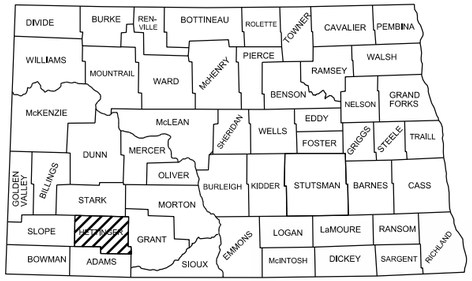
JOB #9

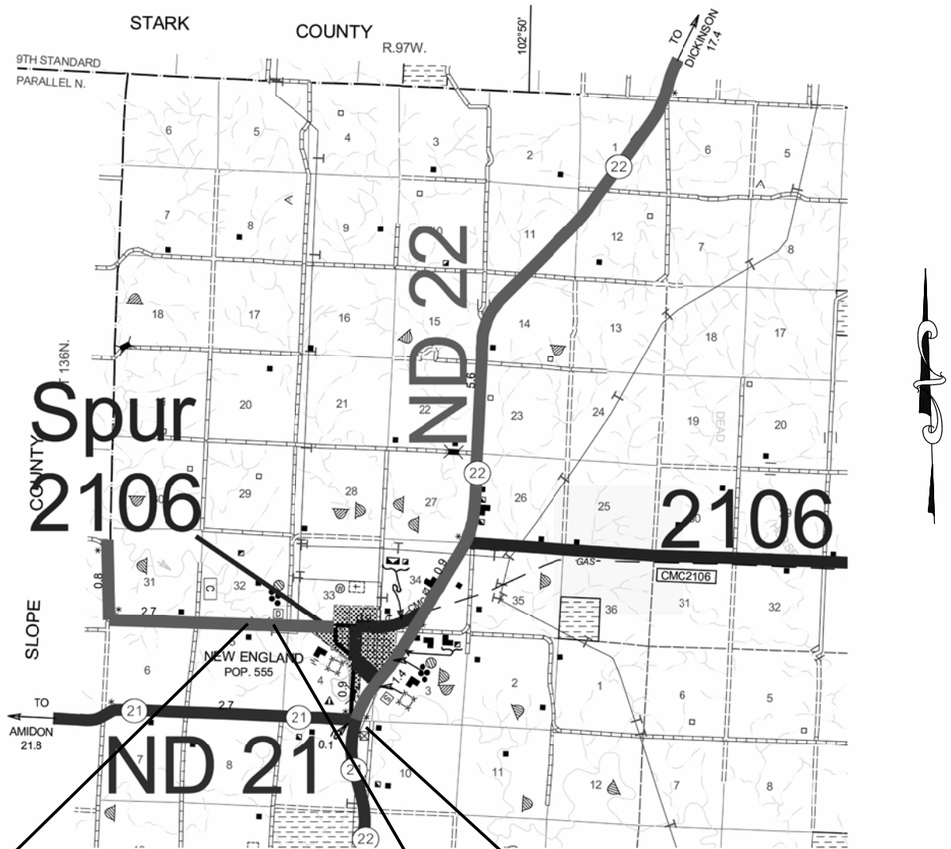
STATE	PROJECT NUMBER	PCN	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	20422	001	1



STATE OF NORTH DAKOTA

HETTINGER COUNTY
NORTH DAKOTA

Plans for Federal Aid
Project No. BRO-0021(019)
One mile west of New England, ND
Cannonball River Structure 21-102-06.0
Structure Replacement



Salvaged Material Stockpile Site

BEGIN PROJECT: BRO-0021(019)
Sta. 37+50, a point approximately 3,750 ft east of the NW Corner of Section 5 Township 135 North, Range 97 West, 5th P.M., Hettinger County, North Dakota.

END PROJECT: BRO-0021(019)
Sta. 43+50, a point approximately 4,350 ft east of the NW Corner of Section 5 Township 135 North, Range 97 West, 5th P.M., Hettinger County, North Dakota.

Any questions regarding these plans may be directed to:

Steven Dorval, PE
Heartland Engineering, Inc.
PO Box 6
49 7th Street East
New England, ND 58647
Phone: (701)426-3387

GOVERNING SPECIFICATIONS

Standard Specifications for Road and Bridge Construction adopted by the North Dakota Department of Transportation, October 2014; Supplemental Specifications effective on the date the project is advertised; Standard drawings currently in effect; and other Contract Provisions submitted herein.

LENGTH OF PROJECT

MILES - GROSS	MILES - NET
0.114	0.114

DESIGN DATA

TRAFFIC	PASS.	TRUCKS	TOTAL	EST 30TH MAX HR	ESAL'S
CURRENT 2016	188	12	200	- -	- -
FORECAST 2032	188	12	200	- -	- -

MINIMUM SIGHT DISTANCE (STOPPING): 495 FEET

DESIGN SPEED: 55 MPH

SURVEYED BY: AE2S DATE: JUL 2017
DESIGNED BY: SCD & AE2S DATE: JAN 2018
P.S. & E. REVISIONS BY: SCD DATE: JAN 2018

CERTIFICATION

I hereby certify that the attached plans were prepared by me or under my direct supervision and that I am a duly registered professional engineer under the laws of the state of North Dakota.

ENGINEER: Steven C. Dorval, P.E.

SIGNATURE: Steven C. Dorval, P.E. /s/

APPROVAL DATE: 06-15-18

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Heartland Engineering, Inc.

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	002	1

TABLE OF CONTENTS & LIST OF STANDARD DRAWINGS

TABLE OF CONTENTS

LIST OF STANDARD DRAWINGS

Standard #	*Description*
D-260-01	Erosion and Siltation Controls - Silt Fence
D-704-07	Breakaway Systems For Construction Zone Signs - Perforated Tube
D-704-08	Breakaway Systems for Construction Zone Signs - U-Channel Posts
D-704-09	Construction Sign Details - Terminal and Guide Signs
D-704-10	Construction Sign Details - Regulatory Signs
D-704-11	Construction Sign Details - Warning Signs
D-704-13	Barricade and Channelizing Device Details
D-704-14	Construction Sign Punching and Mounting Details
D-754-29	Sign Punching, Stringer, and Support Location Details Regulatory, Warning, and Guide Signs
D-764-01	W-Beam Guardrail General Details
D-764-06	Flared Energy Absorbing Terminal
D-764-22	Typical Grading at Bridge Ends with W-Beam Guardrail

SPECIAL PROVISIONS

SP 0003(14) Temporary Erosion Control and Sediment Best Management Practices

SP 0004(14) Federal Migratory Bird Treaty Act

SP 5206(14) Permits and Environmental Considerations

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BRO-0021(019)
HETTINGER COUNTY, ND.

TABLE OF CONTENTS & STANDARD DRAWINGS LIST

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRO-0021(019)	006	1

PLAN NOTES

202-P01 **Removal of Structure:** All materials salvaged from the removal of the existing structure will remain the property of Hettinger County. Transport and stockpile salvaged materials at the old NDDOT shop site located just east of the intersection of Highways 21 and 22.

Separate all rebar from the concrete items and stockpile them separately. Break down concrete chunks so no dimension is greater than 24". Ensure the existing steel I-beams remain intact. Disassemble bridge rail at each joint or splice.

203-P01 **Borrow Excavation:** Thirty-five percent (35%) additional volume in yardage computed by the average end area method is allowed for shrinkage in the earth embankment as shown in the plans.

The contractor is responsible for furnishing the borrow material. Compact borrow as specified in Section 203.04 E.4, Compaction Control, Type C.

203-P02 **Topsoil**: Payment for "TOPSOIL" shall be plan quantity and will be paid for after it has been replaced and accepted.

251-P01 **Seeding Class III:** "SEEDING CLASS III" shall consist of the following mixture:

Species	Lbs. of PLS/Acre
Alfalfa	9
Western Wheatgrass	4
Intermediate Wheatgrass	5
Slender Wheatgrass	2
Total Pounds of PLS / Acre	20

The seeding quantity is based on the calculated areas within the grading limits and will be paid for at plan quantity. Any seeding necessary to areas outside those limits shall be the responsibility of the contractor. This includes locations such as staging areas, stockpile sites, borrow pits and any other temporary locations. These areas shall be seeded with the same mixture as above.

256-P01 **Riprap:** Placement of "RIPRAP GRADE I" will be paid according to the designated length, width and depth as shown on the plans unless otherwise designated by the engineer in the field. Riprap shall be sunk 1' within areas delineated as "Other Waters".

260-P01 **Silt Fence Supported:** Install the silt fence before removing any topsoil to prevent sediment from leaving the project or entering any waterways. Actual silt fence locations will be determined by the engineer in the field.

262-P01 **Flotation Silt Curtain:** Install the flotation silt curtain downstream from the bridge before starting any work in the stream or removing any topsoil to prevent sediment from leaving the project site.

764-P01 **Remove W-Beam Guardrail & Posts:** All materials salvaged from the removal of the existing guardrail will remain the property of Hettinger County. Transport and stockpile salvaged materials at the old NDDOT shop site located east of the intersection of Highways 21 and 22.

Disassemble rail and end treatments to be salvaged at each joint or splice.

764-P02 **W-Beam Guardrail widening areas:** Cross slopes for the guardrail widening areas shall be 25:1 and inslopes shall be 4:1. Widening areas shall be surfaced with 4" of CL13 aggregate surface course.

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BRO-0021(019)
HETTINGER CO., ND.

PLAN NOTES

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

ENVIRONMENTAL NOTES

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRO-0021(019)	006	2

ENVIRONMENTAL COMMITMENTS: Hettinger County, the North Dakota Department of Transportation and the Federal Highway Administration have made environmental commitments to various public agencies and the public to secure approval of this project. The environmental commitments are as follows:

No. 1: No construction or demolition activities will take place during the spawning season in the Cannonball River from April 15 to June 1.

No. 2: The Contractor shall prevent the introduction of ANS into North Dakota waters, or transport aquatic vegetation to or from any waters of the state, or transport any aquatic vegetation into the state.

Action taken/required: The contractor shall follow the North Dakota Game and Fish Department's (NDGFD) Administrative Rules 30-3-06 for compliance with ND Century Code Chapter 20.1-17 on Aquatic Nuisance Species (ANS). Contractor shall notify the NDGFD at least 72 hours prior to the placement IN or ON the waters of the State of North Dakota of any and all vehicles, vessels, pumps and equipment that will be used in the project, to allow the Department sufficient time to inspect any and all such equipment for ANS. The NDGFD ANS Coordinator, Jessica Howell, shall be contacted by phone (701.368.8368) for equipment inspections, or any additional information regarding ANS prevention protocol.

No. 3: Avoid impacts to cultural resources.

Action taken/required: A Class III Cultural Resources Inventory was conducted by Agassiz Archeology and a "No Historic Properties Affected" determination was made. The NDDOT and SHPO have concurred as documented in ND SHPO Ref.: 17-5452 NDDOT BRO-0021(019) PCN 20422. However, if cultural resources are found during construction, construction will be halted and the proper entities will be notified of the finding. Construction will not commence until proper procedures are followed.

No. 4: Measures will be taken to minimize fugitive dust emissions.

Action taken/required: The Contractor will control dust emission by the use of water.

No. 5: Proper disposal of materials associated with the removal of the existing structure will occur to prevent contamination of the waterway. See General Note 202-P01 in Section 170-2.

Action taken/required: It will be the Contractor's responsibility to submit a complete bridge removal plan to be approved by the Engineer and North Dakota State Water Commission. Dispose of waste materials from the removal of the bridge in a proper manner.

Permits and Notifications Required:

North Dakota Department of Health – NDPDES Permit
Status: To be obtained by the Contractor prior to construction. Owner is to be listed as Hettinger County on the permit.

North Dakota Department of Health SFN 17987 Asbestos Notification of Demolition and Renovation for bridges and boxes.
The Contractor shall complete and submit SFN 17987 Asbestos Notification of Demolition and Renovation to the North Dakota Department of Health 10 days prior to beginning the removal of concrete.

United States Army Corps of Engineers – Section 404 Permit
Status: A USACE permit has been obtained and the project will be covered under Department of the Army Nationwide Permit No. NWO-2017-00272-BIS. The Contractor shall comply with all requirements listed in the permit.

Temporary Construction Crossing – If additional fill will be placed within the stream channel for a temporary construction crossing, it will be the contractor's responsibility to develop and employ a work plan for construction. The contractor will be responsible for obtaining the proper permits and approvals prior to performing such activities.

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BRO-0021(019)
HETTINGER COUNTY, ND.

ENVIRONMENTAL NOTES

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	06-15-18

Heartland Engineering, Inc.

SUMMARY OF QUANTITIES & BASIS OF ESTIMATE

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	008	1

SUMMARY OF QUANTITIES

Item	*Spec*	*Code*	*Description*	*Total Quantity*	*Units*
1	103	0100	CONTRACT BOND	1	L SUM
2	201	0330	CLEARING & GRUBBING	1	L SUM
3	202	0105	REMOVAL OF STRUCTURE	1	L SUM
4	203	0109	TOPSOIL	338	CY
5	203	0140	BORROW EXCAVATION	861	CY
6	210	0101	CLASS 1 EXCAVATION	1	L SUM
7	210	0127	CHANNEL EXCAVATION	1	L SUM
8	210	0201	FOUNDATION PREPARATION	1	EA
9	216	0100	WATER	13	M GAL
10	251	0300	SEEDING CLASS III	0.3	ACRE
11	253	0101	STRAW MULCH	0.3	ACRE
12	256	0100	RIPRAP GRADE I	2,002	CY
13	260	0200	SILT FENCE SUPPORTED	300	LF
14	260	0201	REMOVE SILT FENCE SUPPORTED	300	LF
16	262	0100	FLOTATION SILT CURTAIN	50	LF
17	262	0101	REMOVE FLOTATION SILT CURTAIN	50	LF
18	302	0356	AGGRETAGE SURFACE COURSE CL 13	370	TON
19	602	0130	CLASS AAE-3 CONCRETE	117.1	CY
20	602	1130	CLASS AE-3 CONCRETE	116.6	CY
21	602	1250	PENETRATING WATER REPELLENT TREATEMENT	437	SY
22	604	9620	PRESTRESSED BOX BEAM-33IN	506.6	LF
23	612	0115	REINFORCING STEEL-GRADE 60	8,610	LBS
24	612	0116	REINFORCING STEEL-GRADE 60-EPOXY COATED	27,115	LBS
25	616	0364	STRUCTURAL STEEL M270-GRADE 36	781.3	LBS
26	622	0040	STEEL PILING HP 12X53	1,050	LF
27	624	0128	TRAFFIC RAIL-STEEL	262.3	LF
28	702	0100	MOBILIZATION	1	L SUM
29	704	1000	TRAFFIC CONTROL SIGNS	188	UNIT
30	704	1052	TYPE III BARRICADE	6	EA
31	709	0155	GEOSYNTHETIC MATERIAL TYPE RR	2,002	SY
32	764	0131	W-BEAM GUARDRAIL	256.75	LF
33	764	0145	W-BEAM GUARDRAIL END TERMINAL	4	EA
34	764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	493	LF

BASIS OF ESTIMATE

Project Length

BOP: STA 37+50
EOP: STA 43+50
Length: 37+50 - 43+50 = 600 LF = 0.114 Miles
Bridge Length: 39+85 - 41+14.83 = 129.83 LF

Topsoil

4" Depth

Water

Borrow Excavation: 10 Gal/CY x 861 CY / 1,000 Gal/M Gal = 9 M Gal
Agg Surfacing: 10 Gal/Ton x 370 Ton / 1,000 Gal/M Gal = 4 M Gal
Total = 13 M Gal

Aggregate Surface Course Cl 13 (Volume + 25%)

Mainline: 470 LF x 8.67 SF/LF / 27 CF/CY x 1.5 Ton/CY x 1.25 = 283 Ton
Guardrail Widening Areas:
SW Side of Bridge: 1,196 SF
NW Side of Bridge: 633 SF
NE Side of Bridge: 1,313 SF
SE Side of Bridge: 633 SF
Total Widening Area 3,775 SF
Guardrail Widening: 3,775 SF x 4/12 FT / 27 CF/CY x 1.5 Ton/CY x 1.25 = 87 Ton
Project Total = 283 Ton + 87 Ton = 370 Ton

Seeding - Class III & Straw Mulch

Area between construction limits minus road top and riprapped area is estimated to be 0.3 acres

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BRO-0021(019)
HETTINGER COUNTY, ND.

SUMMARY OF QUANTITIES & BASIS OF ESTIMATE

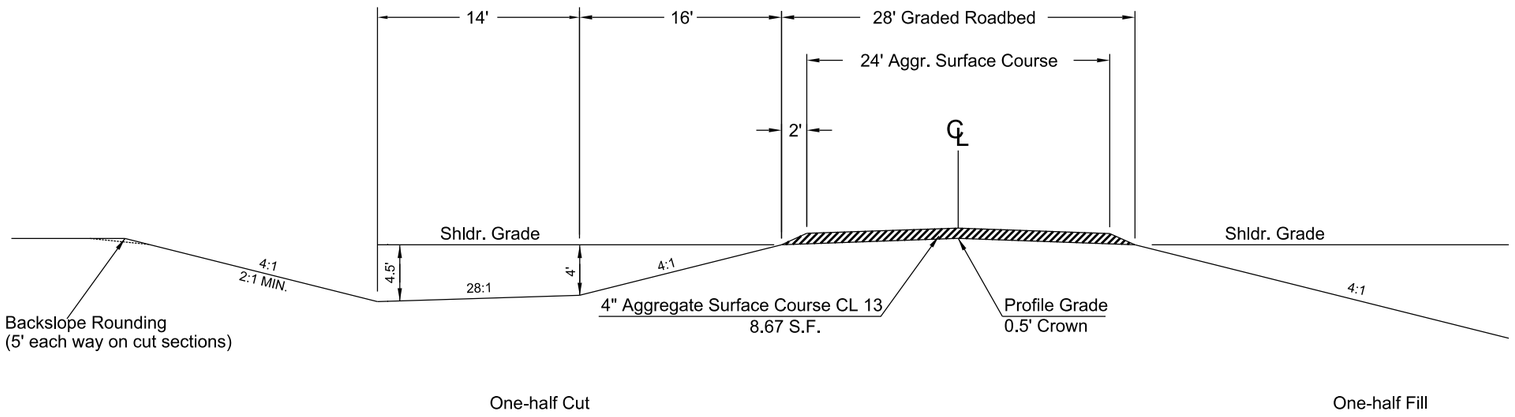
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

TYPICAL SECTIONS

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	030	1

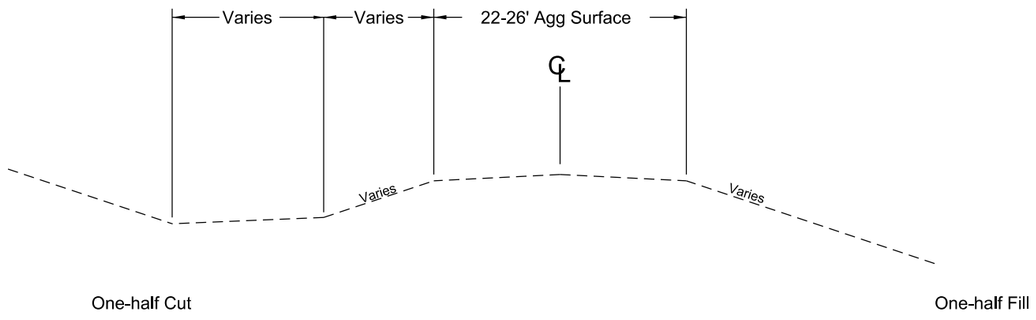
PROPOSED



One-half Cut

One-half Fill

EXISTING



One-half Cut

One-half Fill

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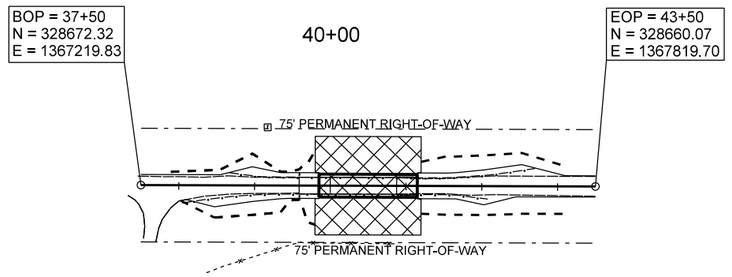
BRO-0021(019)
HETTINGER COUNTY, ND.

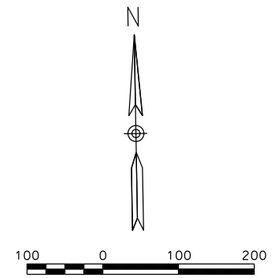
TYPICAL SECTIONS

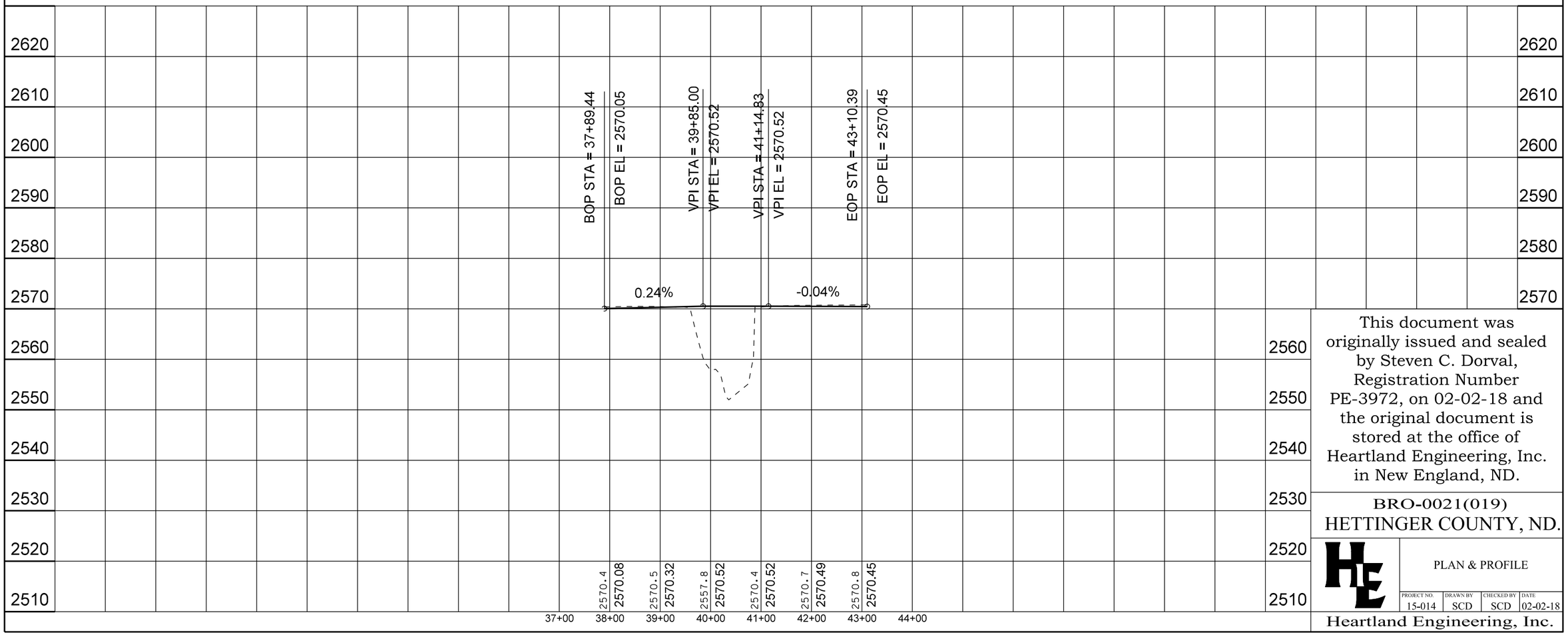
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	060	1







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BRO-0021(019)
HETTINGER COUNTY, ND.

PLAN & PROFILE

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	075	1

OTHER WATERS IMPACTS

Other Water Impact Table

Other Waters							Impact to Other Waters				Other Water Mitigation Mitigation Required				
			Size				Acres		Linear Feet						
Number	Location	Type	Acres	Linear Feet	Feature	USACE Jurisdictional	Temp.	Perm.	Temp.	Perm.	EO 11990	USACE	USFWS	Location	Method
#1	Sec.32, T136N, R97W Sec. 5, T135N, R97W	Cannonball River	0.17	202	River	Yes	0	0.10	0	130	N	N	N	NA	NA
		Totals	**0.17**	**202**			**0**	**0.10**	**0**	**130**					

Summary Impact Table

Total Permanent Impact Summary		**Temporary Impacts and additional information**	
Wetland Type	Total (Acres)	Wetland Type	Total (Acres/Lf)
Natural/JD	0.00	Temporary JD	0.00
Natural/Non-JD	0.00	Non-JD Temporary	0.00
Artificial/JD	0.00	Permanent JD > 0.10	0.00
Artificial INon-JD	0.00	Permanent OW	0.00 ac/0 ft.
Total	**0.00**	Temporary OW	0.10ac/ 130 ft.

Compensation Requirements by Agency and Water Type

Water Type	USACE Mitigation	All
Natural/JD Wetland	> 0.1 acre	All
Natural/Non-JD	No mitigation required	No mitigation required
Artificial/JD Wetland	> 0.1 acre	No mitigation required
Deep Water (> than 6.6 feet)	No mitigation required	No mitigation required
Other Water	> 300 linear feet	No mitigation required
Preamble	No mitigation required	No mitigation required

* A wetland Jurisdictional Determination was issued by the USACE on 7/25/2017; NWO-2017-00272-BIS.
** All impacts to natural wetlands (natural/jurisdictional and natural/non-jurisdictional), regardless of size, as well as impacts greater than 0.10 acre to artificial/jurisdictional wetlands require mitigation.
*** All artificial/non-jurisdictional, deep water (impacts greater than 6.6 feet), Other Waters less than 300 linear feet (determined by the USACE on a case by case), Preamble Wetlands, and temporary impacts do not require mitigation.

BRO-0021(019)
HETTINGER COUNTY, ND.

OTHER WATERS IMPACTS

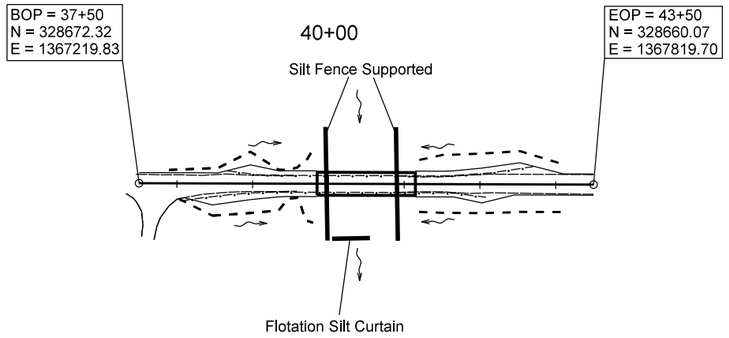
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	06-15-18

Heartland Engineering, Inc.

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	076	1

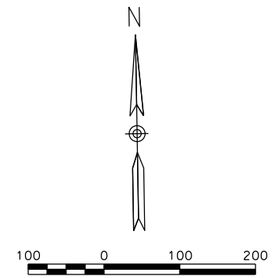
TEMPORARY EROSION CONTROL

Spec-Code	Bid Item	Qty	Unit
260-0200	Silt Fence Supported	300	LF
260-0201	Remove Silt Fence Supported	300	LF
262-0100	Flotation Silt Curtain	50	LF
262-0101	Remove Flotation Silt Curtain	50	LF



LEGEND

FLOW DIRECTION



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BRO-0021(019)
HETTINGER COUNTY, ND.

TEMPORARY EROSION CONTROL

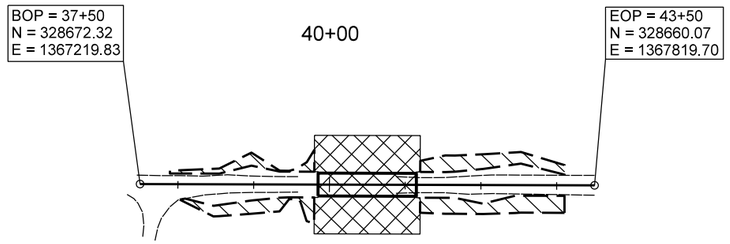
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

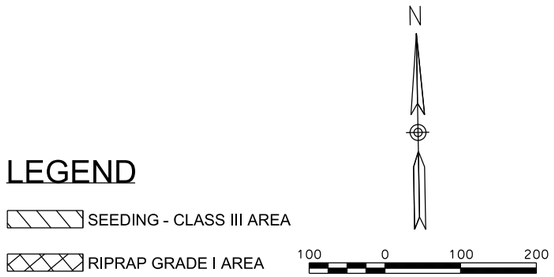
Heartland Engineering, Inc.

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	077	1

PERMANENT EROSION CONTROL

Spec-Code	Bid Item	Qty	Unit
251-0300	SEEDING - CLASS III	0.3	ACRES
253-0101	STRAW MULCH	0.3	ACRES
256-0100	RIPRAP GRADE I	2,002	CY





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BRO-0021(019)
HETTINGER COUNTY, ND.

PERMANENT EROSION CONTROL

PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

TRAFFIC CONTROL DEVICES LIST

	STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
	ND	BRO-0021(019)	100	1

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
D3-36	36"x6"	STREET NAME SIGN (Sign and installation only)		6	
G20-1a-60	60"x24"	ROAD WORK NEXT __ MILES		34	
G20-1b-60	60"x24"	WORK IN PROGRESS/ NO WORK IN PROGRESS (Sign and installation only)		26	
G20-2a-48	48"x24"	END ROAD WORK		19	
G20-4-36	36"x18"	PILOT CAR FOLLOW ME		18	
G20-10-108	108"x48"	CONTRACTOR SIGN		64	
G20-50a-72	72"x36"	ROAD WORK NEXT __ MILES RT & LT ARROWS		37	
G20-52a-72	72"x24"	ROAD WORK NEXT __ MILES RT or LT ARROW		30	
G20-55-96	96"x48"	SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT		59	
M1-1-36	36"x36"	INTERSTATE ROUTE MARKER (Post and installation only)		10	
M1-4-24	24"x24"	U.S. ROUTE MARKER (Post and installation only)		10	
M1-5-24	24"x24"	STATE ROUTE MARKER (Post and installation only)		10	
M3-1-24	24"x12"	NORTH (Mounted on route marker post)		7	
M3-2-24	24"x12"	EAST (Mounted on route marker post)		7	
M3-3-24	24"x12"	SOUTH (Mounted on route marker post)		7	
M3-4-24	24"x12"	WEST (Mounted on route marker post)		7	
M4-8-24	24"x12"	DETOUR (Mounted on route marker post)		7	
M4-9-30	30"x24"	DETOUR ARROW RIGHT or LEFT/AHD AND RT or LT		15	
M4-10-48	48"x18"	DETOUR ARROW RIGHT or LEFT		23	
M5-1-21	21"x15"	ARROW AHD AND RT or LT(Mounted on route marker post)		7	
M5-2-21	21"x15"	ARROW AHD UP & RT or LT (Mounted on route marker post)		7	
M6-1-21	21"x15"	ARROW RT or LT (Mounted on route marker post)		7	
M6-2-21	21"x15"	ARROW UP & RT or LT (Mounted on route marker post)		7	
M6-3-21	21"x15"	ARROW AHD (Mounted on route marker post)		7	
R1-1-48	48"x48"	STOP		32	
R1-1a-18	18"x18"	STOP and SLOW PADDLE Back to Back		5	
R1-2-60	60"x60"	YIELD		29	
R2-1-48	48"x60"	SPEED LIMIT __		39	
R2-1a-24	24"x18"	MINIMUM FEE $80 (Mounted on Speed Limit post)		10	
R3-7-48	48"x48"	LEFT or RIGHT LANE MUST TURN LEFT or RIGHT		35	
R4-1-48	48"x60"	DO NOT PASS		39	
R4-7-48	48"x60"	KEEP RIGHT SYMBOL		39	
R5-1-48	48"x48"	DO NOT ENTER		35	
R6-1-36	36"x12"	ONE WAY RIGHT or LEFT		13	
R7-1-12	12"x18"	NO PARKING		11	
R10-6-24	24"x36"	STOP HERE ON RED		16	
R11-2-48	**48"x30"**	**ROAD CLOSED**	**2**	**28**	**56**
R11-2a-48	48"x30"	STREET CLOSED		28	
R11-3a-60	**60"x30"**	**ROAD CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY**	**2**	**31**	**62**
R11-3c-60	60"x30"	STREET CLOSED __ MILES AHEAD LOCAL TRAFFIC ONLY		31	
R11-4a-60	60"x30"	STREET CLOSED TO THRU TRAFFIC		31	
W1-3-48	48"x48"	RIGHT or LEFT SHARP REVERSE CURVE ARROW		35	
W1-4-48	48"x48"	RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-4b-48	48"x48"	DOUBLE RIGHT or LEFT REVERSE CURVE ARROW		35	
W1-6-48	48"x24"	LARGE ARROW		26	
W3-1-48	48"x48"	STOP AHEAD SYMBOL		35	
W3-3-48	48"x48"	SIGNAL AHEAD SYMBOL		35	
W3-4-48	48"x48"	BE PREPARED TO STOP		35	
W3-5-48	48"x48"	SPEED REDUCTION AHEAD		35	
W4-2-48	48"x48"	RIGHT or LEFT LANE TRANSITION SYMBOL		35	
W5-1-48	48"x48"	ROAD NARROWS		35	
W5-8-48	48"x48"	THRU TRAFFIC RIGHT LANE		35	
W5-9-48	48"x48"	ROAD WORK TRAFFIC ONLY DOWN & LT or RT ARROW		35	
W6-3-48	48"x48"	TWO WAY TRAFFIC SYMBOL		35	
W8-1-48	48"x48"	BUMP		35	
W8-3-48	48"x48"	PAVEMENT ENDS		35	
W8-7-48	48"x48"	LOOSE GRAVEL		35	
W8-9a-48	48"x48"	SHOULDER DROP-OFF		35	
W8-11-48	48"x48"	UNEVEN LANES		35	
W8-12-48	48"x48"	NO CENTER STRIPE		35	
W8-53-48	**48"x48"**	**TRUCKS ENTERING HIGHWAY**	**2**	**35**	**70**
W8-54-48	48"x48"	TRUCKS ENTERING AHEAD or __ FT.		35	
W8-55-48	48"x48"	TRUCKS CROSSING AHEAD or __ FT.		35	
W8-56-48	48"x48"	TRUCKS EXITING HIGHWAY		35	
W9-3a-48	48"x48"	CENTER LANE CLOSED SYMBOL		35	
W12-2-48	48"x48"	LOW CLEARANCE SYMBOL		35	
W13-1-24	24"x24"	__ MPH ADVISORY SPEED PLATE (Mounted on warning sign post)		11	
W13-4-48	48"x60"	RAMP ARROW		39	
W14-3-48	48"x36"	NO PASSING ZONE		23	
W20-1-48	48"x48"	ROAD WORK AHEAD or _FT or _ MILE		35	
W20-2-48	48"x48"	DETOUR AHEAD or __ FT		35	
W20-3-48	48"x48"	ROAD or STREET CLOSED AHEAD or __ FT.		35	
W20-4-48	48"x48"	ONE LANE ROAD AHEAD or __ FT.		35	
W20-5-48	48"x48"	RIGHT or LEFT LANE CLOSED AHEAD or __ FT.		35	
W20-7a-48	48"x48"	FLAGGING SYMBOL		35	
W20-7k-24	24"x18"	__ FEET (Mounted of warning sign post)		10	
W20-8-48	48"x48"	STREET CLOSED		35	
W20-51-48	48"x48"	EQUIPMENT WORKING		35	
W20-52-54	54"x12"	NEXT __ MILES (Mounted on warning sign post)		12	
W21-1a-48	48"x48"	WORKERS SYMBOL		35	
W21-2-48	48"x48"	FRESH OIL		35	
W21-3-48	48"x48"	ROAD MACHINERY AHEAD or __ FT		35	

SIGN NUMBER	SIGN SIZE	DESCRIPTION	AMOUNT REQUIRED	UNITS PER AMOUNT	UNITS SUB TOTAL
W21-5-48	48"x48"	SHOULDER WORK		35	
W21-5a-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED		35	
W21-5b-48	48"x48"	RIGHT or LEFT SHOULDER CLOSED AHEAD or __ FT.		35	
W21-6a-48	48"x48"	SURVEY CREW AHEAD		35	
W21-50-48	48"x48"	BRIDGE PAINTING AHEAD or __ FT.		35	
W21-51-48	48"x48"	MATERIAL ON ROADWAY		35	
W22-8-48	48"x48"	FRESH OIL LOOSE ROCK		35	
	24"x24"	TAKE TURNS (6" D letters) (Mounted on stop sign post)		11	

SPECIAL SIGNS

SPEC & CODE

704-1000	**TRAFFIC CONTROL SIGNS**	**TOTAL UNITS**	**188**

SPEC & CODE	DESCRIPTION	UNIT	QUANTITY
704-0100	FLAGGING	MHR	
704-1041	ATTENUATION DEVICE-TYPE B-55	EACH	
704-1043	ATTENUATION DEVICE-TYPE B-65	EACH	
704-1044	ATTENUATION DEVICE-TYPE B-70	EACH	
704-1050	TYPE I BARRICADES	EACH	
704-1051	TYPE II BARRICADES	EACH	
704-1052	**TYPE III BARRICADES**	**EACH**	**6**
704-1060	DELINEATOR DRUMS	EACH	
704-1065	TRAFFIC CONES	EACH	
704-1067	TUBULAR MARKERS	EACH	
704-1070	DELINEATOR	EACH	
704-1072	FLEXIBLE DELINEATORS	EACH	
704-1081	VERTICAL PANELS - BACK TO BACK	EACH	
704-1085	SEQUENCING ARROW PANEL - TYPE A	EACH	
704-1086	SEQUENCING ARROW PANEL - TYPE B	EACH	
704-1087	SEQUENCING ARROW PANEL - TYPE C	EACH	
704-1088	SEQUENCING ARROW PANEL - TYPE C - CROSSOVER	EACH	
704-1095	TYPE B FLASHERS	EACH	
704-3501	PORTABLE PRECAST CONCRETE MED BARRIER	LF	
704-3510	PRECAST CONCRETE MED BARRIER - STATE FURNISHED	EACH	
762-0200	RAISED PAVEMENT MARKERS	EACH	
762-0420	SHORT TERM 4IN LINE - TYPE R	LF	
762-0430	SHORT TERM 4IN LINE - TYPE NR	LF	
762-1500	OBLITERATION OF PVMT MK	SF	
772-2110	FLASHING BEACON - POST MOUNTED	EACH	

NOTE:
If additional signs are required, units will be calculated using the formula from Section III-19.06 of the Design Manual.
http://www.dot.nd.gov/

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BRO-0021(019)
HETTINGER COUNTY, ND

TRAFFIC CONTROL DEVICES LIST

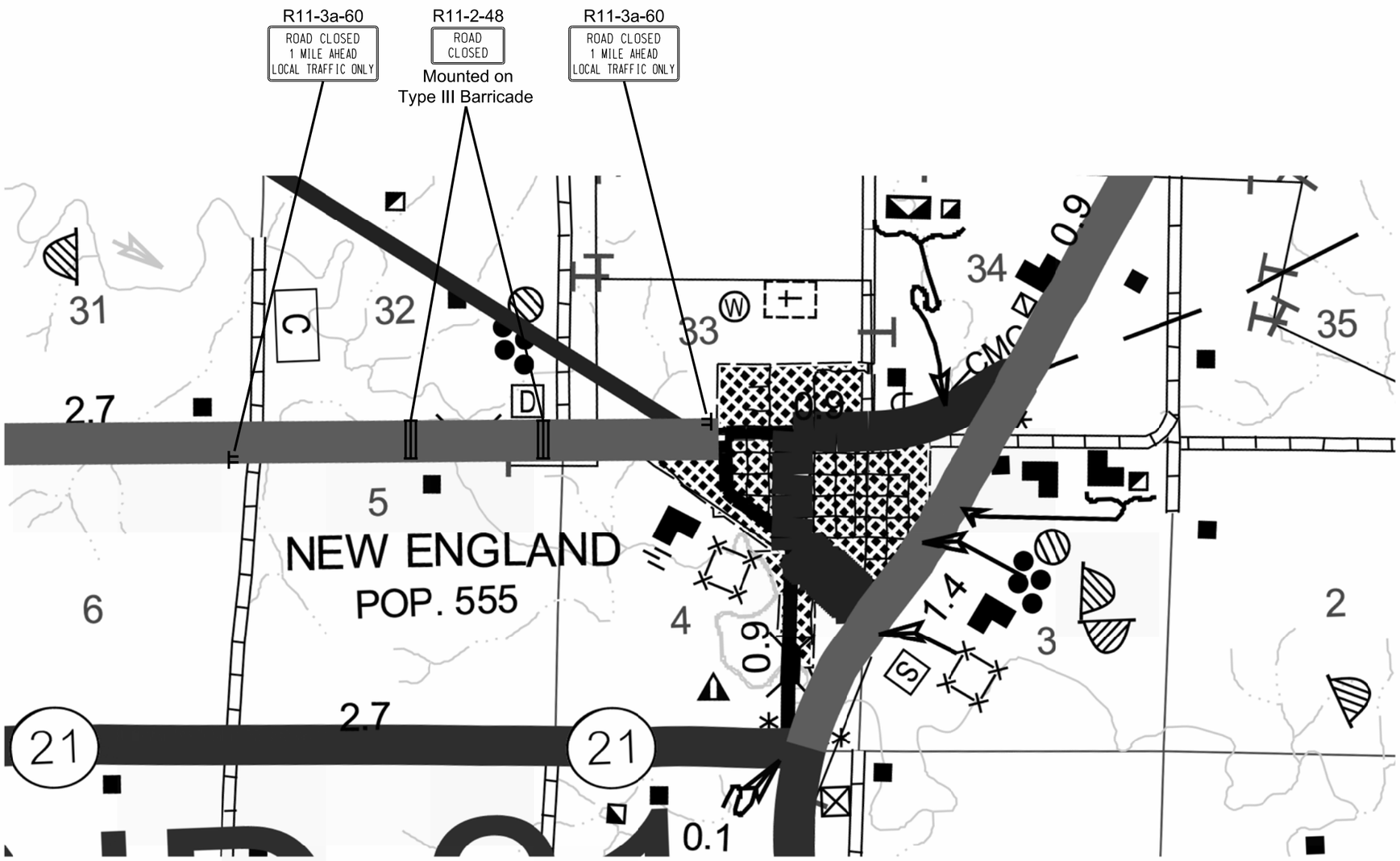
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	01-23-18

Heartland Engineering, Inc.

TRAFFIC CONTROL DEVICES LAYOUT

STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	100	2

NOTE
Three barricades shall be post mounted accross the roadway at both road closure locations.



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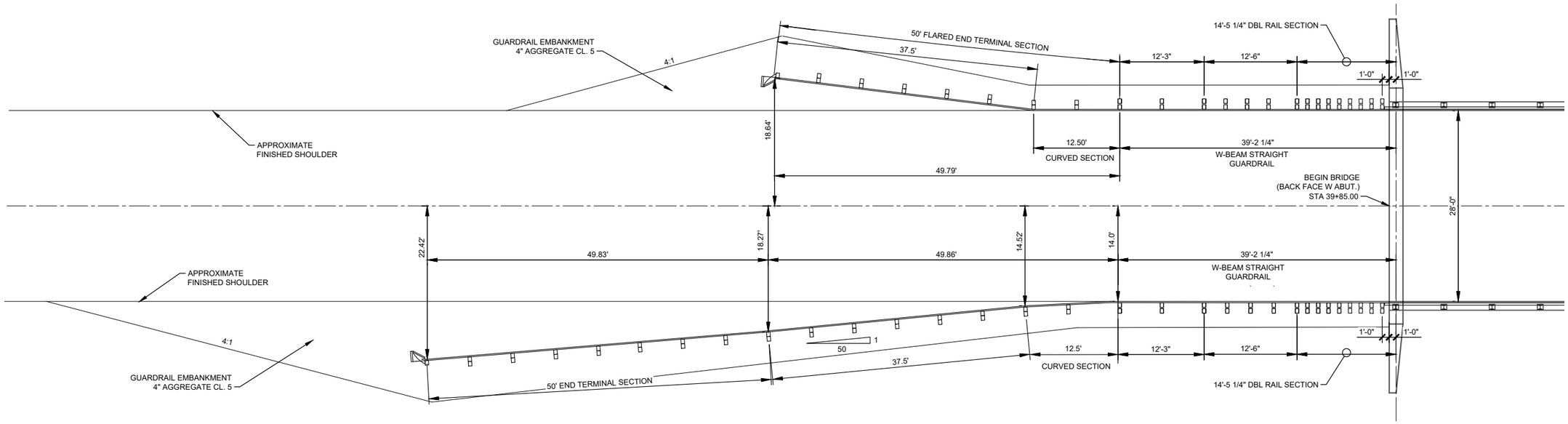
BRO-0021(019)
HETTINGER COUNTY, ND

TRAFFIC CONTROL DEVICES LAYOUT

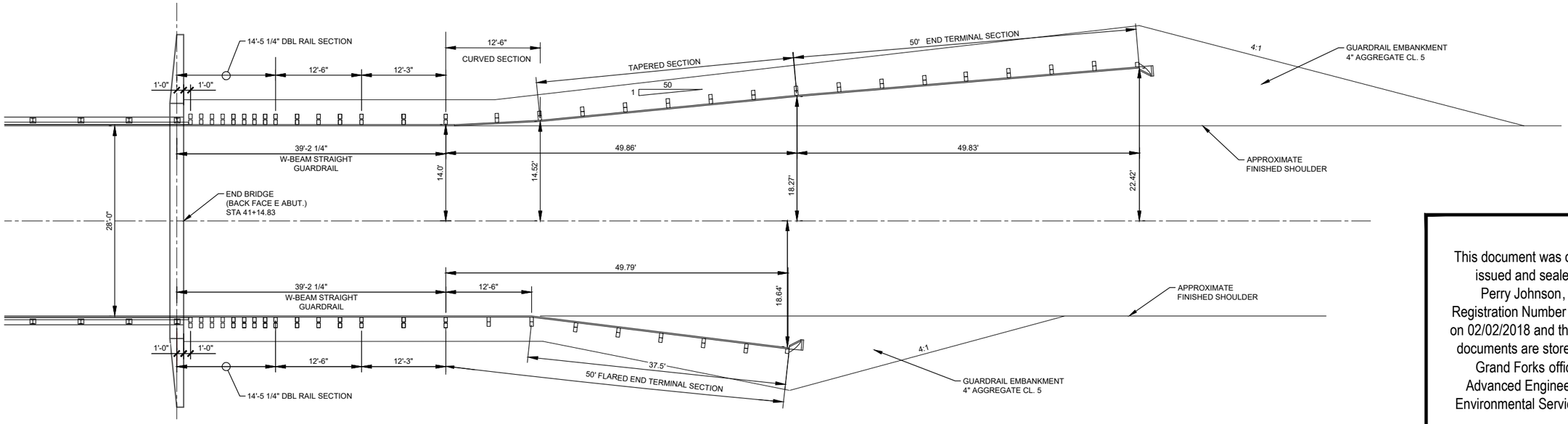
PROJECT NO.	DRAWN BY	CHECKED BY	DATE
15-014	SCD	SCD	02-02-18

Heartland Engineering, Inc.

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	130	1



WEST END OF BRIDGE



EAST END OF BRIDGE

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CANNONBALL RIVER
NEW ENGLAND, ND

APPROACH GUARDRAIL LAYOUT

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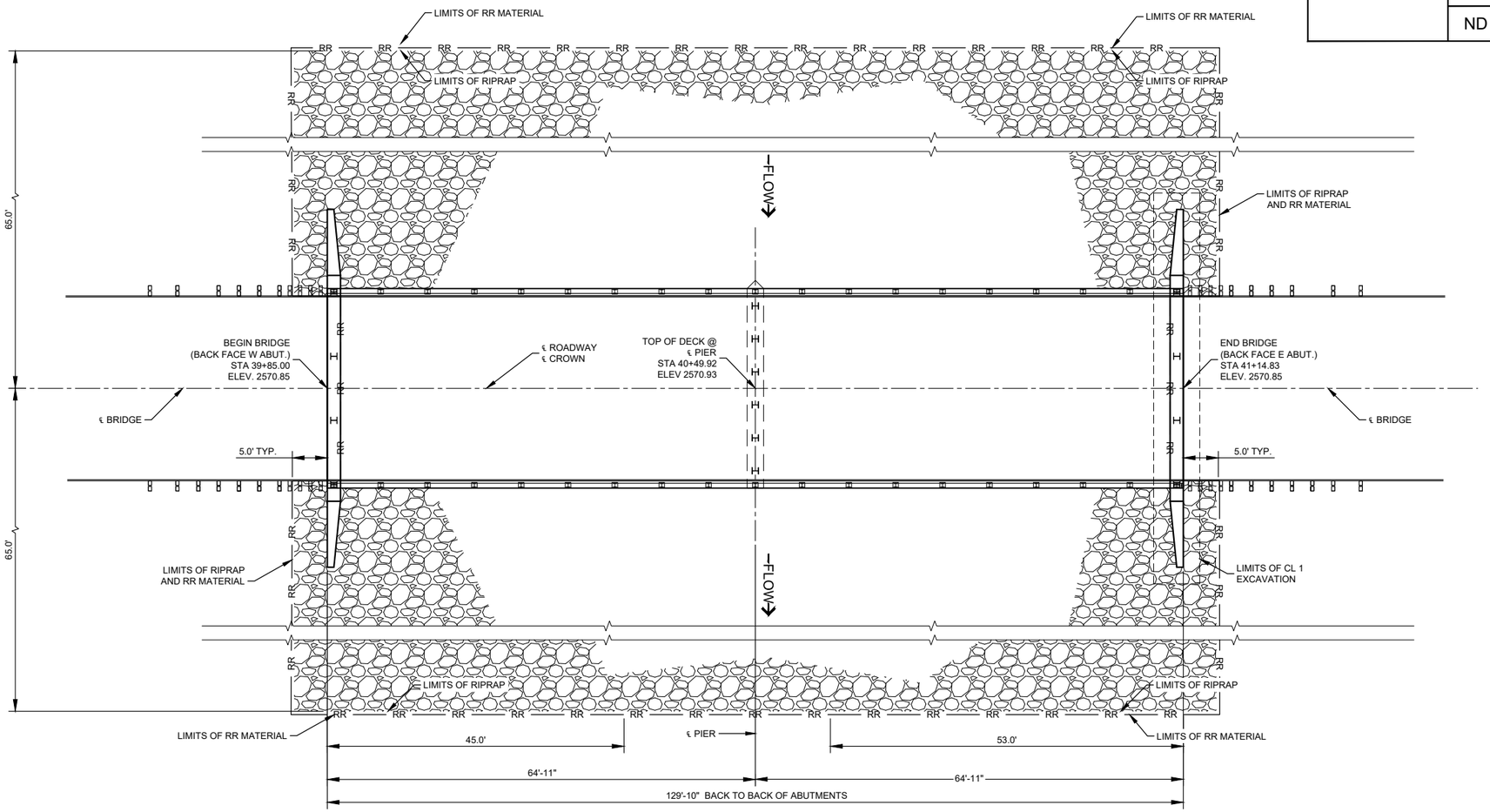
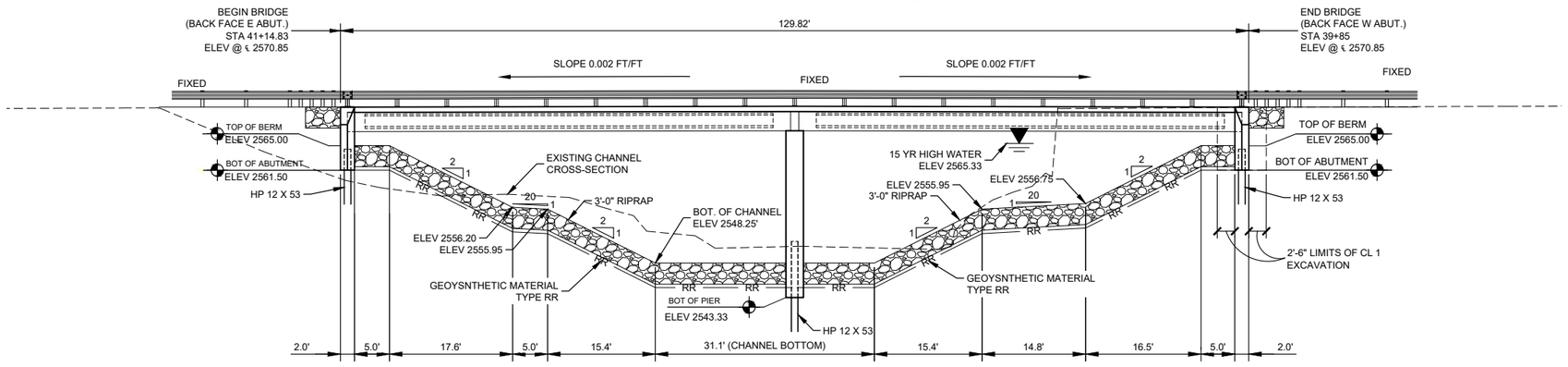
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	1



GENERAL PLAN

NORTH



ELEVATION LOOKING DOWNSTREAM

HYDRAULIC DATA:

DRAINAGE AREA	286 SQ. MI.
DESIGN FREQUENCY	15 YR
DESIGN DISCHARGE	4,758 CFS
DESIGN STAGE,NAVD88 (UPSTREAM)	2,565.33 FT
STREAM GRADIENT	0.00061 FT/FT
WATERWAY PROVIDED BELOW DESIGN STAGE	1,235 SQ. FT
WATERWAY PROVIDE BELOW CLEARANCE ELEVATION	1,440 SQ. FT
VELOCITY OF FLOW UNDER BRIDGE AT DESIGN DISCHARGE	3.9 FT/SEC
VELOCITY OF FLOW UNDER BRIDGE AT 100-YR DISCHARGE	6.0 FT/SEC
100-YEAR FREQUENCY DISCHARGE	8,680 CFS
100-YEAR FREQUENCY STAGE, NAVD88 (DOWNSTREAM)	2,568.24 FT
OVERTOPPING STAGE, NAVD88	2,570.5 FT
100-YR OVERTOPPING DISCHARGE	GREATER THAN 500-YEAR EVENT

DESIGN STRENGTHS:

F'C = 3,000 PSI ~ CLASS AE-3 CONCRETE
F'C = 4,000 PSI ~ CLASS AAE-3 CONCRETE
F'C = 6,000 PSI ~ PRESTRESSED BEAM CONCRETE
FY = 60,000 PSI ~ REINFORCING STEEL

LOAD & RESISTANCE FACTOR DESIGN

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CANNONBALL RIVER
NEW ENGLAND, ND

BRIDGE LAYOUT

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	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	2

GENERAL NOTES

100-P01 **SCOPE OF WORK:** THIS PROJECT CONSISTS OF BUILDING A NEW 2-SPAN PRESTRESSED CONCRETE SPREAD BOX GIRDER BRIDGE WITH AN OVERALL BRIDGE LENGTH OF 129'-10" AND A CLEAR ROADWAY WIDTH OF 28'-0". THE OVERALL DECK WIDTH IS 30'-3".

202-P01 **REMOVAL OF STRUCTURE:** THE EXISTING STRUCTURE IS A 128.64 FOOT THREE SPAN BRIDGE WITH A 22 FOOT OVERALL DECK WIDTH. THE SUPERSTRUCTURE CONSISTS OF A CONCRETE DECK SUPPORTED BY STEEL I-BEAMS. THE CLEAR ROADWAY WIDTH BETWEEN DECK CURBS IS 22'-4". THE LUMP SUM BID ITEM, "REMOVAL OF STRUCTURE" SHALL INCLUDE ALL WORK REQUIRED TO REMOVE THE BRIDGE IN ITS ENTIRETY, INCLUDING SUPERSTRUCTURE, SUBSTRUCTURE AND PILING TO MIN OF 2'-0" BELOW FINISHED GRADE CONTRACTOR SHALL USE METHODS WHICH PREVENT MATERIALS FROM ENTERING THE STREAM CHANNEL. THE CONTRACTOR SHALL EXERCISE DO DILIGENCE IN REMOVING ALL MATERIALS WHICH HAVE ENTERED THE STREAM BODY IN A TIMELY MANNER.

THE CONTRACTOR SHALL SUBMIT A COMPLETE BRIDGE REMOVAL PLAN TO THE ENGINEER DETAILING PROCEDURES AND SEQUENCE FOR REMOVING PORTIONS OF THE BRIDGE, INCLUDING ALL FEATURES NECESSARY TO REMOVE THE BRIDGE IN A SAFE AND CONTROLLED MANNER. THE REMOVAL PLANS, INDICATING DETAILED SEQUENCES OF OPERATIONS, SHALL BE SUBMITTED TO THE ENGINEER, AT LEAST, THIRTY (30) CALENDAR DAYS PRIOR TO START OF REMOVAL OPERATIONS OF THE EXISTING BRIDGE. THE BRIDGE REMOVAL PLAN SHALL INCLUDE THE FOLLOWING:

A. THE BRIDGE REMOVAL SEQUENCE FOR THE ENTIRE STRUCTURE, INCLUDING STAGING OF BRIDGE REMOVAL;
B. EQUIPMENT LOCATIONS ON THE STRUCTURE DURING REMOVAL OPERATIONS;
C. LOCATIONS WHERE WORK IS TO BE PERFORMED OVER THE STREAM; AND
D. DETAILS AND LOCATIONS OF PROTECTIVE COVERS OR OTHER MEASURES TO ASSURE THAT BRIDGE REMOVAL WILL NOT IMPACT THE STREAM.

210-P01 **EXCAVATION:** THE EXCAVATION AT THE ABUTMENTS SHALL BE INCLUDED AS "CLASS 1 EXCAVATION." ALL REMAINING EXCAVATION REQUIRED FOR CONSTRUCTION OF THE BRIDGE, INCLUDING CHANNEL SLOPES AND PIER SHALL BE INCLUDED IN THE LUMP SUM BID ITEM, "CHANNEL EXCAVATION."

602-P01 **DIAPHRAGMS AND ENDWALLS:** THE PIER DIAPHRAGM AND ENDWALL CONCRETE SHALL BE PLACED AT THE SAME TIME AS THE DECK CONCRETE.

602-P02 **DECK CONCRETE:** BEAMS HAVE SLIGHT VARIATIONS IN THE ANTICIPATED CAMBER. TO BUILD THE DECK TO THE DESIGNATED THICKNESS WILL REQUIRE SLIGHT ADJUSTMENTS IN DECK ELEVATION AND/OR RISER DIMENSIONS. THESE ADJUSTMENTS RESULT IN MINOR CONCRETE QUANTITY DISCREPANCIES. THE CONTRACTOR SHALL CONSIDER THIS QUANTITY DISCREPANCY WHEN HE BIDS THE UNIT PRICE FOR CLASS AAE-3 CONCRETE. THIS PROJECT WILL PAY PLAN QUANTITY WITH NO ADDITIONAL COMPENSATION FOR OVERRUN.

602-P03 **PENETRATING WATER REPELLENT TREATMENT:** PENETRATING WATER REPELLENT SHALL BE APPLIED TO THE DRIVING SURFACE OF THE CONCRETE DECK.

602-P04 **CURING CONCRETE:** WET CURE ALL CONCRETE SURFACES NOT COVERED BY FORMS. COVER THE CONCRETE WITH A DOUBLE THICKNESS OF BURLAP. MAINTAIN SURFACE MOISTURE BETWEEN THE FINAL FINISH AND PLACEMENT OF BURLAP BY PERIODIC APPLICATIONS OF A LIGHT FOG SPRAY OF WATER. KEEP THE BURLAP CONTINUOUSLY MOIST UNTIL THE END OF THE CURING PERIOD.

CURE DECK AND APPROACH SLAB CONCRETE AS SPECIFIED IN SECTION 602.04 F.2, "DECK SLAB CONCRETE"

602-P05 **CONCRETE:** PROVIDE AGGREGATE FOR CONCRETE THAT MEETS THE REQUIREMENTS OF SECTION 802.01 C.2, "COARSE AGGREGATE" AND SECTION 802.01 C.3, "FINE AGGREGATE"

622-P01 **PILING:** PILING SHALL BE DRIVEN WITH A STEAM, AIR, OR DIESEL HAMMER WITH A RATED ENERGY OF RAM WEIGHT NOT LESS THAN 78,836 FOOT-POUND-TONS, AS COMPUTED BY THE FORMULA W(E-22,176) + 0.711E, WHERE W IS THE WEIGHT OF THE RAM IN TONS AND E IS THE RATED HAMMER ENERGY. IN NO CASE SHALL THE RAM WEIGHT BE LESS THAN 4,000 POUNDS. THE HAMMER SHALL BE RUN AT AN ENERGY THAT PRODUCES A PENETRATION AT BEARING BETWEEN 1/2" AND 3 INCHES IN THE LAST 10 BLOWS.

622-P02 **PILE DRIVING:** FOR DOUBLE ACTING OR SINGLE ACTING DIESEL HAMMERS, CALCULATE THE SAFE BEARING VALUE OF PILES BY THE FOLLOWING FORMULA:

$$P = \frac{4.5E}{S + 0.2} \times \frac{W + 0.2M}{W + M}$$

WHERE:
P = SAFE BEARING VALUE, IN POUNDS.
W = WEIGHT OF STRIKING PARTS (RAM), IN POUNDS
M = WEIGHT OF PARTS BEING DRIVEN, IN POUNDS. INCLUDES PILE WEIGHT, ANVIL (IF ANY), DRIVING CAP, ETC.
E = ENERGY PER BLOW, IN FOOT-POUNDS.
S = AVERAGE PENETRATION OF PILE IN INCHES PER BLOW FOR LAST TEN BLOWS

FOR SINGLE ACTING HAMMERS, CALCULATE E BY MULTIPLYING OBSERVED STROKE (FT) AND W (LBS).

WORK DRAWINGS: THE CONTRACTOR SHALL SUBMIT THE FOLLOWING WORK DRAWINGS TO THE ENGINEER FOR REVIEW:

1. PRESTRESSED BOX BEAMS
2. TRAFFIC RAIL STEEL

BRIDGE BID ITEMS

SPEC	CODE	ITEM DESCRIPTION	UNIT	QUANTITY
202	0105	REMOVAL OF STRUCTURE	L SUM	1
210	0101	CLASS 1 EXCAVATION	L SUM	1
210	0127	CHANNEL EXCAVATION	L SUM	1
210	0200	FOUNDATION PREPARATION	EA	1
256	0100	RIPRAP GRADE I	CY	2,002
602	0130	CLASS AAE-3 CONCRETE	CY	117.1
602	1130	CLASS AE-3 CONCRETE	CY	116.6
602	1250	PENETRATING WATER REPELLENT TREATMENT	SY	437
604	9620	PRESTRESSED BOX BEAM-33IN	LF	506.6
612	0115	REINFORCING STEEL - GRADE 60	LBS	8,610
612	0116	REINFORCING STEEL - GRADE 60 - EPOXY COATED	LBS	27,115
616	0364	STRUCTURAL STEEL M270 - GRADE 36	LBS	781.3
622	0040	STEEL PILING HP 12 X 53	LF	1,050
624	0128	TRAFFIC RAIL-STEEL	LF	262.3
709	0155	GEOSYNTHETIC MATERIAL TYPE RR	SY	2,002
764	0151	REMOVE W-BEAM GUARDRAIL & POSTS	LF	493

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CANNONBALL RIVER
NEW ENGLAND, ND

BRIDGE LAYOUT

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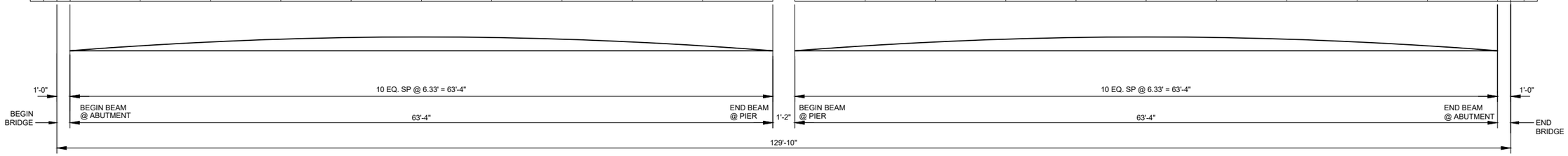
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	3

CENTERLINE BEAM ELEVATIONS @ TOP OF DECK					DEAD LOAD DEFLECTION	TENTHS	CENTERLINE BEAM ELEVATIONS @ TOP OF DECK					DEAD LOAD DEFLECTION	TENTHS
BEAM NO 1	BEAM NO 2	BEAM NO 3	BEAM NO 4		(FT.)	POINTS	BEAM NO 1	BEAM NO 2	BEAM NO 3	BEAM NO 4		(FT.)	POINTS
2570.61	2570.77	2570.77	2570.61		0.00	0	2570.61	2570.77	2570.77	2570.61		0.00	0
2570.61	2570.77	2570.77	2570.61				2570.61	2570.77	2570.77	2570.61			
2570.65	2570.81	2570.81	2570.65		0.036	1	2570.65	2570.81	2570.81	2570.65		0.036	9
2570.69	2570.85	2570.85	2570.69		0.068	2	2570.69	2570.85	2570.85	2570.69		0.068	8
2570.72	2570.89	2570.89	2570.72		0.093	3	2570.72	2570.89	2570.89	2570.72		0.093	7
2570.74	2570.91	2570.91	2570.74		0.109	4	2570.74	2570.91	2570.91	2570.74		0.109	6
2570.75	2570.92	2570.92	2570.75		0.114	5	2570.75	2570.92	2570.92	2570.75		0.114	5
2570.76	2570.93	2570.93	2570.76		0.109	6	2570.76	2570.93	2570.93	2570.76		0.109	4
2570.75	2570.92	2570.92	2570.75		0.093	7	2570.75	2570.92	2570.92	2570.75		0.093	3
2570.73	2570.90	2570.90	2570.73		0.068	8	2570.73	2570.90	2570.90	2570.73		0.068	2
2570.71	2570.88	2570.88	2570.71		0.036	9	2570.71	2570.88	2570.88	2570.71		0.036	1
2570.69	2570.85	2570.85	2570.69		0.00	10	2570.69	2570.85	2570.85	2570.69		0.00	10



SCREED ELEVATIONS

ELEVATIONS - TOP OF DECK @ CENTERLINE OF ROAD

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SCREED ELEVATIONS

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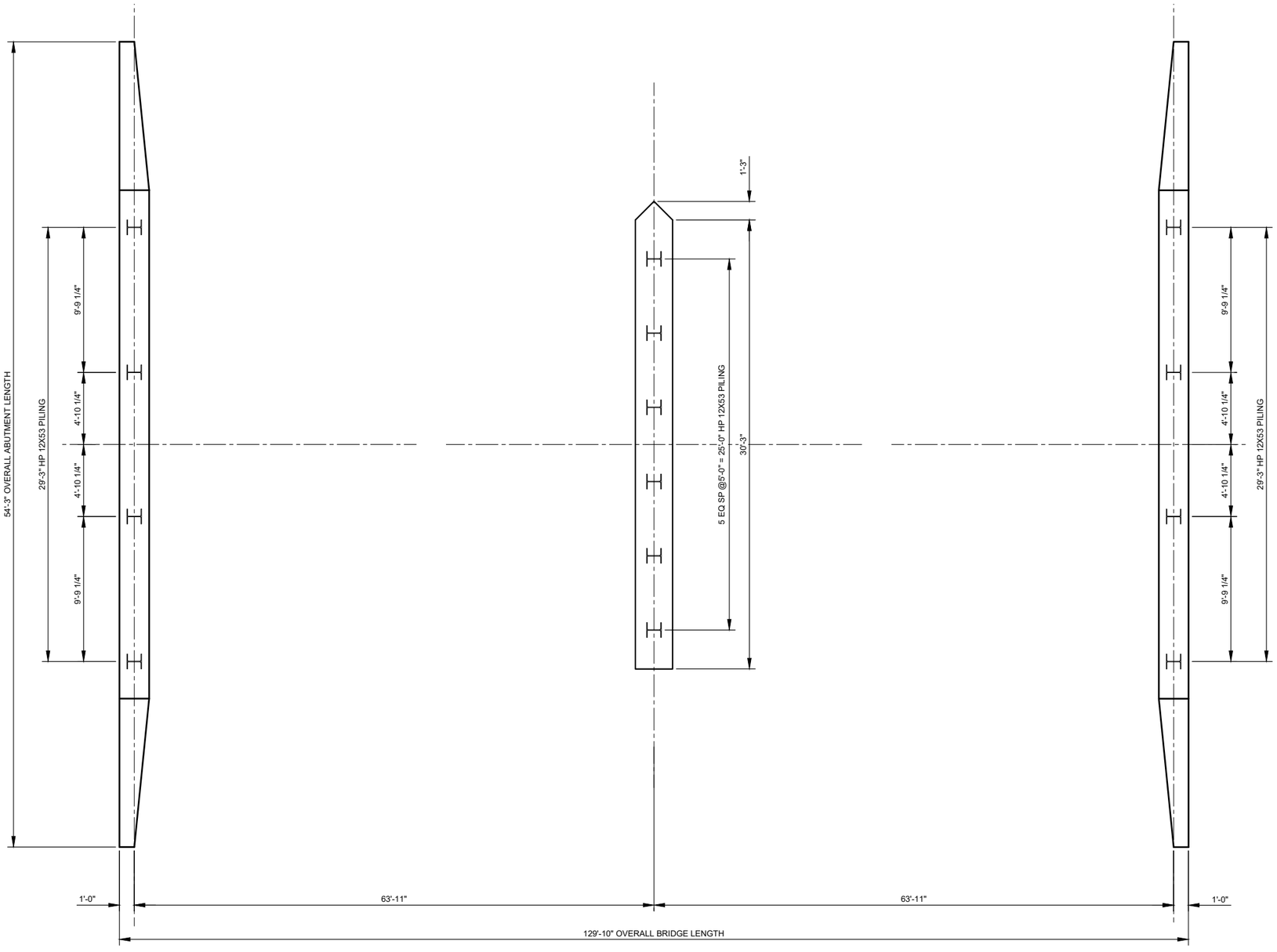

NOTE:

HP 12 X 53 PILE IN PIER SHALL BE DRIVEN TO 130.0 TON
HP 12 X 53 PILE IN ABUTMENTS SHALL BE DRIVEN TO 130.0 TON

PLAN VIEW - PILING LAYOUT

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PILING LAYOUT

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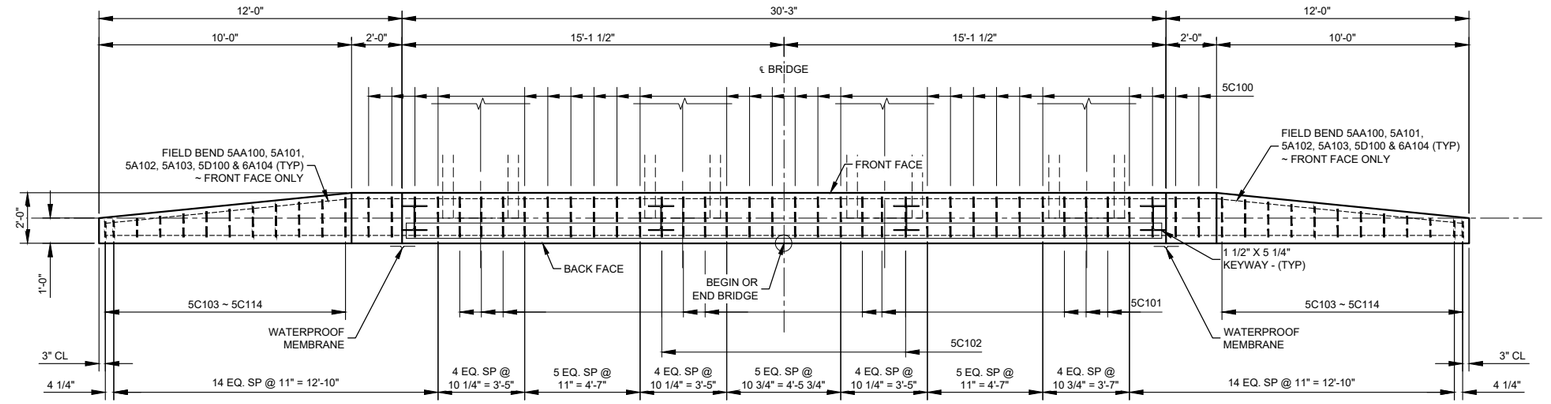
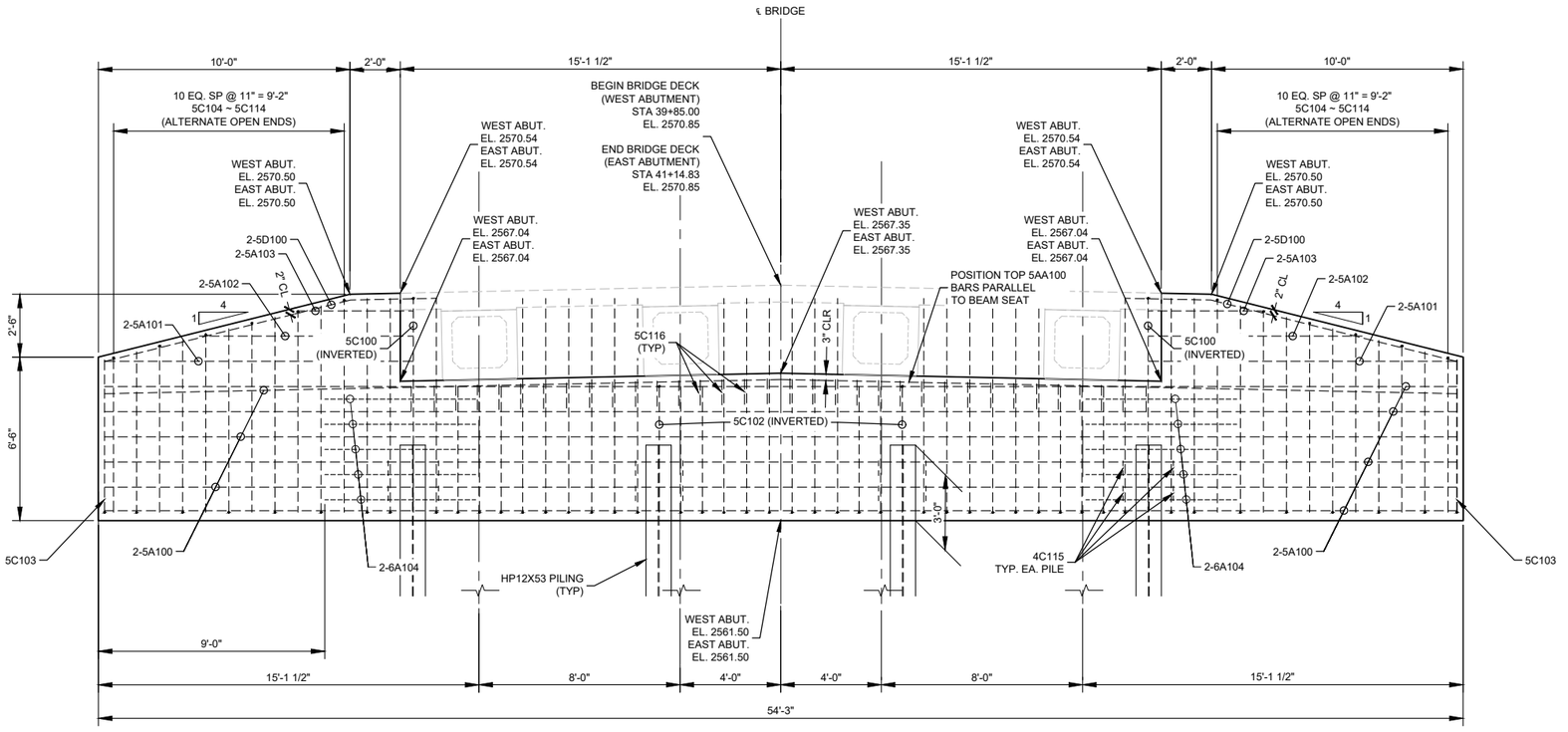
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	5



PLAN VIEW - ABUTMENT



ELEVATION - ABUTMENT

ESTIMATED MATERIAL QUANTITIES
(both) ABUTMENTS

ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AE-3 CONCRETE	CY	48.1
612	REINFORCING STEEL - GRADE 60	LBS	4753.0
622	STEEL PILING HP 12X53	LF	600

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CANNONBALL RIVER
NEW ENGLAND, ND

ABUTMENT PLAN & ELEVATION

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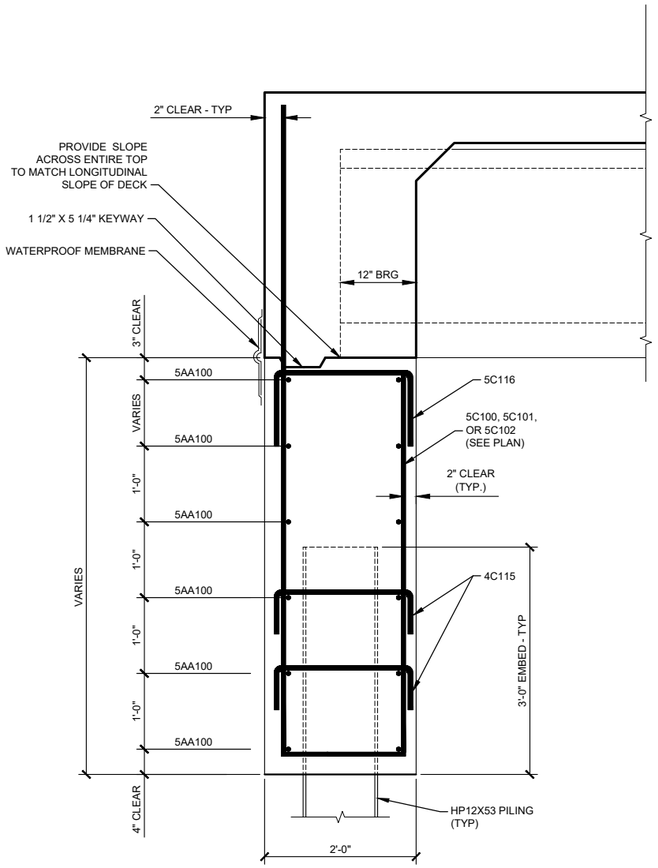
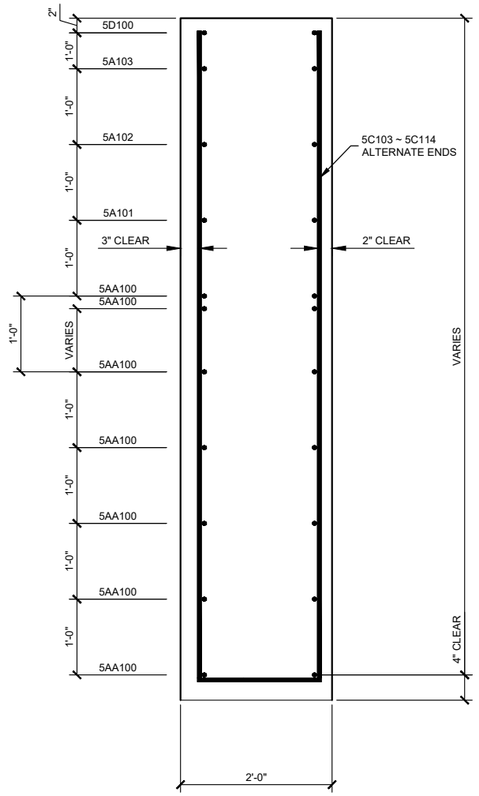
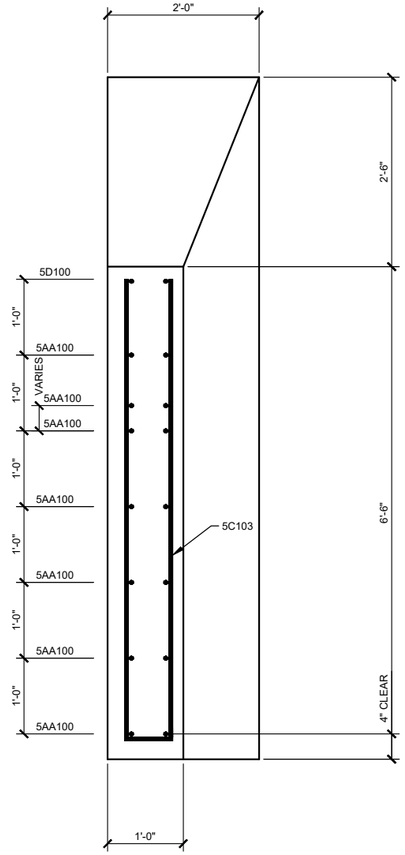
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	6



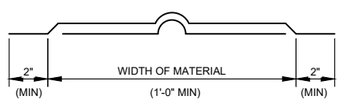
TYP SECTION THRU BEAM SEAT



TYP SECTION THRU WING WALL



TYP SECTION @ END OF WING WALL



WATERPROOF MEMBRANE SHALL MEET SECTION 602 OF THE NDDOT SPECIFICATIONS. ALL MATERIAL AND WORK SHALL BE INCLUDED IN THE PAY ITEM "CLASS AE-3 CONCRETE"

WATERPROOF MEMBRANE DETAIL

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CANNONBALL RIVER
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ABUTMENT DETAILS

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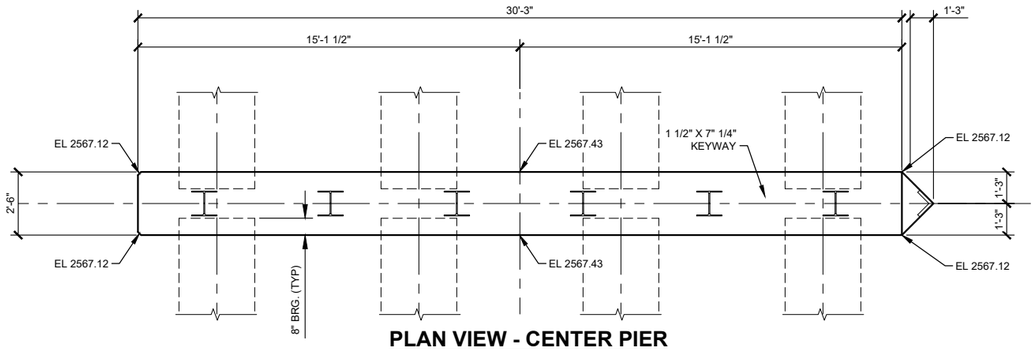
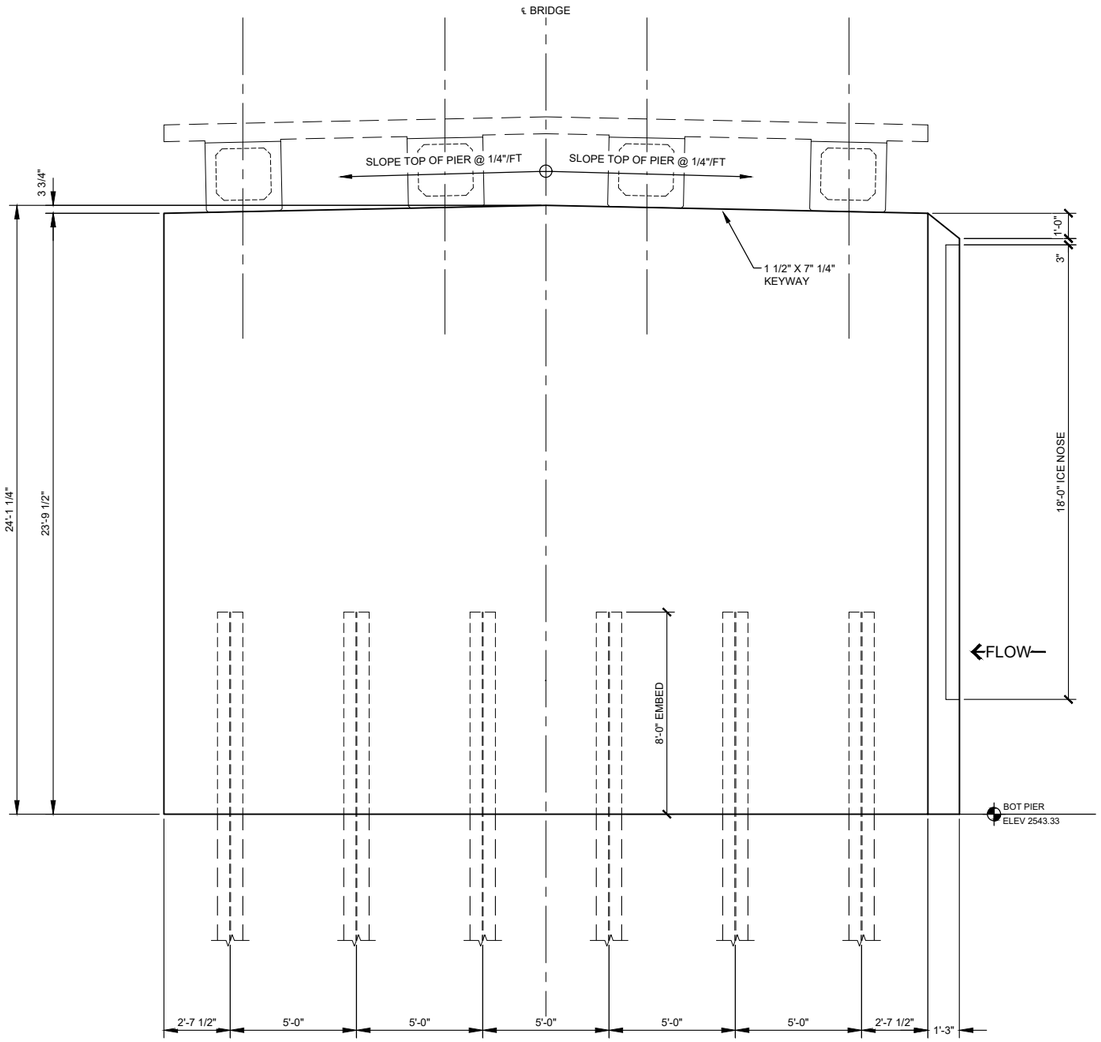
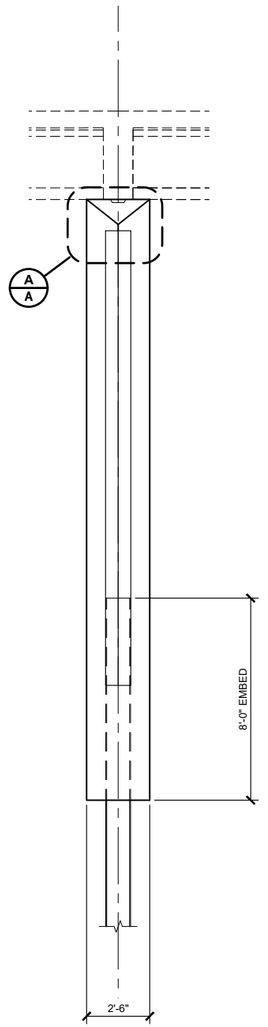
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	7



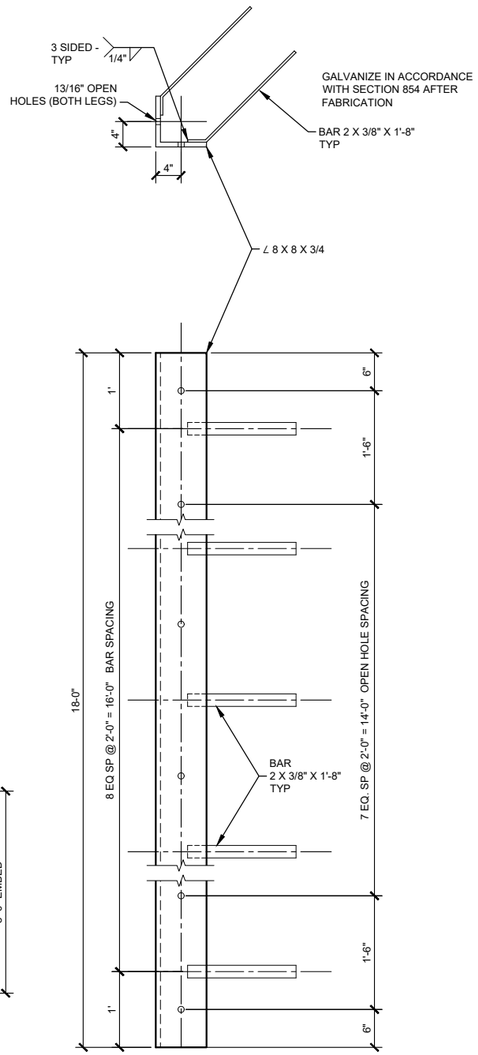
PLAN VIEW - CENTER PIER



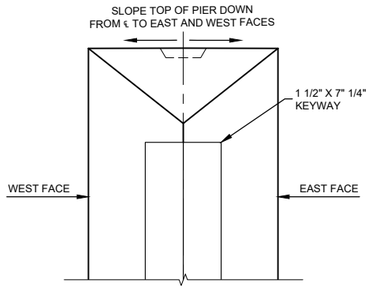
ELEVATION - CENTER PIER



UPSTREAM ELEVATION @ END PIER



DETAIL - ICE NOSE



DETAIL A-A

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CANNONBALL RIVER
NEW ENGLAND, ND

PIER DETAILS

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
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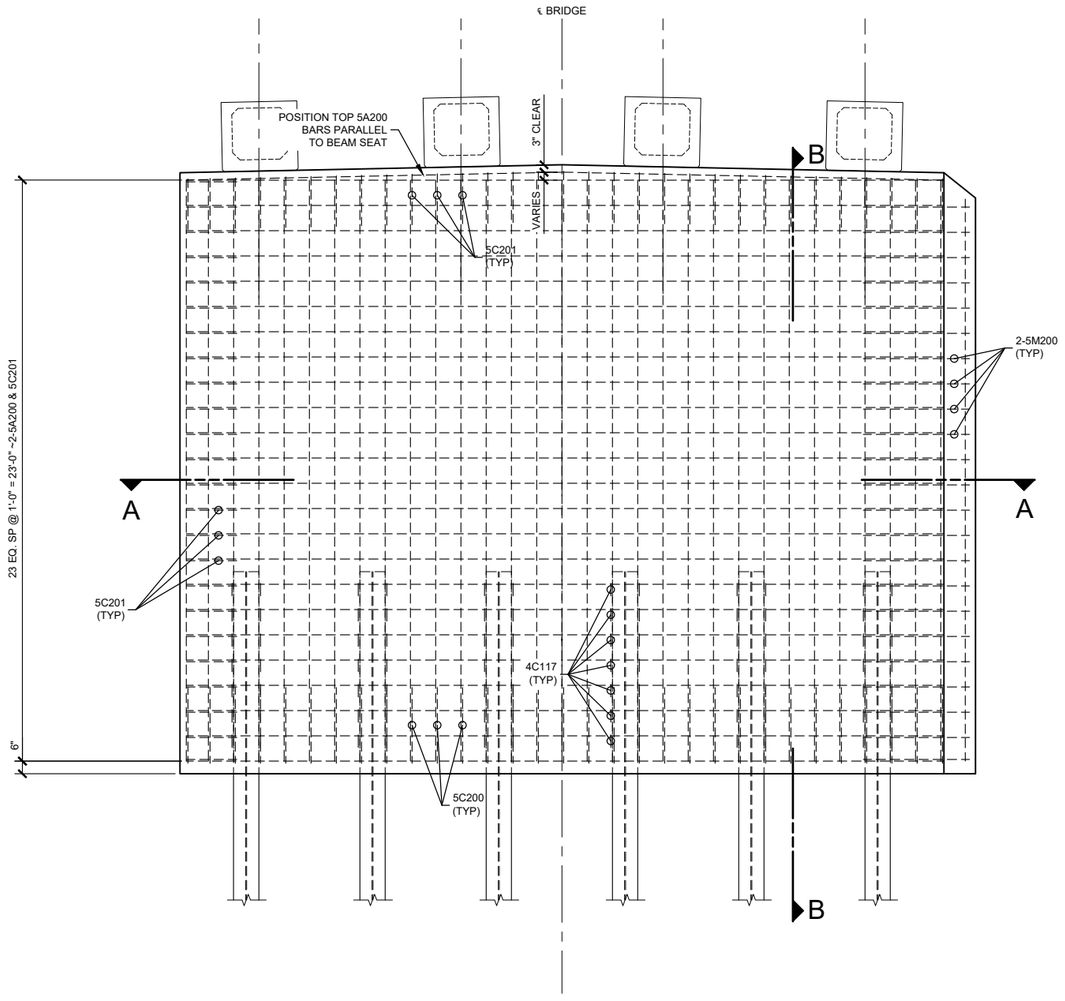
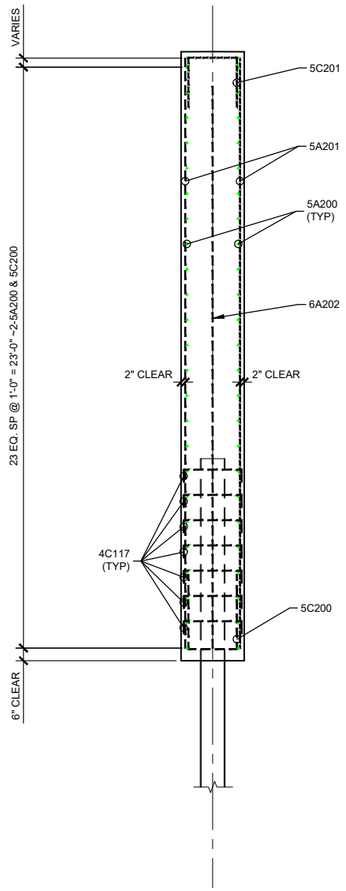
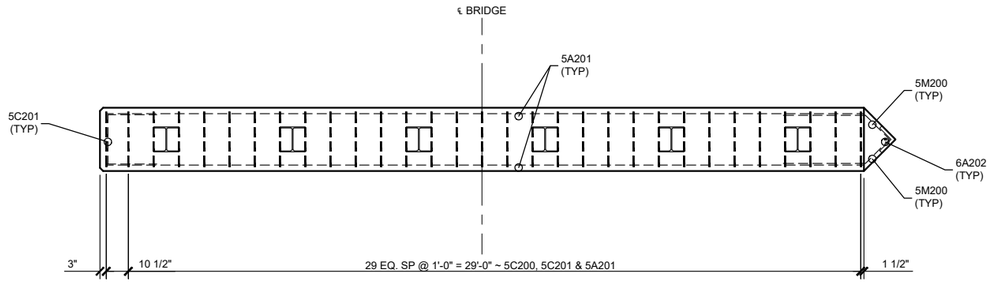
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	8



ELEVATION CENTER PIER - SHOWING REINFORCING



SECTION B-B



SECTION A-A

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ESTIMATED MATERIAL QUANTITIES - PIER

ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AE-3 CONCRETE	CY	68.5
612	REINFORCING STEEL - GRADE 60	LBS	3902.0
616	STRUCTURAL STEEL M270-GR 36	LBS	781.3
622	STEEL PILING HP 12X53	LF	450

CANNONBALL RIVER
NEW ENGLAND, ND

PIER DETAILS

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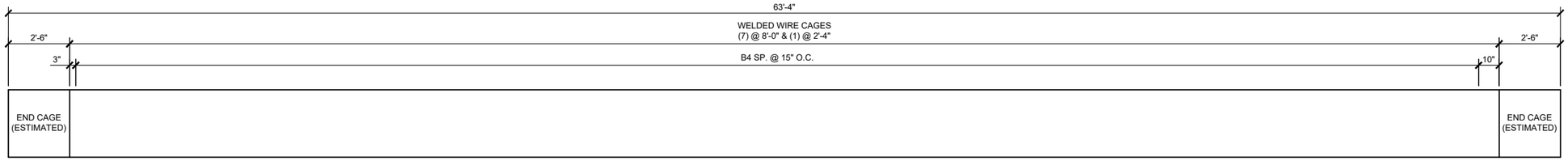
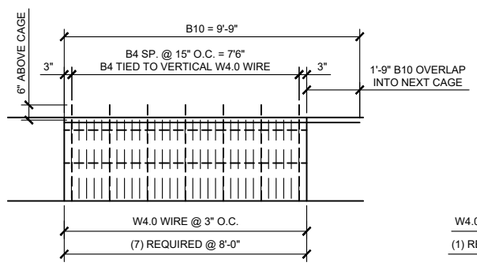
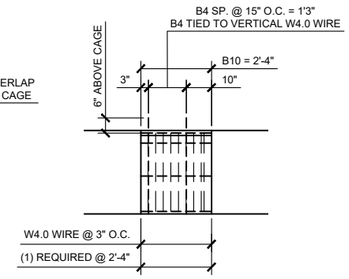
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	9

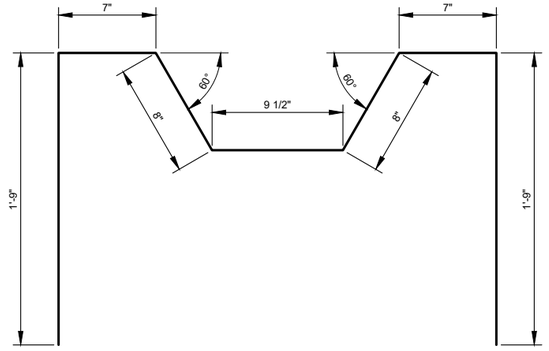


ELEVATION
NO SCALE

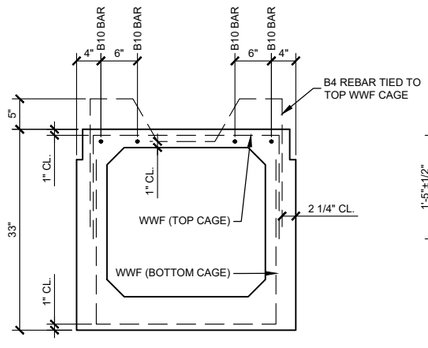




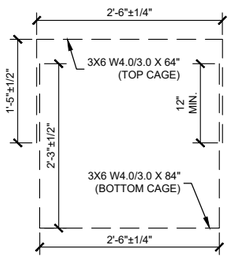
WWF CAGE LAYOUT
NO SCALE



B4
NO SCALE



SECTION



WWF CAGE

QUANTITIES (ONE BEAM)		
BEAM LENGTH	=	63.33 LF

BEAM SECTION DATA
WT = 602 LB/LFT
CROSS SECTIONAL AREA = 559 SQ IN.
C.G. = 14.85 IN
I = 73,709 IN^4
S_B = 4,964 IN^3

BAR LIST ~ ONE BEAM				
MARK	SIZE	NO.	LENGTH	SHAPE
B10	4	4	63'-0"	STR
B4	4	57	6'-9"	BENT

NOTES:

AT LEAST 14 DAYS PRIOR TO THE FORMING AND POURING OF ANY BEAMS, THE CONTRACTOR SHALL SUBMIT WORK DRAWINGS TO THE ENGINEER FOR REVIEW. THE WORK DRAWINGS SHALL INCLUDE THE TOTAL INITIAL PRESTRESS FORCE AND THE LOSSES IN THE PRESTRESS DUE TO ELASTIC SHORTENING, SHRINKING OR CREEPING OF CONCRETE AND THE RELAXATION OF STEEL STRESS AS DETERMINED BY THE CONTRACTOR FOR HIS METHOD OF STRESSING.

WORK DRAWINGS FURNISHED TO THE ENGINEER FOR REVIEW SHALL USE THE FOLLOWING MINIMUM TEXT SIZES ON ALL WORK SHEETS:
DIMENSIONS AND NOTES = 0.08"
DETAIL SUBTITLES = 0.09"
DETAIL TITLES= 0.10"

WORK DRAWINGS SHALLL SHOW STRAND LAYOUT, PULL DOWN LOCATIONS, TENSIONING FORCES, ELONGATION AND ANY PROPOSED CHANGES IN REINFORCING STEEL.

THE FINALPRESTRESS FORCE (REMAINING AFTER ALL LOSSES HAVE BEEN ACCOUNTED FOR) AND ITS CORRESPONDING CENTER OF GRAVITY, SHALL BE SELECTED FROM THOSE ON A CURVE DETERMINED BY THE THREE VALUES SHOWN. ALL PRESTRESSING STEEL SHALL CONFORM TO AASHTO M203

THE BEAMS SHALL BE POURED IN ALL STEEL FORMS. HOLES AND INSERTS TO ACCOMODATE THE DIAPHRAGM BARS SHALL BE PROVIDED IN THE BEAMS AT LOCATIONS AS SHOWN.

MINOR CHANGES TO THE SHAPE OF THE BEAM AND TO REINFORCING STEEL MAY BE MADE TO ACCOMMODATE THE FORMS OF VARIOUS CONTRACTORS AND THEIR CONSTRUCTION METHODS WITH THE APPROVAL OF THE ENGINEER.

THE TOPS OF THE BEAMS SHALL BE ROUGH FLOATED AND BROOMED TRANSVERSELY FOR BOND.

PROVIDE HANDLING HOOKS OR DEVICES AS REQUIRED BY THE CONTRACTOR. HOOKS OR DEVICES PROVIDED WILL BE SUBJECT TO APPROVAL BY THE PRECAST SUPPLIER.

3X6 W4.0/3.0 WELDED WIRE FABRIC EQUAL TO A STEEL AREA OF 0.16 IN.2/LF OF BEAM.

B4 BAR BAR TO HAVE A MINIMUM EMBEDMENT OF 16" AND A MAXIMUM SPACING OF 16" ACROSS THE BEAM.

WELDED WIRE FABRIC = 65 K.S.I. STEEL

REBAR = 60 K.S.I. STEEL

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CANNONBALL RIVER
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33IN PRESTRESSED BOX BEAM

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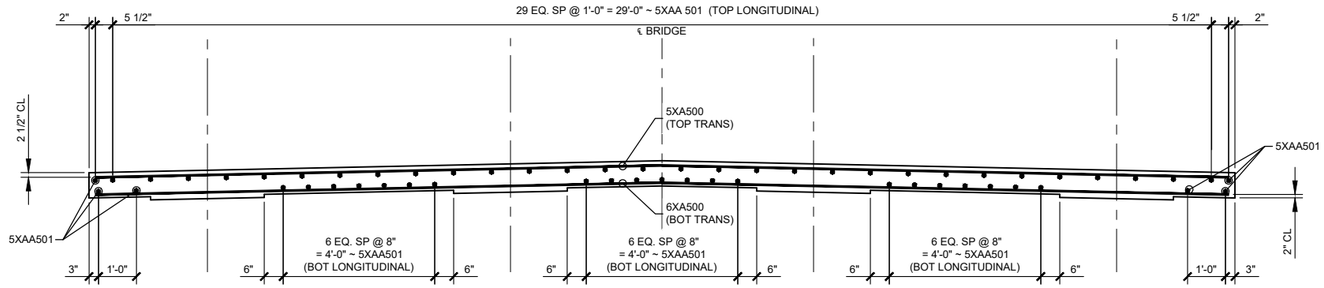
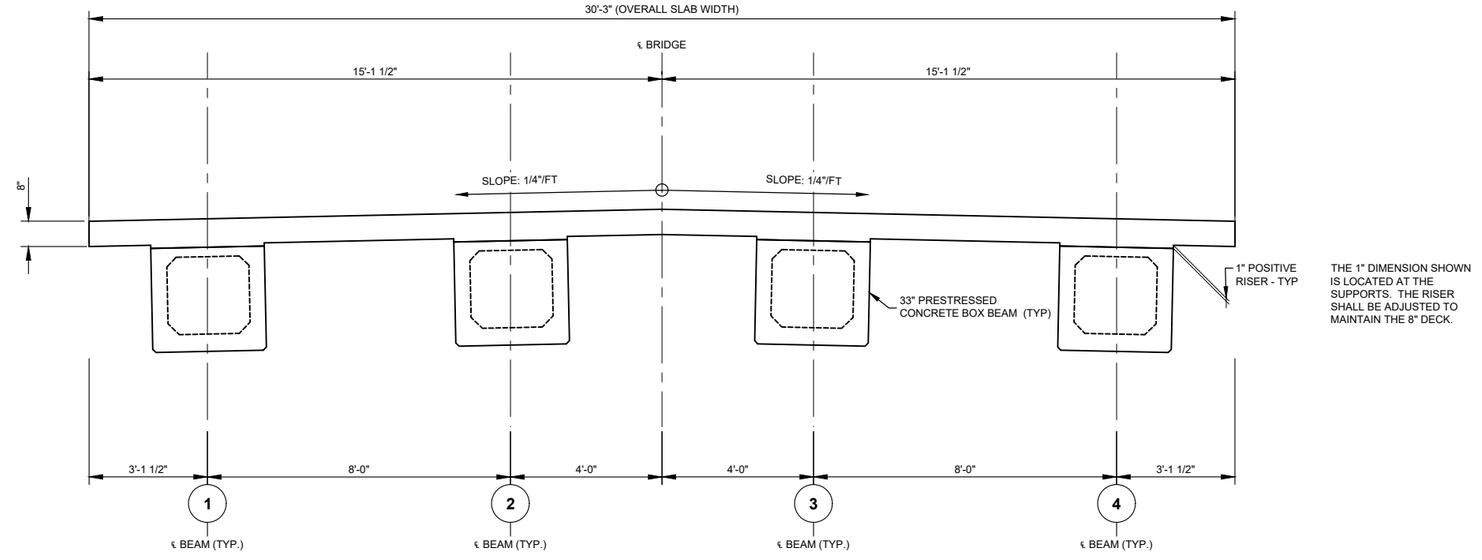
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	10



SECTION - SUPERSTRUCTURE SHOWING REINFORCEMENT



THE 1" DIMENSION SHOWN IS LOCATED AT THE SUPPORTS. THE RISER SHALL BE ADJUSTED TO MAINTAIN THE 8" DECK.

SECTION - SUPERSTRUCTURE SHOWING DIMENSIONS

ESTIMATED MATERIAL QUANTITIES
SUPERSTRUCTURE

ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	101.8
612	REINFORCING STEEL - GRADE 60	LBS	24,921.0

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DECK SLAB SECTION

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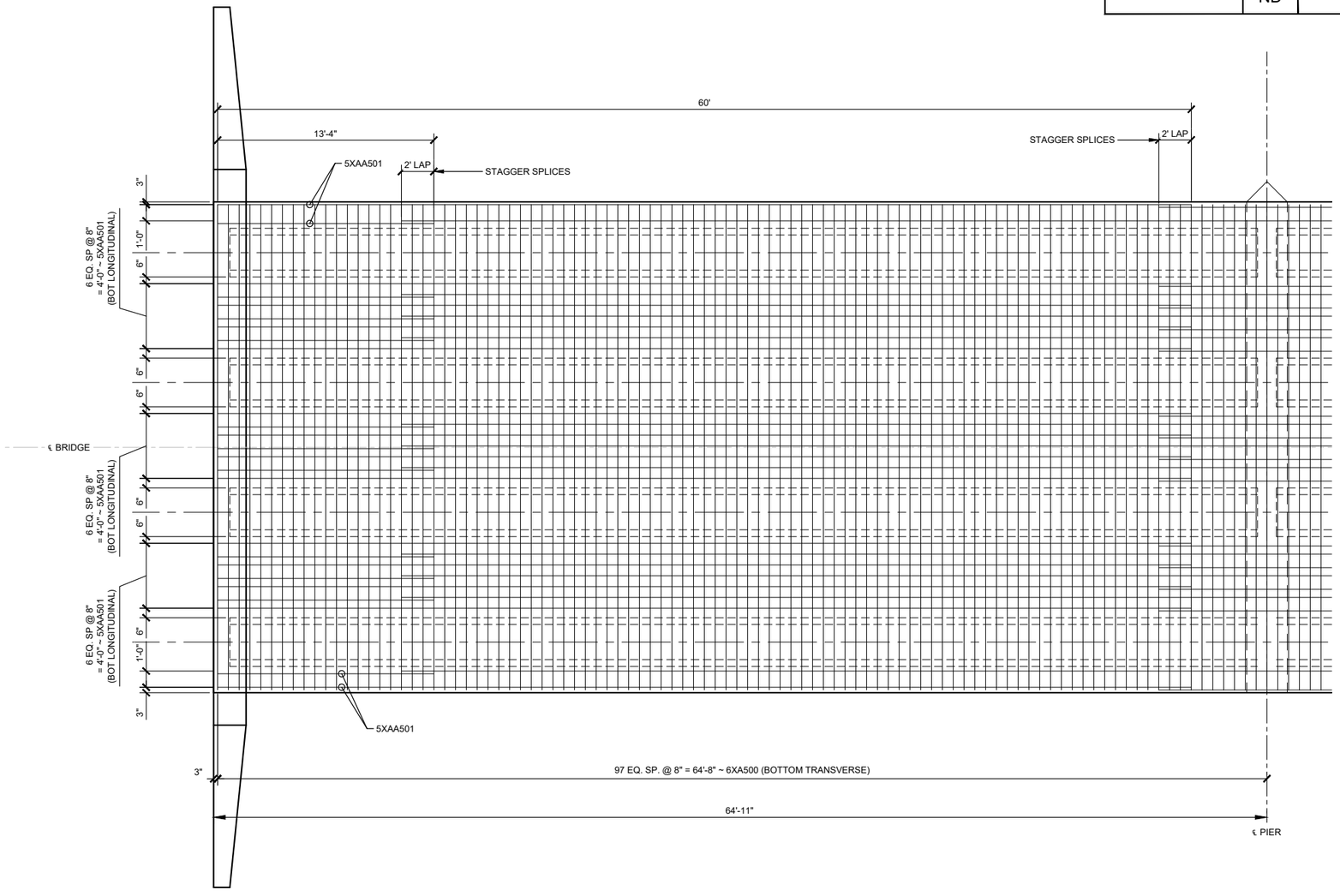
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	11



PART SLAB LAYOUT - BOTTOM REINFORCEMENT

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SLAB LAYOUT

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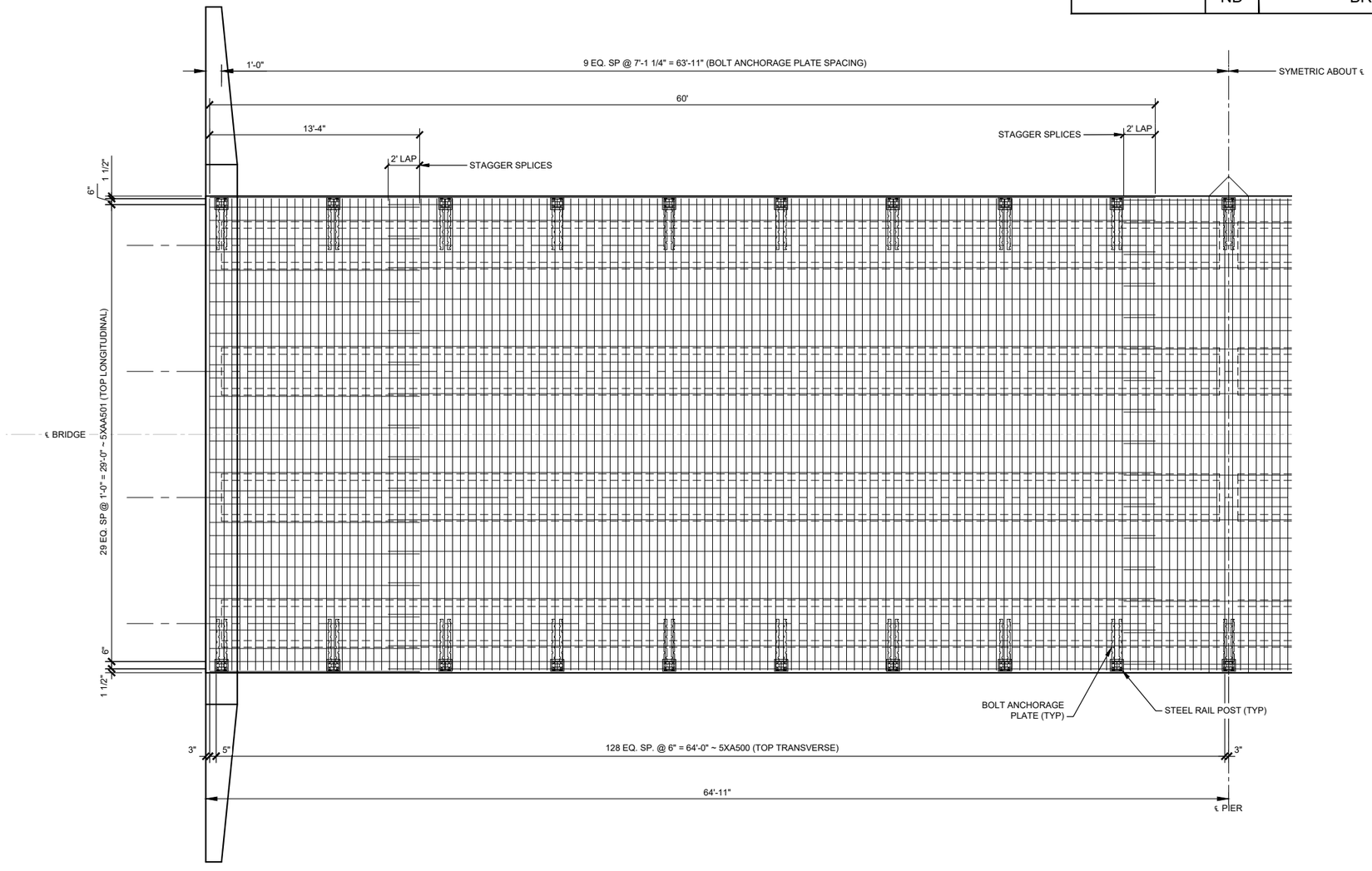
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	12



PART SLAB LAYOUT - TOP SLAB REINFORCEMENT

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PART SLAB - TOP REINFORCEMENT

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
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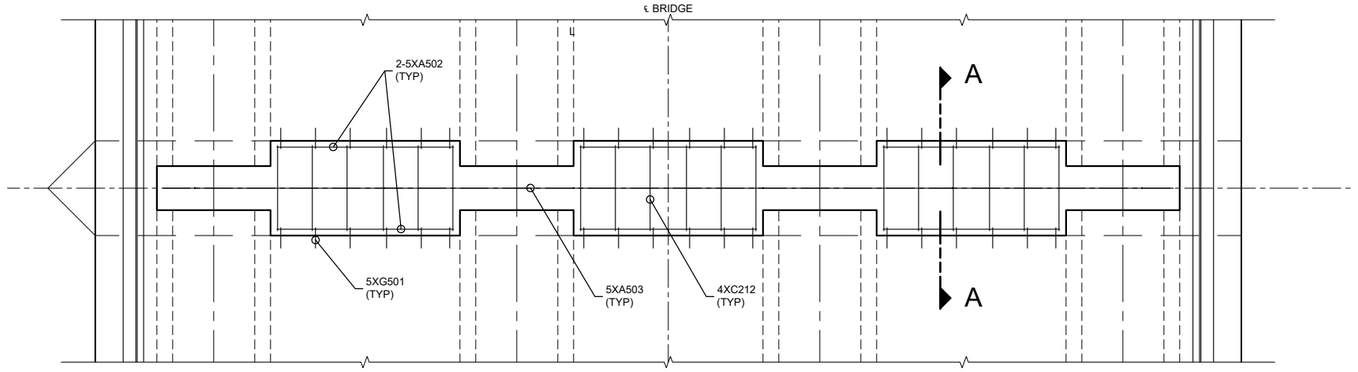
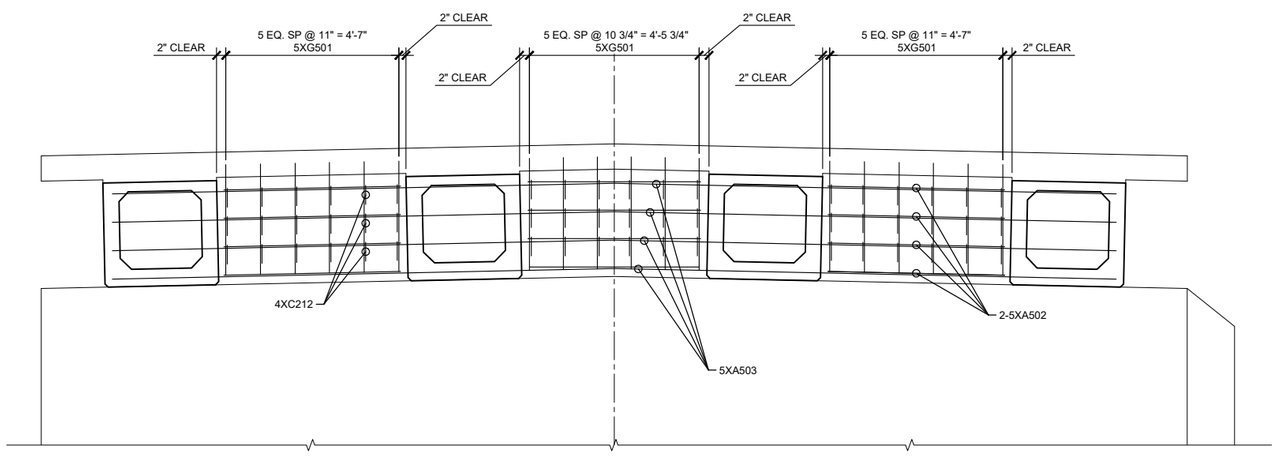
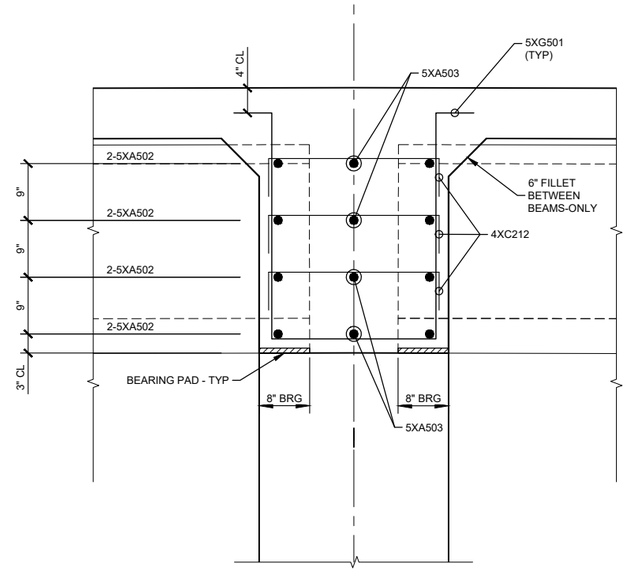
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	13



PLAN VIEW - PIER DIAPHRAGM



ELEVATION - PIER DIAPHRAGM



SECTION A-A

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ESTIMATED MATERIAL QUANTITIES
PIER DIAPHRAGM

ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	5.5
612	REINFORCING STEEL - GRADE 60	LBS	515.0

CANNONBALL RIVER
NEW ENGLAND, ND

PIER DIAPHRAGM DETAILS

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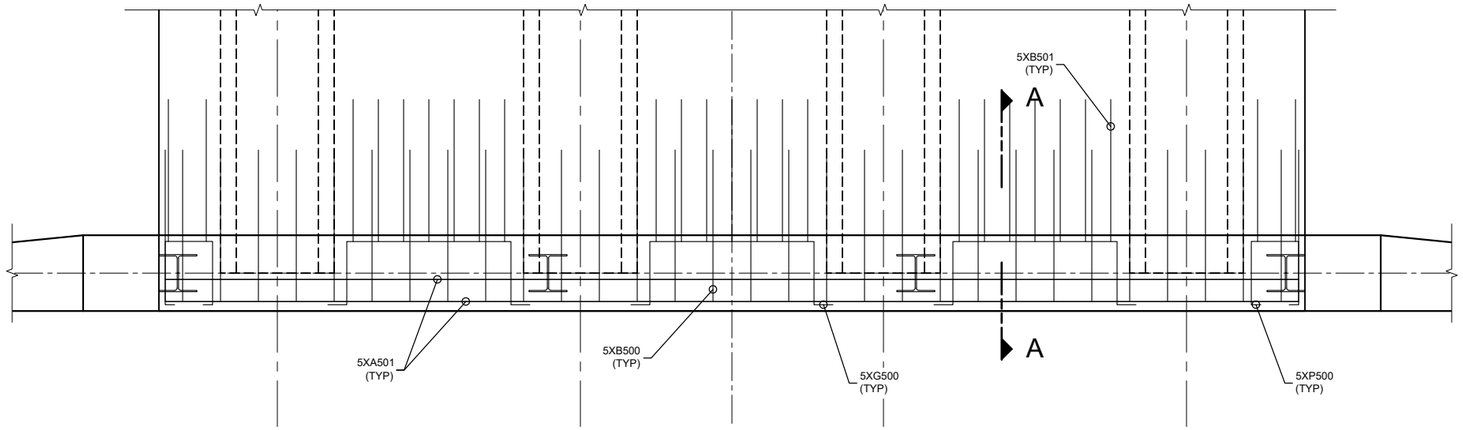
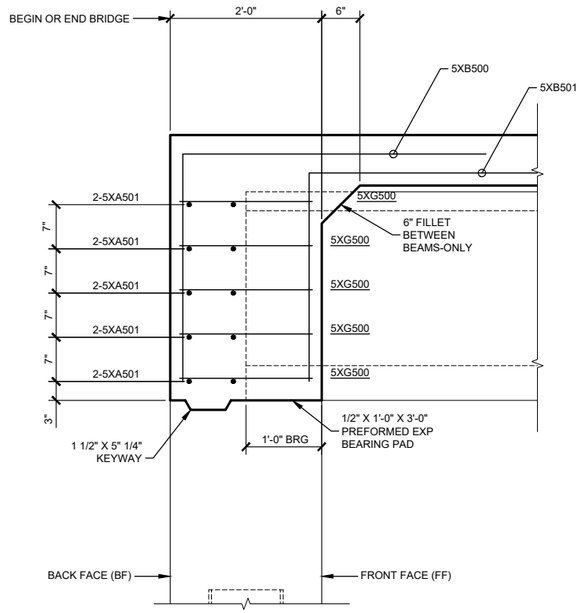
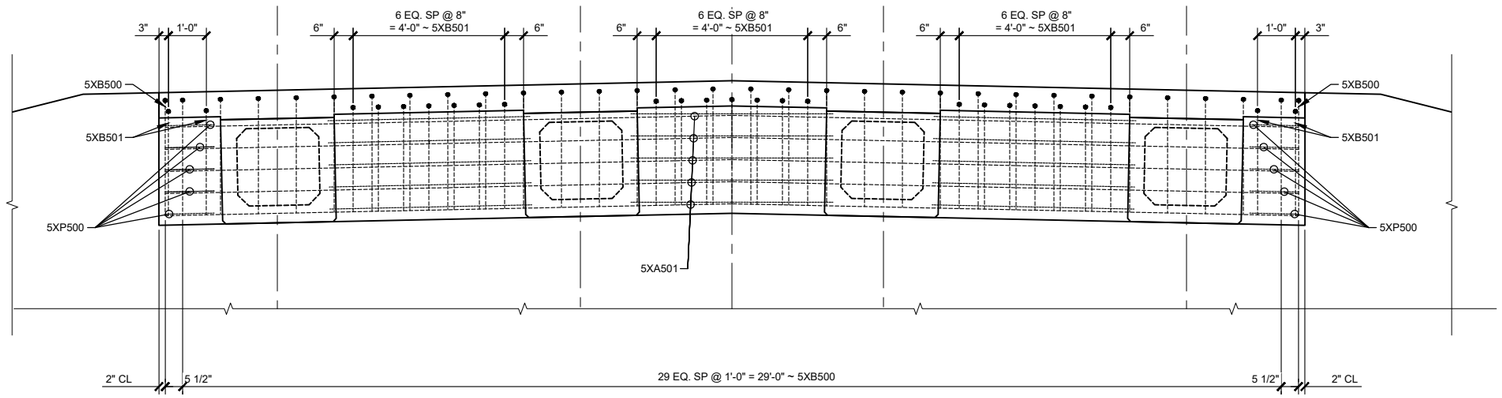
	ND	BRO-0021(019)	20422	170	14



PLAN - SHOWING ENDWALL REINF



SECTION A-A



ELEVATION - SHOWING ENDWALL REINF

ESTIMATED MATERIAL QUANTITIES
BOTH ENDWALLS

ITEM	DESCRIPTION	UNIT	QUANTITY
602	CLASS AAE-3 CONCRETE	CY	9.8
612	REINFORCING STEEL - GRADE 60	LBS	1799.0

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CANNONBALL RIVER
NEW ENGLAND, ND
END WALL DETAILS

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	ND	BRO-0021(019)	20422	170	15

BILL OF REINFORCING STEEL, GRADE 60

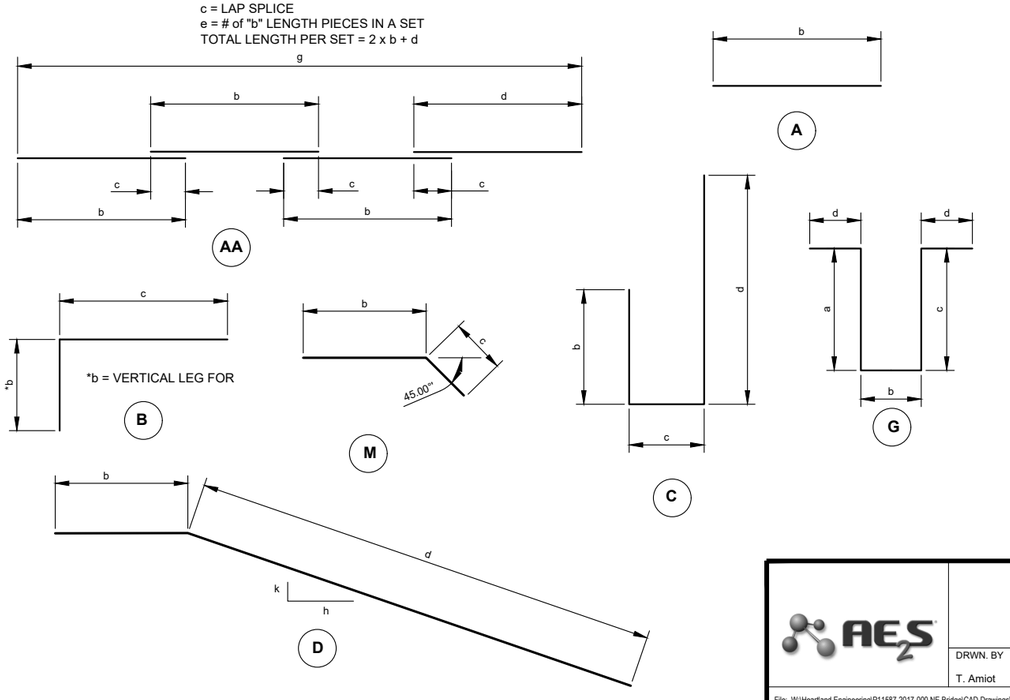
LETTER PREFIX OF BAR MARK DENOTES SHAPE ~ SEE BAR DETAILS

LOCATION		SIZE	MARK	NO EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS								
						a	b	c	d	e	f	g	h	k
ABUTMENTS	REGULAR	5	C100	52	18'-7"		8'-6"	1'-7"	8'-6"					
		5	C101	20	15'-1"		5'-0"	1'-7"	8'-6"					
		5	C102	4	11'-7"		5'-0"	1'-7"	5'-0"					
		5	C103	4	12'-9"		6'-1"	7"	6'-1"					
		5	C104	4	13'-0"		6'-2"	8"	6'-2"					
		5	C105	4	13'-7"		6'-5"	9"	6'-5"					
		5	C106	4	14'-0"		6'-7"	10"	6'-7"					
		5	C107	4	14'-7"		6'-10"	11"	6'-10"					
		5	C108	4	15'-2"		7'-1"	1'-0"	7'-1"					
		5	C109	4	15'-9"		7'-4"	1'-1"	7'-4"					
		5	C110	4	16'-2"		7'-6"	1'-2"	7'-6"					
		5	C111	4	16'-10"		7'-9"	1'-4"	7'-9"					
		5	C112	4	17'-5"		8'-0"	1'-5"	8'-0"					
		5	C113	4	18'-0"		8'-3"	1'-6"	8'-3"					
		5	C114	4	18'-5"		8'-5"	1'-7"	8'-5"					
		4	C115	32	2'-7"		6"	1'-7"	6"					
		5	C116	68	3'-7"		1'-0"	1'-7"	1'-0"					
		5	A100	28	53'-9"		53'-9"							
		5	A101	8	12'-3"		12'-3"							
		5	A102	8	8'-6"		8'-6"							
		5	A103	8	4'-6"		4'-6"							
		6	A104	40	6'-0"		6'-0"							
		5	D100	8	13'-6"		3'-5"		10'-6"				4	1
END WALLS	EPOXY													
		5	XA501	20	30'-0"		30'-0"							
		5	XB500	64	8'-0"		4'-0"	4'-0"						
		5	XB501	60	7'-6"		3'-9"	3'-9"						
		5	5XP500	12	4'-10"	1'-8"	1'-6"	1'-8"	3"					
		5	XG500	18	8'-8"	1'-8"	4'-10"	1'-8"	6"					
PIER	REGULAR													
		5	A200	58	30'-0"		30'-0"							
		5	A201	64	27'-4"		27'-4"							
		6	A202	1	26'-6"		26'-6"							
		5	C200	31	8'-2"		3'-0"	2'-2"	3'-0"					
		5	C201	60	6'-2"		2'-0"	2'-2"	2'-0"					
		4	C117	50	3'-2"		6"	2'-2"	6"					
		5	M200	54	4'-0"		2'-6"	1'-6"						

LOCATION		SIZE	MARK	NO EACH /SET	NOMINAL LENGTH	DETAILING DIMENSIONS								
						a	b	c	d	e	f	g	h	k
PIER DIAPHRAGM	EPOXY	5	XA502	24	4'-8"		4'-8"							
		5	XA503	4	26'-8"		26'-8"							
		5	XG501	18	9'-2"	3'-0"	2'-2"	3'-0"	6"					
		4	XC212	54	3'-2"		6"	2'-2"	6"					
SUPERSTRUCTURE	EPOXY													
		5	XA500	260	29'-11"		29'-11"							
		6	XA500	195	29'-11"		29'-11"							
		5	XAA501	57	133'-4"		60'-0"	2'-0"	13'-4"	2		129'-4"		

NOTES:

1. FABRICATION AND TOLERANCES SHALL BE IN ACCORDANCE WITH THE CRSI MANUAL OF STANDARD PRACTICE.
2. ALL DIMENSIONS ARE OUT TO OUT OF BARS
3. NOMINAL LENGTH OF EACH BENT BAR OR CUT BAR IS THE SUM TOTAL OF THE DETAILING DIMENSIONS FOR THAT BAR, UNLESS OTHERWISE NOTED.
4. ADJACENT "AA" BARS SHALL BE TURNED END FOR END SO THAT THE SPLICE LOCATIONS ARE STAGGERED.
5. THE "I" DIMENSION INDICATES THE INSIDE RADIUS UNLESS OTHERWISE NOTED.
6. AN "X" PRECEDING A BAR DESIGNATION INDICATES AN EPOXY COATED BAR.



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CANNONBALL RIVER
NEW ENGLAND, ND

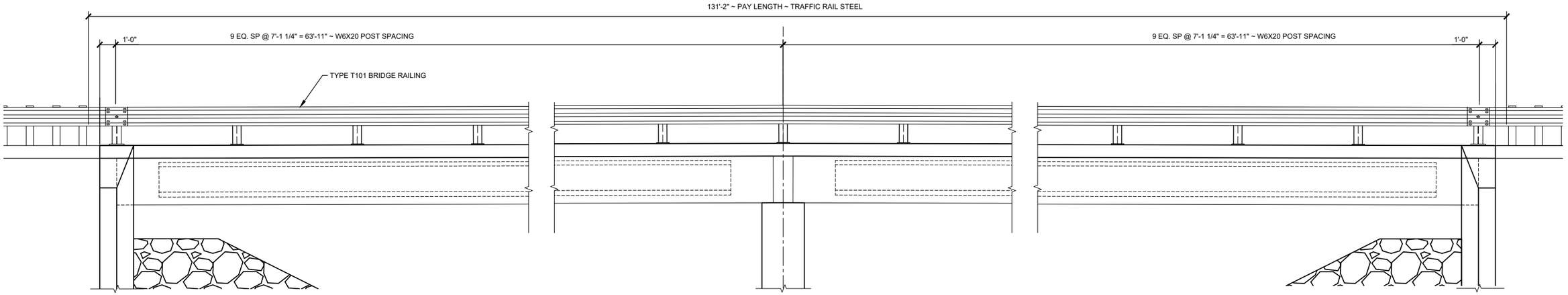
REINFORCEMENT SCHEDULE

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
T. Amiot	P. Johnson	P11587-2017-000	FEB. 2018

File: W:\Heartland Engineering\P11587-2017-000 NE Bridge\CAD Drawings\Drawings\BRIDGE DESIGN NDDOT COMMENTS.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	16



ELEVATION - SHOWING TRAFFIC RAIL STEEL

GENERAL RAILING NOTES

DESIGNED ACCORDING TO AASHTO STANDARD AND CURRENT INTERIM SPECIFICATIONS

PANEL LENGTHS OF TUBE MEMBERS SHALL BE ATTACHED CONTINUOUSLY TO A MINIMUM OF THREE POSTS

RAIL POSTS SHALL BE SET PERPENDICULAR TO ROADWAY PROFILE GRADE

ALL BOLTS, NUTS, WASHERS, ANCHORAGE PLATES AND BOTTOM PLATES ARE CONSIDERED AS PARTS OF THE RAIL FOR PAYMENT.

AT EXPANSION SLOTS IN W-BEAM RAIL, TIGHTEN BOLTS SNUGLY

ANCHOR BOLTS SHALL BE 3/4" DIA. ASTM A325 BOLTS (OR A321 THREADED RODS WITH TACK WELDED NUTS) WITH HEX NUTS AND WASHERS AS SHOWN. THREADED RODS MAY BE .670" MIN DIA.W WITH ROLLED THREADS. NUTS AND WASHERS FOR ANCHOR BOLTS SHALL CONFORM TO A325 REQUIREMENTS. NUTS MAY BE TAPPED AFTER GALVANIZING. BOLTS AND NUTS SHALL HAVE CLASS 2A AND 2B FIT TOLERANCES.

SHOP DRAWINGS TO BE SUBMITTED TO THE FIELD ENGINEER FOR APPROVAL IN ACCORDANCE WITH SECTION 616.04A OF THE STD. SPECIFICATIONS.

ALL STRUCTURAL STEEL, INCLUDING FASTENERS, SHALL BE HOT DIP GALVANIZED AFTER FABRICATION UNLESS SPECIFICALLY NOTED OTHERWISE. THIS WORK, AS WELL AS REPAIR OF DAMAGED GALVANIZED COATINGS SHALL BE ACCORDING TO SECTION 854 OF THE NDDOT STANDARD SPECS. SAID WORK SHALL BE CONSIDERED AS AN INCIDENTAL TO THE PRICE BID FOR TRAFFIC RAIL-STEEL.

SEAL BETWEEN BOTTOM OF RAIL POST PLATE AND DECK OR FILL AREA BETWEENBOLTS AND DECK SLEEVE WITH CAULK MATERIAL APPROVED BY THE ENGINEER TO KEEP MOISTURE FROM DRAINING THROUGH SLEEVE.

W-BEAM RAIL MEMBER IS TO BE SHOP FABRICATED FROM STD 25' OR 12 1/2' NOMINAL W-BEAM SECTIONS. BEAMS SHALL BE BUTT WELDED, CONTINUOUS SEAM WELDING IS ALSO ACCEPTABLE.

ESTIMATED MATERIAL QUANTITIES - RAILING

ITEM	DESCRIPTION	UNIT	QUANTITY
624	TRAFFIC RAIL - STEEL	LF	131.2

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AE2S

CANNONBALL RIVER
NEW ENGLAND, ND

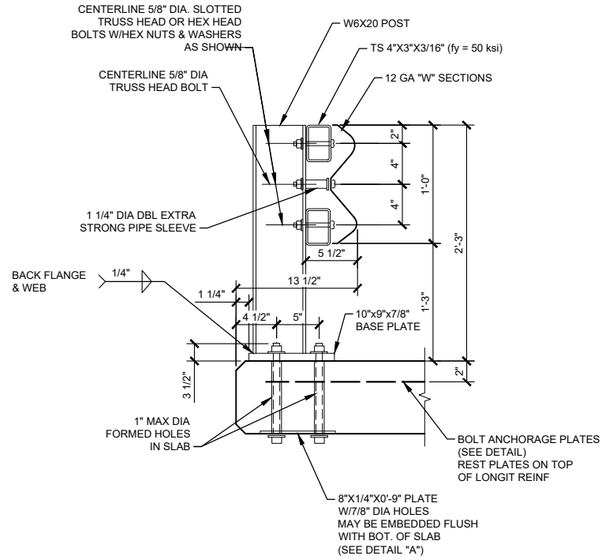
BRIDGE RAILING ELEVATION

DRWN. BY	CHK'D BY	PROJECT NO.	DATE
T. Amiot	P. Johnson	P11587-2017-000	FEB. 2018

File: W:\Heartland Engineering\P11587-2017-000 NE Bridge\CAD Drawings\Drawings\BRIDGE DESIGN NDDOT COMMENTS.dwg

AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370

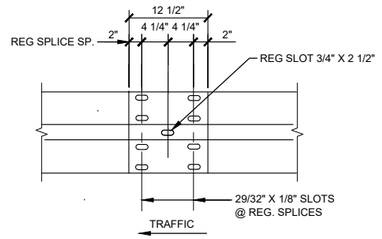
	STATE	PROJECT NO.	PCN	SEC. NO.	SHEET NO.
	ND	BRO-0021(019)	20422	170	17



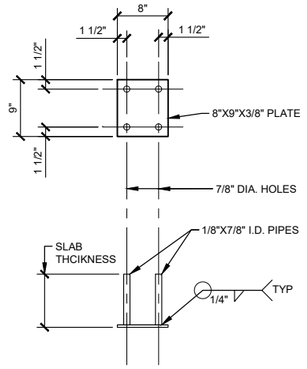
TYP SECTION OF POST & RAIL

MEMBER MAY BE EITHER ALUMINUM - NOM. THICKNESS .105" OR STEEL - NOM. THICKNESS - .1048" EXCLUSIVE OF PROTECTIVE COATING

RAIL MEMBER

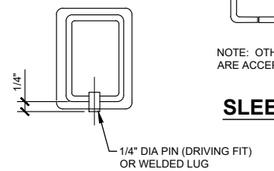


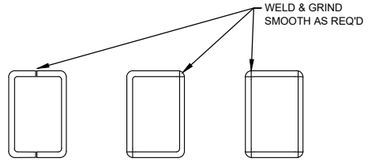
DEEP BEAM RAIL DETAIL



DETAIL -A

TUBE AND SLEEVE MEMBERS		
RAIL MEMBER		SLEEVE THICKNESS
MATERIAL	THICKNESS	MATERIAL A36
A 500 GR. C	.188"	.188"
A 500 GR. B	.250"	.250"
A 500 GR. A OR A 501	.313"	.250"

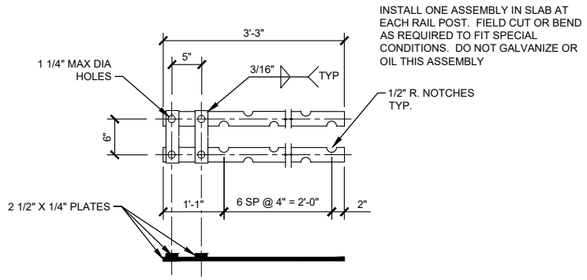




NOTE: OTHER SECTIONS OF EQUAL OR GREATER STRENGTH ARE ACCEPTABLE FOR SLEEVES

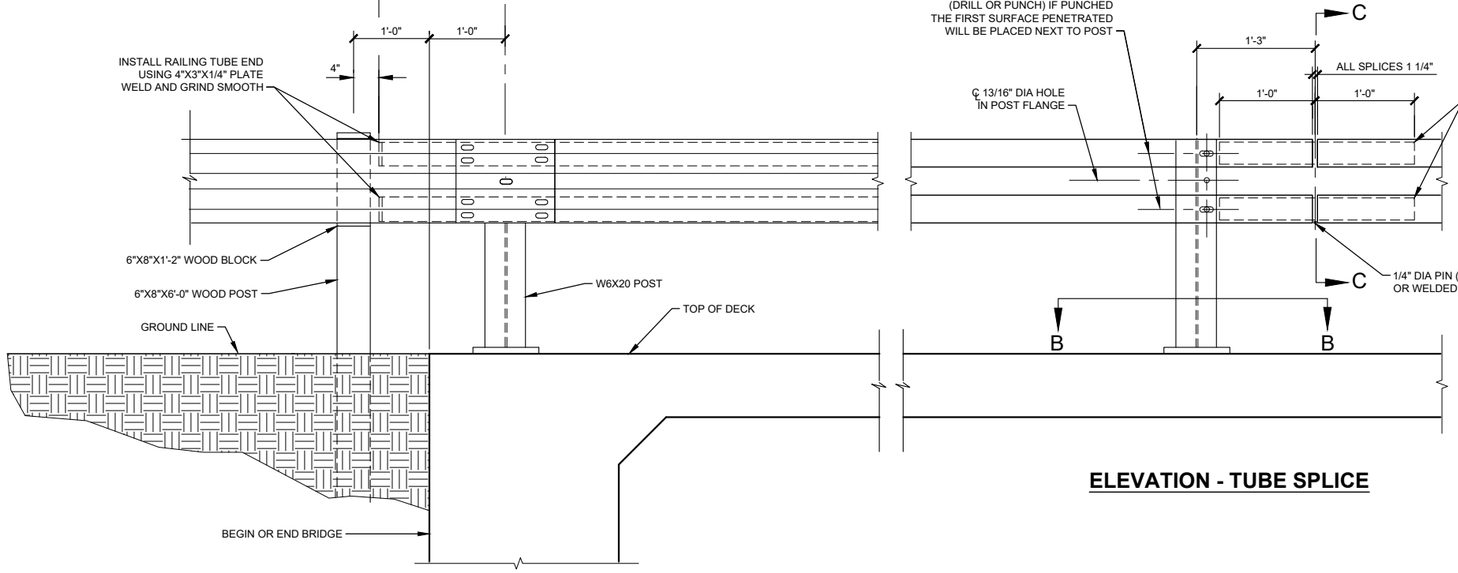
SLEEVE FABRICATION OPTIONS

SECTION C-C



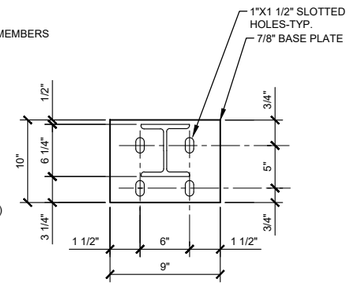
INSTALL ONE ASSEMBLY IN SLAB AT EACH RAIL POST. FIELD CUT OR BEND AS REQUIRED TO FIT SPECIAL CONDITIONS. DO NOT GALVANIZE OR OIL THIS ASSEMBLY

TYP - BOLT ANCHORAGE PLATE



INSIDE DECK ELEVATION OF RAIL

ELEVATION - TUBE SPLICE



SECTION B-B

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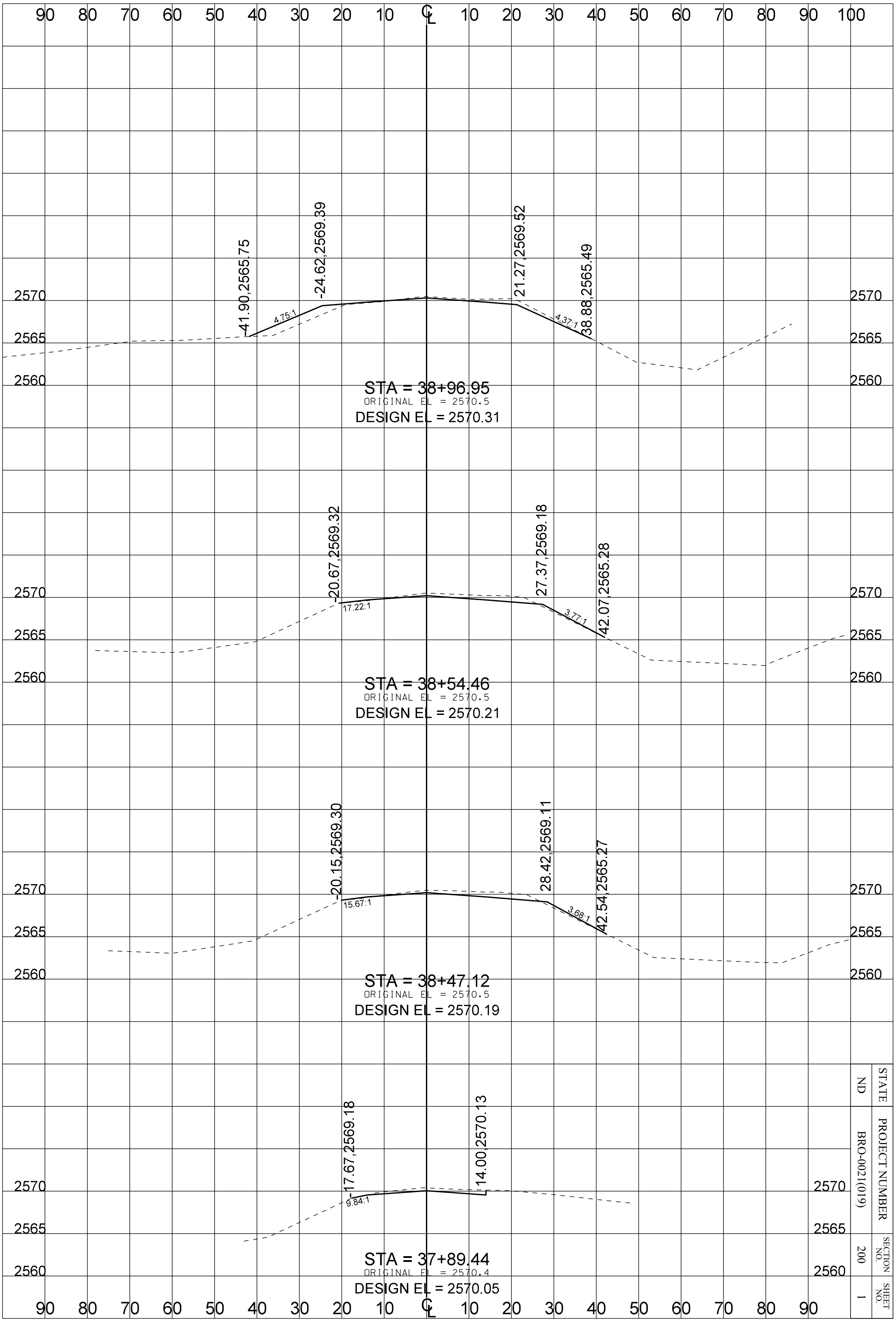
CANNONBALL RIVER
NEW ENGLAND, ND

BRIDGE LAYOUT

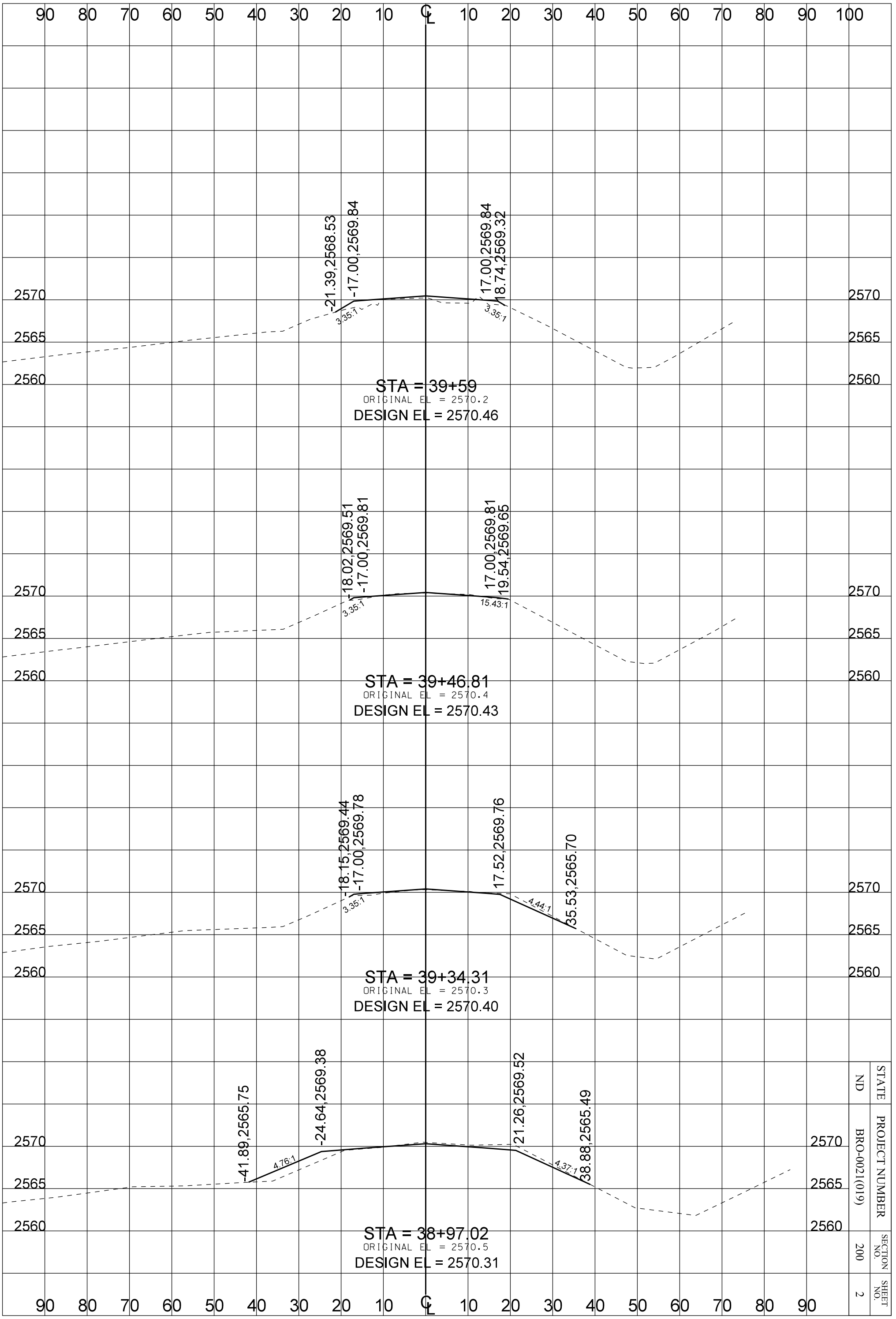
DRWN. BY	CHK'D BY	PROJECT NO.	DATE
T. Amiot	P. Johnson	P11587-2017-000	FEB. 2018

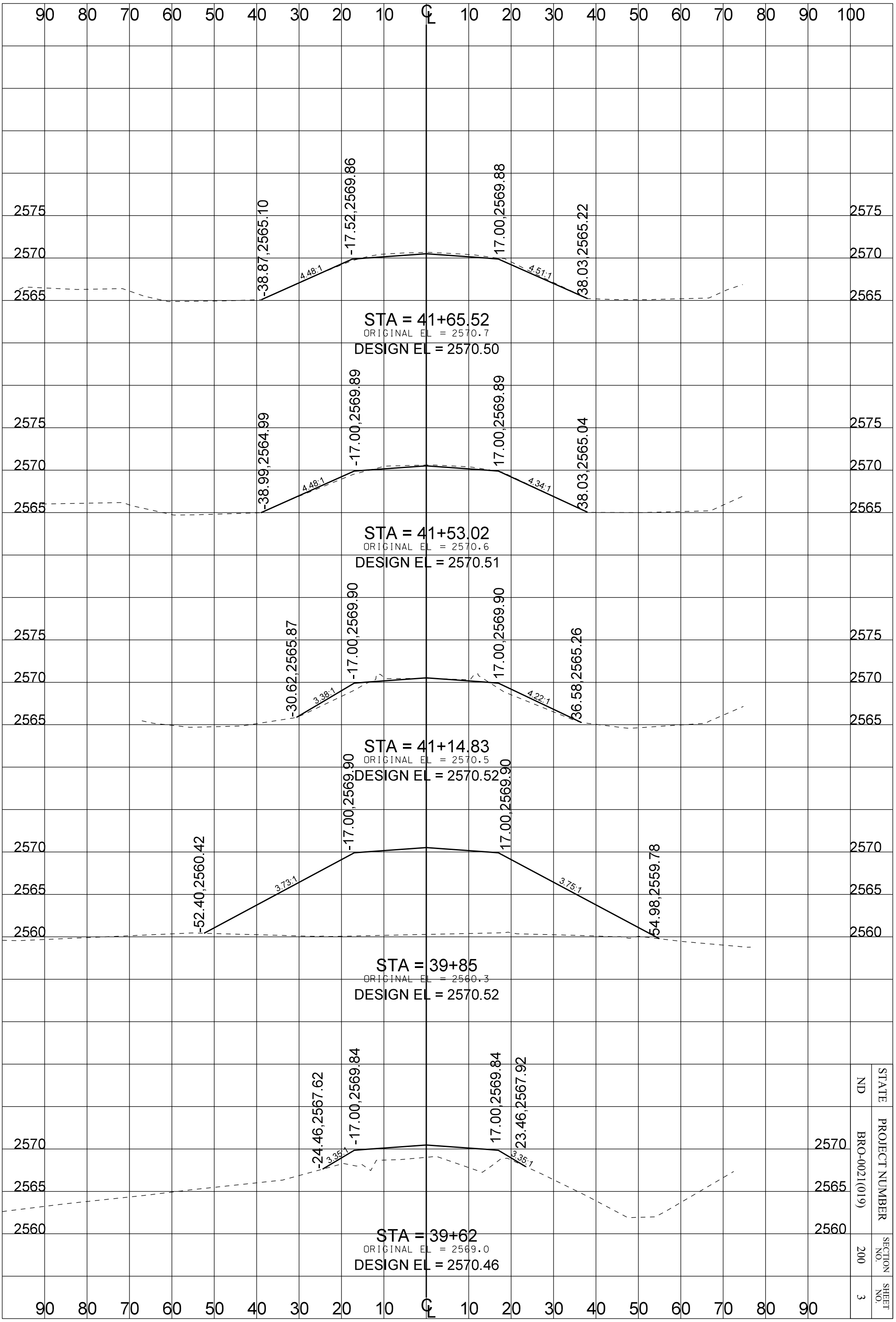
File: W:\Heartland Engineering\P11587-2017-000 NE Bridge\CAD Drawings\Drawings\BRIDGE DESIGN NDDOT COMMENTS.dwg

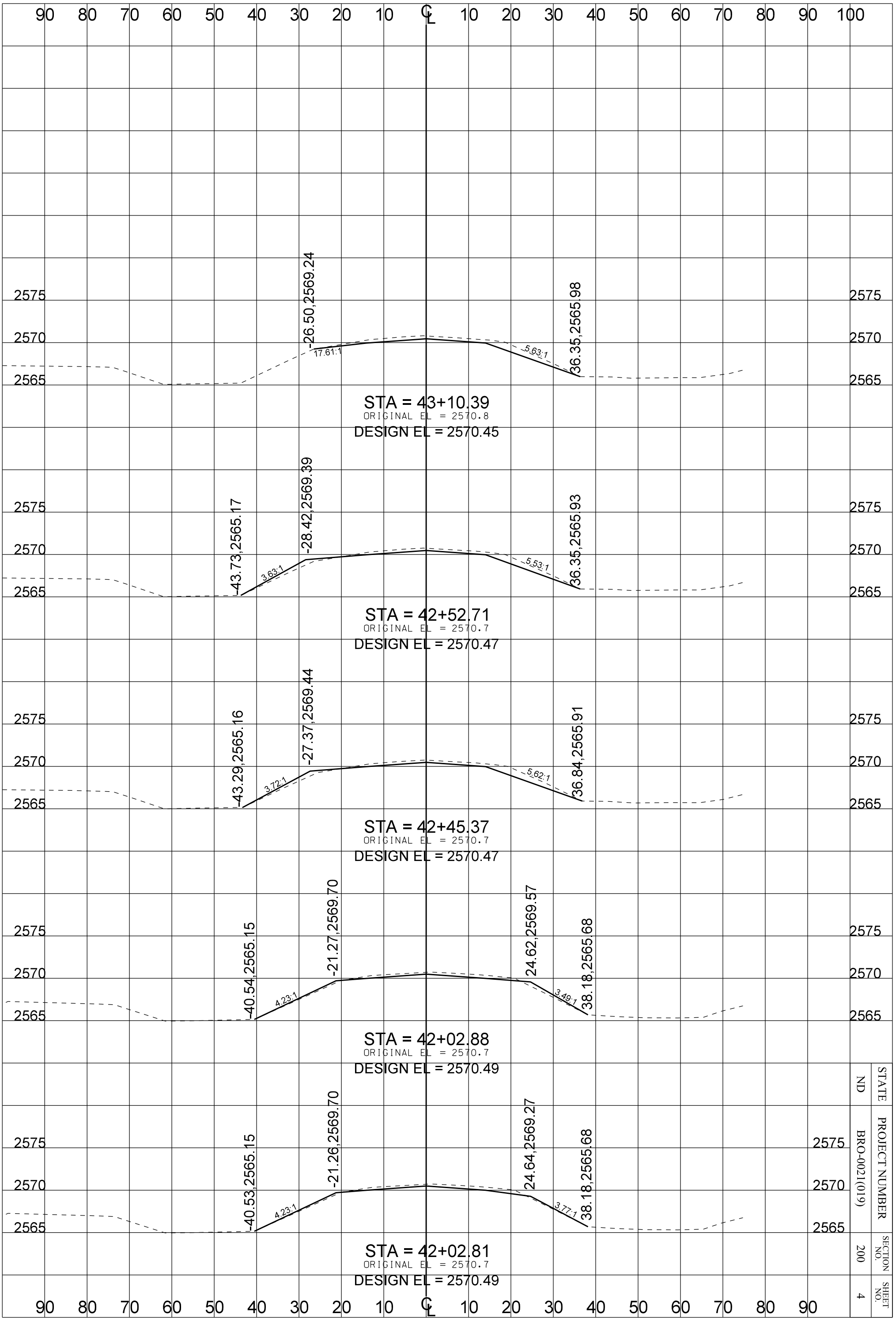
AE2S ● 4050 Garden View Dr Ste 200 Grand Forks, ND 58201 ● (t) 701-746-8087 (f) 701-746-0370



STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	200	1


90 80 70 60 50 40 30 20 10 ℄ 10 20 30 40 50 60 70 80 90 100
2570
2565
2560
-21.39,2568.53
-17.00,2569.84
17.00,2569.84
18.74,2569.32
3:35:1
3:35:1
STA = 39+59
ORIGINAL EL = 2570.2
DESIGN EL = 2570.46
-18.02,2569.51
-17.00,2569.81
17.00,2569.81
19.54,2569.65
3:35:1
15.43:1
STA = 39+46.81
ORIGINAL EL = 2570.4
DESIGN EL = 2570.43
-18.15,2569.44
-17.00,2569.78
17.52,2569.76
35.53,2565.70
3:35:1
4.44:1
STA = 39+34.31
ORIGINAL EL = 2570.3
DESIGN EL = 2570.40
-41.89,2565.75
-24.64,2569.38
21.26,2569.52
38.88,2565.49
4.76:1
4.37:1
STA = 38+97.02
ORIGINAL EL = 2570.5
DESIGN EL = 2570.31
STATE
ND
PROJECT NUMBER
BRO-0021(019)
SECTION NO.
200
SHEET NO.
2

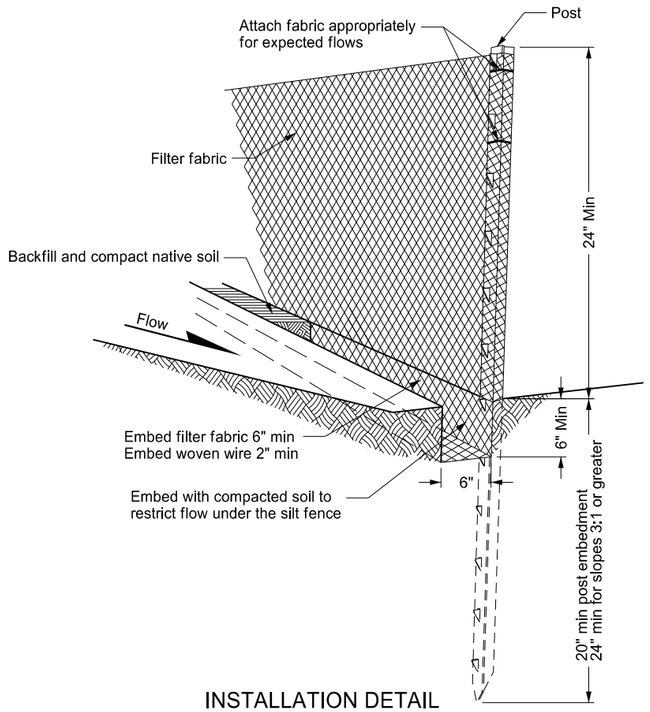

90 80 70 60 50 40 30 20 10 ℄ 10 20 30 40 50 60 70 80 90 100
2575
2570
2565
-38.87,2565.10
-17.52,2569.86
17.00,2569.88
38.03,2565.22
4.48:1
4.51:1
STA = 41+65.52
ORIGINAL EL = 2570.7
DESIGN EL = 2570.50
-38.99,2564.99
-17.00,2569.89
17.00,2569.89
38.03,2565.04
4.48:1
4.34:1
STA = 41+53.02
ORIGINAL EL = 2570.6
DESIGN EL = 2570.51
-30.62,2565.87
-17.00,2569.90
17.00,2569.90
36.58,2565.26
3.38:1
4.22:1
STA = 41+14.83
ORIGINAL EL = 2570.5
DESIGN EL = 2570.52
2560
-52.40,2560.42
-17.00,2569.90
17.00,2569.90
54.98,2559.78
3.73:1
3.75:1
STA = 39+85
ORIGINAL EL = 2560.3
DESIGN EL = 2570.52
-24.46,2567.62
-17.00,2569.84
17.00,2569.84
23.46,2567.92
3.35:1
3.35:1
STA = 39+62
ORIGINAL EL = 2569.0
DESIGN EL = 2570.46
STATE
ND
PROJECT NUMBER
BRO-0021(019)
SECTION NO.
200
SHEET NO.
3



STATE	PROJECT NUMBER	SECTION NO.	SHEET NO.
ND	BRO-0021(019)	200	4

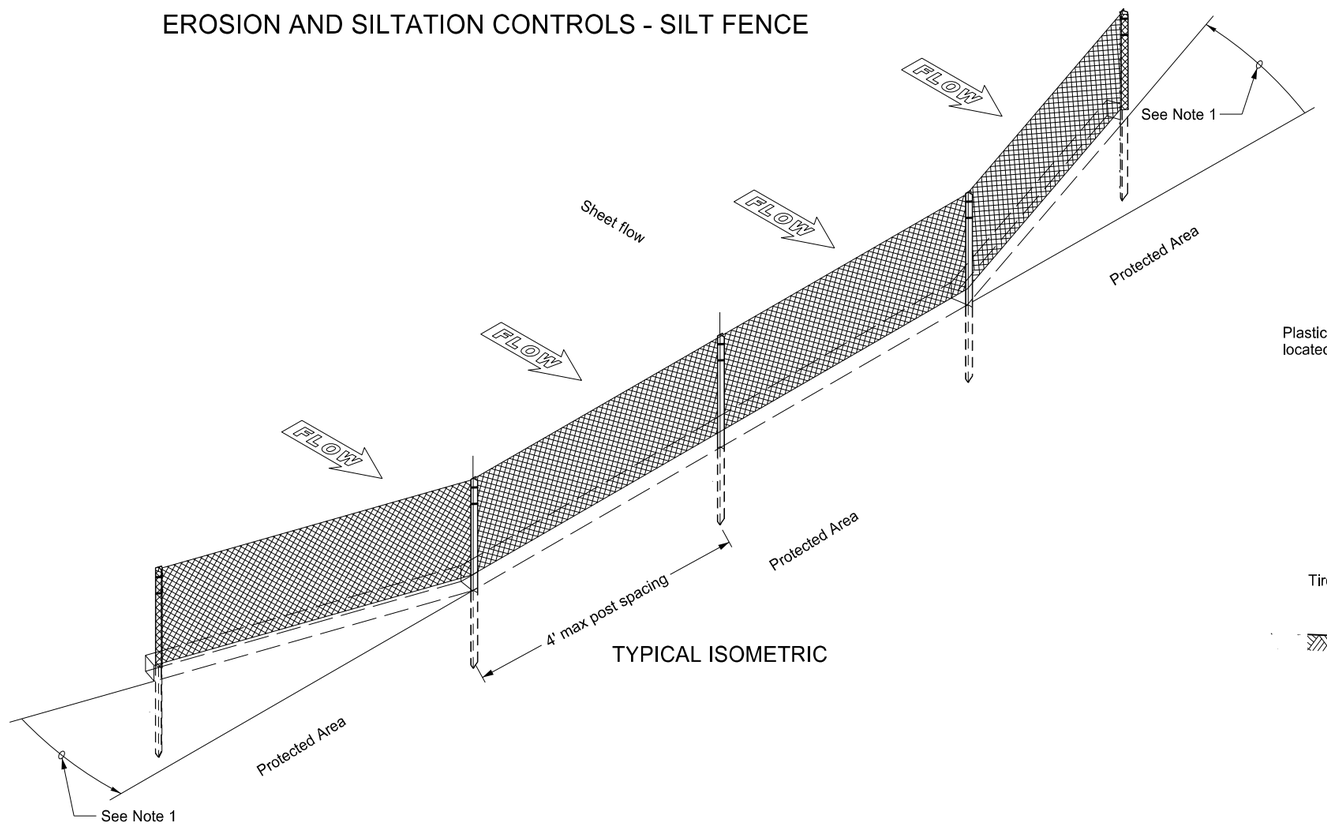
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

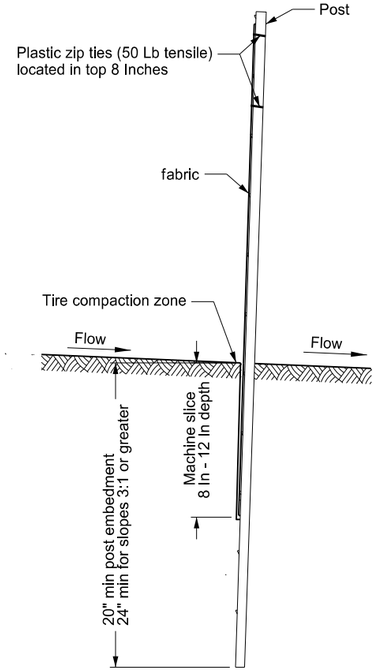


INSTALLATION DETAIL

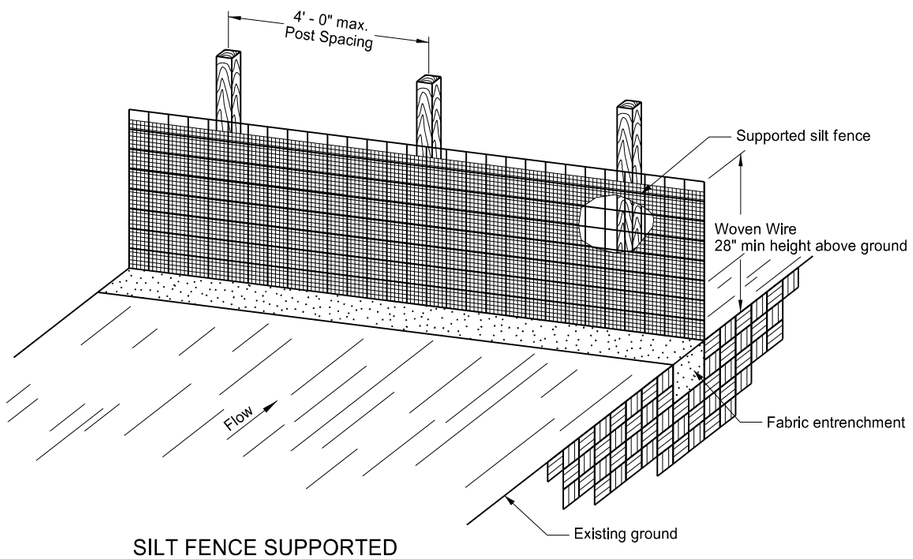
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



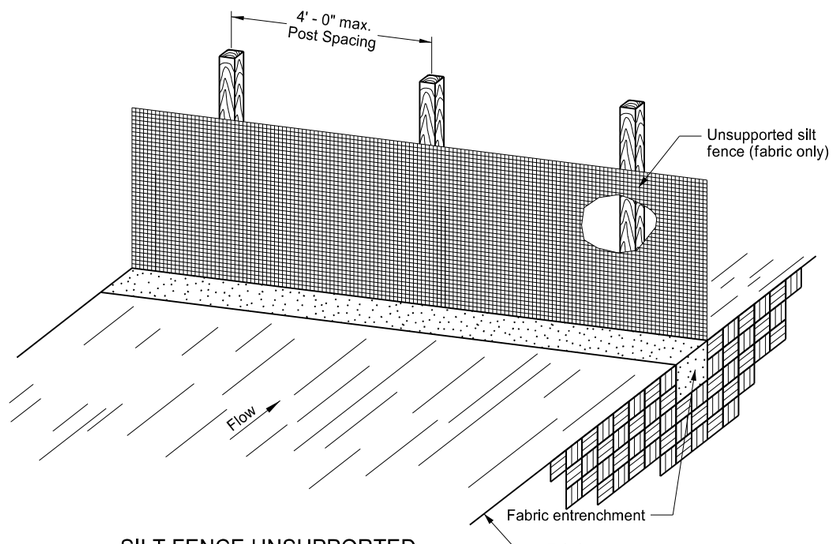
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



SILT FENCE UNSUPPORTED

NOTES:
1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Place splices outside low spots.
3. Install silt fencing parallel to contour lines.
4. Do not embed silt fence when placed in standing water.
5. Silt fence material does not need to reach the top of woven wire support.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16	Revised details & added new ones.

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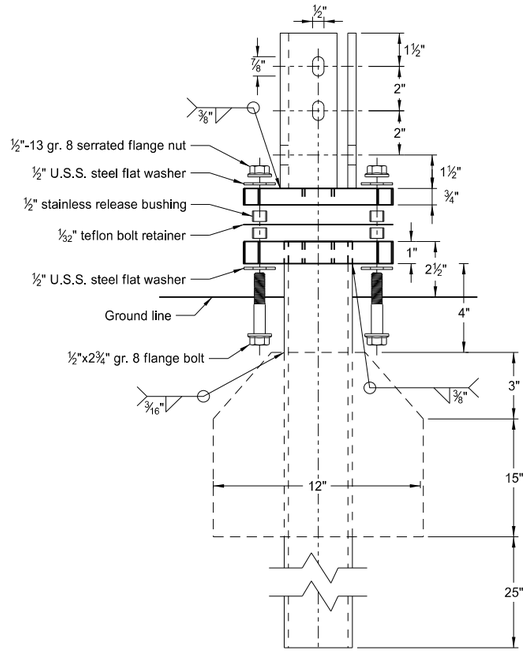
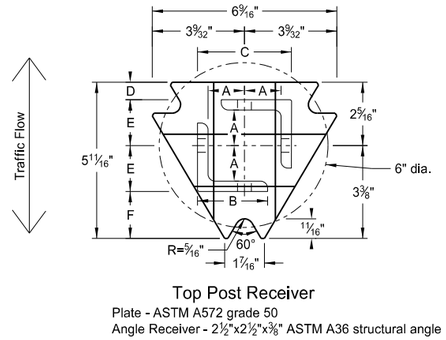
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

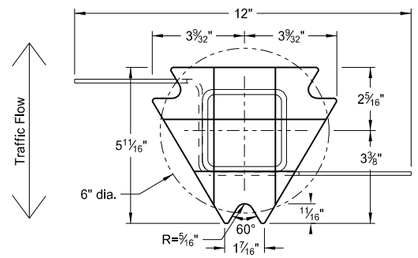


Multi-Directional
Slip Base Assembly

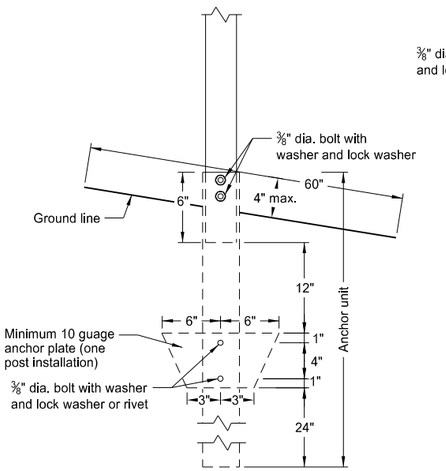
Perforated Tube



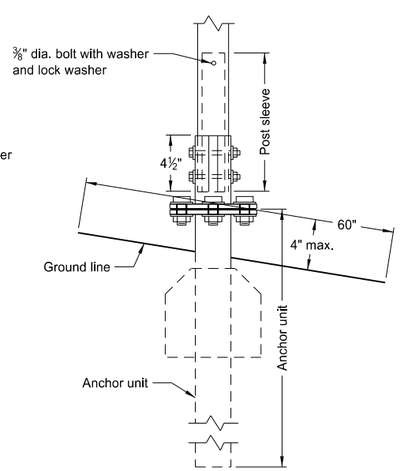
Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



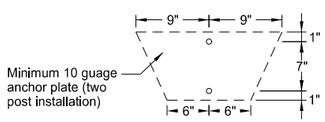
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50

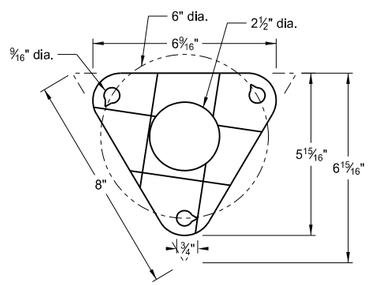


Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly





Bolt Retainer for Base Connection
Bolt Retainer- 1/32" Reprocessed Teflon

Notes:

1. Torque slip base bolts as specified by manufacturer.
2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
4. In concrete sidewalk, use same anchor without wings.
5. Provide more than 7' between the first and fourth posts of a four post sign.

Telescoping Perforated Tube						
Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2¾16	10	Yes	

Properties of Telescoping Perforated Tube						
Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in.⁴	Cross Sec. Area in.²	Section Modulus in.³
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2¾16 x 2¾16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

Top Post Receiver Data Table						
Square Post Sizes (B)	A	B	C	D	E	F
2¾16"x10 ga.	1⁹/64"	2½"	3¹/32"	2⁵/32"	1³³/64"	1⅞"
2½"x10 ga.	1⁹/32"	2½"	3⁵/16"	⅝"	1²¹/32"	1¾"

(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

(B) For additional wind load, insert the 2¾16"x10 ga. into 2½"x10 ga.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice

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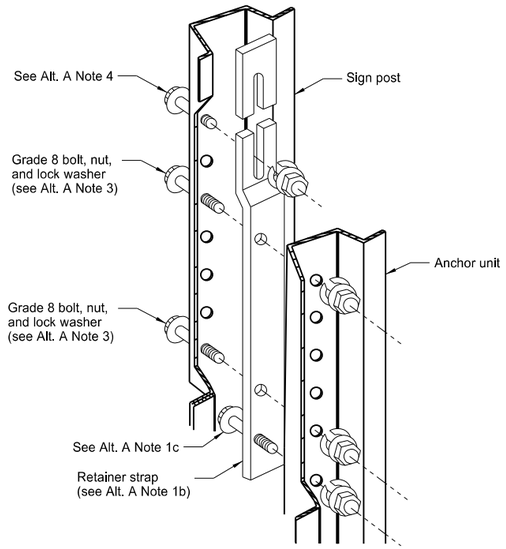
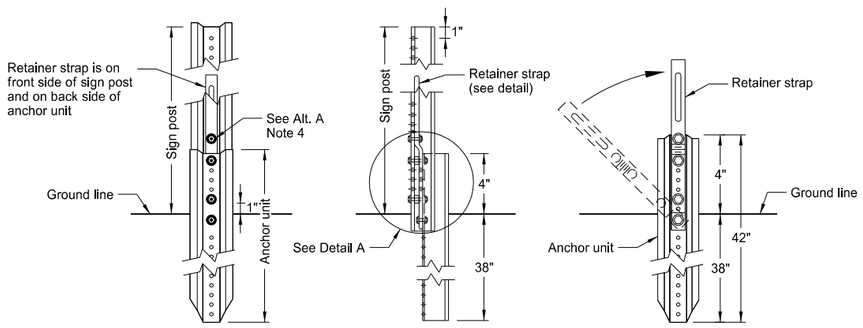
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post



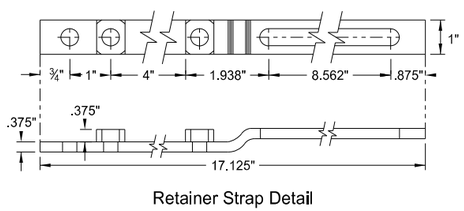
Detail A



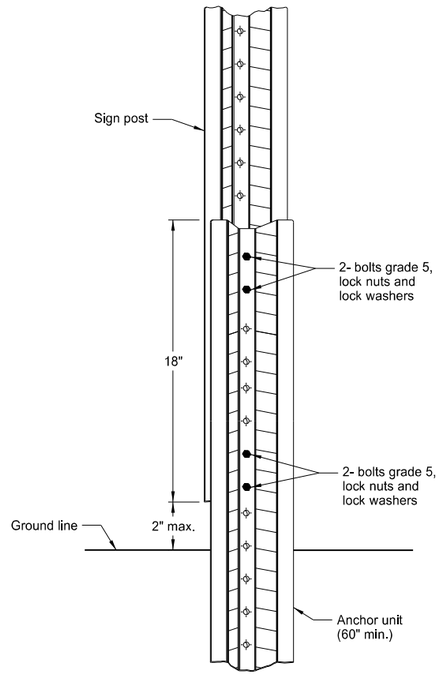
Front View | Side View | Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.

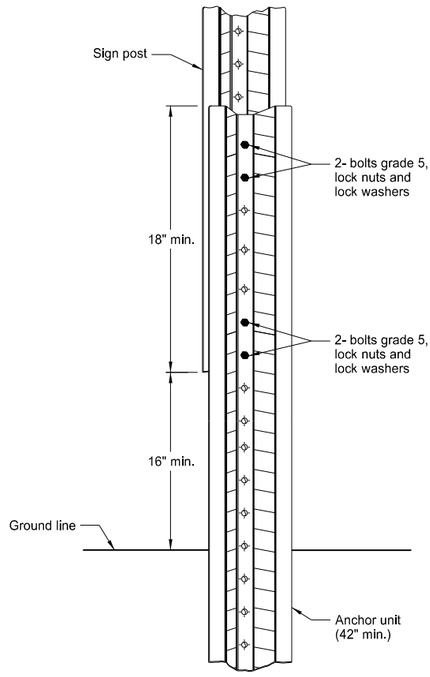


Retainer Strap Detail



Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



Breakaway U-Channel Splice Detail
Alternate C
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
   c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
   d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
   b) Rotate strap to vertical position.
3. a) Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
   b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. Properly nest base post, strap, and sign post. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post at the bolts have full contact across the entire width.

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9-27-17	Updated to active voice

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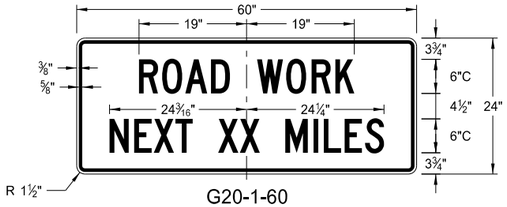
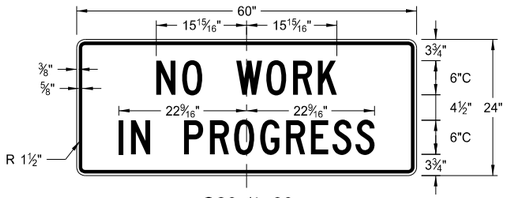
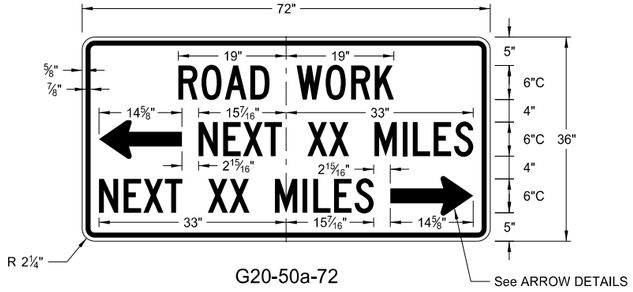
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS



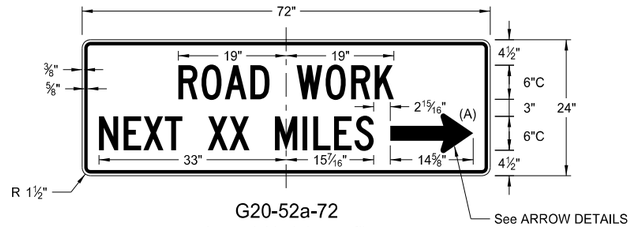
G20-1-60
Legend: black (non-refl)
Background: orange



G20-1b-60
Legend: black (non-refl)
Background: orange



G20-50a-72
Legend: black (non-refl)
Background: orange



G20-52a-72
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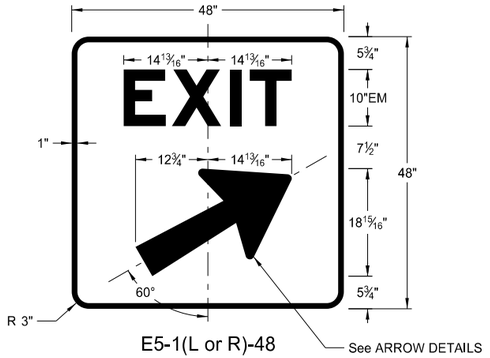
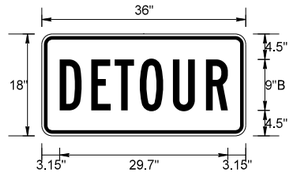
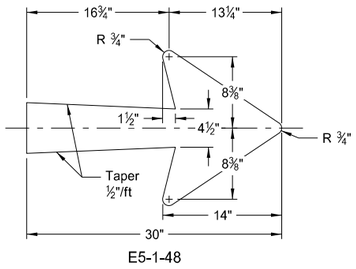
Background: orange



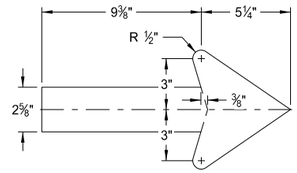
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



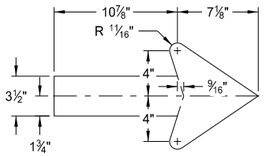
M4-8-36
Legend: black (non-refl)
Background: orange



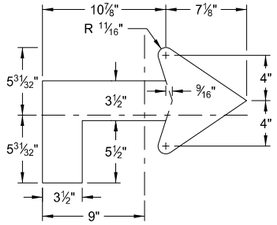
E5-1-48



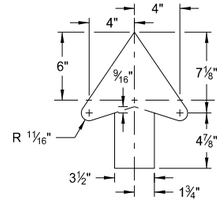
G20-50a-72
G20-52a-72



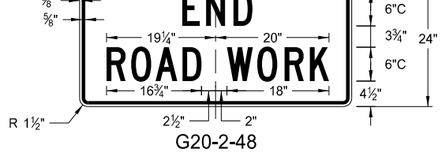
M4-9(L or R)-30
Right or Left



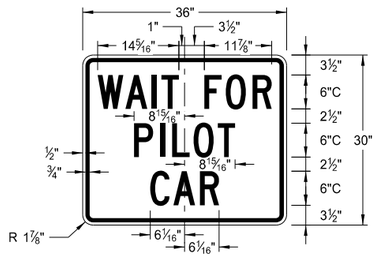
M4-9(L or R)-30
Advanced Right or Left



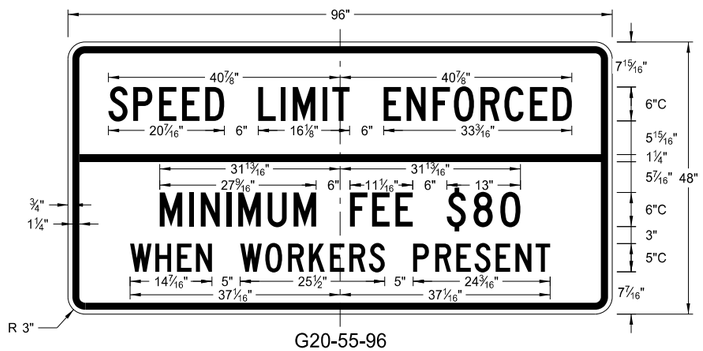
M4-9-30
Straight



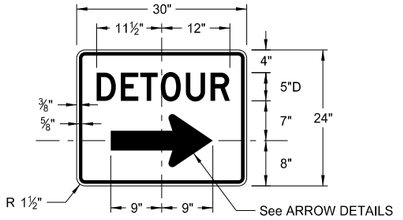
G20-2-48
Legend: black (non-refl)
Background: orange



G20-4b-36
Legend: black (non-refl)
Background: orange



G20-55-96
Legend: black (non-refl)
Background: orange



M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange

ARROW DETAILS

NOTES:

(A) Arrow may be right or left of the legend to indicate construction to the right or left.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added sign & background color

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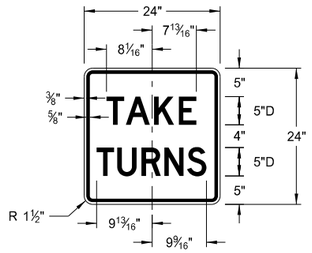
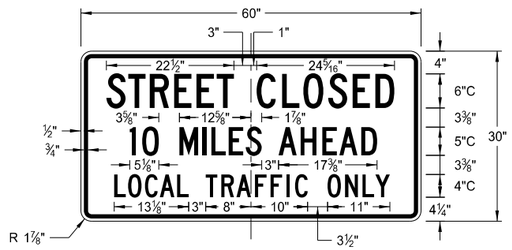
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



R1-50P-24
Legend: black (non-refl)
Background: white



R11-3c-60
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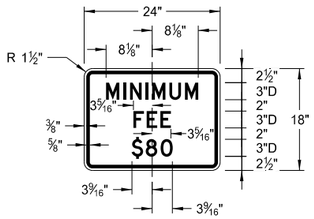
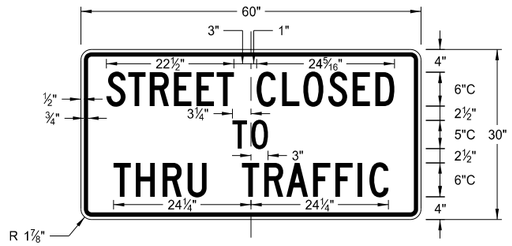
Background: white



R2-1aP-24
Legend: black (non-refl)
Background: white



R11-4a-60
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Background: white

R11-2a-48
Legend: black (non-refl)
Background: white

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number

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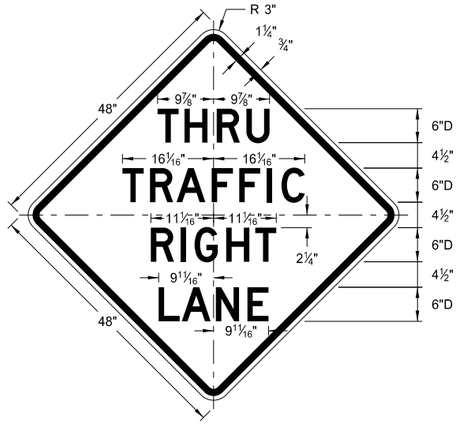
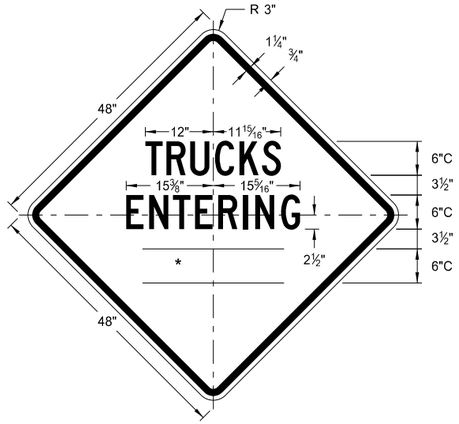
CONSTRUCTION SIGN DETAILS
WARNING SIGNS



W5-8-48
Legend: black (non-refl)
Background: orange



W8-54-48
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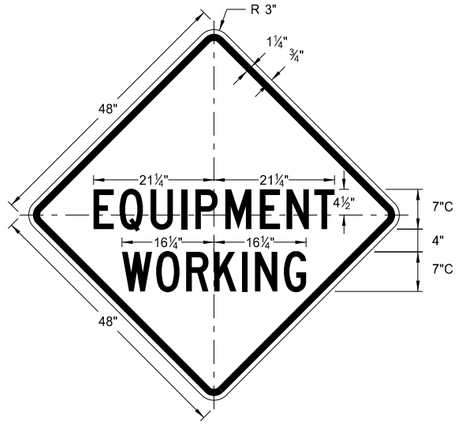
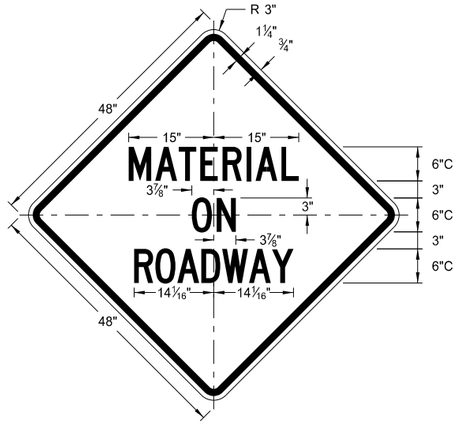
Background: orange



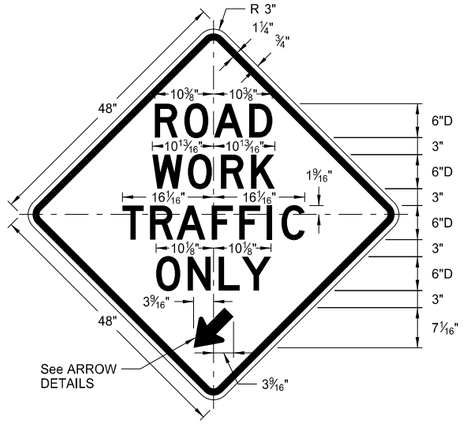
W20-51-48
Legend: black (non-refl)
Background: orange



W21-51-48
Legend: black (non-refl)
Background: orange

WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



W5-9-48
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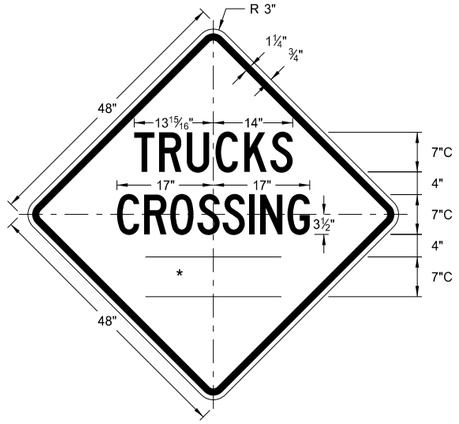
Background: orange



W8-55-48
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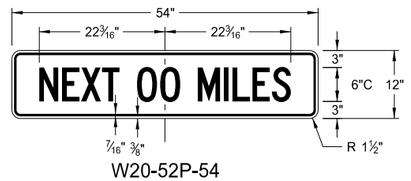
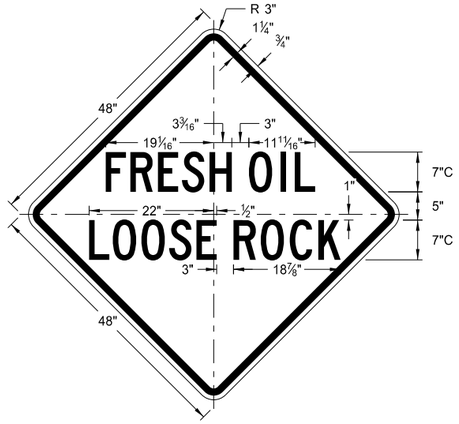
Background: orange



W20-52P-54
Legend: black (non-refl)
Background: orange



W22-8-48
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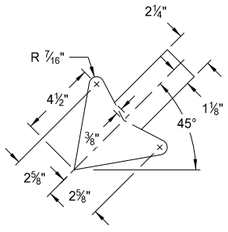
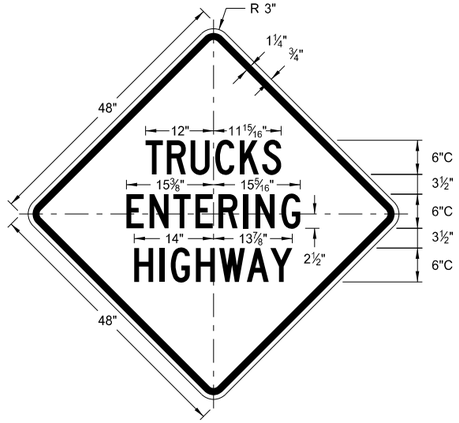


W5-9-48

ARROW DETAILS



W8-53-48
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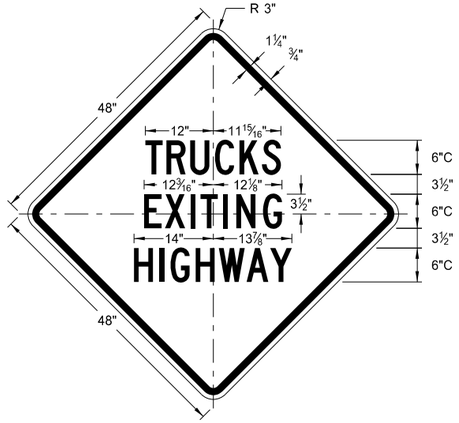
Background: orange



W8-56-48
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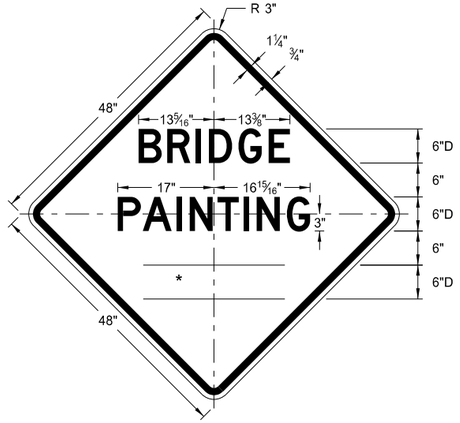
Background: orange



W21-50-48
Legend: black (non-refl)
Background: orange

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number

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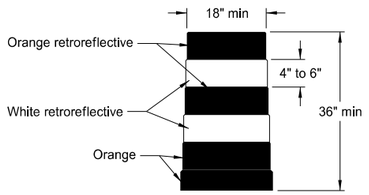
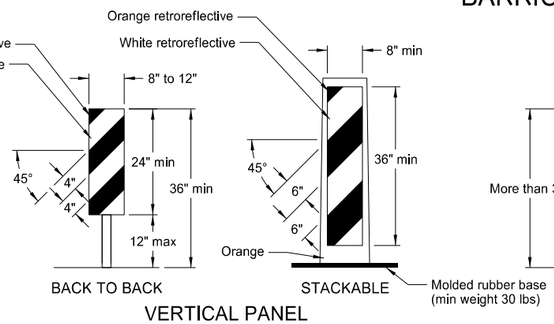
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



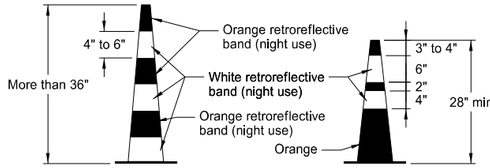
DELINEATOR DRUM

Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectorized spaces between the horizontal orange and white stripes. Avoid placement of stripes on drum ribs or indentations. Use closed top drums that will not allow collection of debris. Do not place ballast on the top of drum.



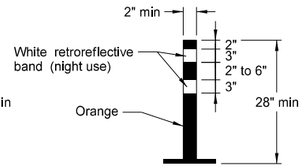
VERTICAL PANEL

Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, use a stripe width of 6 inches.



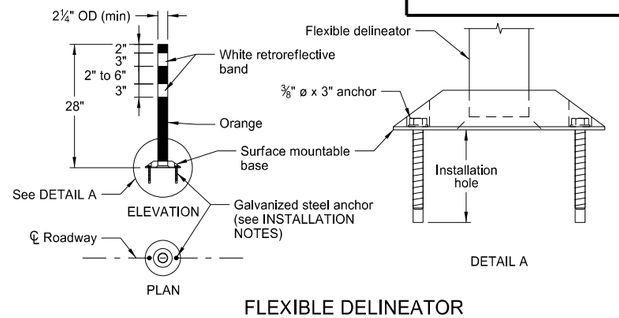
TRAFFIC CONE

Provide retroreflectorization of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectorized space between the orange and white stripes.



TUBULAR MARKER

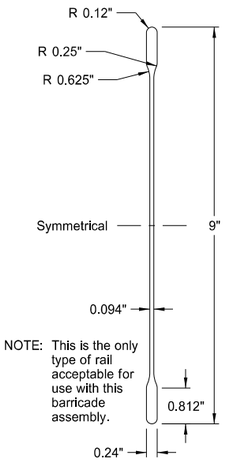
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

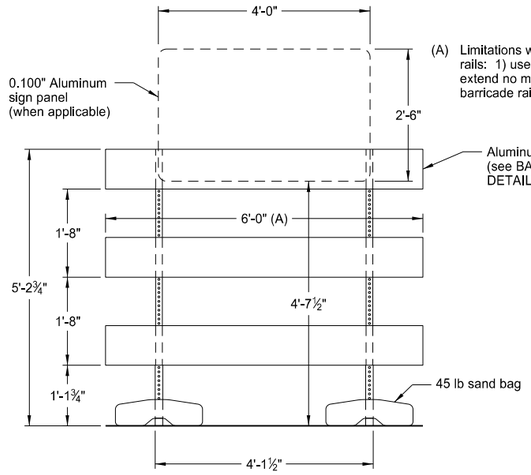
INSTALLATION NOTES:

1. Drill installation holes to diameter and depth required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl. Remove butyl as close as possible to pavement surface.



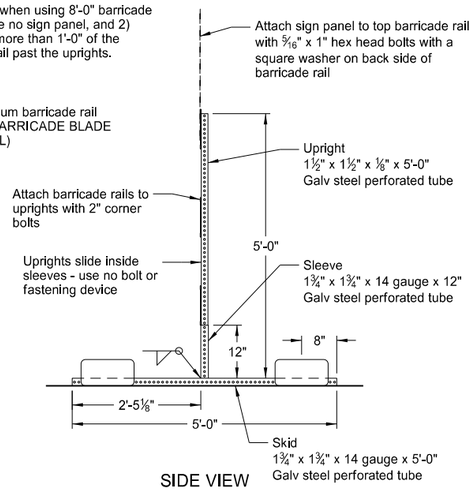
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



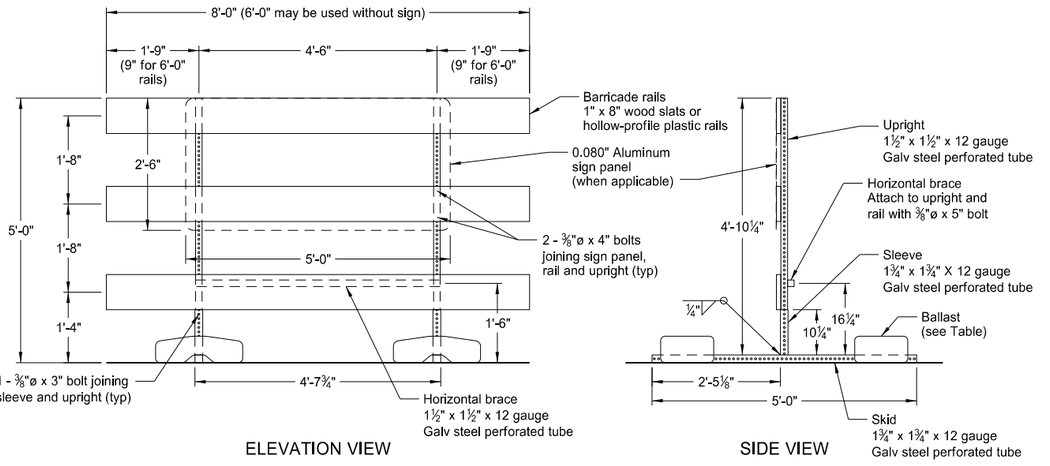
ELEVATION VIEW

(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.



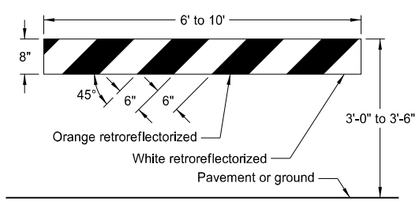
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

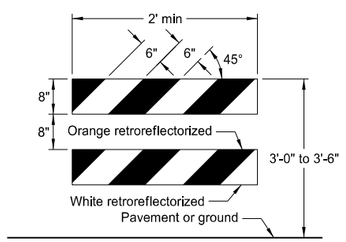


BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

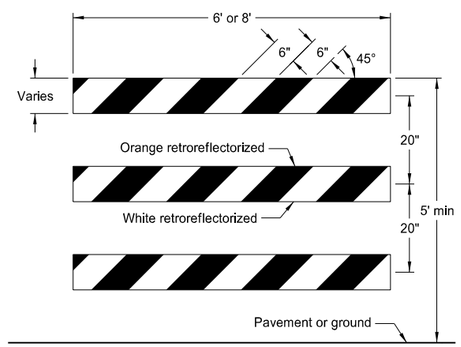
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", use a rail stripe width of 4".



TYPE I BARRICADE

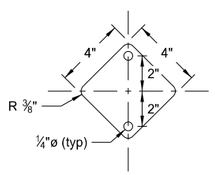


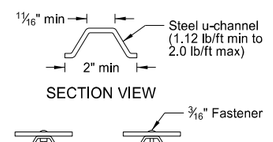
TYPE II BARRICADE

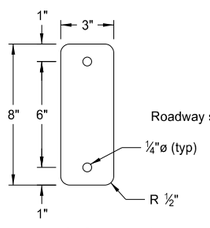


TYPE III BARRICADE

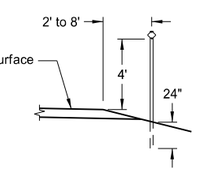
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

Without Sign	4 - 25 lb sandbags
With Sign	6 - 25 lb sandbags

Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

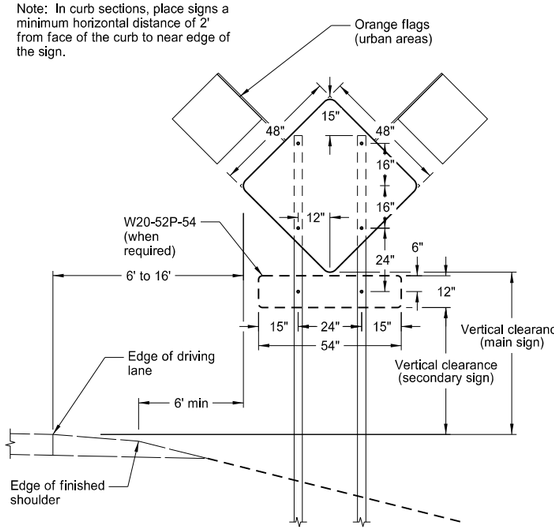
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

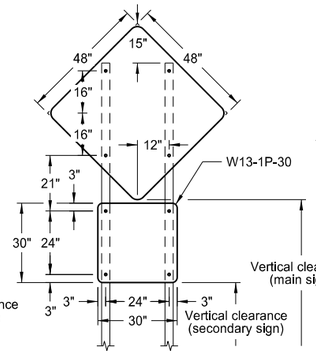
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

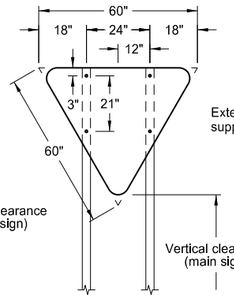
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



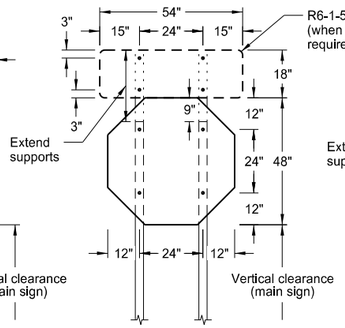
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



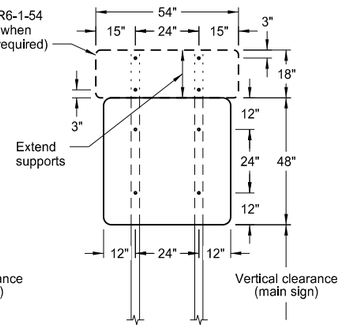
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



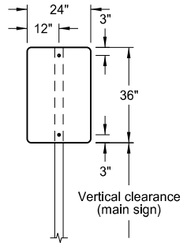
R1-2-60 - YIELD SIGN



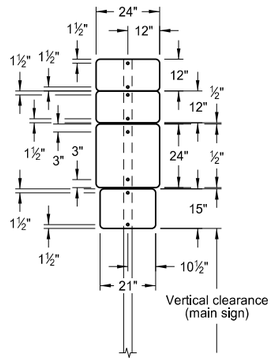
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



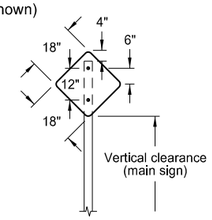
48" x 48" SIGN
(with R6-1-54 sign as required)



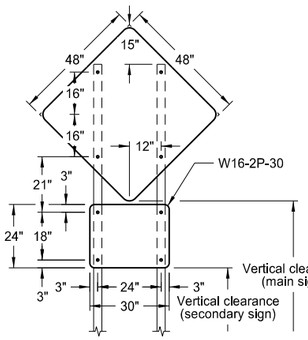
24" x 36" SIGN



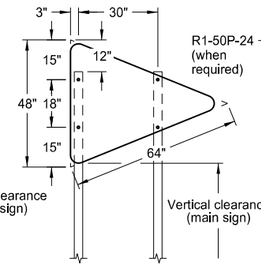
24" x 24"
ROUTE MARKER
ASSEMBLY



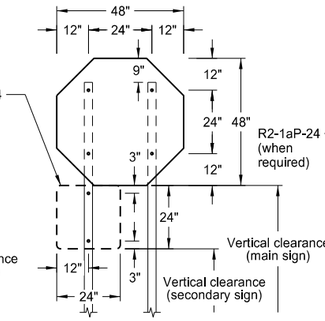
18" x 18"
DIAMOND SIGN



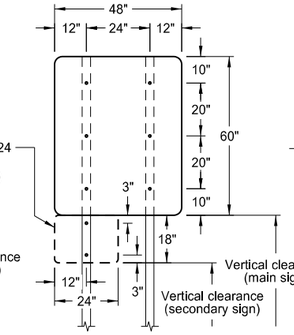
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



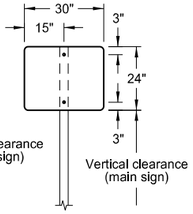
W14-3-64 - PENNANT SIGN



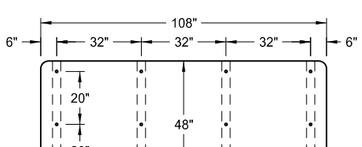
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



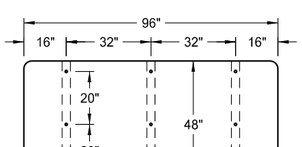
48" x 48" SIGN
(with R2-1aP-24 sign as required)



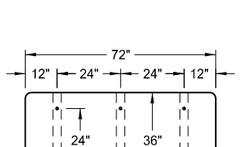
30" x 24" SIGN



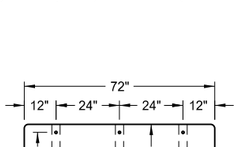
108" x 48" SIGN



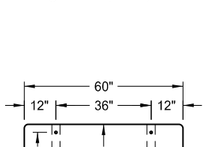
96" x 48" SIGN



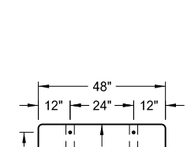
72" x 36" SIGN



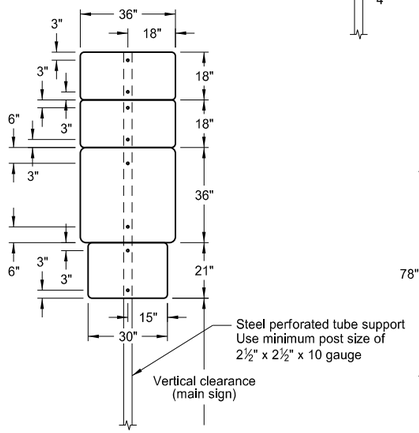
72" x 24" SIGN



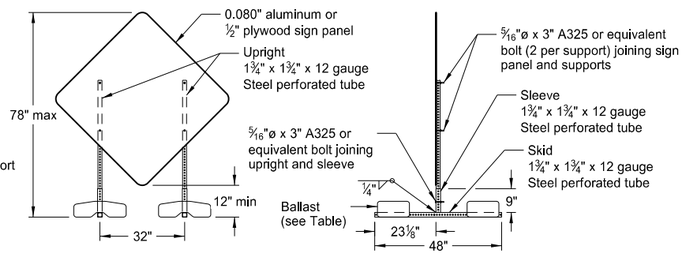
60" x 24" SIGN



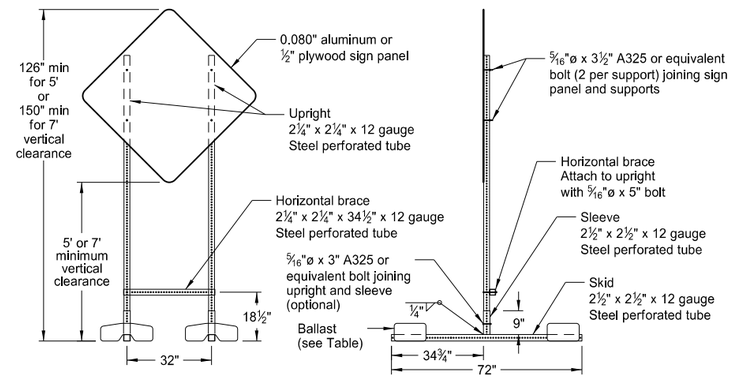
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Galvanize or paint supports. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes based on a wind speed of 55 MPH.

   Place signs over 50 square feet on 2½" x 2½" perforated tube supports as a minimum.

   Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. Punch all holes round for ⅜" bolts.

3. Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)

4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

   Interstate - white legend on blue background
   Interstate Business Loop - white legend on green background
   US and State - black legend on white background
   County - yellow legend on blue background

5. Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

   The vertical clearance to secondary signs is 1'-0" less than the vertical clearance stated above.

   Provide a minimum clearance of 7'-0" from the ground at the post for signs with an area exceeding 50 square feet.

6. Portable Signs: Provide portable signs that meet the vertical clearance stated above when it is necessary to place signs within the pavement surface.

   Use of low-mounting height (minimum 12" vertical clearance) portable signs for 5 days or less, is allowed as long as the view of the sign is not obstructed. Time delays caused by unforseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. Use of R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 is allowed for longer than 5 days.

   Restrict signs mounted on portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT details to a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

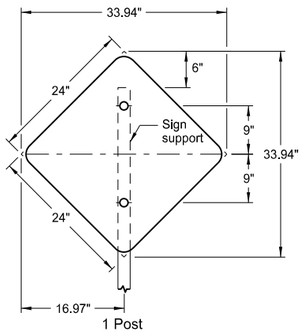
Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

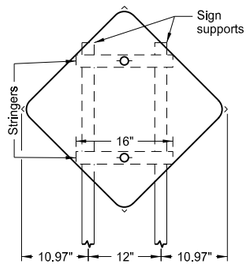
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-4-13	
REVISIONS	
DATE	CHANGE
11-14-13 9-27-17	Revised Note 6. Updated to active voice

This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 9/27/2017 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

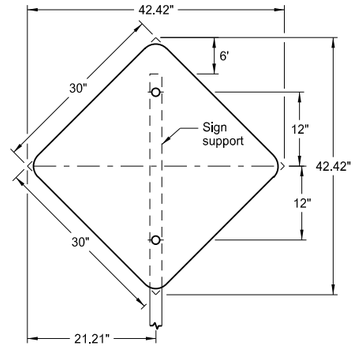


1 Post

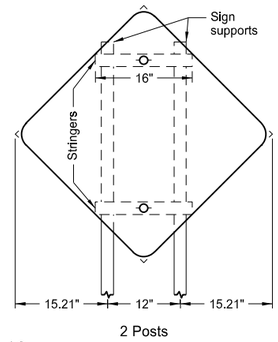


2 Posts

Assembly No. 18

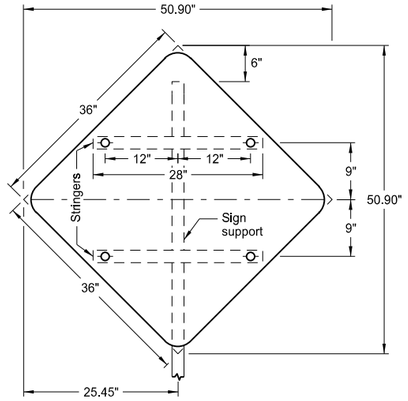


1 Post

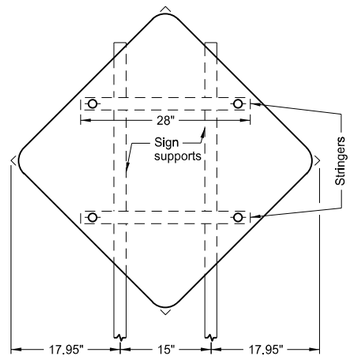


2 Posts

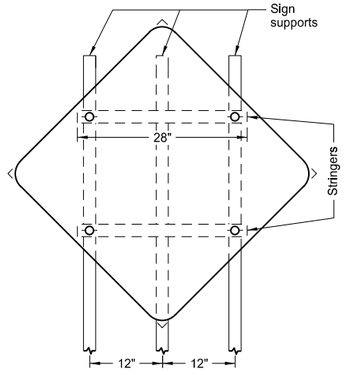
Assembly No. 19



1 Post

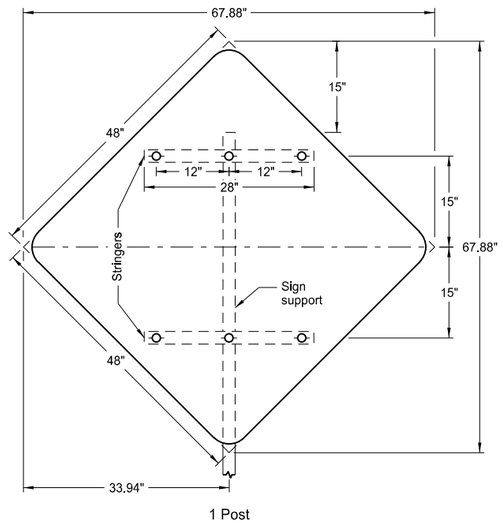


2 Posts

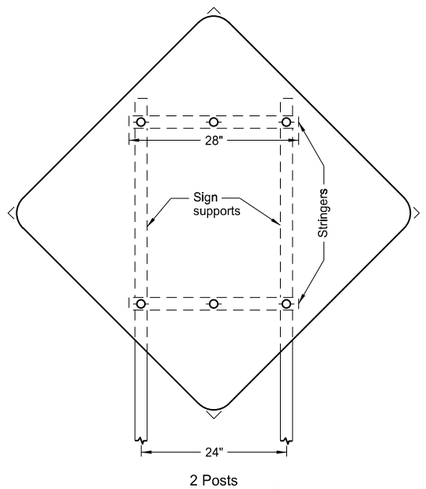


3 Posts

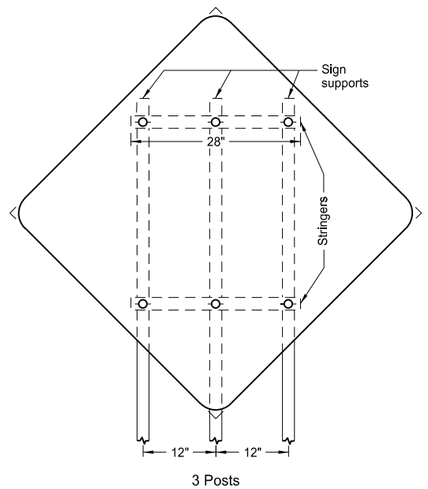
Assembly No. 20



1 Post



2 Posts



3 Posts

Assembly No. 21

Notes:

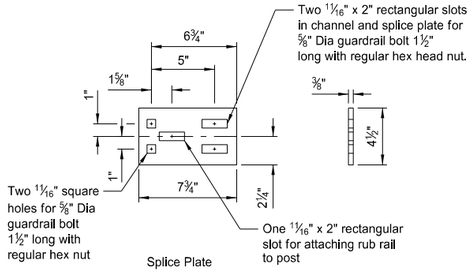
1. See Standard D-754-25 for mounting details.
2. The minimum sign backing material thickness shall be 0.100 inch.
3. Perforated square tube stringer shall be 1½" x 1½".
4. All holes shall be punched round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE

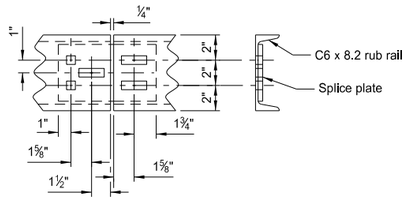
This document was originally issued and sealed by Roger Weigel, Registration Number PE-2930, on 12-1-10 and the original document is stored at the North Dakota Department of Transportation

W-BEAM GUARDRAIL GENERAL DETAILS

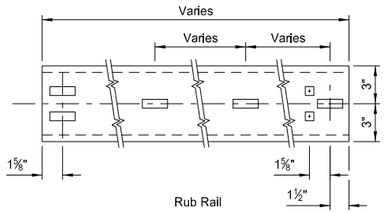
D-764-1



Splice Plate

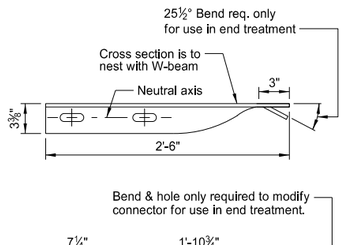


Splice Detail

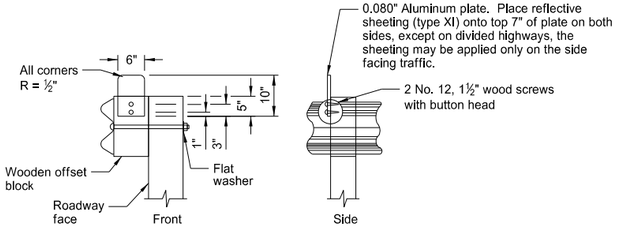


Rub Rail

C6x8 RUB RAIL AND SPLICE PLATE

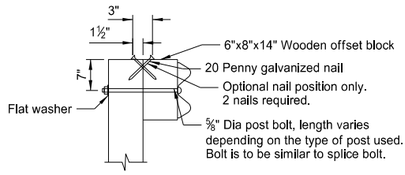


W BEAM TERMINAL CONNECTOR

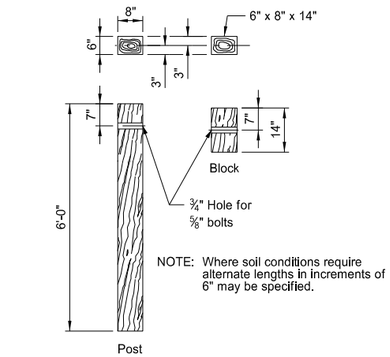


REFLECTORIZED PLATE DETAIL

Additional reflectors are added to the W-beam guardrail quantities for placement on end treatment.

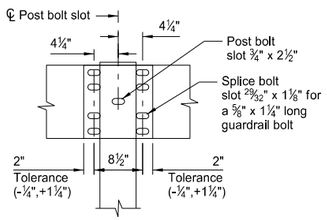


TYPICAL POST ATTACHMENT DETAIL

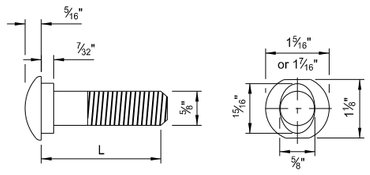


NOTE: Where soil conditions require alternate lengths in increments of 6" may be specified.

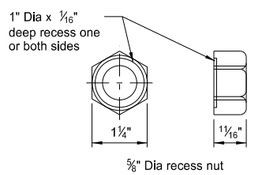
6"x8" TIMBER POST & BLOCK



SPLICE DETAIL

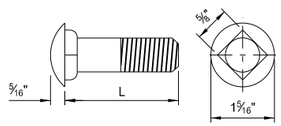


5/8" Diameter Guardrail Bolt	
L	Thread Length
1 1/4"	Full length thread
2"	1 3/4" Min thread length
9 1/2"	4" Min thread length
18"	4" Min thread length
20"	4" Min thread length
22"	4" Min thread length
25"	4" Min thread length



5/8" Dia recess nut

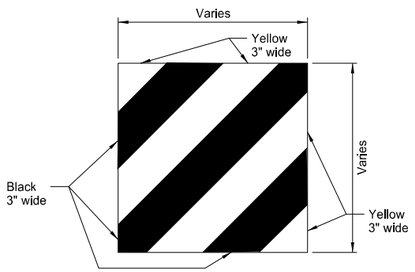
5/8" GUARDRAIL BOLT & RECESS NUT



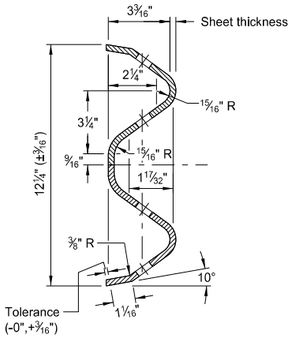
5/8" Diameter Carriage Bolt	
L	Thread Length
1 1/2"	Full length thread
3"	1 1/2" Min thread length
11"	1 3/4" Min thread length
13"	1 3/4" Min thread length

5/8" Hex nut

5/8" CARRIAGE BOLT & NUT



IMPACT HEAD OBJECT MARKER



W-BEAM CROSS SECTION

NOTES:

1. Reflectorized plates: Reflector plates shall begin at the first post and be spaced at 25' centers on guardrail less than 250' in length and at 50' centers for guardrail over 250' in length. The reflector shall be the same color as the pavement marking adjacent to that reflector unless noted otherwise on the plans.
2. Manner of replacing bituminous material at guardrail post: All excess earth from excavations for guard posts shall be disposed of as directed by the engineer. Replace bituminous material wherever guardrail is installed after mat has been laid. Cost of excavation and replacing of bituminous material to be included in the price bid for other items.
3. The Object Marker shall fit within the vertical edges of the Impact Plate. The retroreflective sheeting shall be type XI sheeting meeting the requirements of Section 894.02.B of the standard specifications. The sheeting shall be applied to 0.100 Aluminum sheeting meeting the requirements Section 894.01.A. The Object Marker shall attach to the Impact Head Plate with rivets or some other attachment device. The rivets or attachment device shall be non-rust. The stripes shall slope downward toward the roadway side.
4. Guardrail installation height tolerance = - 1/4" , + 1".

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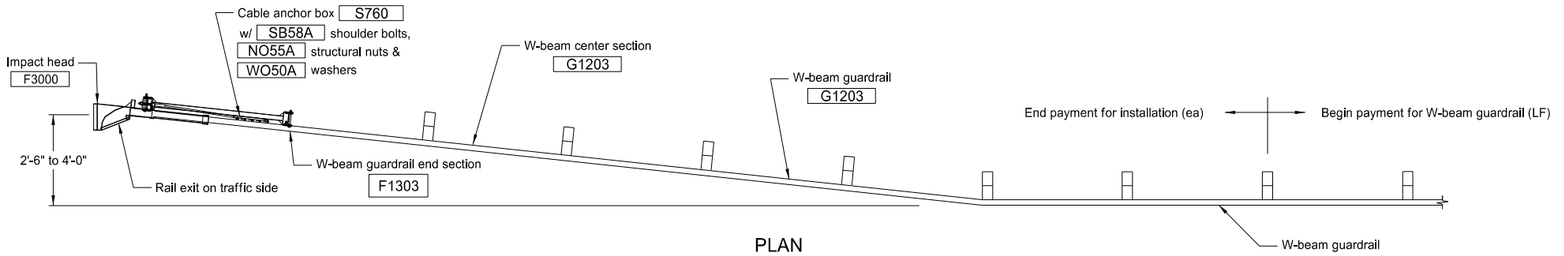
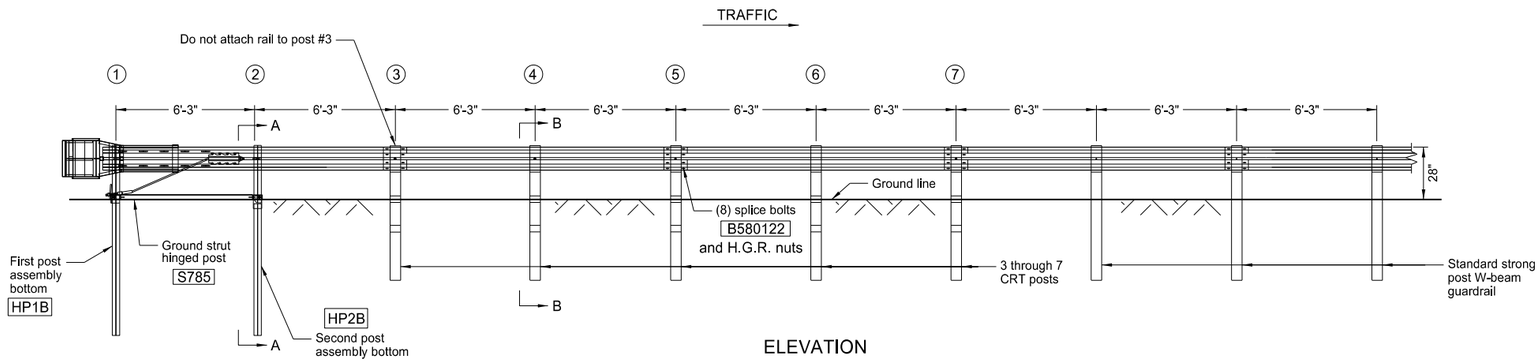
FLARED ENERGY ABSORBING TERMINAL

D-764-6



PLAN

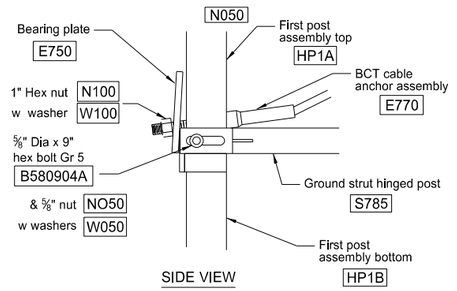


ELEVATION

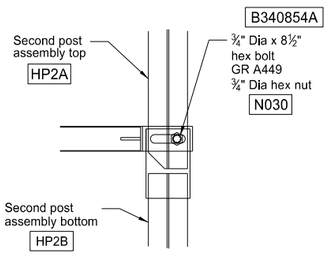
ITEM #	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA
G1203	2	W-BEAM GUARDRAIL, 12 GA
HP1A	1	FIRST POST ASSEMBLY TOP
HP1B	1	FIRST POST ASSEMBLY BOTTOM
HP2A	1	SECOND POST ASSEMBLY TOP
HP2B	1	SECOND POST ASSEMBLY BOTTOM
P671	5	WOOD CRT POST
P675	5	TIMBER BLOCKOUT OR RECYCLED EQUIVALENT
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
S785	1	GROUND STRUT HINGED POST
		HARDWARE (ALL DIMENSIONS IN INCHES)
B140404	2	¼ Dia x 4 HEX BOLT
WO14	4	¼ WASHER
N014	2	¼ HEX NUT
B580122	17	⅝ Dia x 1¼ SPLICE BOLT
B581802	4	⅝ Dia x 10 H.G.R. BOLT (POSTS 3 THRU 6)
B580904A	1	⅝ Dia x 9 HEX BOLT GR 5
W050	5	⅝ WASHER
N050	22	⅝ Dia H.G.R. NUT
B340854A	1	¾ Dia x 8½ HEX BOLT GR A449
NO30	1	¾ Dia HEX NUT
N100	2	1 ANCHOR CABLE HEX NUT
W100	2	1 ANCHOR CABLE WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	½ A325 STRUCTURAL NUT
W050A	16	1 1/16 OD x 9/16 ID A325 STR. WASHER

GENERAL NOTES

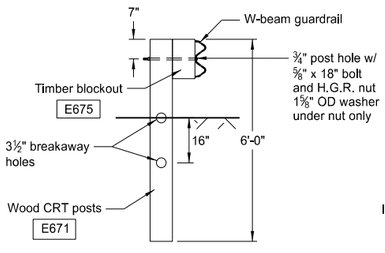
1. Wood posts are required with the Flared Energy Absorbing Terminal except posts #1 and #2.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The lower sections of the posts shall not protrude more than 4 inches above the ground (measured along a 60 inch cord). Site grading may be necessary to meet this requirement.
4. Lower post sections shall not be driven with the upper post attached. If the the post is placed in a drilled hole, the backfill material must be satisfactory compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" diameter post hole 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approximately 2½" deep to provide drainage. The soil tubes shall be field cut to length, placed in the hole and back filled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly shall be taut. A locking device (vice grips or channel lock pliers) should be used to prevent cable from twisting when tightening nuts.
7. The wood blockouts shall be "toe nailed" to the rectangular wood posts to prevent them from turning when wood shrinks. The nail shall be 20 penny and galvanized.
8. The Flared Energy Absorbing Terminal shall be flared only when the approach guardrail is parallel with the roadway. When the approach guardrail is flared at 16:1 to 10:1, the Flared Energy Absorbing Terminal shall have only the flare rate of the guardrail. When the guardrail flare is between 10:1 and 7:1, the Flared Energy Absorbing Terminal shall be turned parallel to the roadway.



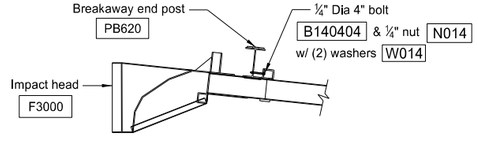
SIDE VIEW



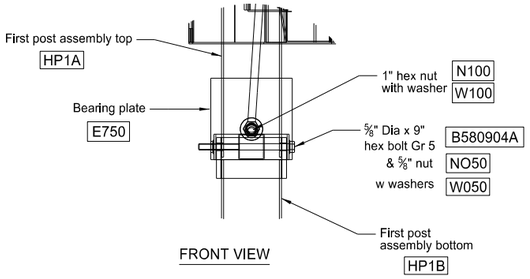
SIDE VIEW DETAIL OF POST #2



SECTION B-B
POST 3 THRU 7

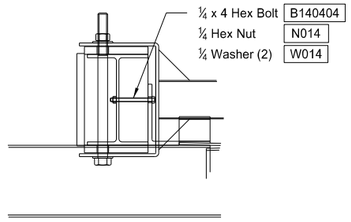


IMPACT HEAD CONNECTING DETAIL

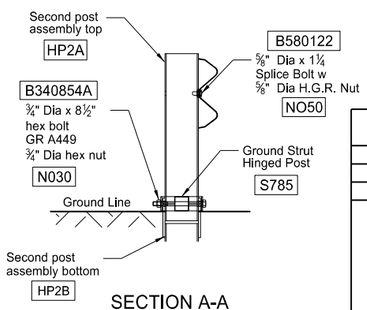


FRONT VIEW

POST #1 CONNECTION DETAILS



IMPACT HEAD CONNECTION DETAIL



SECTION A-A
at Post #2

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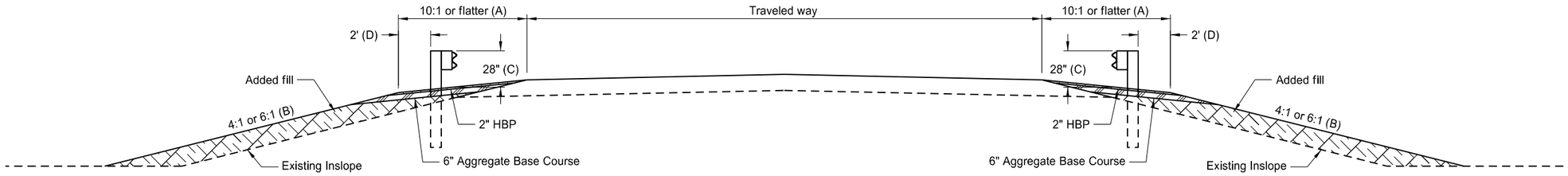
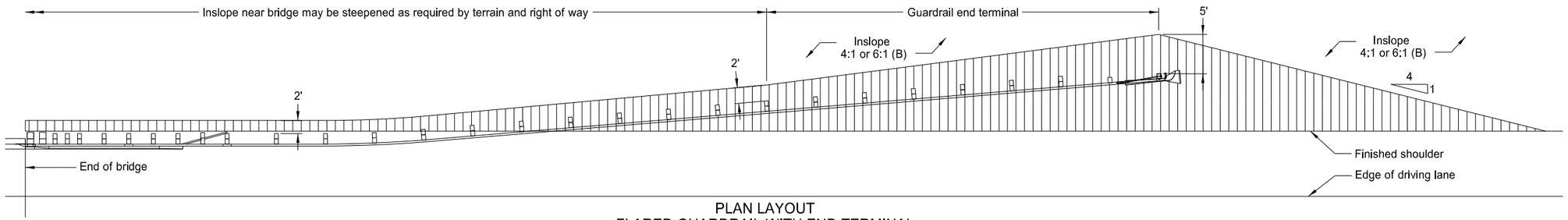
D-764-22

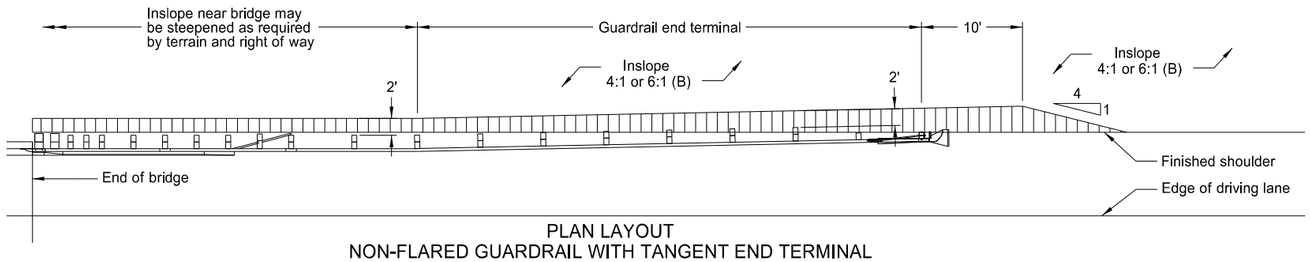
TYPICAL GRADING AT BRIDGE ENDS WITH W-BEAM GUARDRAIL



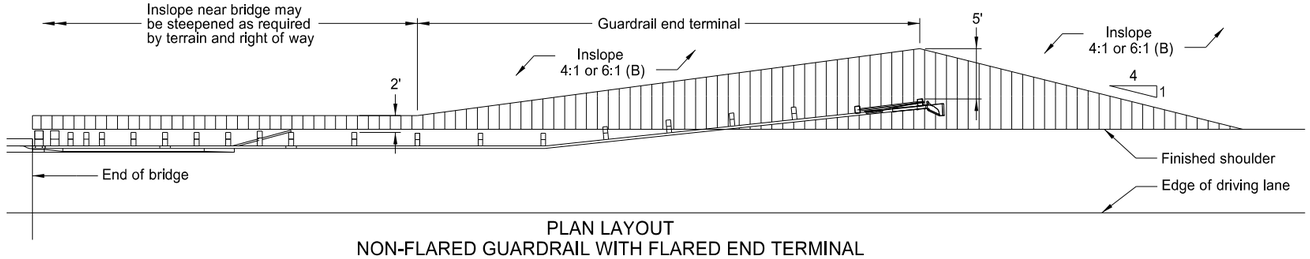
TYPICAL SECTION



PLAN LAYOUT
FLARED GUARDRAIL WITH END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH TANGENT END TERMINAL



PLAN LAYOUT
NON-FLARED GUARDRAIL WITH FLARED END TERMINAL

NOTES:

(A) Slope flatter than 10:1 may be required to provide proper guardrail height.

(B) Where normal inslope is 4:1 the added fill shall be 4:1. Where normal inslope is 6:1 the added fill shall be 6:1.

(C) Measured from top of guardrail to top of surfacing at front face of guardrail.

(D) Dimension at end terminals may vary per Plan Layouts shown on this sheet.

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