

INDEX OF BRIDGE SHEETS-

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Cold Milling Asphalt Concrete	Sq. Yd.	866.7
Asphalt Concrete Bridge Deck Overlay	Sq. Yd.	866.7

Registered Professional Engineer
REG. NO. 13271
AARON M. BUETTNER
SOUTH DAKOTA
31 Jul 2025

PLANS BY :
ALFRED BENESCH & CO.

LAYOUT FOR UPGRADING AND TYPICAL DECK SECTION
FOR
290' - 0" TIMBER ARCH BRIDGE

26' - 0" ROADWAY
OVER US 16A W
STR. NO. 52-308-412
PCN 0A46

0° SKEW
SEC. 31-T1S-R6E
P 0016(110)59

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

1 OF 13

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENN0A46	0A46AB12		BRIDGE ENGINEER

ESTIMATE OF STRUCTURE QUANTITIES

DESCRIPTION	QUANTITY	UNIT	REMARKS
Bridge Elevation Survey	Lump Sum	LS	
Asphalt Concrete Bridge Deck Overlay	866.7	Sq Yd	See Special Provision and Notes
Asphalt Bridge Joint	52	Ft	
Cold Milling Asphalt Concrete	867	Sq Yd	See Special Provision and Notes

SPECIFICATIONS FOR BRIDGE

Construction Specifications. South Dakota Standard Specifications for Roads and Bridges, 2025 Edition and Required Provisions, Supplemental Specifications and Special Provisions as included in the Proposal.

DETAILS AND DIMENSIONS OF EXISTING BRIDGE

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

SCOPE OF BRIDGE WORK & SEQUENCE OF OPERATIONS

1. Mill 2" of the existing asphalt composite wear surface. Take care to ensure that mill depths are accurate. It is imperative that the underlying timber deck not be damaged during the milling operation.
2. Install bridge plate at abutment joints.
3. Place single component, hot applied elastomeric membrane over the entire milled surface.
4. Apply asphalt binder over single component, hot applied elastomeric membrane.
5. Seat a nonwoven polypropylene paving fabric into the single component, hot applied elastomeric membrane.
6. Place 2" thick asphalt composite wear surface.
7. Complete full-depth asphalt overlay removal as necessary at abutments and install asphalt bridge joint.

BRIDGE LAYOUT AND ORIENTATION

The original construction plans have been provided at the end of the Overlay Plans. The Contractor is to be aware that the bridge layout has been revised to current practices and is opposite of shown in the original construction plans. This includes girder, abutment, bent, bracing, strut, and span numbering. The Contractor will record notes and as-built drawings according to the new layout as shown in the Overlay Plans.

ASPHALT BRIDGE JOINT AT ABUTMENT

1. The asphalt overlay at the abutment expansion joints will be removed to the top of the membrane and to the width indicated in the plans. Take care not to damage the membrane sheet during the asphalt removal process. The asphalt and aggregate joint system as noted on the plans will be placed in this removal area. The asphalt bridge joint system shall be one of the approved types for Asphalt Growth & Asphalt Bridge Joint.
2. The intent is to place an asphalt and aggregate joint system in the bridge deck with a uniform thickness of 4 inches.
3. Milling and placement of the new asphalt overlay will be completed prior to placing the Asphalt Bridge Joint.
4. The costs of removing the asphalt overlay and membrane material as well as furnishing and placing all material for the joint system including the bridge plate, all labor, equipment, tools, materials and any incidentals necessary to complete the work satisfactorily will be paid for at the contract price per foot for "Asphalt Bridge Joint."

BRIDGE ELEVATION SURVEY FOR ASPHALT CONCRETE BRIDGE DECK OVERLAY

The Contractor will take bridge deck elevation shots at the locations shown by Table of Elevations. The Contractor will take an elevation reading at these locations on the milled asphalt surface prior to any placement of the asphalt concrete bridge deck overlay. After the Asphalt Concrete Deck Overlay is in-place the Contractor will take an elevation reading at these locations on the finished asphalt concrete surface. The elevations will be used to determine the as-built thickness of the asphalt concrete bridge deck overlay.

The elevations to be recorded in these tables will be based on the National Geodetic Survey (NGS) North American Vertical Datum of 1988 (NAV88). The Engineer will provide the Contractor with a description, elevation and location of the nearest benchmark that has a NAVD88 established elevation for the Contractor's use. The benchmark shown in the plans has not been tied to the NAVD88. The Contractor will be responsible for establishing a NAVD88 elevation for the benchmark provided in the plans. All costs associated with obtaining the NAVD88 elevations at the locations shown in the table and for the benchmark shown in the plans, including all equipment, labor and any incidentals required will be included in the contract lump sum price for "Bridge Elevation Survey

ASHPALT CONCRETE BRIDGE DECK OVERLAY

1. An asphalt concrete overlay system shall be placed on the bridge deck. The system shall consist of the following components:

   A single component, hot applied, elastomeric membrane placed over the entire milled asphalt surface.

   A performance graded (PG) binder as set forth in Section 890 of the Standard Specifications. The performance grade shall be PG 70-34.

   A nonwoven polypropylene paving fabric seated into the single component, hot applied, elastomeric membrane.

   Section 324 will apply except that a Class G, Type 1 asphalt concrete overlay will be specified and the asphalt binder used in the mixture will be PG 64-34 or PG 70-34. Thickness shall be as indicated in the details.

2. The material for the single component, hot applied, elastomeric membrane shall be Roadsaver 221 as manufactured by:

   Crafco, Inc.
   6165 W Detroit Street
   Chandler, AZ 85226
   Telephone No. 602-276-0406
   www.crafco.com.

   The membrane material shall be sprayed or spread to a uniform thickness at the application temperature recommended by the manufacturer. After cooling, it shall form a tough resilient membrane, well bonded to the milled asphalt surface.

3. The nonwoven polypropylene paving fabric shall be Petromat MPV500 as manufactured by:

   TenCate Geosynthetics Americas (A Solmax Company)
   365 South Holland Drive
   Pendergrass, GA 30567
   Telephone No. 706-693-2226
   www.tencategeo.us

   The nonwoven polypropylene paving fabric may be furnished either in rolls or sheets. Upon installation, the material shall be free of visible external defects, such as holes, ragged or untrue edges, breaks, cracks, tears, protuberances, and indentations.

Registered Professional Engineer
REG NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
29 Sep 2025

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES
FOR
290'-0" TIMBER ARCH BRIDGE

STR. NO. 52-308-412
APRIL 2025

DESIGNED BY:	DRAWN BY:	CHECKED BY:	
MJK	NTF	ZZJ	
PENN0A46	0A46AB02		BRIDGE ENGINEER

FOR BIDDING PURPOSES ONLY

ASHPALT CONCRETE BRIDGE DECK OVERLAY CONT.

4. There is an existing asphalt concrete overlay on the bridge deck. The existing overlay shall be milled to a depth of 2” (except that within 2’-0” of the rail, the mill depth shall be transitioned to 1” as shown in the plans), and any protrusions or irregularities over ¼” shall be corrected by mechanical means. Prior to applying the single component, hot applied, elastomeric membrane, all dust and loose material shall be removed from the deck with compressed air. Water shall not be used to clean the deck. Areas not to be coated with the single component, hot applied, elastomeric membrane shall be protected using masking tape, roll paper, roofing felt paper or other materials suitable to protect the surfaces.

5. Work shall not be performed during wet weather conditions, nor when the deck and ambient air temperatures are below 50° F. The deck surface shall be thoroughly dry at the time of the installation of the single component, hot applied, elastomeric membrane.

6. The single component, hot applied, elastomeric membrane shall be applied to the prepared deck surface at a uniform minimum rate necessary to achieve an applied thickness of 90-110 mils (1 mil = 0.001 inch). During application the thickness may be measured by the Engineer. Lack of reasonably uniform application shall be cause for termination of the work until remedial measures are taken. Primer, if required, and membrane shall be placed up the curb faces for a height of two inches above the plan thickness of Type 1 Class G Asphalt Concrete Overlay. No vehicles, including mechanical spreaders, shall be allowed to operate on the bare membrane.

   Any openings or gaps on the downslope edge of the deck shall be plugged as necessary to prevent the membrane material or the Asphalt Binder from running down the edge of the deck.

7. As soon as practical, but in all cases no later than 24 hours after membrane application, the nonwoven polypropylene paving fabric shall be placed from gutter line to gutter line. Prior to placing the paving fabric, the PG 70-34 binder shall be applied to the top of the elastomeric membrane at a uniform coverage of approximately 0.23 gallons per square yard. The Asphalt Binder shall be applied for the full width of the bridge deck from gutter line to gutter line. Asphalt Binder, once sprayed on the deck, is not permitted to be pushed or relocated by hand in any way.

   The nonwoven polypropylene paving fabric shall be laid parallel to the centerline of the bridge and shall be placed on the surface while the Asphalt Binder is still tacky. The paving fabric shall be butted together at longitudinal and transverse joints. Overlapping will not be permitted. The maximum allowable space between adjoining sections of paving fabric shall be one inch. Following placement of paving fabric, a bead of compatible mastic or hot applied membrane shall be applied where the paving fabric contacts the curbs, and in cracks between adjoining sections that are apart by more than 3/8 inch. The bead shall fill the void preventing water from entering at this point. The completed membrane with the paving fabric shall be subject to the approval of the Engineer prior to the placement of the Type 1 Class G Asphalt Concrete Overlay. The Contractor shall be responsible for maintaining the condition of the membrane and paving fabric system on the bridge deck until covered with the Type 1 Class G Asphalt Concrete to the thickness required by the plans and specifications. Only rubber-tired vehicles necessary for construction shall be allowed on the paving fabric.

8. The Type 1 Class G Asphalt Concrete shall be placed, spread and compacted, in accordance with the specifications with the following modifications: A tack or prime coat shall not be used on the top surface of the nonwoven polypropylene paving fabric. The asphalt concrete shall be dumped directly into the laydown machine hopper. After filling the hopper, the truck shall pull forward and shall not be in contact with the lay-down machine while it is moving. Dumping the mixture onto the deck ahead of the lay-down machine shall not be permitted. The asphalt concrete shall be spread and rolled in such a manner that the membrane and paving fabric will not be damaged. The minimum temperature of the asphalt concrete at the time compaction begins shall be 250°F. To assure this temperature, the mixing discharge temperature may be up to 30°F higher than the job-mix formula. The use of vibratory rollers, with the vibrator on, will not be permitted. A minimum percent compaction is not specified, however compaction shall be accomplished to the satisfaction of the Engineer. The Contractor shall exercise extreme care when placing the paver and/or miscellaneous equipment on the completed membrane with paving fabric. Any damage to the paving fabric and/or membrane caused by the asphalt application shall be repaired or replaced as directed by the Engineer at no cost to the Department.

   The deck shall be paved with asphalt within 14 days of fabric placement or as approved by the Engineer.

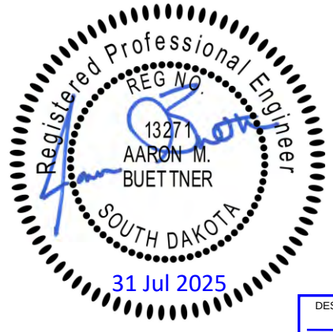
   It is not advisable to pave the deck the same day as the membrane placement, unless during cooler temperatures, 75°F or less. Overnight cure of the membrane with paving fabric has been shown to help solidify the binder to reduce impacts of operating paving equipment on the membrane with paving fabric.

   The only traffic permitted on the deck after the membrane with paving fabric is placed shall be the necessary workers and equipment to place the asphalt overlay.

   The contractor may be required to use a blotting sand on top of the paving fabric to prevent the paving fabric from adhering to asphalt paving equipment, as determined by the Engineer. The material shall be blotted and then broomed to remove any excess sand.

9. Install the single component, hot applied, elastomeric membrane and the nonwoven polypropylene paving fabric under the on-site supervision of a third-party representative from each respective manufacturer. The representative must not be employed by the contractor, subcontractor or installer. The representative must be on site for the full duration of the installation and testing, and during placement of the asphalt overlay. Do not substitute the manufacturer's representative listed in the submittal without prior written approval from the Engineer.

10. All costs associated with furnishing and installing the asphalt overlay system on the bridge deck including the cost of the single component, hot applied, elastomeric membrane; the Asphalt Binder; the nonwoven polypropylene paving fabric and the Type 1 Class G Asphalt Concrete shall be included in the price bid per square foot for ASPHALT CONCRETE BRIDGE DECK OVERLAY. The cost shall include all equipment, labor and incidentals required to adequately install the Asphalt Concrete Overlay system on the Bridge Deck.



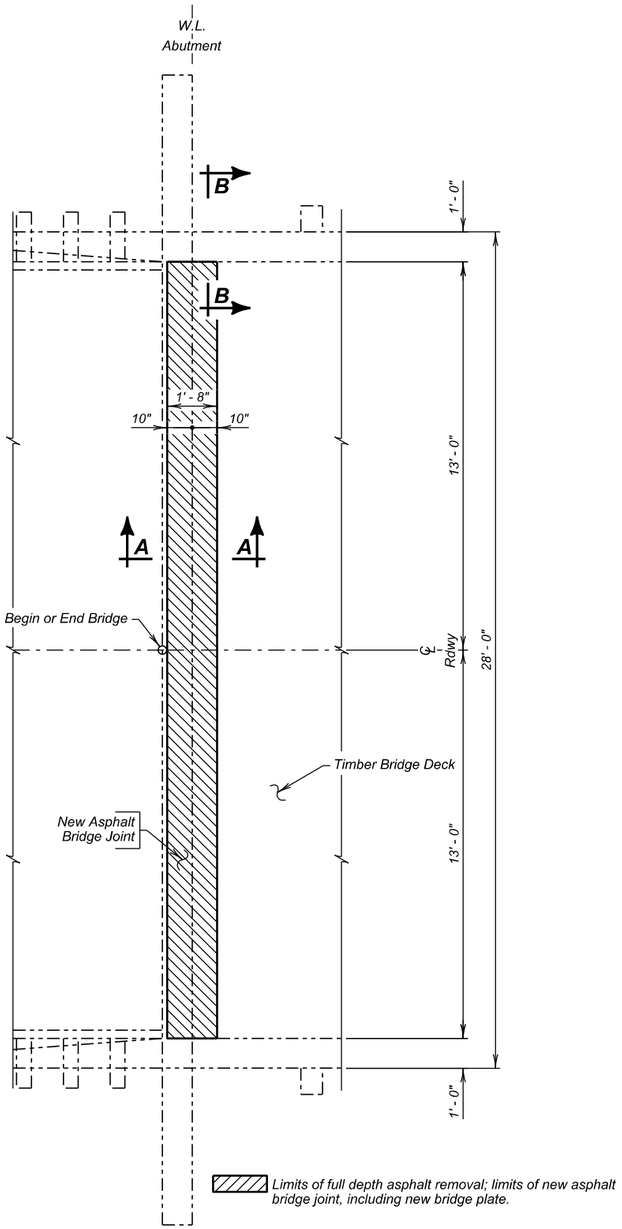
NOTES (CONTINUED)
FOR
290’-0” TIMBER ARCH BRIDGE

STR. NO. 52-308-412

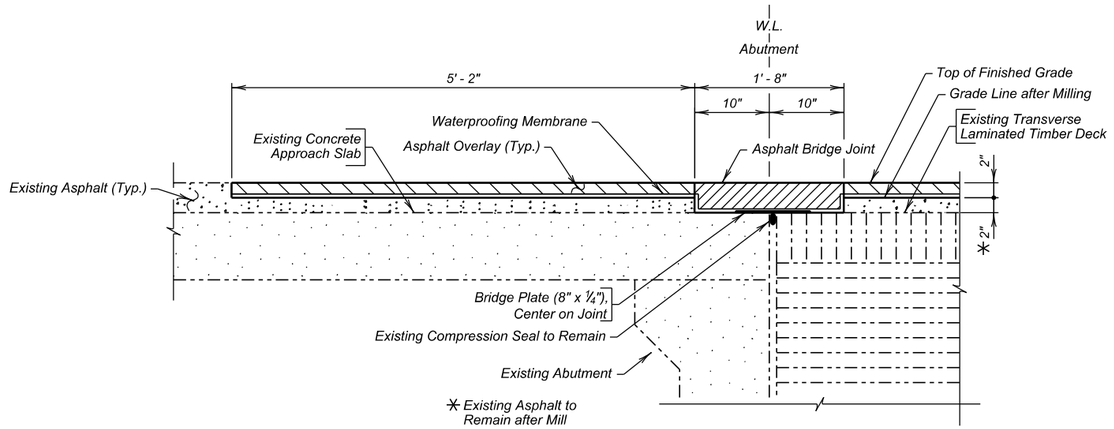
APRIL 2025

DESIGNED BY:	DRAWN BY:	CHECKED BY:	
MJK	NTF	ZZJ	BRIDGE ENGINEER
PENN0A46	0A46AB03		

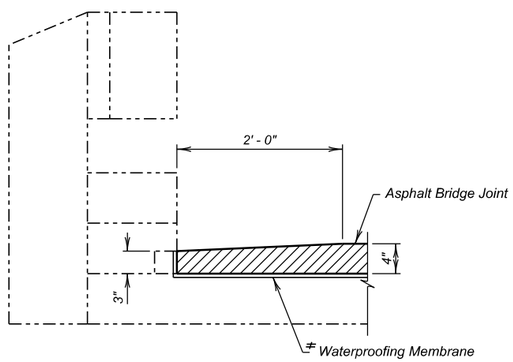
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E31	E40



PLAN



SECTION A - A



SECTION B - B

≠ *Extend Membrane upward along Face of Curb/Screed Board*

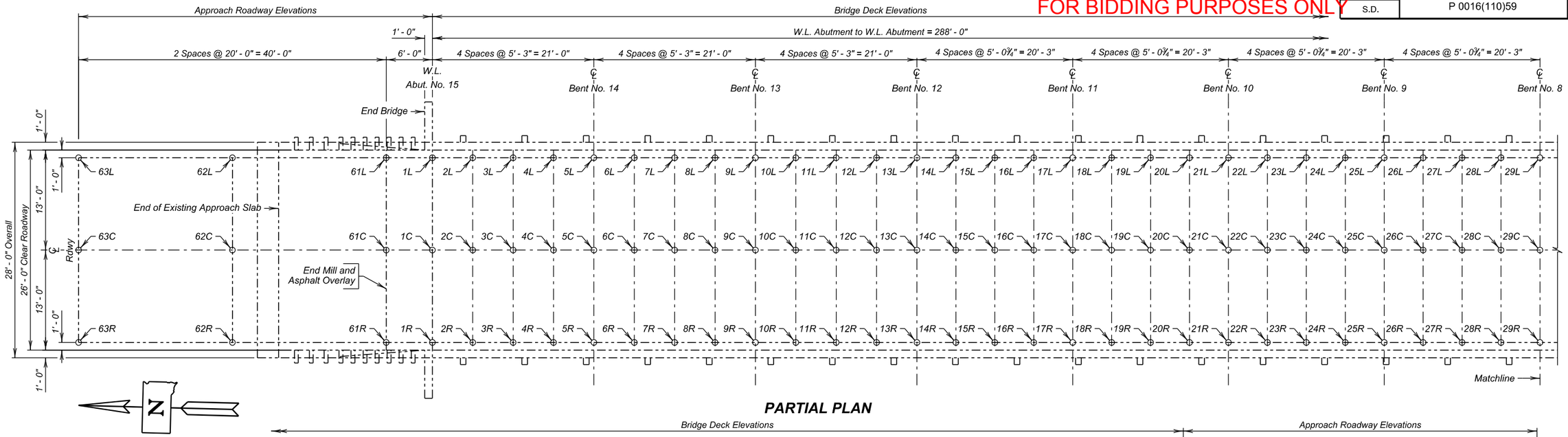
ESTIMATED QUANTITIES (For Two Approach Slabs)		
ITEM	**UNIT**	**QUANTITY**
Asphalt Bridge Joint	Ft.	52

Registered Professional Engineer
REG NO.
13271
AARON M.
BUETTNER
SOUTH DAKOTA
31 Jul 2025

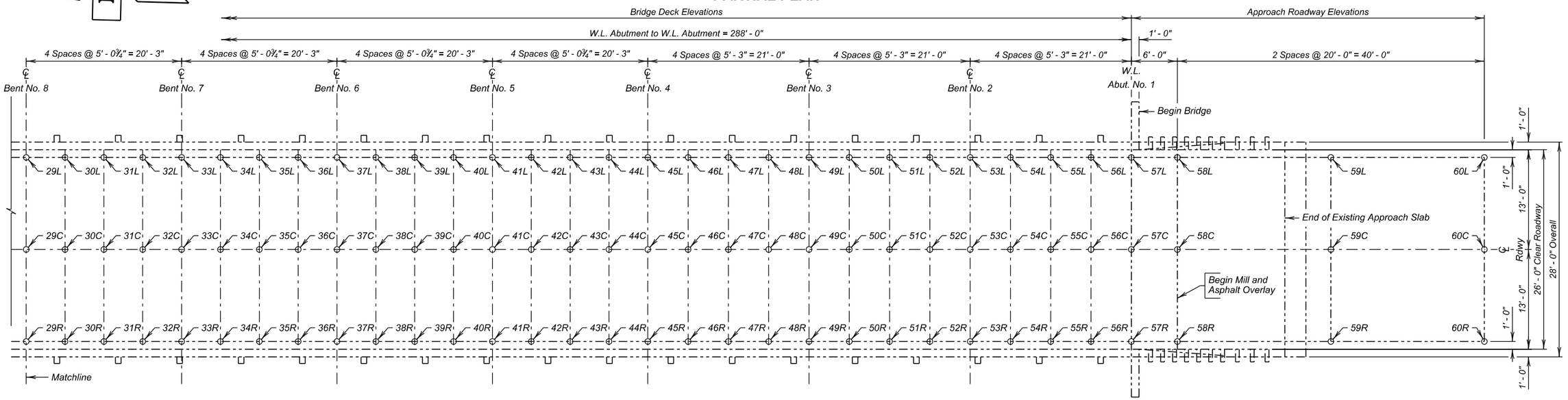
ABUTMENT JOINT DETAILS
FOR
290' - 0" TIMBER ARCH BRIDGE
26' - 0" ROADWAY
OVER US 16A W
STR. NO. 52-308-412
0° SKEW
SEC. 31-T1S-R6E
P 0016(110)59
PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENN0A46	0A46AB14		BRIDGE ENGINEER

FOR BIDDING PURPOSES ONLY



PARTIAL PLAN



PARTIAL PLAN

Registered Professional Engineer
REG NO. 13271
AARON M. BUETTNER
SOUTH DAKOTA
31 Jul 2025

AS-BUILT ELEVATION SURVEY (A)
FOR
290' - 0" TIMBER ARCH BRIDGE

26' - 0" ROADWAY
OVER US 16A W
STR. NO. 52-308-412

0° SKEW
SEC. 31-T1S-R6E
P 0016(110)59

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	
PENN0A46	0A46AB15		BRIDGE ENGINEER

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E33	E40

FOR BIDDING PURPOSES ONLY

Table of As-Built Elevations - Bridge Deck

Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d
1L				1C				1R			
2L				2C				2R			
3L				3C				3R			
4L				4C				4R			
5L				5C				5R			
6L				6C				6R			
7L				7C				7R			
8L				8C				8R			
9L				9C				9R			
10L				10C				10R			
11L				11C				11R			
12L				12C				12R			
13L				13C				13R			
14L				14C				14R			
15L				15C				15R			
16L				16C				16R			
17L				17C				17R			
18L				18C				18R			
19L				19C				19R			
20L				20C				20R			
21L				21C				21R			
22L				22C				22R			
23L				23C				23R			
24L				24C				24R			
25L				25C				25R			
26L				26C				26R			
27L				27C				27R			
28L				28C				28R			
29L				29C				29R			
30L				30C				30R			
31L				31C				31R			
32L				32C				32R			
33L				33C				33R			
34L				34C				34R			
35L				35C				35R			
36L				36C				36R			
37L				37C				37R			
38L				38C				38R			
39L				39C				39R			
40L				40C				40R			
41L				41C				41R			
42L				42C				42R			
43L				43C				43R			
44L				44C				44R			
45L				45C				45R			
46L				46C				46R			
47L				47C				47R			
48L				48C				48R			
49L				49C				49R			
50L				50C				50R			
51L				51C				51R			
52L				52C				52R			
53L				53C				53R			
54L				54C				54R			
55L				55C				55R			
56L				56C				56R			
57L				57C				57R			

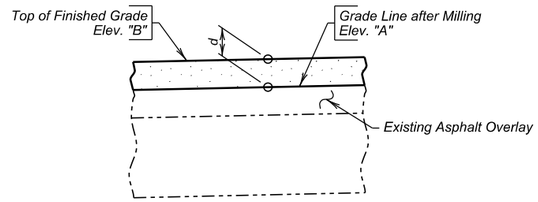


Table of As-Built Elevations - Approach Roadway

Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d	Location	Elev. "A"	Elev. "B"	d
58L				58C				58R			
59L				59C				59R			
60L				60C				60R			
61L				61C				61R			
62L				62C				62R			
63L				63C				63R			

Table of Elevations - Bridge Survey Markers

Location	Station - Offset	Elevation
Begin Bridge		
End Bridge		

ESTIMATED QUANTITIES

ITEM	UNIT	QUANTITY
Bridge Elevation Survey	L.S.	Lump Sum

NOTE:
The Contractor will be responsible for producing the As - Built Elevation Survey soon after construction is complete and before the bridge is opened to traffic. The As- Built Elevations of the Bridge will be based on the Geodetic Survey North American Vertical Datum of 1988 and will be taken and recorded at the locations shown by the tables on this sheet. The completed tables will be given to the Engineer who will forward a copy to the Office of Bridge Design and the Region Office.

Registered Professional Engineer
REG NO. 13271
AARON M. BUETTNER
SOUTH DAKOTA
31 Jul 2025

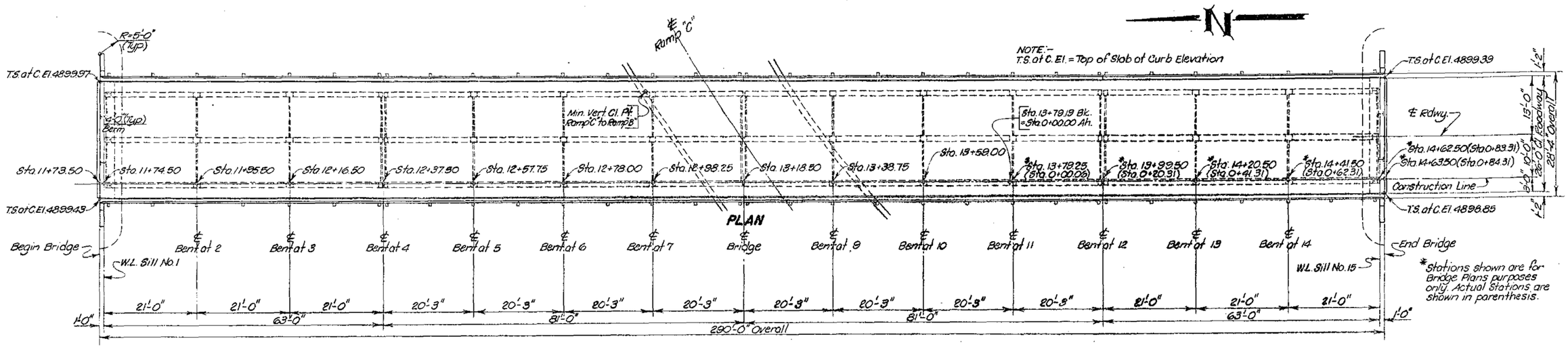
AS-BUILT ELEVATION SURVEY (B)
FOR
290' - 0" TIMBER ARCH BRIDGE
26' - 0" ROADWAY — 0° SKEW
OVER US 16A W — SEC. 31-T1S-R6E
STR. NO. 52-308-412 — P 0016(110)59

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
APRIL 2025

DESIGNED BY	CK. DES. BY	DRAFTED BY	
MJK	ZZJ	NTF	BRIDGE ENGINEER
PENN0A46	0A46AB16		

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E34	E40

FOR BIDDING PURPOSES ONLY



RAMP "B"

GENERAL DRAWING

FOR

290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY

OVER RAMP "C" & E.B.L.-U.S. NO. 16 SEC. 31-T1S-R6E

STA. 11+73.50 TO 14+63.50 F017-1(9)

PENNINGTON COUNTY

SOUTH DAKOTA HS20-44

DEPARTMENT OF HIGHWAYS

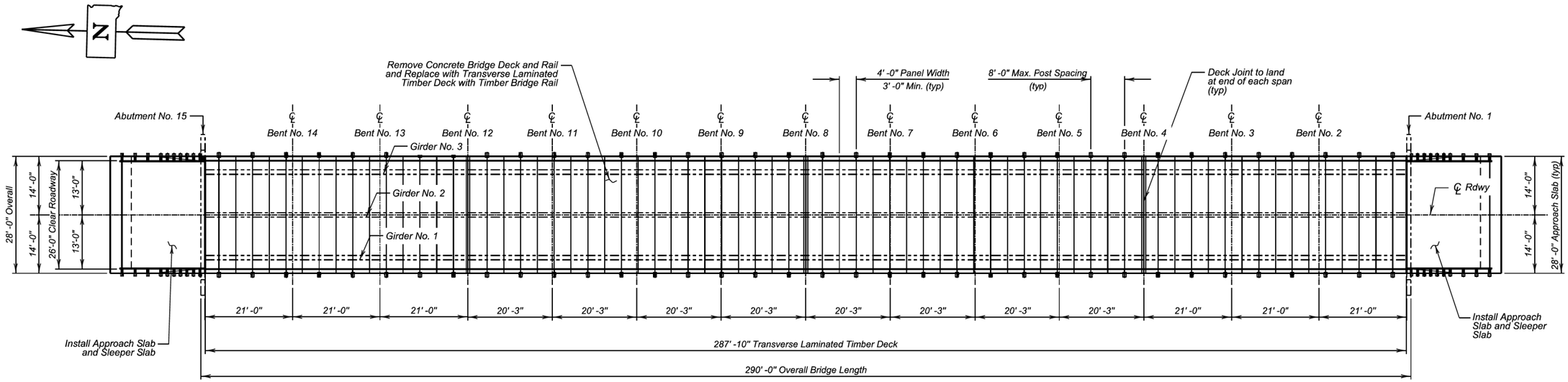
AUGUST 1966 (7) OF (13)

-X604-

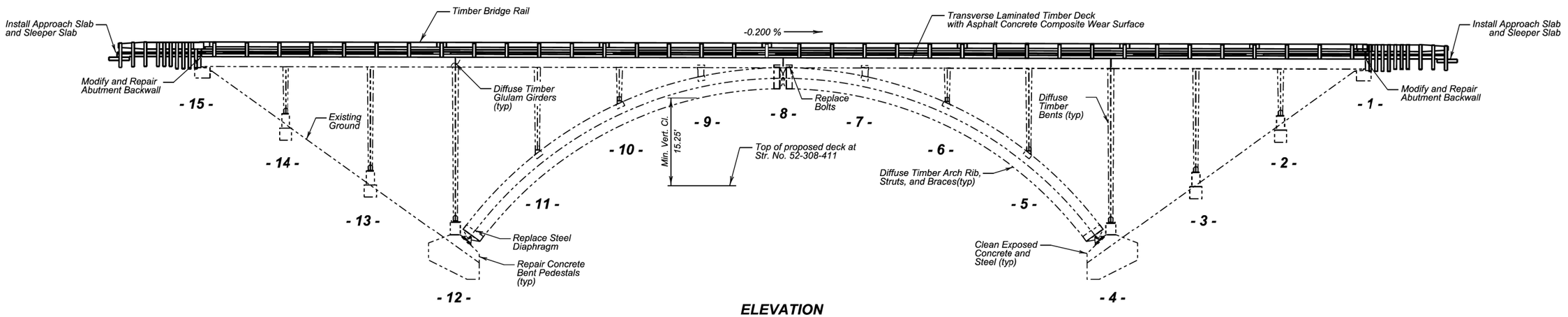
ORIGINAL CONSTRUCTION PLANS

STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E35	E40

FOR BIDDING PURPOSES ONLY



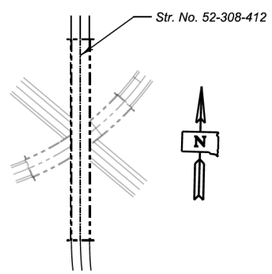
PLAN



ELEVATION

- X204 -

INDEX OF BRIDGE SHEETS



LAYOUT

GENERAL DRAWING
FOR
290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 11+73.50 TO 14+63.50 — P016A(08)59
STR. NO. 52-308-412 — HS-20
PCN 04FU

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

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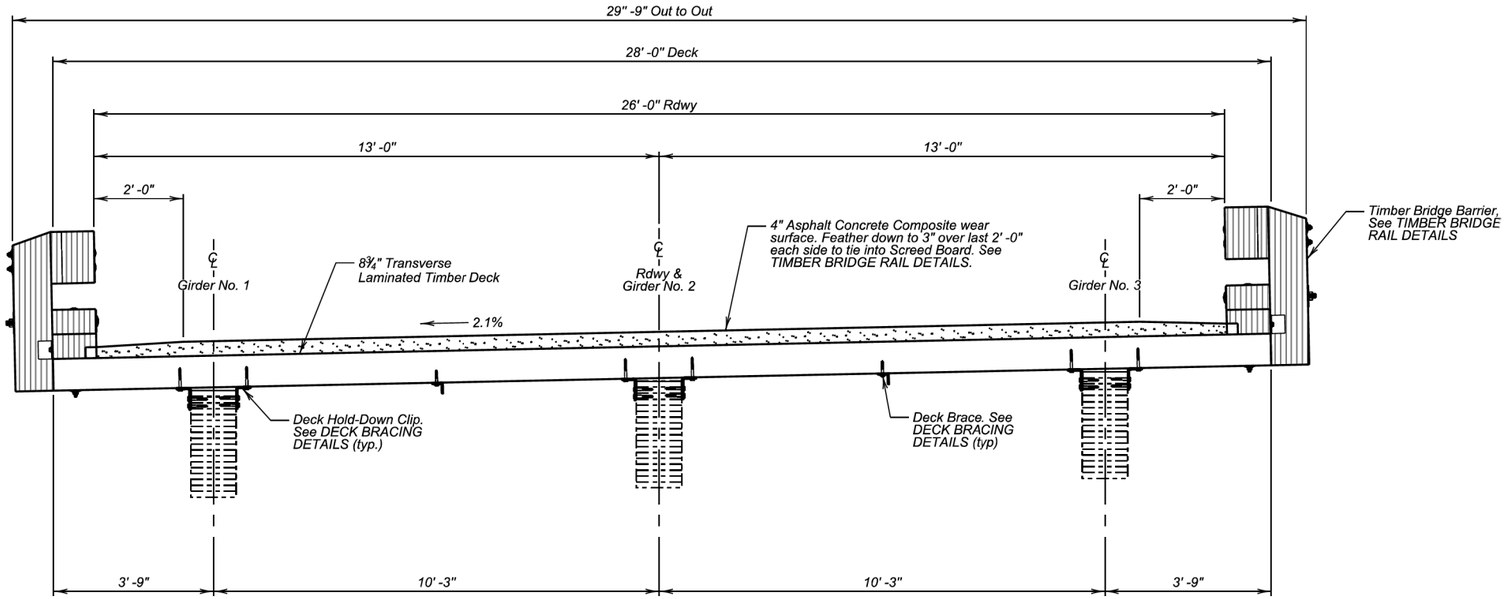
ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



TYPICAL SECTION

TYPICAL DECK SECTION
FOR
290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 11+73.50 TO 14+63.50 — P016A(08)59
STR. NO. 52-308-412 — HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

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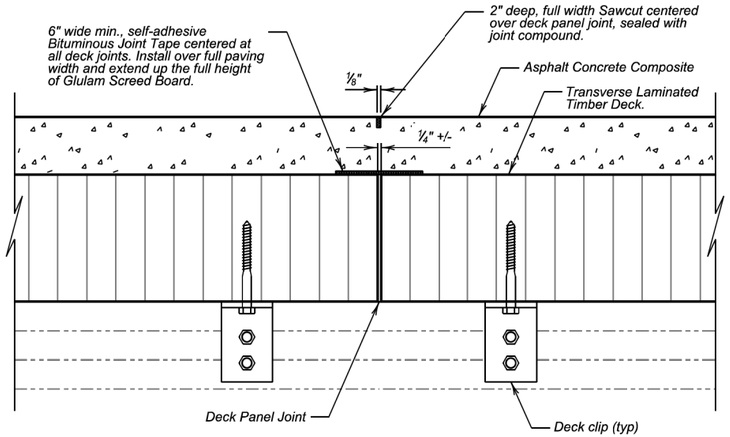
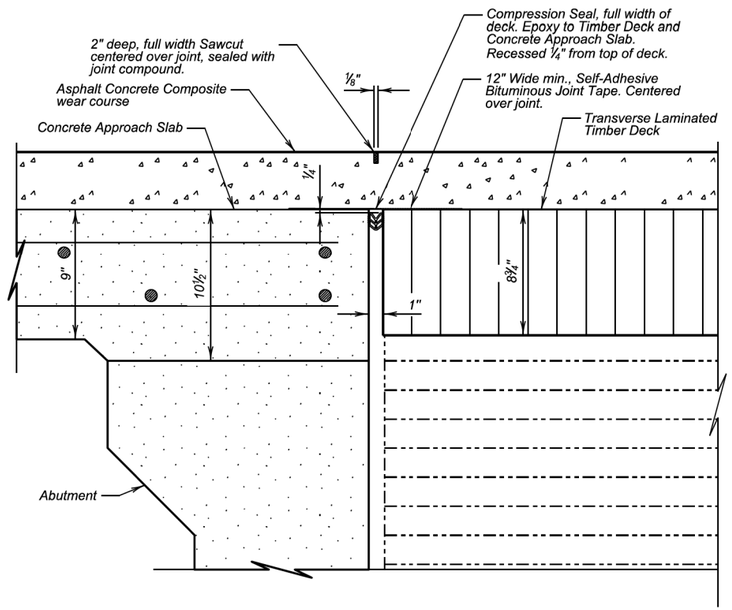
ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



TYPICAL DECK JOINT



DECK JOINT AT APPROACH SLAB

NOTE

1. *Install the bituminous joint tape according to the manufacturer's recommendations. Provide end laps of at least 4 inches.*
2. *Cost of bituminous joint tape, sawcut, and sealing of bituminous joints is incidental to the bid item Asphalt Concrete Composite. No additional payment will be made.*

COMPRESSION SEAL	
Location	Length ft
Abut. No. 1	28
Abut No. 15	28

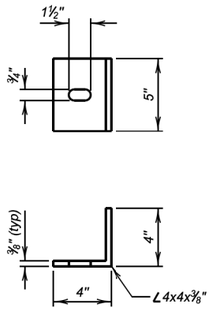
DECK JOINT DETAILS
FOR
290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 11+73.50 TO 14+63.50 — P016A(08)59
STR. NO. 52-308-412 — HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

ORIGINAL CONSTRUCTION PLANS

FOR BIDDING PURPOSES ONLY



POST BRACE

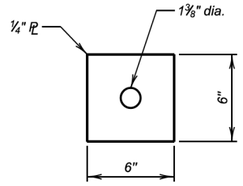
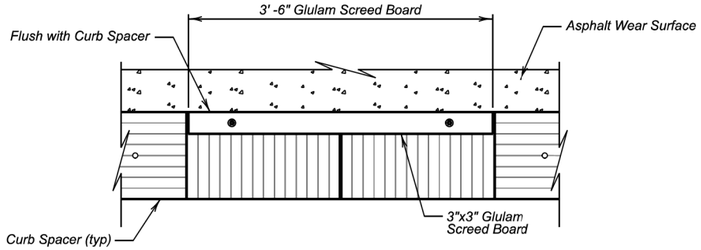


PLATE WASHER

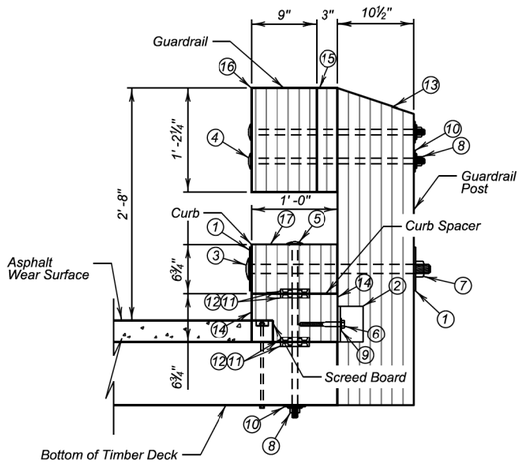


SECTION B-B

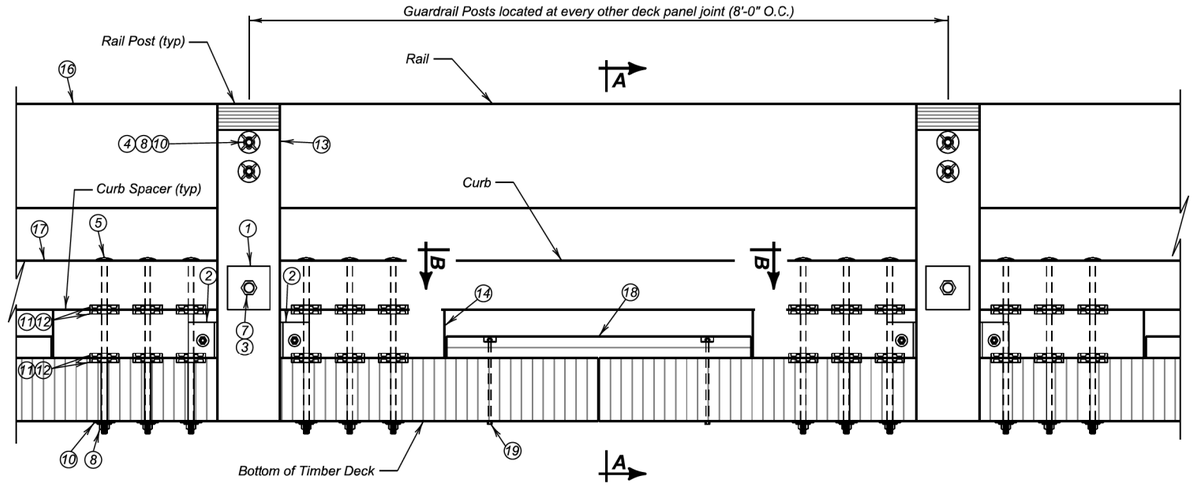
NOTE

Cost of Glulam Screed Board is incidental to the bid item Timber Bridge Rail. No additional payment will be made.

TIMBER BRIDGE RAIL SPLICE	
PARTS FOR FABRICATION:	
ITEM	
①	6" x 6" x¼" Plate Washer
②	4 x 4 x ⅜ x 5" Long - Post Brace
ITEM	
③	1-¼" x 25" Timber Bolt (No Lugs)
④	¾" x 24" Timber Bolt
⑤	¾" x 22" or 24" Timber Bolt
⑥	⅝" x 6" Lag Screw
⑦	1-¼" Hex Nut
⑧	¾" Hex Nut
⑨	⅝" Flat Washer
⑩	¾" Maleable Iron Washer
⑪	Shear Plate - 4" dia. for ¾" Bolt
⑫	#10 x ¾" Wood Screw
⑲	⅝" Dia. x 12" Long Bolt
TIMBER:	
ITEM	
⑬	Rail Post - (GLB 8¾" x 10½" x 3'-5¾")
⑭	Curb Spacer - (GLB 6¾" x 1'-0" x 4'-6")
⑮	Post Spacer - (GLB 1'-2¼" x 3" x 8¾")
⑯	Rail - (GLB 1'-2¼" x 9")
⑰	Curb - (GLB 6¾" x 1'-0")
⑱	Screed Board (GLB 3" x 3" x 3' -6")



SECTION A-A



ELEVATION - TIMBER BRIDGE RAIL

TIMBER BRIDGE RAIL DETAILS
FOR
290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 11+73.50 TO 14+63.50 — P016A(08)59
STR. NO. 52-308-412 — HS-20

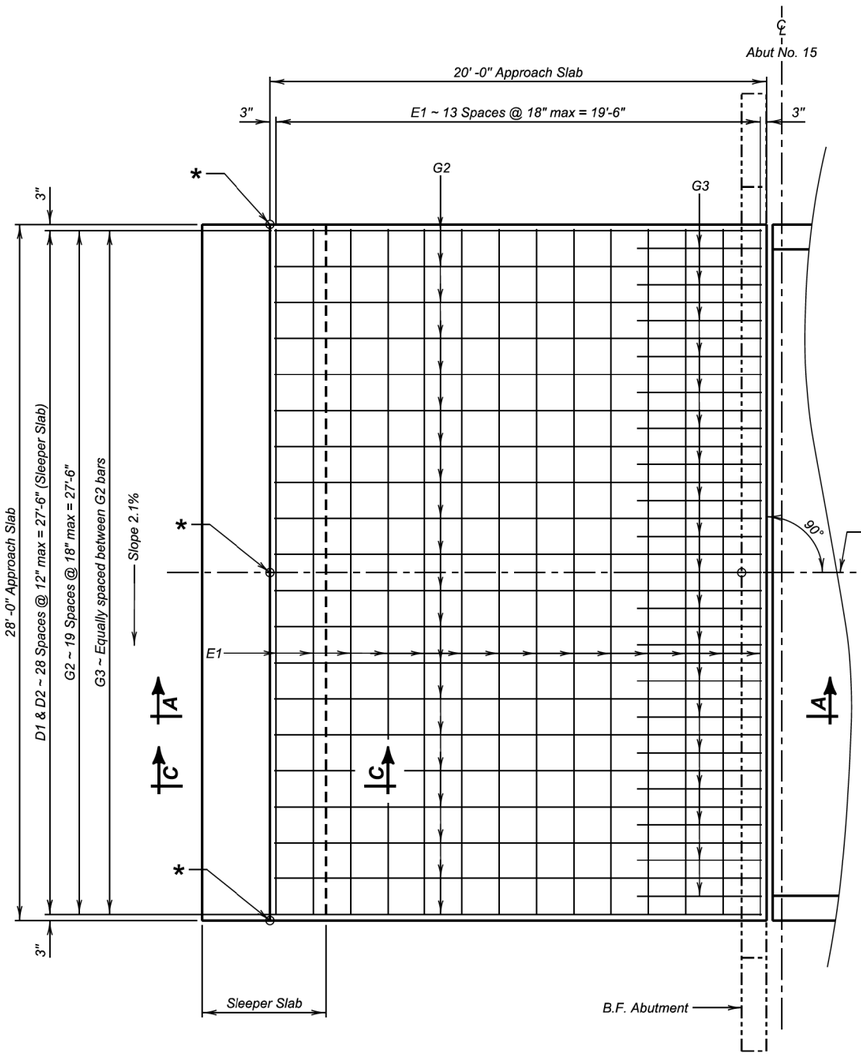
PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

ORIGINAL CONSTRUCTION PLANS

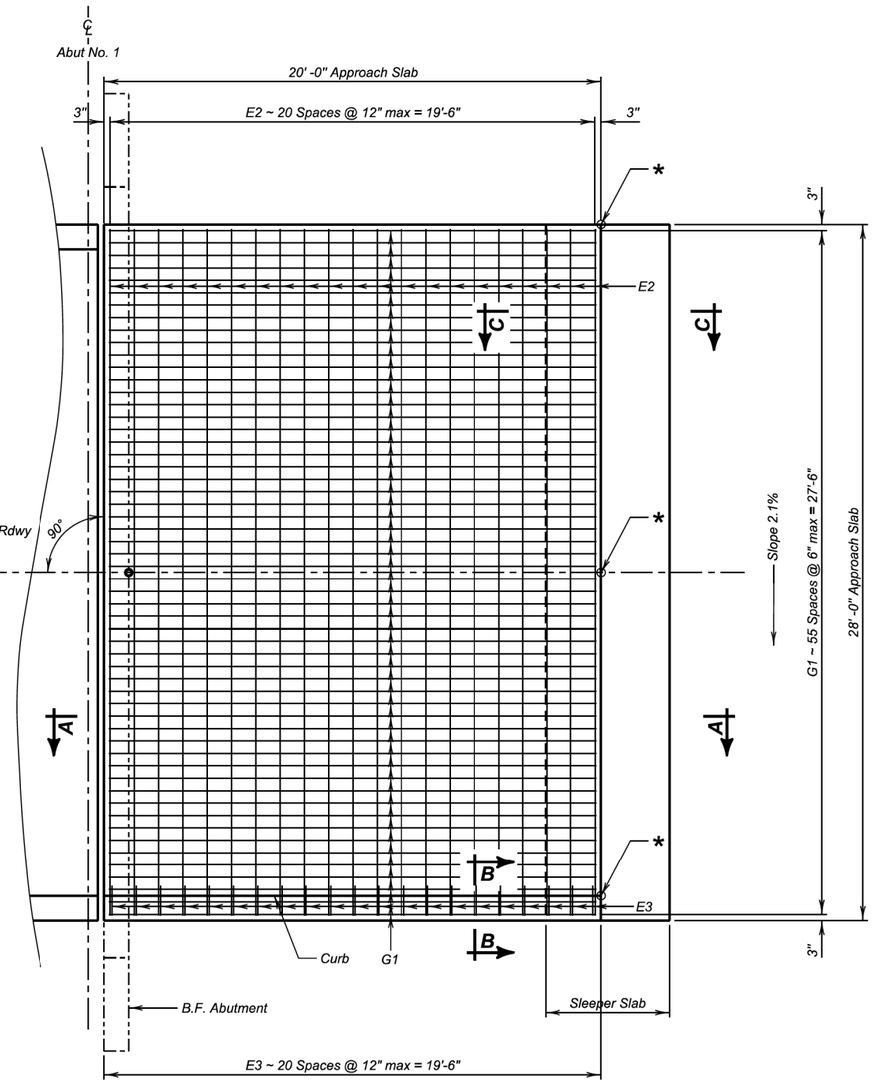
STATE OF	PROJECT	SHEET NO.	TOTAL SHEETS
S.D.	P 0016(110)59	E39	E40

FOR BIDDING PURPOSES ONLY

* *Elevations may need to be adjusted for a smooth ride from the final bridge deck elevations to final pavement elevations. Elevations will be taken and adjusted in the field during construction.*



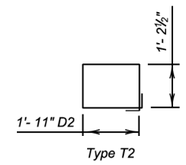
PLAN - AT ABUTMENT NO. 15
(Top Steel)
(Similar at Abutment No. 1)



PLAN - AT ABUTMENT NO. 1
(Bottom Steel)
(Similar at Abutment No. 15)

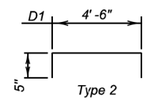
REINFORCING SCHEDULE
(For Two Approach Slabs and Two Sleeper Slabs)

Mk.	No.	Size	Length	Type
Sleeper Slabs				
C1	24	5	27' - 6"	Str.
D1	116	4	5' - 6"	2
D2	58	4	6' - 11"	T2
Approach Slabs				
E1	28	4	27' - 6"	Str.
E2	42	6	27' - 6"	Str.
E3	21	4	3' - 0"	38
G1	112	8	19' - 6"	Str.
G2	40	4	19' - 6"	Str.
G3	38	4	5' - 0"	Str.

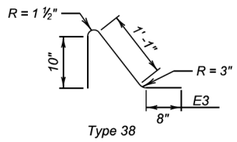


Type T2

NOTES:
All Bars to be Epoxy Coated.
All dimensions are out to out of bars.



Type 2



Type 38

ESTIMATED QUANTITIES
(For Two Approach Slabs and Two Sleeper Slabs)

ITEM	UNIT	QUANTITY
Concrete Approach Slab for Bridge	Sq. Yd.	125
Concrete Approach Sleeper Slab for Bridge	Sq. Yd.	32

1. 33.1 Cu. Yds. Concrete in Approach Slab.
2. 8771 Lbs. Epoxy Coated Re-Steel in Approach Slab.
3. 8.0 Cu. Yds. Concrete in Sleeper Slab.
4. 1383 Lbs. Epoxy Coated Re-Steel in Sleeper Slab.

Items 1 thru 4 are approximate quantities contained in the above bid items and are for information only.

APPROACH SLAB PLAN
FOR
290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY — 0 SKEW
OVER US 16A W — SEC. 31-TIS-R6E
STA. 11+73.50 TO 14+63.50 — P016A(08)59
STR. NO. 52-308-412 — HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

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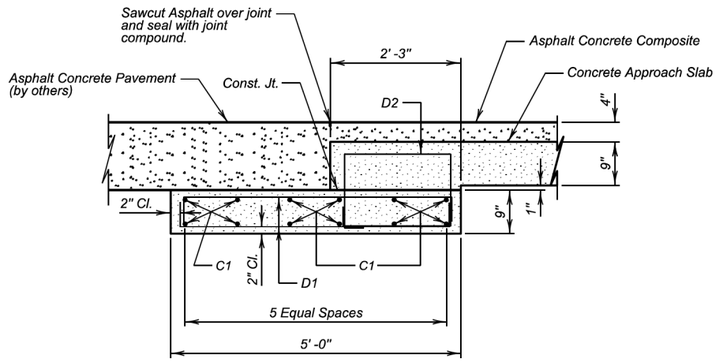
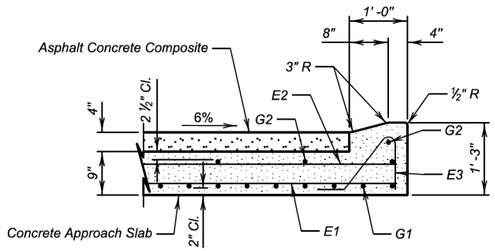
ORIGINAL CONSTRUCTION PLANS

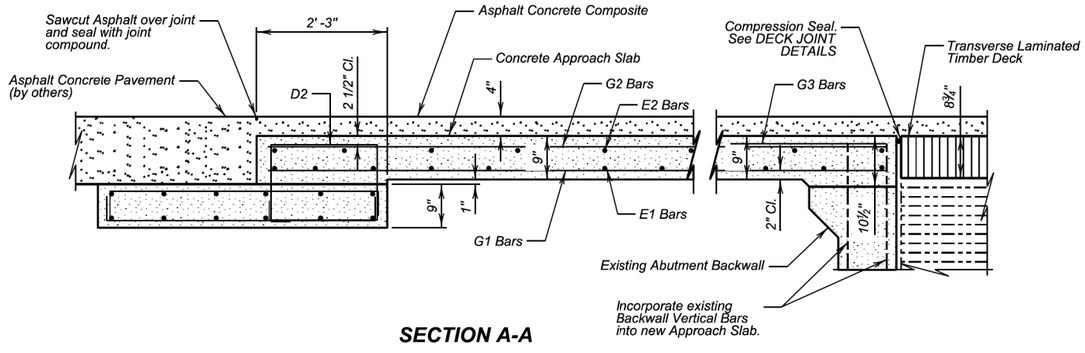
FOR BIDDING PURPOSES ONLY



SECTION C-C



SECTION B-B



SECTION A-A

APPROACH SLAB DETAILS
FOR
290'-0" TIMBER ARCH BRIDGE

26'-0" ROADWAY	0 SKEW
OVER US 16A W	SEC. 31-TIS-R6E
STA. 11+73.50 TO 14+63.50	P016A(08)59
STR. NO. 52-308-412	HS-20

PENNINGTON COUNTY
S. D. DEPT. OF TRANSPORTATION
FEBRUARY 2020

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ORIGINAL CONSTRUCTION PLANS